ABSTRACT
These teacher and student materials for a
postsecondary-level course in pharmacy comprise one of a number of
military-developed curriculum packages selected for adaptation to
vocational instruction and curriculum development in a civilian
setting. The purpose stated for the 256-hour course is to train
students in the basic technical phases of pharmacy and the minimum
essential knowledge and skills necessary for the compounding and
dispensing of drugs, the economical operation of a pharmacy, and the
proper use of drugs, chemicals, and biological products. The course
consists of three blocks of instruction. Block I contains four
lessons: pharmaceutical calculations I and laboratory, inorganic
chemistry, and organic chemistry. The five lessons in Block II cover
anatomy and physiology, introduction to pharmacology, toxicology,
drug abuse, and pharmaceutical and medicinal agents. Block III
provides five lessons: pharmaceutical calculations I and II,
techniques of pharmaceutical compounding, pharmaceutical dosage
forms, and compounding laboratory. Instructor materials include a
course chart, lesson plans, and a plan of instruction detailing
instructional units, criterion objectives, lesson duration, and
support materials needed. Student materials are eight study guides or
workbooks with exercises and problems, three programed tests, and
seven handouts. Suggested audiovisual aids are not provided. (YLB)

ERIC
Full Text Provided by ERIC

MILITARY CURRICULUM MATERIALS

The military-developed curriculum materials in this course package were selected by the National Center for Research in Vocational Education Military Curriculum Project for dissemination to the six regional Curriculum Coordination Centers and other instructional materials agencies. The purpose of disseminating these courses was to make curriculum materials developed by the military more accessible to vocational educators in the civilian setting.

The course materials were acquired, evaluated by project staff and practitioners in the field, and prepared for dissemination. Materials which were specific to the military were deleted, copyrighted materials were either omitted or approval for their use was obtained. These course packages contain curriculum resource materials which can be adapted to support vocational instruction and curriculum development.

The National Center Mission Statement

The National Center for Research in Vocational Education's mission is to increase the ability of diverse agencies, institutions, and organizations to solve educational problems relating to individual career planning, preparation, and progression. The National Center fulfills its mission by:

- Generating knowledge through research

- Developing educational programs and products

- Evaluating individual program needs and outcomes

- Installing educational programs and products

- Operating information systems and services

- Conducting leadership development and training programs

FOR FURTHER INFORMATION ABOUT
Military Curriculum Materials
WRITE OR CALL
Program Information Office
The National Center for Research in Vocational
Education
The Ohio State University
1960 Kenny Road, Columbus, Ohio 43210
Telephone: 614/486-3655 or Toll Free 800/
848 4815 within the continental U.S.
(except Ohio)

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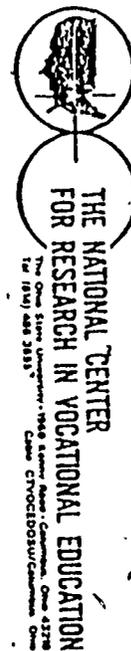
Military Curriculum Materials for Vocational and Technical Education

Information and Field
Services Division

The National Center for Research
in Vocational Education

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Military Curriculum Materials Dissemination Is . . .

an activity to increase the accessibility of military developed curriculum materials to vocational and technical educators.

This project, funded by the U.S. Office of Education, includes the identification and acquisition of curriculum-materials in print form from the Coast Guard, Air Force, Army, Marine Corps and Navy.

Access to military curriculum materials is provided through a "Joint Memorandum of Understanding" between the U.S. Office of Education and the Department of Defense.

The acquired materials are reviewed by staff and subject matter specialists, and courses deemed applicable to vocational and technical education are selected for dissemination.

The National Center for Research in Vocational Education is the U.S. Office of Education's designated representative to acquire the materials and conduct the project activities.

Project Staff:

Wesley E. Budke, Ph D., Director
National Center Clearinghouse

Shirley A. Chase, Ph.D.
Project Director

What Materials Are Available?

One hundred twenty courses on microfiche (thirteen in paper form) and descriptions of each have been provided to the vocational Curriculum Coordination Centers and other instructional materials agencies for dissemination.

Course materials include programmed instruction, curriculum outlines, instructor guides, student workbooks and technical manuals.

The 120 courses represent the following sixteen vocational subject areas:

Agriculture	Food Service
Aviation	Health
Building &	Heating & Air
Construction	Conditioning
Trades	Machine Shop
Clerical	Management &
Occupations	Supervision
Communications	Meteorology &
Drafting	Navigation
Electronics	Photography
Engine Mechanics	Public Service

The number of courses and the subject areas represented will expand as additional materials with application to vocational and technical education are identified and selected for dissemination.

How Can These Materials Be Obtained?

Contact the Curriculum Coordination Center in your region for information on obtaining materials (e.g., availability and cost). They will respond to your request directly or refer you to an instructional materials agency closer to you.

CURRICULUM COORDINATION CENTERS

EAST CENTRAL
Rebecca S. Douglass
Director
100 North First Street
Springfield, IL 62777
217/782-0759

NORTHWEST
William Daniels
Director
Building 17
Airdustrial Park
Olympia, WA 98504
206/753-0879

MIDWEST
Robert Patton
Director
1515 West Sixth Ave.
Stillwater, OK 74704
405/377 2000

SOUTHEAST
James F. Shill, Ph.D.
Director
Mississippi State University
Drawer DX
Mississippi State, MS 39762
601/325-2510

NORTHEAST
Joseph F. Kelly, Ph.D.
Director
225 West State Street
Trenton, NJ 08625
609/292-6562

WESTERN
Lawrence F. H. Zane, Ph.D.
Director
1776 University Ave.
Honolulu, HI 96822
808/948-7834

PHARMACY SPECIALIST

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PHARMACY SPECIALIST

(Table of Contents cont'd)

Developed by
United States Air Force

Development and
Review Dates
July 18, 1975

D.O.T. No.:
074.181

Occupational Area:
Health

Target Audiences:
Grades 13-adult

Print Pages:
748

Cost:

Availability:
Military Curriculum Project, The Center
for Vocational Education, 1960 Kenny
Rd., Columbus, OH 43210

Contents	Type of Materials:	Lesson Plans.	Programmed Text:	Student Workbook No. of pages	Handouts:	Text Materials.	Audio-Visuals:	Instructional Design:	Performance Objectives:	Tests:	Review Exercises:	Additional Materials Required:	Type of Instruction:	Group Instruction:	Individualized:
Block I — Fundamentals of Pharmacy		●	●	148	●	●	★		●	★		★		●	
Block II — Pharmacology		●	●	47	●	●	★		●	★		★		●	
Block III — Pharmaceutical Preparations and Their Manufacture		●		152	●	●	★		●	★		★		●	

★ Materials are recommended but not provided.

Expires July 1, 1978

Course Description

This course trains students in the basic technical phases of pharmacy and the minimum essential knowledge and skills necessary for the compounding and dispensing of drugs, the economical operation of a pharmacy, and the proper use of drugs, chemicals, and biological products. The course consists of three blocks covering 256 hours of instruction.

Block I — *Fundamentals of Pharmacy* contains four lessons involving 64 hours of instruction. One orientation lesson and two lessons on pharmacy administration were deleted because they discuss specific military operations and clinical procedures. The included lesson topics and respective hours follow:

Pharmaceutical Calculations I (18 hours)
Pharmaceutical Calculations I Laboratory (6 hours)
Pharmaceutical Inorganic Chemistry (18 hours)
Pharmaceutical Organic Chemistry (22 hours)

Block II — *Pharmacology* contains five lessons covering 86 hours of instruction. One lesson on the dispensing laboratory was deleted.

Anatomy and Physiology (18 hours)
Introduction to Pharmacology (2 hours)
Toxicology (2 hours)
Drug Abuse (4 hours)
Pharmaceutical and Medicinal Agents (60 hours)

Block III — *Pharmaceutical Preparations and Manufacture* contains five lessons covering 102 hours of instruction.

Pharmaceutical Calculations II (16 hours)
Pharmaceutical Calculations II Laboratory (3 hours)
Techniques of Pharmaceutical Compounding (8 hours)
Pharmaceutical Dosage Forms (34 hours)
Compounding Laboratory (42 hours)

This course contain both teacher and student materials. Printed instructor materials include a course chart, lesson plans for each block of instruction, and a plan of instruction detailing instructional units, criterion objectives, the duration of the lessons, and support materials needed. Student materials provided include four study guide/workbooks, one programmed text and two handouts for Block I, one study guide/workbook, two programmed texts and three handouts for Block II; and three study guide/workbooks and two handouts for Block III.

All text materials are provided for this course. Audiovisuals suggested for use include four slide sets, eight transparency sets, and nine films. The audiovisuals are not provided.

COURSE CHART

NUMBER	POS CODE	DATE
3ABR90530	ARC	3 December 1975

COURSE TITLE
Pharmacy Specialist

ATC OPR AND APPROVAL DATE	CENTER OPR	SUPERSEDES COURSE CHART
SGHE, 3 March 1975	Sheppard/SHCS/MSOXC	3ABR90530, 18 July 1975

DEPARTMENT OPR	APPLICABLE TRAINING STANDARD
Department of Biomedical Sciences	STS 905X0, 28 February 1975

LOCATION OF TRAINING	COURSE SECURITY CLASSIFICATION
Sheppard AFB, Texas 76311	UNCLASSIFIED

INSTRUCTIONAL DESIGN	TARGET READING GRADE LEVEL FOR PREPARATION OF TRAINING LITERATURE
Group/Lock Step	11.3

LENGTH OF TRAINING

(12 Weeks, 0 Days)

	Hours
Technical Training	460
Classroom/Laboratory (C/L)	360
Complementary Technical Training (CTT)	100
Related Training	20
Standard Traffic Safety (AFR 50-24)	12
Local Conditions Course (Course II) (AFR 50-24)	2
Commander's Calls/Briefings	4
End of Course Appointments; Predeparture Safety Briefing (ATCR 127-1)	2
TOTAL	480

REMARKS

Applicable safety is integrated throughout the course.

Effective date: 5 January 1976 with class 760102. All previously enrolled classes will continue to be governed by course chart dated 18 July 1975.

TABLE J - MAJOR ITEMS OF EQUIPMENT

Class A Prescription Balances
Laboratory Magnetic Stirrer - Hot Plate
Filter Tank Unit with Mixer
Water Distilling Apparatus
Suppository Molds
Prescription Bottle Filling Machine
Laminar Flow Station
Typewriters
Prescription Numbering Machines
Prescription Label Imprinter
Tablet-Capsule Counting Machine

ATC FORM 449 DEC 74   REPLACES PREVIOUS EDITIONS AND ATC FORM 449 B, NOV 72

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COURSE CHART – TABLE II – TRAINING CONTENT   3ABR90530

NOTE: Include time spent on technical training (TT) (classroom/laboratory (C/L) and complementary technical training (CTTl)and related training (RT). Exclude time spent on individual assistance (remedial instruction). A single entry of time shown for a unit is C/L time. When a double entry is shown, the second entry is CTT time.

WK OF TNG	HRS PER DAY 1	2	3	4	5	6	7	8
1 2 3 4(2/5)	Course Material - UNCLASSIFIED 122 Hours TT BLOCK I - Fundamentals of Pharmacy Welcome and Orientation (2 hrs); Pharmaceutical Calculations I (18/6 hrs); Pharmaceutical Calculations I Laboratory (6 hrs); Pharmaceutical Inorganic Chemistry (18/3 hrs); Pharmaceutical Organic Chemistry (22/5 hrs); Pharmacy Administration (22/4 hrs); Pharmacy Administration Laboratory (6 hrs); Measurement Test and Test Critique (10 hrs) 104 Hours C/L						14 Hours RT 18 Hours CTT	
4(3/5) 5 6 7 8 9(2/5)	Course Material - UNCLASSIFIED 182 Hours TT BLOCK II - Pharmacology Anatomy and Physiology (18/6 hrs); Introduction to Pharmacology (2/2 hrs); Toxicology (2 hrs); Drug Abuse (4 hrs); Pharmaceutical and Medicinal Agents (60/22 hrs); Dispensing Laboratory (42/14 hrs); Measurement Test and Test Critique (10 hrs) 138 Hours C/L						8 Hours CTT 2 Hours RT 36 Hours CTT 2 Hours RT	
9(4.8/5) 10 11 12	Course Material - UNCLASSIFIED 156 Hours TT BLOCK III - Pharmaceutical Preparations and Their Manufacture Pharmaceutical Calculations II (16/6 hrs); Pharmaceutical Calculations II Laboratory (3/2 hrs); Techniques of Pharmaceutical Compounding (8/2 hrs); Pharmaceutical Dosage Forms (34/12 hrs); Compounding Laboratory (42/16 hrs); Measurement Test and Test Critique (11 hrs); Equipment Turn-In (1 hr); Course Critique (2 hrs); Graduation (1 hr) 118 Hours C/L						38 Hours CTT 2 Hours RT	

ATC FORM 449A   PREVIOUS EDITION OBSOLETE.
APR 73

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PLAN OF INSTRUCTION

(Technical Training)

10-8

PHARMACY SPECIALIST

SHEPPARD TECHNICAL TRAINING CENTER

18 July 1975- Effective 31 July 1975 with Class 750731

DEPARTMENT OF THE AIR FORCE   PLAN OF INSTRUCTION 3ABR90530
School of Health Care Sciences, USAF   (PDS Code ARC)
Sheppard Air Force Base, Texas 76311   18 July 1975

FOREWORD

1. PURPOSE. This plan of instruction prescribes the qualitative requirements for
Course Number 3ABR90530, Pharmacy Specialist, in terms of criterion objectives
presented by units/modules of instruction, and shows duration, correlation with
the training standard, support materials, and instructional guidance. It was
developed under the provisions of ATCR 50-5, Instructional Systems Development, and
ATCR 52-7, Plans of Instruction.

2. COURSE DESCRIPTION. This 12 week technical training course trains airmen to
perform duties prescribed in AFM 39-1 for Pharmacy Specialist, AFSC 90530. It
includes training in the basic technical phases of pharmacy and the minimum essential
knowledge and skills necessary for compounding and dispensing of drugs, the eco-
nomical operation of an Air Force Pharmacy, the proper use of drugs, chemicals, and
biological products of the Federal Catalog of Medical Materiel. In addition,
related training consists of driver education, supplemental military training,
commander's calls/briefing, end of course appointments and a predeparture safety
briefing.

3. EQUIPMENT ALLOWANCE AND AUTHORIZATION. Training equipment required to conduct
this course, and for which accountability must be maintained, is found in the
Report of Medical and Non-Medical In-Use Equipment and is listed under custody
account number 28558B.

   NOTE: Group size is shown in parentheses after equipment listed in column
          3 of numbered pages of this POI.

4. MULTIPLE INSTRUCTOR REQUIREMENTS. Units of instruction which require more
than one instructor per instructional group are identified in the multiple
instructor annex to this POI.

5. REFERENCES. This plan of instruction is based on SPECIALTY TRAINING STANDARD
905X0, 28 February 1975, Change 1, 24 July 1975 and COURSE CHART 18 July 1975.

6. POI OVERLAP DURING PHASE-IN. All classes enrolled prior to 31 July 1975 will
continue to be governed by POI 3ABR90530, 26 June 1974.

FOR THE COMMANDER

LORNE A. DAVIS
Chief, Training Operations Division

Supersedes Plan of Instruction 3ABR90530, 26 June 1974
OPR: Department of Biomedical Sciences
DISTRIBUTION: Listed on Page A.

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MODIFICATIONS

<u>Lesson 1</u> of this publication has (have) been deleted in adopting this material for inclusion in the "Trial Implementation of a Model System to Provide Military Curriculum Materials for Use in Vocational and Technical Education." Deleted material involves extensive use of military forms, procedures, systems, etc. and was not considered appropriate for use in vocational and technical education.

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UNITS OF INSTRUCTION AND CRITERION OBJECTIVES	DURATION (HOURS)	SUPPORT MATERIALS AND GUIDANCE
1	2	3

2. Pharmaceutical Calculations I

Duration: 24 (18/6)

a. Solve problems pertaining to basic mathematical operations, metric system, apothecary system, avoirdupois system, and ratio and proportion. — (10)

b. Solve problems pertaining to conversion of weights and measures, and calculation of doses. — (8)

Column 1 Reference   STS Reference
2a   14a, 14b, 14c, 14d
2b   14a, 14b, 14c, 14d

Instructional Materials
SW 3ABR90530-I-1, Pharmaceutical Calculations I
HO 3ABR90530-I-1 thru 12, Pharmaceutical Calculations-1

Audio Visual Aids
Flip Chart Set, Pharmaceutical Calculations I
Transparency Set, Pharmaceutical Calculations I

Training Methods
Lecture/Discussion (15 hrs)
Demonstration (3 hrs)
Outside Assignments (6 hrs)

Instructional Environment/Design
Classroom (18 hrs)
Home Study (6 hrs)
Group/Lock Step

Instructional Guidance
Discuss and demonstrate Basic Mathematical Operations, Metric System, Apothecary System, Ratio and Proportion. Conduct a two-hour Pharmaceutical Calculations Laboratory (as indicated in Block I, Unit 3) followed by Measurement Test I-1 and Critique. Discuss and demonstrate conversion of weights and measures and calculation of doses. Conduct a four hour Calculations laboratory (as indicated in Block I, Unit 3) and administer Measurement Test I-2 and Critique.

PLAN OF INSTR NO 3ABR90530	DATE 18 JUL 1975	BLOCK NO. I	PAGE NO 2

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PLAN OF INSTRUCTION (Continued)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES 1	DURATION (HOURS) 2	SUPPORT MATERIALS AND GUIDANCE 3
3. Pharmaceutical Calculations I Laboratory	6	**Column 1 Reference** **STS Reference** 3a 14a, 14b, 14c, 14d 3b 14a, 14b, 14c, 14d
a. Given instructor assistance, solve problems in each area in SW 3ABR90530-I-1, with a 60 percent accuracy in Basic Mathematical Operations, Metric System, Apothecary System Avoirdupois System, and Ratio and Proportion.	(2)	**Instructional Materials** SW 3ABR90530-I-1.
b. Given instructor assistance, solve problems in each area in SW 3ABR90530-I-1, with a 60 percent accuracy in conversion of weights and measurements and calculations of doses.	(4)	**Training Methods** Performance (6 hrs) **Instructional Environment/Design** Laboratory (6 hrs) Group/Lock Step **Instructional Guidance** This laboratory will be conducted over subject areas as indicated in Block I, Unit 2.
4. Measurement Test and Test Critique	4	
5. Pharmaceutical Inorganic Chemistry	21 (18/3)	**Column 1 Reference** **STS Reference** 5a 15a, 15b, 15c, 15d, 15e, 15f, 15g, 15h, 15i, 15j, 15k
a. Identify the basic concepts, principles, and definitions of pharmaceutical inorganic chemistry.	(10)	5b 15a, 15b, 15c, 15d, 15e, 15f, 15g, 15h, 15i, 15j, 15k
b. Select the properties of pharmaceutical inorganic chemical elements and compounds.	(6)	5c 15d 5d 15i
c. Given the names of specific inorganic elements, correctly write and balance simple chemical equations. Instructor assistance is permitted.	(1)	**Instructional Materials** WB 3ABR90530-I-1, Fundamentals of Pharmacy HO 3ABR90530-I-13, Pharmaceutical Inorganic Chemistry **Audio Visual Aids**
d. Given the necessary data, correctly calculate the milliequivalent concentration of electrolyte solutions. Instructor assistance is permitted.	(1)	Transparency Set, Pharmaceutical Inorganic Chemistry Unnumbered Film, Explaining Matter: Atoms and Molecules

PLAN OF INSTRUCTION NO 3ABR90530	DATE 18 JUL 1975	BLOCK NO I	PAGE NO 3

ERIC

PLAN OF INSTRUCTION (Continued)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES	DURATION (HOURS) 2	SUPPORT MATERIALS AND GUIDANCE 3
		Training Methods Lecture/Discussion (16 hrs) Performance (2 hrs) Outside Assignments (3 hrs) **Instructional Environment/Design** Classroom (16 hrs) Laboratory (2 hrs) Home Study (3 hrs) Group/Lock Step **Instructional Guidance** Discuss the Basic Concepts, Composition and Properties of Matter; Classification of the Elements, Formulas and Naming Inorganic Compounds Writing and Balancing Equations; Molar and Normal Solutions; Oxygen, Hydrogen, Water and Peroxides, Alkali and Alkaline Earth Metals; Halogens; Sulfur, Nitrogen and Boron; and Miscellaneous Inorganic Elements.
6. Measurement Test and Test-Critique	2	
7. Pharmaceutical Organic Chemistry	27 (22/5)	Column 1 Reference STS Reference 7a 15j, 15k 7b 15j, 15k
a. Identify the basic concepts, principles and definitions of pharmaceutical organic chemistry.	(11)	**Instructional Materials** WB 3ABR90530-1-2, Fundamentals of Pharmacy
b. Select the properties of pharmaceutical organic chemical compounds.	(11)	**Audio Visual Aids** Transparency Set, Pharmaceutical Organic Chemistry Flip Chart Set, Pharmaceutical Organic Chemistry **Training Methods** Lecture/Discussion (22 hrs) Outside Assignments (5 hrs)

PLAN OF INSTRUCTION 3ABR90530	DATE 18 JUL 1975	BLOCK NO I	PAGE NO 4

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UNITS OF INSTRUCTION AND CRITERION OBJECTIVES	DURATION (HOURS)	SUPPORT MATERIALS AND GUIDANCE
1	2	3
		Instructional Environment/Design Classroom (22 hrs) Home Study (5 hrs) Group/Lock Step **Instructional Guidance** Discuss Organic Chemistry; Aliphatic Hydrocarbons, Alcohols, Aldehydes, Ketones and Esthers; Aliphatic Acids, Esthers and Salts; Surfactants, Aromatic Acids and Derivatives, Aliphatic and Aromatic Halogenated Compounds; Amines and Amides; Amino Acids and Proteins, Carbohydrates; Glycosides; Alkaloids; Steroids and Miscellaneous Organic Compounds.
8. Measurement Test and Test Critique	2	

MODIFICATIONS

Lessons 9 +10 of this publication has (have) been deleted in
adapting this material for inclusion in the "Trial Implementation of a
Model System to Provide Military Curriculum Materials for Use in Vocational
and Technical Education." Deleted material involves extensive use of
military forms, procedures, systems, etc. and was not considered appropriate
for use in vocational and technical education.

PLAN OF INSTRUCTION NO 3ABR90530	DATE 1 8 JUL 1975	BLOCK NO I	PAGE NO 5

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PLAN OF INSTRUCTION (Continued)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES	DURATION (HOURS)	SUPPORT MATERIALS AND GUIDANCE
1	2	3
		Instructional Environment/Design Classroom (22 hrs) Home Study (4 hrs) Group/Lock Step **Instructional Guidance** Discuss Pharmacy References, Pharmacy Law, Pharmacy Supply, Prescription Reading and Terminology. Conduct a Pharmacy Administration Laboratory as explained in Block I, Unit 10.

10. <u>Pharmacy Administration Laboratory</u>
 	
 a. Given instructor assistance and placed in the dispensing pharmacy, fill prescriptions and complete ward, bulk compounding and supply forms in accordance with AFM 168-4 for legend and controlled drugs.
	6	**Column 1 Reference** **STS Reference**
		 10a 5a, 5b, 5c, 7b, 7d(2), 7d(3), 7d(4), 7d(5),
		                      7d(7), 7d(8), 7d(9), 7d(10), 8a(3), 9a, 9g,
		                      10b, 11b, 11d, 11f, 11g
		
		 Instructional Materials
		 Extract AFM 168-4, Administration of Medical Activities
		 AF Form 579, Ward Alcohol and Narcotics Register
		 AF Form 582, Pharmacy Stock Record
		 AF Form 781, Multiple Item Prescription
		 AF Form 115a, Register of Control Numbers
		 DD 1348-6, NON-FSN Requisition (Manual)
		 Pharmacy Administration Reference File
		 HO 3ABR90530-I-14, Pharmacy Administration
		
		 Training Equipment
		 Dispensing Pharmacy (7)
		 Typewriter (3)
		 Numbering Machines (7)
		 Prescription Files (7)
		 Telephones (7)
		
		 Training Methods
		 Performance (6 hrs)
		
		 Instructional Environment/Design
		 Laboratory (6 hrs)
		 Group/Lock Step

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PLAN OF INSTRUCTION	COURSE TITLE Pharmacy Specialist

BLOCK TITLE Pharmacology

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES.	DURATION HOURS	SUPPORT MATERIALS AND GUIDANCE
1. Anatomy and Physiology	24 (18/6)	Column 1 Reference STS Reference 1a 16a 1b 16c 1c 16b, 16d
a. Identify the etymology of selected medical terms and choose the meaning of terms, word roots, combining forms, suffixes and prefixes.	(0/6)	1d, 1e, 1f, 1g 16d, 16e 1h 16d, 16e, 16f 1i 16d, 16e
b. Identify selected cells, tissues and glands pertaining to the human body.	(2)	1j 16d, 16e, 16g 1k 16d, 16e 1l 16d, 16e
c. Identify selected basic facts and terms about the skeletal system.	(1)	Instructional Materials PT 3ABR90530-II-1, Prefixes, Roots and Suffixes of Medical Terminology HO 3ABR90530-II-1, Anatomical Drawings SW 3ABR90530-II-1b, Anatomy and Physiology
d. Identify selected basic facts and terms about the muscular system.	(2)	
e. Identify selected basic facts and terms about the nervous system.	(3)	Audio Visual Aids Transparency Set #1, Anatomy and Physiology
f. Identify selected basic facts and terms about the circulatory system.	(2)	Training Equipment American Froshe Anatomical Chart (20) FA Manual (1)
g. Identify selected basic facts and terms about the respiratory system.	(1)	Training Methods Lecture/Discussion (18 hrs) Outside Assignments (6 hrs)
h. Identify selected basic facts and terms about the digestive system.	(2)	Instructional Environment/Design Classroom (18 hrs)
i. Identify selected basic facts and terms about the endocrine system.	(1)	Home Study (6 hrs) Group/Lock Step
j. Identify selected basic facts and terms about the urinary system.	(1)	

PLAN OF INSTRUCTION 3ABR90530	18 JUL 1975	BLOCK NO II	8

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PLAN OF INSTRUCTION (Continued)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES	DURATION (HOURS) 2	SUPPORT MATERIALS AND GUIDANCE 3
k. Identify selected basic facts and terms about the reproductive system.	(1)	**Instructional Guidance** Identify the major organs and describe the functions of each system. Also relate the importance of each system to the body. Have students label parts of the human body in their workbooks.
l. Identify selected basic facts and terms about the eye and ear.	(2)	
2. ✓Introduction to Pharmacology	4 (2/2)	**Column 1 Reference** **STS Reference** 2a 17a, 17b, 17c
a. Identify the basic principles of pharmacology.		**Instructional Materials** WB 3ABR90530-II-1, Pharmacology
		Audio Visual Aids Transparency Set #1, Pharmacology
		Training Methods Lecture/Discussion (2 hrs) Outside Assignments (2 hrs)
		Instructional Environment/Design Classroom (2 hrs) Home Study (2 hrs.) Group/Lock Step
3. ✓Toxicology	2	**Column 1 Reference** **STS Reference** 3a 4d(4), 18a, 18b, 18c, 18d
a. Classify the symptoms of drug toxicity.		**Instructional Materials** WB 3ABR90530-II-1, Pharmacology
		Audio Visual Aids Transparency Set, Toxicology
		Training Methods Lecture/Discussion (2 hrs)

PLAN OF INSTRUCTION NO 3ABR90530	DATE 18 JUL 1975	BLOCK NO II	PAGE NO 9

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES	DURATION (HOURS)	SUPPORT MATERIALS AND GUIDANCE
1	2	3
		Instructional Environment/Design Classroom (2 hrs) Group/Lock Step
4. Drug Abuse a. Describe the drugs subject to abuse and the symptoms of drug abuse.	4	Column 1 Reference STS Reference 4a III Instructional Materials WB 3ABR90530-II-1, Pharmacology Audio Visual Aids Unnumbered Films, Weed; Acid 11:59 - Last Minute to Choose; Speedscene - The Problem of Amphetamine Abuse; The Perfect Drug; Hooks; Drug Abuse Training Methods Lecture/Discussion (4 hrs). Instructional Environment/Design Classroom (4 hrs) Group/Lock Step Instructional Guidance Discuss films with students. Show one of the above which has not been previously shown in basic training.
5. Pharmaceutical and Medicinal Agents a. Classify and describe the properties of locally acting drugs, gastrointestinal drugs, local anesthetics and anti-infective drugs. b. Classify and describe the properties of drugs acting on the central nervous system.	82 (60/22) (18) (10)	Column 1 Reference STS Reference 5a, 5b, 5c 17a, 17b, 17c 5d 17a, 17b, 17c Instructional Materials WB 3ABR90530-II-1, Pharmacology Audio Visual Aids Transparency Sets #2, 3, 4, 5; Pharmacology Commercial Films, The Digestive System; Ascariasis; Fundamentals of the Nervous System; Halothane; Work of the Heart; The Blood; Common Heart Disorders; Congestive Heart Failure; Endocrine System; Menstrual Cycle; Vitamins and Some Deficiency Diseases; Immunization; It's A Plot; Abnormal Behavior

PLAN OF INSTRUCTION (Continued)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES	DURATION (HOURS)	SUPPORT MATERIALS AND GUIDANCE
c. Classify and describe the properties of drugs acting on the autonomic nervous system and circulatory system.	(16)	**Training Methods** Lecture/Discussion (60 hrs) Outside Assignments (22 hrs)
d. Classify and describe the properties of drugs acting on the endocrine system and miscellaneous therapeutic drugs.	(16)	**Instructional Environment/Design** Classroom (60 hrs.) Home Study (22 hrs) Group/Lock Step

Instructional Guidance
Discuss anatomy and physiology of the human body, Introduction to Pharmacology and Toxicology. Administer measurement test II-1. Discuss locally acting drugs, gastrointestinal drugs, local anesthetic drugs and anti-infective drugs. Conduct a 12 hour dispensing laboratory utilizing these drugs as explained in Block II, Unit 6. Administer measurement test II-2 and critique. Discuss drugs acting on the central nervous system. Conduct a 6 hour dispensing laboratory utilizing these drugs as explained in Block II, Unit 6. Administer measurement test II-3. Discuss drugs acting on the autonomic nervous system and circulatory system. Conduct a 12 hour dispensing laboratory utilizing these drugs as explained in Block II, Unit 6. Administer measurement test II-4 and critique. Discuss drugs acting on the endocrine system and miscellaneous therapeutic drugs. Conduct a 12 hour dispensing laboratory utilizing these drugs as explained in Block II, Unit 6. Administer measurement test II-5 and critique.

6. Dispensing Laboratory — 56 (42/14)

a. Given instructor assistance and placed in the dispensing pharmacy (model pharmacy and pharmacology research area), correctly interpret, fill and label prescriptions in accordance with AFM 168-4 and complete handouts for locally acting drugs, gastrointestinal drugs, local anesthetics and anti-infective drugs. — (12)

Column 1 Reference
6a, 6b, 6c

6d

STS Reference
5a, 5b, 5c, 7d(6), 7d(8), 9a, 9g, 10b, 11b, 11d, 11f, 11g, 13a, 13b, 13c, 13h, 13i, 18a, 18c, 18d

6b, 9a, 10b, 11b, 11d, 11f, 11g, 13a, 13b, 13c, 13d, 13i, 18a, 18c, 18d

Instructional Materials
HO 3ABR90530-II-1 thru 7, Pharmacology

PLAN OF INSTRUCTION NO 3ABR90530	DATE 18 JUL 1975	BLOCK NO II	PAGE NO. 11

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PLAN OF INSTRUCTION.	COURSE TITLE Pharmacy Specialist

BLOCK TITLE Pharmaceutical Preparations and Their Manufacture		

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES 1	DURATION (HOURS) 2	SUPPORT MATERIALS AND GUIDANCE 3
1. Pharmaceutical Calculations II a. Solve problems in reducing and enlarging formulas, specific gravity, percentage preparations, concentration and dilution, alligation, and temperature conversion.	20 (16/4)	Column 1 Reference STS Reference 1a 14e, 14f, 14g, 14h, 14i, 14j, 14k Instructional Materials SW 3ABR90530-III-1, Pharmaceutical Preparations HO 3ABR90530-III-1 thru 2, Pharmaceutical Preparations Audio Visual Aids Transparency Set #1, Pharmaceutical Calculations II Training Methods Lecture/Discussion (16 hrs) Outside Assignments (4 hrs) Instructional Environment/Design Classroom (16 hrs) Home Study (4 hrs) Group/Lock Step Instructional Guidance Discuss reducing and enlarging of formulas, specific gravity, percentage preparation, concentration and dilution of stock solutions and stock triturations, alligation, temperature conversion. Conduct a three hour pharmaceutical calculations laboratory (as indicated in Block I, Unit 2) followed by Measurement Test III-1 and Critique.

PLAN OF INSTRUCTION NO. 3ABR90530	DATE 18 JUL 1975	BLOCK NO III	PAGE NO 13

PLAN OF INSTRUCTION (Continued)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES	DURATION (HOURS) 2	SUPPORT MATERIALS AND GUIDANCE 3
2. Pharmaceutical Calculations II Laboratory	3	**Column 1 Reference** **STS Reference** 2a 14e, 14f, 14g, 14h, 14i, 14j, 14k
a. Given information pertaining to reducing and enlarging formulas, specific gravity, percentage preparations, concentration and dilution, alligation, and temperature conversion, solve problems in each area in SW 3ABR90530-III-1 with 60 percent accuracy.		**Instructional Materials** SW 3ABR90530-III-1, Pharmaceutical Preparations
		Audio Visual Aids Transparency Set #2, Pharmaceutical Calculations II
		Training Methods Performance (3 hrs)
		Instructional Environment/Design Laboratory (3 hrs) Group/Lock Step
		Instructional Guidance This laboratory will be conducted over subject areas indicated in Block III Unit 1. All work in SW 3ABR90530-III-1 which is related to POI objective 2a must be completed in class under the supervision of the instructor.
3. Measurement Test and Test Critique	3	
4. Techniques of Pharmaceutical Compounding	.8	**Column 1 Reference** **STS Reference** 4a 12a, 12b, 12g, 19a, 19b, 19c, 19d
a. Identify laboratory equipment, equipment user maintenance procedures, metrology procedures, incompatibilities, and methods of comminution.		**Instructional Materials** WB 3ABR90530-III-2, Pharmaceutical Preparations
		Audio Visual Aids Transparency Set #1, Pharmaceutical Preparations
		Training Methods Lecture/Demonstration (8 hrs)

PLAN OF INSTRUCTION NO 3ABR90530	DATE 18 JUL 1975	BLOCK NO. III	PAGE NO. 14

37.

PLAN OF INSTRUCTION.(Continued)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES	DURATION (HOURS)	SUPPORT MATERIALS AND GUIDANCE
1	2	3

Instructional Environment/Design
Classroom (8 hrs)
Group/Lock Step

Instructional Guidance
Demonstrate and discuss laboratory equipment, metrology, incompatibilities and comminution. Review pertinent forms and emphasize safety procedures.

5. Pharmaceutical Dosage Forms	40 (34/6)	**Column 1 Reference** **STS Reference**
a. Identify the properties, preparation techniques and incompatibilities of waters, spirits, solutions, and syrups.	(4)	5a 12c(1), 12c(2), 12c(3), 12c(4), 12f, 13h, 19a, 19b, 19c, 19d
		5b 12c(5), 12c(6), 12c(7), 12c(8), 12c(9), 12c(10), 12c(11), 12c(12), 12c(13), 12f 13g, 13h, 19a, 19b, 19c, 19d
b. Identify the properties, preparation techniques and incompatibilities of eye, ear and nose preparations, elixirs, tinctures, mixtures, magmas, suspension, gels, lotions, and liniments.	(8)	5c 12c(14), 12c(15), 12c(16), 12c(17), 12c(18), 12c(19), 12c(20), 12f, 13h, 19a, 19b, 19c, 19d
		5d 12f, 13e, 13h, 19a, 19b, 19c, 19d
		5e 3a, 3b
		5f 3c, 3d
c. Identify the properties, preparation techniques and incompatibilities of powders capsules, emulsions, ointments, pastes, creams, and suppositories.	(10)	**Instructional Materials** WB 3ABR90530-III-2, Pharmaceutical Preparations SW 3ABR9XXXX, Communication Security
d. Identify the properties, preparation techniques and incompatibilities of parenterals, bulk compound, prepackaged items and intravenous admixtures.	(12)	**Audio Visual Aids** Slides, Ohio State University Admixture Slides and Cassette Tape

Training Methods Lecture/Discussion (34 hrs) Outside Assignments (6 hrs) |
| e. Identify information as classified, unclassified, of possible intelligence value. Top Secret, Secret, Confidential, or For Official Use Only. | (0/.5) | **Instructional Environment/Design** Classroom (34 hrs) Home Study (6 hrs) Group/Lock Step |

PLAN OF INSTRUCTION NO. 3ABR90530	DATE 18 JUL 1975	BLOCK NO. III	PAGE NO. 15

PLAN OF INSTRUCTION (Continued)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES	DURATION (HOURS) 2	SUPPORT MATERIALS AND GUIDANCE 3
f. Select and recommend mode of transmission dictated by security and expediency required, and observe security precautions involved in communications.	(0/.5)	**Instructional Guidance** Discuss and demonstrate the preparation of waters, spirits, solutions, and syrups. Conduct a compounding laboratory as explained in Block III, Unit 6. Administer Measurement Test III-2 and Critique. Discuss and demonstrate the preparation of eye, ear, and nose preparation, elixirs and tinctures, mixtures, magmas, suspensions, gels, lotions and liniments. Conduct a compounding laboratory as explained in Block III Unit 6. Administer Measurement Test III-3 and Critique. Discuss and demonstrate the preparation of powders, capsules, emulsions, ointments, pastes, creams and suppositories. Conduct a compounding laboratory as explained in Block III, Unit 6. Administer Measurement Test III-4 and Critique. Discuss and demonstrate parenterals, bulk compounding, prepackaging and intravenous admixtures. Conduct a laboratory as explained in Block III, Unit 6. Administer Measurement Test III-5 and Critique. These hours may vary in scheduling due to a lack of availability of equipment.
6. ✓Compounding Laboratory	50 (42/8)	Column 1 Reference
a. Given instructor assistance, necessary references and selected formulas; compound waters, spirits, solutions, and syrups in accordance with AF Form 2380 and AF Form 2381. Then package and label in accordance with AFM 168-4.		6a
b. Given instructor assistance, necessary references and selected formulas; compound ear and nose preparations, elixirs, tinctures, magmas, suspensions, lotions and liniments in accordance with AF Form 2380 and AF Form 2381. Then package and label preparation in accordance with AFM 168-4.	(4)	6b
c. Given instructor assistance, necessary references and selected formulas; compound powders, capsules, emulsions, ointments, creams and suppositories in accordance with AF Form 2380 and AF Form 2381. Then package and label	(10)	6c 6d 6e

STS Reference
6a: 4a, 4b, 4c, 4d(1), 4d(2), 4d(3), 10a, 10b, 10c, 12a, 12b, 12c(1), 12c(2), 12c(3), 12c(4) 12d, 12e, 12f, 12g, 12h, 13a, 13b, 13c, 13d, 13e, 13f, 131, 19a, 19b, 19c, 19d

6b: 4b, 4d(1), 4d(2), 4d(3), 10a, 10b, 10c, 12a, 12b, 12c(5), 12c(6), 12c(7), 12c(10), 12c(12) 12d, 12e, 12f, 12g, 12h, 13a, 13b, 13c, 13d, 13f, 131, 19a, 19b, 19c, 19d

6c: 4d(1), 4d(2), 4d(3), 10a, 10b, 10c, 12a, 12b, 12c(15), 12c(16), 12c(17), 12c(19), 12d, 12e, 12f, 12g, 13a, 13b, 13c, 13d, 13f, 13g, 131, 19a, 19b, 19c, 19d

6d: 4d(1), 4d(2), 4d(3), 10a, 10b, 10c, 12a, 12b, 12f, 12g, 12h, 13a, 13b, 13c, 13e, 13f, 13h, 131, 19a, 19b, 19c, 19d

6e: 4b, 4d(1), 4d(2), 4d(3), 5a, 5b, 5c, 7d(6), 7d(8), 9g, 10a, 10b, 10c, 11b, 11d, 11f, 11g, 12a, 12b, 12c(8), 12c(11), 12c(13), 12d, 12e, 12f, 12g, 12h, 13a, 13b, 13c, 13d, 13f, 13h, 131, 18c, 18d, 19a, 19b, 19c, 19d

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42

PLAN OF INSTRUCTION (Continued)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES	DURATION (HOURS)	SUPPORT MATERIALS AND GUIDANCE
preparations in accordance with AFM 168-4. d. Given instructor assistance, necessary references and selected prescriptions; compound intravenous admixtures, correcting any incompatibilities, using accepted methods and techniques as outlined in checklist 3ABR90530-III-6d. e. Given instructor assistance, rotate through the outpatient, inpatient, supply and administrative work areas of the USAF Regional Hospital Sheppard Pharmacy in accordance with local directives and policies.	(10) (12) (6)	**Instructional Materials** WB 3ABR90530-III-3, Pharmaceutical Preparations Book, <u>The United States Pharmacopeia</u>, Committee of Revision, United States Pharmacopeia Convention Book, <u>National Formulary</u>, National Formulary Board, American Pharmaceutical Association Book, <u>Remington's Pharmaceutical Sciences</u>, Mack Publishing Company **Training Equipment** Compounding laboratory (20) Laboratory equipment (1) Laminar flow hood (7) IV admixture materials (1) Chemicals (1) Class A balances (1) Typewriters (4) Prescriptions (1) Alsop filter-tank unit (20) Tablet counting machine (20) Bottle filling machine (20) Label imprinter (20) **Training Methods** Performance (42 hrs) Outside Assignments (8 hrs) **Instructional Environment/Design** Laboratory (42 hrs) Home Study (8 hrs) Group/Lock Step **Instructional Guidance** Students compound the preparations demonstrated in Block III, Unit 5. Students are placed at work benches and using properly prepared forms in WB 3ABR90530-III-3 with instructor assistance, properly prepare selected formulas. Preparations are carefully checked for quality and correctness. During 3 days of the 12th week, divide the class into three groups. One group will work at the USAF Regional Hospital Sheppard. Two instructors

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PLAN OF INSTRUCTION (Continued)

UNITS OF INSTRUCTION AND CRITERION OBJECTIVES	DURATION (HOURS) 2	SUPPORT MATERIALS AND GUIDANCE
		<u>Instructional Guidance (Cont'd)</u> are required with the group at the Sheppard AFB Hospital since the groups will be working at two different locations within the hospital pharmacy. The second group will participate in the intravenous admixture program. The third group will participate in the incompatibilities laboratory. Rotate each group through each of the areas. Instructors will check and initial AF Form 2380 and AF Form 2381 in WB 3ABR90530-III-3 prior to students starting preparations.
7. Related Training (identified in course chart	22	
8. Measurement Test and Test Critique	8	
9. Equipment Turn-In	1	
10. Course Critique	2	
11. Graduation	1	

PLAN OF INSTRUCTION NO 3ABR90530   DATE 1 8 JUL 1975   BLOCK NO. III   PAGE NO 18

MODIFICATIONS

__Annex 1-5__ of this publication has (have) been deleted in adapting this material for inclusion in the "Trial Implementation of a Model System to Provide Military Curriculum Materials for Use in Vocational and Technical Education." Deleted material involves extensive use of military forms, procedures, systems, etc. and was not considered appropriate for use in vocational and technical education.

Pharmaceutical Calculations I, Block I: Pharmaceutical Calculations
Performance - 2 instructors

The following training method will apply to all performance hours in
pharmaceutical calculations I, block I.

In order for students to achieve the proficiency level required, they must
be able to interpret the problem, select the correct formula and follow
the correct procedures for solving pharmaceutical problems, with instructor
assistance. They must then be able to solve selected problems independently.

Each instructor will work with a group of 10 students. He will lend individual
assistance, make on-the-spot corrections, and determine when the student is
capable of solving the problems independently. Finally, he will administer
an evaluation quiz to determine if the objective has been met.

Week 1, Day 3, Hours 1-2 - Performance - 2 instructors

Week 1, Day 5, Hours 1-4 - Performance - 2 instructors

Pharmaceutical Inorganic Chemistry, Block I: Pharmaceutical Inorganic
Chemistry Performance - 2 instructors

The rationale for multiple instructors and training methods are identical
to that for Pharmaceutical Calculations I, Block I.

Week 2, Day 7, Hours 5-6 - Performance - 2 instructors

Pharmacy Administration, Block I: Pharmacy Administration Laboratory -
Performance - 4 instructors .

To achieve this function, the class is divided into three distinct functional
areas in three separate physical locations. Students rotate through each of
these 3 areas.

The functional areas and instructor requirements are as follows: -

        a. Model Pharmacy - 2 instructors

            1. One instructor inside model pharmacy

            2. One instructor outside model pharmacy

        b. Inpatient Dispensing - 1 instructor

        c. Supply procedures - 1 instructor

Model Pharmacy: Inside instructor assists students in receiving, interpreting,
preparing, labeling, dispensing and filing prescriptions.

Outside instructor functions in the role of physician, patient and evaluator
of final preparations.

Inpatient Dispensing: Instructor assists students in receiving, preparing and
dispensing ward and clinic orders. Involved in maintaining records on Schedule
II controlled drugs, inpatient medication labels, and inspecting ward pharmaceuticals.

Supply Procedures: Instructor assists students in proper methods of inventory-
ing drugs and equipment, procedures for suspending unsuitable items, determining
stock levels, procedures in purchasing nonstock listed medications, receiving
and storing bulk pharmaceuticals, biologicals, narcotics and other controlled
drugs.

Week 4, Day 17, Hours 1-6 - Performance - 4 instructors

Pharmacology, Block II: Pharmacology Performance - 4 instructors

The following training method will apply to all performance hours in pharma-
cology, block II.

After listening to classroom lectures concerning a class of drugs, students
will be divided into 3 separate groups as in the pharmacy administration
laboratory and will perform in the model pharmacy, inpatient dispensing and
supply procedures areas. They will apply all knowledge, procedures and
techniques gained in the course thus far to filling prescriptions and dispensing
actual drugs in the following categories:

    a. Locally-acting drugs

    b. Anti-infective drugs

    c. Drugs acting on the Central Nervous System

    d. Drugs acting on the Autonomic Nervous System

    e. Drugs acting on the Circulatory System

    f. Drugs acting on the Endocrine System

    g. Miscellaneous Therapeutic Drugs

Instructor function in the three performance areas in the same manner as they
do in the performance phase of the Pharmacy Administration laboratory.

Week 6, Day 26, Hours 1-6 Performance - 4 instructors

Week 6, Day 27, Hours 1-6 - Performance - 4 instructors

Week 6, Day 30, Hours 1-6 - Performance - 4 instructors

Week 7, Day 34, Hours 1-6 - Performance - 4 instructors

Week 7, Day 35, Hours 1-6 - Performance - 4 instructors

Week 8, Day 39, Hours 1-6 - Performance - 4 instructors

Week 8, Day 40, Hours 1-6 - Performance - 4 instructors

Pharmaceutical Calculations II, Block III: Pharmaceutical Calculations
Performance - 2 instructors.

The rationale for multiple instructors in this block is identical to that for
Pharmaceutical Calculations, Block I.

Week 9, Day 44, Hours 1-3 - Performance - 2 instructors.

Techniques of Pharmaceutical Compounding, Block III: Techniques of Pharmaceutical compounding performance - 6 instructors

After listening to classroom lectures and demonstration students will be assigned projects to complete at the workbenches involving the principles and techniques of metrology. Close supervision of performance is vital to insuring student proficiency in this very important area. An instructor at each of the 5 work benches is required to enable the continual monitoring of student technique, accuracy and safety practices. The sixth laboratory instructor will serve as primary lecturer, evaluator and coordinator of bench instructors.

Week 10, Day 47, Hours 1-4 - Performance - 6 instructors

Compounding Laboratory, Block III: Compounding Laboratory Performance - 6 instructors.

The following training method will apply to all performance hours in Compounding Laboratory, Block III.

After listening to classroom lectures concerning pharmaceutical dosage forms the students will be placed in the laboratory and compound representative dosage forms. The specialty training standard requires that the students be able to:

a.   Weigh and measure drugs and chemicals

b.   Combine ingredients and prepare dosage forms

c.   Combine and compound stock and extemporaneous preparations

d.   Provide quality control data on manufactured and prepackaged preparations

e.   Identify and correct physical and chemical incompatabilities

f.   Identify toxic dose of ingredients

Students must develop correct compounding techniques as the health and welfare of the patient are at stake. Close supervision of performance is vital to insuring student proficiency in this very important area. An instructor at each of the 5 workbenches is required to enable the continual monitoring of student compound technique, accuracy and safety practices. Specifically, his duties include monitoring:

a.   Compounding technique and accuracy

1.   Selection of proper compounding material

2.   Selection of correct ingredients

3.   Accurate measurement of drugs

4.   Correct order of combining ingredients

5.   Correct packaging and labeling

b.   Safety practices

Annex-8   50

1. Flammable materials

2. Caustic materials

3. Explosive combinations

4. Equipment such as Fisher burners, pipetting techniques and steam baths

The sixth laboratory instructor will serve as primary lecturer, preparation evaluator and coordinator of bench instructors. He will also monitor the use of the controlled substances used in the laboratory.

Week 10, Day 49, Hours 3-6 - Performance - 6 instructors

Week 10, Day 50, Hours 1-6 - Performance - 6 instructors

Week 11, Day 53, Hours 1-6 - Performance - 6 instructors

Week 11, Day 54, Hours 1-4 - Performance - 6 instructors

Field Trip, Intravenous Admixture Performance and Incompatability Research: During the last week of the course, to achieve the criterion objectives, the students are divided into three distinct functional areas in three separate physical locations. Each day a student group rotates through these areas.

The functional areas and instructor requirements are as follows:

    Hospital field trip - 2 instructors
    Incompatability research - 1 instructor
    Intravenous Admixture performance - 3 instructors

Hospital Field Trip: The students will be assigned and rotated through outpatient dispensing, inpatient dispensing, bulk compounding, prepackaging, intravenous admixture, supply and records management areas of the hospital pharmacy by the instructors. The instructors will monitor the students performance in each of these areas. When actively dispensing medication to a patient, the student must be under the direct supervision of an instructor. One instructor will always be present at the dispensing window, the other to monitor the students in the areas mentioned above.

Incompatability research: Instructor assists students in selecting and using correct pharmaceutical reference compendia to determine the correct dosage forms, doses, indications, contraindications, side effects, incompatabilities and drug interactions using a set of selected prescriptions.

Intravenous Admixture Performance: Extremely close supervision of performance is vital to insure student proficiency in this very important area. The group will be subdivided into 3 subgroups. Each subgroup will research the intravenous admixture prescriptions for incompatabilities, properly prepare the I.V. tray, prepare the I.V. admixture, check the I.V. admixture under the light/dark field, check the I.V. tray and label the I.V. admixture. Each subgroup will perform under simulated conditions and actual use of the laminar flow hood. The maximum number of students that can simultaneously use the flow hood is two.

Annex-9

Week 12, Day 57, Hours 1-6 - Performance - 5 instructors
Week 12, Day 58, Hours 1-6 - Performance - 5 instructors
Week 12, Day 59, Hours 1-6 - Performance - 5 instructors

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APPROVAL OFFICE AND DATE	INSTRUCTOR		
MSDB _Wilson_ 8 Nov 74			
COURSE NUMBER 3ABR90530	COURSE TITLE Pharmacy Specialist		
BLOCK NUMBER I	BLOCK TITLE Fundamentals of Pharmacy		
LESSON TITLE Pharmacy Orientation			

	LESSON DURATION		
CLASSROOM / Laboratory 2 / 0	LABORATORY Complementary 0	TOTAL 2 hrs	

	POI REFERENCE		
PAGE NUMBER 1	PAGE DATE 18 July 75	PARAGRAPH 1	

	STS/CTS REFERENCE	
NUMBER STS 905X0	28 Feb 75	

SUPERVISOR APPROVAL			
SIGNATURE	DATE	SIGNATURE	DATE
(signature)	8 Nov 7_		
(signature)	25 April 5		
(signature)	_Mar 1975_		

PRECLASS PREPARATION			
EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
NA	NA	NA	SW3ABR90530-I-1, Course Orientation PT 3ABR90530-II-IA

CRITERION OBJECTIVES AND TEACHING STEPS

1. Course Orientation

   a. Welcome of class and introduction of staff

   b. Overview of course

   c. Course supervisor's briefing

   (Teaching steps listed in Part II)

TC FORM 770
AUG 72

30

LESSON TITLE

Pharmaceutical Calculations I

LESSON DURATION		
CLASSROOM/Laboratory	~~xxxxxxxxxx~~ Complementary	TOTAL
18 hrs/0 hrs	6 8 hrs	24 26 hrs

POI REFERENCE		
PAGE NUMBER	PAGE DATE	PARAGRAPH
2	18 July 75	2a, b

STS/CTS REFERENCE	
NUMBER	
STS 905X0	28 Feb 75

SUPERVISOR APPROVAL			
SIGNATURE	DATE	SIGNATURE	DATE
Ra Eudigeus	3 Sept 7	_R.C. Wegeun_	6 OCT 1975
R.E. Wegeun	1 Mar 5		
R.E. Eudigeus	27 Aug 5		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
NA	NA	NA	Pharmaceutical Calculation - 1 Flip Chart Set Pharmaceutical Calculations Transparency Set SW3ABR90530-I-1, Fundamentals of Pharmacy WS1-1 Reduce all Fractions

CRITERION OBJECTIVES AND TEACHING STEPS

2a. Solve problems pertaining to basic mathematical operations, metric system, apothecary system, avoirdupois system, and ratio and proportion.

2b. Solve problems pertaining to conversion of weights and measures, and calculation of doses.

(Teaching steps listed in Part II)

ATC FORM 770

GPO 1072779-386/23

APPROVAL OFFICE AND DATE	INSTRUCTOR	
MSDB *Wilson 3 Sept 74*		
COURSE NUMBER 3ABR90530	**COURSE TITLE** Pharmacy Specialist	
BLOCK NUMBER I	**BLOCK TITLE** Fundamentals of Pharmacy	

LESSON TITLE
Pharmaceutical Calculations I Laboratory

	LESSON DURATION	
CLASSROOM/Laboratory 0 hrs/6 hrs	~~xxxxxxxxx~~ Complementary 0 hrs	TOTAL 6 hrs

POI REFERENCE

PAGE NUMBER 3	PAGE DATE 18 July 75	PARAGRAPH 3a, b,

STS/CTS REFERENCE

NUMBER STS 905X0	28 Feb 75

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE
Rox Budgeur	3 Sept 74	*Sk C. Wegeur*	6 Oct 1975
Rox Budgeur	3 Mar 5		
Rox Budgeur	2 Aug 5		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
NA	NA	NA	SW3ABR90530-I-1

CRITERION OBJECTIVES AND TEACHING STEPS

3a. Given instructor assistance, solve problems in each each in SW3ABR90530-I-1, with a 60% accuracy in Basic Mathematical Operations, Metric System, Apothecary System, Avoirdupois System, and Ration and Proportion.

3b. Given instructor assistance, solve problems in each area in SW3ABR90530-I-1, with a 60% accuracy in conversion of weights and measurements and calculation of doses.

(Teaching steps listed in Part II)

GPO. 1372 779-196/83

APPROVAL OFFICE AND DATE	INSTRUCTOR		
MSDB *Wilson 3 Sept 74*			

COURSE NUMBER	COURSE TITLE
3ABR90530	Pharmacy Specialist

BLOCK NUMBER	BLOCK TITLE
I	Fundamentals of Pharmacy

LESSON TITLE

Pharmaceutical Inorganic Chemistry

LESSON DURATION

CLASSROOM / Laboratory	~~xxxxxxxxxx~~ Complementary	TOTAL
16 hrs /2 hrs	6 hrs	24

POI REFERENCE

PAGE NUMBER	PAGE D---	PARAGRAPH
3	18 July 75	5

STS/CTS REFERENCE

NUMBER	
STS 905X0	28 Feb 75

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE
[signature]	3 SEPT 7	*[signature]*	6 OCT 1975
[signature]	1 Mar 3		
[signature]	27 Aug 5		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
NA	NA	NA	SW3ABR90530-1-1-Fundamentals of Pharmacy Transparency Set Pharmaceutical Inorganic Chemistry Unnumbered Film Explaining Matter, Atoms and Molecules

CRITERION OBJECTIVES AND TEACHING STEPS

5a. Identify the basic concepts, principles, and definitions of pharmaceutical inorganic chemistry.

b. Select the properties of pharmaceutical inorganic chemical elements and compounds.

c. Given the names of specific inorganic elements, correctly write and balance simple chemical equations. Instructor assistance is permitted.

d. Given the necessary data, correctly calculate the milliequivalent concentration of electrolyte solutions. Instructor assistance is permitted.

(Teaching steps   II)

LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE	INSTRUCTOR
MSDB Wilson 26 Sept 74	

COURSE NUMBER	COURSE TITLE
3ABR90530	Pharmacy Specialist

BLOCK NUMBER	BLOCK TITLE
1	Fundamentals of Pharmacy

LESSON TITLE
Pharmaceutical Organic Chemistry

LESSON DURATION

CLASSROOM / Laboratory	XXXXXXXX Complementary	TOTAL
22 hrs/0 hrs	5 hrs	27 hrs

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
4	18 July 75	7

STS/CTS REFERENCE

NUMBER	
STS 905X0	28 Feb 75

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE
	27 Sept 4		
	27 Mar 7		
	12 Sept 7		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
NA	NA	NA	WB 3ABR90530-I-2 Fundamentals of Pharmacy Transparency Set Pharmaceutical Organic Chemistry Flip Chart Set, Pharmaceutical Organic Chemistry

CRITERION OBJECTIVES AND TEACHING STEPS

7a. Identify the basic concepts, principles, and definitions of pharmaceutical organic chemistry.

b. Select the properties of pharmaceutical organic chemical compounds.

(Teaching steps listed in Part II)

ATC FORM 770

WORKSHEETS AND HANDOUTS - BLOCK I

COURSE 10-8

3ABR90530 Pharm Cal-I   Worksheet 3ABR90530-I-1

1. Add: 5/6 + 1/2 + 1/6 + 1/3   Answer _____

2. Add: 3/8 + 5/7 + 1 1/2 + 2 3/4   Answer _____

3. Subtract: 3/7 from 5/6   Answer _____

4. Subtract: 1 5/16 from 5 6/24   Answer _____

5. Multiply: 5/8 x 6/30   Answer _____

6. Multiply: 3/8 x 4/9 x 8/15   Answer _____

7. Divide: 5/16 by 7/8   Answer _____

8. Divide: 1 6/7 by 1 3/5   Answer _____

9. Convert 5/9 to a decimal fraction   Answer _____

10. Convert 1 3/16 to a decimal fraction Answer _____

11. Convert .135 to a simple fraction   Answer _____

12. Convert .625 to a simple fraction   Answer _____

13. Add: 1.35 + .697 + .573 + 3.2153   Answer _____

14. Add 6.3 + 9.721 + .611 + .0035   Answer _____

15. Subtract .037 from 1.67   Answer _____

16. Subtract 5.335 from 10.224   Answer _____

17. Multiply 103.65 x 15.11   Answer _____

18. Multiply 19.66 x 5.25   Answer _____

19. Divide 103.6 by 7.5   Answer _____

20. Divide 6.3 by .773   Answer _____

21. Given $X = y/z$ solve for y answer _____

22. Given $12 = 15/A$ solve for A answer _____

23. Write the following in Arabic Numbers:

    MCDLXI   = _____
    XXIV   = _____
    MMXX   = _____
    LXXIV   = _____
    CCXVII   = _____

24. Write the following in Roman Numerals:

    635   = _____
    37   = _____
    1974 = _____
    338   = _____
    99   = _____

59

1. Add: $6/4 + 13/15 + 1/9 + 4/8$ Answer _____

2. Add: $2/3 + 14/16 + 1 5/6 + 5 5/16$ Answer _____

3. Subtract: $1/3$ from $14/15$ Answer _____

4. Subtract: $1 3/8$ from $5 7/14$ Answer _____

5. Multiply: $6/10 \times 5/14$ Answer _____

6. Multiply: $1 3/5 \times 15/16 \times 6/9$ Answer _____

7. Divide: $5/6 \div 1/12$ Answer _____

8. Divide: $1 3/5 \div 4/7$ Answer _____

9. Convert $5/8$ to a decimal fraction   Answer _____

10. Convert $3 9/16$ to a decimal fraction   Answer _____

11. Convert $.035$ to a simple fraction   Answer _____

12. Convert $.655$ to a simple fraction   Answer _____

13. Add: $135.606 + .039 + 1.776 + 66.66$ Answer _____

14. Add: $27.005 + 1.375 + 10.6 + 1.396$ Answer _____

15. Subtract: 1.567 from 3.01 Answer _____

16. Subtract: $.036$ from 1.0066 Answer _____

17. Multiply: $9.66 \times .75$ Answer _____

18. Multiply: $.035 \times 6.69$ Answer _____

19. Divide: $10.5 \div 5.35$ Answer _____

20. Divide: $.776 \div 1.359$ Answer _____

21. Given $C = A/B$ Solve for B   Answer _____

22. Given $9 = 12/x$ Solve for x   Answer _____

23. Write the following in Arabic Numbers:

   MMMCDXLVI $=$ _____

   XXXVIII $=$ _____

   MCCLIX $=$ _____

   DCCXXXII $=$ _____

   MCMXL $=$ _____

24. Write the following in Roman Numerals:

   765       $=$ _____   999 $=$ _____

   3655 $=$ _____   36 $=$ _____

   75        $=$ _____

1. Add: 5/14 + 6/7 + 1/8 + 3/28   Answer _____

2. Add: 3/8 + 5/16 + 3 4/7 + 1/6   Answer _____

3. Subtract: 1/3 from 6/13   Answer _____

4. Subtract: 5/8 from 1 6/7   Answer _____

5. Multiply: 3/7 x 1 3/5   Answer _____

6. Multiply: 1 7/8 x 3/5 x 9/12   Answer _____

7. Divide: 6/7 ÷ 9/21   Answer _____

8. Divide: 1/8 ÷ 3 5/16   Answer _____

9. Convert: 7/8 to a decimal fraction   Answer _____

10. Convert: 12/13 to a decimal fraction   Answer _____

11. Convert: .325 to a simple fraction   Answer _____

12. Convert: .777 to a simple fraction   Answer _____

13. Add: 5.037 + 1.798 + .555 + 10.003   Answer _____

14. Add: 20.1 + 15.09 + 9.667 + 1.0037   Answer _____

15. Subtract: 10.77 from 11.035   Answer _____

16. Subtract: .097 from 1.01   Answer _____

17. Multiply: 9.73 x 10.11   Answer _____

18. Multiply: 1.07 x 6.735.   Answer _____

19. Divide: 1.395 ÷ 16.711   Answer _____

20. Divide: 19.01 ÷ 16.335   Answer _____

21. Given Z/P = W Solve for Z   Answer _____

22. Given 15/T = 21 Solve for T   Answer _____

23. Write the following in Arabic Numbers:

    MCMLXXVII   = _____   CDXIV   = _____

        XLVI   = _____   LV   = _____

      MMMCXI   = _____

24. Write the following in Roman Numerals:

    125   = _____   1965   = _____

    37   = _____   91   = _____

    1333   = _____

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PHARMACEUTICAL CALCULATIONS - I

1. Change the following to milligrams:

    a. 39.1 Gm

    b. 125 Hg

    c. .035 Mcg

    d. .01 cg

    e. .075 Gm

2. Change the following to liters

    a. 35 Kl

    b. 1.07 Dl

    c. .03 dl

    d. 19.77 mcl

    e. .03 cl

3. Add: 1.25 dl + 12L = 13 Kl + 125 mcl + 25 cl - express in ml.

4. Add: 25 M + 1.07 mm + 120 cm + .005 Hm - express in dm.

5. Subtract: 1.25 dg from .01 Hg - express in Gm.

6. Subtract: .035 dl from 250 L - express in L.

7. Multiply: 25 ml x 50   Answer _____

8. Multiply: 115 x .01 cg   Answer _____

9. Restate to a lower denomination in the apothecary system.

    a. Reduce 1℈, 3 fl℥, 6 fl℈ to mx

    b. Reduce 1℔, 10℥ to ℨ

    c. Reduce 4c, 2 qt, 1℈ to fl℥

10. Restate to a higher denomination in the apothecary system.

    a. 3985 gr

    b. 10,125 gr

    c. 61,955 mx

This supersedes WS 3ABR90530-I-4

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11. Add: 1c, 3 qt, 2 fl℥, 40 mx + 2c, 3 qt, 6 fl℥, 20 mx

12. Add: 3c, 1 qt, 1θ, 12 fl℥ + 1 c, 3 qt, 1θ, 4fl℥, 6 fl℥

13. Subtract: 3c, 1 qt, 1θ, 14 fl℥, 6 fl℥, - 3 qt, 2 fl℥, 7 fl℥, 20 mx

14. Subtract: 1 c, 2 qt, 1θ, 7 fl℥, 6 fl℥ - 3 qt, 1θ, 8 fl℥, 2 fl℥

15. Restate to a lower denomination in the Avoirdupois System.

    a. 2 lb, 5 oz, 400 gr to gr

    b. 1 lb, 12 oz, 125 gr to gr

    c. 6 lb, 218.75 gr to oz

16. Restate to a higher denomination in the Avoirdupois System.

    a. 6735 gr

    b. 8927 gr

    c. 1225 gr

17. 6 lb of tomatoes cost $1.25. How many pounds can you buy for $6.00?

18. 3 fl℥ of a preparation contains 6 Gm of active ingredient. How much would be needed to prepare 14 fl℥ of the preparation?

19. A pharmacist has 3 ℔ of medication. How many 3 gr tablets can be prepared from the total?

20. You have $1.50. How many Gm's can you buy if 6 Gm cost $10.00?

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1. Change the following to milliliters:

   45.6 L
   625 Hl
   9.01 mcl
   .005 cl
   1,025.6 L

2. Change the following to meters:

   27 Km
   16.3 Dm
   .012 dm
   21.035 mcm
   5,033.635 cm

3. Add: 15.03 dl + 1.03 L + 1.077 Kl + 1.0011 mcl + 303 Hl
   (express in ml).

4. Add: 6.6 M + 103.6 mm + .967 cm + .005 Hm (express in dm).

5. Subtract: 9.999 dg from 10 Hg (express in grams).

6. Subtract: 103,596 ml from .9 Kl (express in L).

7. Multiply: 37.5 x 66 ml   Answer _____ L

8. Multiply: 113.6 x 1.01 cg   Answer _____ Cm

9. Restate to a lower denomination in the Apothecary System:

   a. Reduce 1c, 10, 5 fl℥, 6 fl℥ to mx
   b. Reduce 2℔ 9℥, to ℥
   c. Reduce 3 qt, 10, 6 fl℥ to fl℥

10. Restate to a higher denomination in the Apothecary System.

    a. 2375 gr
    b. 16,125 gr
    c. 60,655 mx

11. Add: 2c, 2 qt, 6 fl℥; 25 mx + 1 c, 1 qt, 8 fl℥, 20 mx

12. Add: 1℔, 10℥, 5℥, 1℈, 10 gr + 3℔, 1℥, 5℥, 2℈ 10 gr.

13. Subtract: 4 c, 2 qt, 14 fl℥, 5 fl℥ - 3 qt, 1 fl℥, 5 fl℥, 20 mx.

14. Subtract: 2℔, 11℥, 6℥, 2℈, 10 gr - 1℔, 7℥, 1℈., 15 gr.

15. Restate to a lower denomination in the Avoirdupois System.

    a. 3 lb, 10 oz, 250 gr to gr
    b. 1 lb, 13 oz, 425 gr to gr
    c. 4 lb, 218.75 gr to oz

16. Restate to a higher denomination in the Avoirdupois System.

    a. 5355 gr
    b. 8525 gr
    c. 14,437.5 gr

17. 1 lb of oranges cost $2.50. How many pounds can you buy for $1.75?

18. 5 fl ℨ of a preparation contains 3 gm of active ingredient. How many gm of active ingredient would be needed to prepare 12 fl of the preparation?

19. A pharmacist has 4 lb of medication. How many 2 gr tablets can be prepared from the total?

20. You have $2.25. How many Gm can you buy if 6 Gm cost $25.00?

1. Change the following to millimeters:

   65.5 M
   427 Hm
   10.13 mcm
   .015 cm
   4,326 .1 M

2. Change the following to grams:

   13 Kg
   21.05 Dg
   .137 dg
   36.755 mcg
   7,036.111 cg

3. Add: 11.6 dm + .137 M + 12.66 Km + 125.1 mcm + 325 M (express in mm).

4. Add: 7.7 L + 125.6 ml + .037 cl + .0777 Kl (Express in dl).

5. Subtract: 625 ml from 1 L (express in liters).

6. Subtract: 253.6 L from 33.36 Hl (express in ml).

7. Multiply: 33.1 cl x .426 (express in L).

8. Multiply: .6.113 x 25 mg (express in Gm).

9. Restate to a lower denomination in the Apothecary System.

   a. Reduce 1 c, 2 qt, 1 O, 12 fl℥ , 6 fl℥ to mx.
   b. Reduce 1℔ , 6 ℥ , 6 ℥ , 1℈ , 11 gr to gr
   c. Reduce 1 qt, 1O, 11 fl℥ , to fl℥

10. Restate to a higher denomination in the Apothecary System.

    a. 5476 gr
    b. 8995 gr
    c. 10125 mx

11. Add: 3c, 3 qt, 10 fl℥ , 3 fl℥ , 25 mx + 1 qt, 6 fl℥ , 5 fl℥ , 35 mx.

12. Add: 2℔ , 11℥ , 5℥ , 2℈ , 10 gr + 2℔ , 1℥ , 3℥ , 1℈ , 10 gr.

13. Subtract: 2c, 1O, 5 fl℥ , 1 fl℥ , 3 mx - 1 c, 2 qt, 7 fl℥ , 2 fl℥ .

14. Subtract: 4℔ , 5℥ , 2℥ , 1℈ , 11 gr - 1℔ , 11℥ , 7℥ ,
    2℈ , 10 gr.

15. Restate to a lower denomination in the Avoirdupois System.

    a. 2 lb, 12 oz, 235 gr to gr
    b. 1 lb, 10 oz, 10 gr to gr
    c. 1 lb, 218.75 gr to oz

16. Restate to a higher denomination in the Avoirdupois System:

   a. 6125 gr
   b. 10666 gr
   c. 13,125 gr

17. 5 lb of peaches cost $10.25. How many pounds can you buy for $3.25?

18. .7 fl ℨ of a prescription contains 3 Gm of active ingredient. How many Gm of active ingredient would be needed to prepare 16 fl ℨ of the preparation?

19. A pharmacist has 5 lb of medication. How many 4 gr tablets can be prepared from the total?

20. You have $2.25. How many meters can you buy if 3 meters cost $15.35?

PHARMACEUTICAL CALCULATIONS I

1. Convert 6 fl ℥ to ml.

2. Convert 15 Gm to gr.

3. Convert 250 ml to fl ℥.

4. Convert 1 fl ℥ 20 mx to ml.

5. If a mixture weighing 30 Gm is divided into 100 dosage forms, how many grains will each dose weigh?

6. Convert each of the following to the Metric System: ml or mg

    a. 1/60 gr

    b. 2 fl

    c. 3/8 gr

    d. 30 mx

    e. 1/200 gr

7. Convert each of the following to the Apothecaries unit: ℥ or fl ℥

    a. .150 ml

    b. 0.3 ml

    c. .001 Gm

    d. 065. mg

8. A certain drug is available in 15, 25 and 30 mg tablets. Express these amounts in Apothecaries system. (gr)

9. Convert 50 micrograms to grains.

10. If 2 fl ℥ of a solution contain 7 1/2 gr of a chemical, how many grams would be contained in 125 ml of solution?

11. If a chemical costs $3.50 a pound (AV) what is the cost of 15 Gm?

12. How many 6.5 mg tablets can be obtained from ℥ ss of a chemical?

This supersedes WS 3ABR90530-I-7

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13. A prescription calls for 4/5 gr of Atropine Sulfate to be divided into 80 doses. How many milligrams will each dose weigh?

14. In the compounding of a prescription a pharmacist used 1/4 gr of Atropine Sulfate. How many 0.000325 Gm doses were prescribed on the prescription?

15. A certain elixir contains 0.325 Gm of Potassium Thiocyanate per fl ℥. At $1.75 per pound, what is the cost of the Potassium Thiocyanate required to make 1 gallon of the elixir?

16. A formula for a cough syrup calls for 1/8 gr of Codeine Phosphate per fl ℥. How many Gm of Codeine Phosphate should be used in preparing one pint of the cough syrup?

17. A prescription calls for 2 grains of Ephedrine Bitartrate. If 1 Gm of Ephedrine Bitartrate cost $2.00, what is the cost of the amount needed in the prescription?

18. Convert 2 c, 3 qt, 1 θ to ml.

19. Convert 1 lb, 3 oz to mg.

20. Convert 15 Gm to oz.

2

1. Convert 8 fl ʒ to ml.

2. Convert 21 Gm to gr.

3. Convert 350 ml to fl ʒ.

4. Convert 5 fl ʒ 15 mx to ml.

5. If a mixture weighing 15 Gm is divided into 50 dosage forms, how many grains will each weigh?

6. Convert each of the following to the Metric System: ml or mg

   a. 1/15 gr
   b. 5 fl ʒ
   c. 6/7 gr
   d. 15 mx
   e. 125 ʒ

7. Convert each of the following to the Apothecaries units: ʒ or fʒ.

   a. 125 ml
   b. 015. ml
   c. 01.5 Gm
   d. 135. mg

8. A certain drug is available in 20, 30, and 40 mg tablets. Express these amounts in Apothecaries system. (gr)

9. Convert 25 micrograms to grains.

10. If 3 fl ʒ of a solution contains 10 gr of a chemical, how many grams would be contained in 125 ml of solution?

11. If a chemical cost $2.75 a pound (AV), what is the cost of 7 Gm?

12. How many 6.5 mg tablets can be obtained from ʒ ss of a chemical?

13. A prescription calls for 1 1/4 gr of atrophine sulfate to be divided into 80 doses. How many milligrams will each dose weigh?

14. In the compounding of a prescription a pharmacist used 1/2 gr of atropine sulfate. How many 0.000650 Gm doses were prescribed on the prescription?

15. A certain elixir contains 0.125 Gm of potassium thiocyanate per fl ʒ. At $1.75 per pound, what is the cost of the potassium thiocyanate required to make 1 gallon of the elixir?

16. A formula for a cough syrup calls for 1/4 gr of codeine phosphate per fl ʒ. How many Gm of codeine phosphate should be used in preparing 1 qt of the cough syrup?

17. A prescription calls for 4 grains of ephedrine bitartrate. If
    2 Gm of ephedrine bitartrate cost $4.00, what is the cost of the
    amount needed in the prescription?

18. Convert 3 c, 1 qt, 1 ℧ to ml.

19. Convert 5 lb, 11 oz to mg.

20. Convert 350 Gm to oz.

2.

1. Convert 11 Fl ʒ to ml.

2. Convert 35 Gm to gr.

3. Convert 275 ml to fl ʒ.

4. Convert 5 fl ʒ 20 mx to ml.

5. If a mixture weighing 10 Gm is divided into 25 dosage forms, how many grains will each dose weigh?

6. Convert each of the following to the Metric System. ml or mg

    a. 1/20 gr
    b. 7 fl
    c. 5/7 gr
    d. 26 mx
    e. 35

7. Convert each of the following to the Apothecaries Units. ʒ or fʒ

    a. 75 ml
    b. 0.25 ml
    c. .025 Gm
    d. 205. mg

8. A certain drug is available in 5, 10 & 15 mg tablets. Express these amounts in apothecaries system. (gr)

9. Convert 10 micrograms to grains.

10. If 5 fl ʒ of a solution contains 9 gr of a chemical, how many grams would be contained in 100 ml of solution?

11. If a chemical cost $1.50 a pound (AV), what is the cost of 3.5 Gm?

12. How many 13 mg tablets can be obtained from ʒii of a chemical?

13. A prescription calls for 3/5 gr of atropine sulfate to be divided into 60 doses. How many milligrams will each dose weigh?

14. In the compounding of a prescription a pharmacist used 1/8 gr of atropine sulfate. How many 0.000325 Gm doses were prescribed on the prescription?

15. A certain elixir contains 0.275 Gm of potassium thiocyanate per fl ʒii. At $1.75 per pound, what is the cost of the potassium thiocyanate required to make 1 gallom of the elixir?

16. A formula for a cough syrup calls for 1/2 gr of codeine phosphate per fl ʒ i. How many Gm of codeine phosphate should be used in preparing 1 gallon of the cough syrup?

17. A prescription calls for 1 grain of ephedrine bitartrate. If 1/2 Gm of ephedrine bitartrate costs $1.50 what is the cost of the ephedrine bitartrate needed in the prescription?

18. Convert 1 c, 3 qt, 1 ℥, 5 fl ʒ to ml.

19. Convert 6 lb, 6 oz to mg.

20. Convert 225 Gm to oz.

1. A certain elixir contains 0.325 Gm of Potassium Thiocyanate per 1 f.℥. At $1.75 per pound (Avoir), what is the cost of the potassium thio-cyanate required to make 1 gallon of the elixir?

2. A formula for a cough syrup calls for 1/8 gr of codeine phosphate per 1 f℥. How many grams of codeine phosphate should be used in preparing one pint of the cough syrup?

3. If the cost of 10 Gm of merbromin is $1.25, what is the cost of 4 1/2 gr?

4. Convert 3 gal, 1 pt, 10 f℥ to milliliters.

5. If a preparation contains 5 Gm of a drug in 500 ml, how many Gm are contained in each tablespoonful dose?

6. How many grams of a chemical are required to make 120 ml of a solution, each teaspoonful of which will contain 3 mg of the chemical?

7. How many 15 minimum doses are contained in 60 ml of a tincture?

8. If the dose of a drug is 1/16 gr, how many doses are contained in 1℥?

9. If a medicine is to be taken three times daily, and if 180 ml are to be taken in four days, how many tablespoonfuls should be prescribed for each dose?

10. How many teaspoonfuls per dose must be taken if 8 f℥ of a medicine are to be taken three times a day for eight days?

11. What is the dosage in teaspoonfuls if 240 ml of a medicine contain 48 doses?

12. If a prescription contains 0.24 Gm of codeine phosphate in 120 mi, how much is contained in each teaspoonful dose?

13. How many grains of a chemical are contained in each capsule if a mixture containing 1 1/4 gr of the chemical is divided into 30 capsules?

14. If 180 ml of a cough mixture contain 3/4 gr of Dilaudid, how much is contained in 1 teaspoonful of the mixture?

15. How many grams of a chemical are required to make 120 ml of a mixture each teaspoonful of which is to contain 2.5 mg?

16. Rx Codeine Phosphate   0.24 Gm
        Sodium Citrate   4.0 Gm
        Chloroform   0.5 ml
        Tolu Syrup Qsad   120.0 ml

    Sig: Fl ℥i
    How many mg of codeine phosphate and how much chloroform are contained in each dose?

7-1

17. Rx Phenobarbital   0.6 mg
         Belladonna Tinc   12.0 ml
         Peppermint Water
                    Qsad   120.0 ml
     Sig: 1 tsp T.I.D.
     how much phenobarbital & how much Belladonna Tincture will be
     contained in each dose?

18. A powder is divided into 36 capsules. If each capsule contains 0.5
     mg of one ingredient, 15 mg of a second, and enough of a third to make
     0.300 Gm, how much of each was there in the original powder?

19. A solution contains 30 mg of a chemical per 120 ml and has a dose
     of 10 drops. If the dispensing dropper calibrates 25 drops per ml,
     how many mcg of the chemical are contained in each dose?

20. The dose of a drug is 5 mg per kilogram of body weight. How many
     grams should be given to a child weighing 55 lb?

21. The usual rectal dose of tribromoethanol is 0.06 ml for each kilogram
     of body weight. How many milliliters should be given to a person
     weighing 150 lb?

22. If the usual adult dose of a drug is 324 mg, what is the dose for a
     child 6 years old?

23. If the usual adult dose of a drug is 5 ml, what is the dose in fl ʒ
     of a child 4 years old?

24. If the usual adult dose is 6 fl ʒ, what is the dose, in milliliters,
     for a child weighing 75 lbs?

25. The usual adult dose of Benadryl Elixir is 2 tablespoonfuls, what is
     the dose in milliliters for a child weighing 120 lbs?

PHARMACEUTICAL CALCULATIONS I

1. A certain elixir contains 0.225 Gm of Potassium Thiocyanate per fl℥i. At $1.75 per pound (AV), what is the cost of the Potassium Thiocyanate required to make 1 gallon of the elixir?

2. A formula for cough syrup calls for 1/4 gr of Codeine Phosphate per fl℥ii. How many Gm of Codeine Phosphate should be used in preparing one pint of the cough syrup?

3. If the cost of 15 Gm of Merbromin is $1.50, what is the cost of 5 gr?

4. Convert 1 gal, 1 qt, 5 fl℥ to ml.

5. If a preparation contained 3 Gm of a drug in 250 ml, how many Gm are contained in each tablespoonful dose?

6. How many Gm of a chemical are required to make 150 ml of a solution, each tablespoonful of which will contain 5 mg of the chemical?

7. How many 10 minimum doses are contained in 30 ml of a tincture?

8. If the dose of a drug is 1/20 gr, how many doses are contained in ℥i?

9. If a medicine is to be taken three times daily and if 250 ml are to be taken in four days, how many tablespoonfuls should be prescribed for each dose?

10. How many teaspoonfuls per dose must be taken if f℥v of a medicine are to be taken three times a day for 3 days?

11. What is the dosage in tablespoonfuls, if 300 ml of a medicine contain 40 doses?

12. If a prescription contains 0.45 Gm of Codeine Phosphate in 150 ml, how much is contained in each teaspoonful dose?

13. How many grains of a chemical are contained in each capsule if a mixture containing 3/4 gr of the chemical is divided into 30 capsules?

14. If 150 ml of a cough mixture contain 3/4 gr of Dilaudid, how much is contained in 1 teaspoonful of the mixture?

15. How many grams of a chemical are required to make 150 ml of a mixture, each teaspoonful of which is to contain 5 mg?

16. Rx Codeine Phosphate   0.36 Gm
        Sodium Citrate   5.0 Gm
        Chloroform   0.75 ml
        Tolu Syrup QSAD   125.0 ml

    Sig: Fl℥ii
    How many mg of Codeine Phosphate and how much Chloroform are contained in each dose?

This supersedes WS 3ABR90530-I-11

Designed For ATC Course Use

DO NOT USE ON THE JOB

17. Rx   Phenobarbitol   0.5 mg
         Belladonna Tinc   15.0 ml
         Peppermint Water

                           QSAD 125.0 ml

     Sig: Fl 3 ii T.I.D.
     How much Phenobarbitol and how much Belladonna Tincture will be contained in each
dose?

18. A powder is divided into 25 capsules. If each capsule contain 0.6 mg of one ingredient,
17 mg of a second, and enough of a third to make 0.50 Gm, how much of each was there in
the original powder?

19. A solution contains 25 mg of a chemical per 150 ml and has a dose of 5 drops. If
the dispensing dropper calibrates 30 drops per ml, how many mcg of the chemical are con-
tained in each dose?

20. The dose of a drug is 7 mg per kilogram of body weight. How many grams should be
given to a child weighing 75 lbs?

21. The usual rectal dose of Tribromoethanol is 0.15 ml for each kilogram of body weight.
How many milliliters should be given to a person weighing 125 lbs?

22. If the usual adult dose of a drug is 7.5 ml, what is the dose in fl 3 of a child 6
years old?

23. If the usual adult dose of a drug is 250 mg, what is the dose for a child 8 years
old?

24. If the usual adult dose is 8 fl 3, what is the dose in milliliters, for a child
weighing 80 lbs?

25. The usual dose of Benedryl elixir is 2 teaspoonfuls, what is the dose in milliliters
for a child weighing 100 lbs?

2

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17. ℞ Phenobarbitol   0.75 mg
        Belladonna Tinc   12.5 ml
        Peppermint Water
                QSAD   150.0 ml

    Sig: Fl℥ ss T.I. D.
    How much phenobarbital and how much belladonna tincture will be
    contained in each dose?

18. A powder is divided into 30 capsules. If each capsule contains
    0.5 mg of one ingredient, 18 mg of a second, and enough of a third
    to make 0.70 Gm, how much of each was there in the original powder?

19. A solution contains 35 mg of a chemical per 175 ml and has a dose
    of 7 drops. If the dispensing dropper calibrates 25 drops per ml,
    how many mcg of the chemical are contained in each dose?

20. The dose of a drug is 10 mg per kilogram of body weight. How many
    grams should be given to a child weighing 80 lb?

21. The usual rectal dose of tribromoethanol is 0.05 ml for each kilogram
    of body weight. How many milliliters should be given to a person
    weighing 115 lb?

22. If the usual adult dose of a drug is 300 mg, what is the dose for
    a child 10 years old?

23. If the usual adult dose of a drug is 10 ml, what is the dose in
    fl℥ of a child 8 years old?

24. If the usual adult dose is 10 fl℥, what is the dose in milliliters
    for a child weighing 50 lb?

25. The usual adult dose of Benedryl elixir is 1 tablespoonful, what is
    the dose in milliliters for a child weighing 95 lb?

1. A certain elixir contains 0.125 Gm of Potassium Thiocyanate per fl ℥ ss. At $1.50 per pound (AV), what is the cost of the potassium thiocyanate required to make 2 gallons of the elixir?

2. A formula for a cough syrup calls for 1/2 gr of codeine phosphate per fl ℥ i. How many Gm of codeine phosphate should be used in preparing one gallon of the cough syrup?

3. If the cost of 12.5 Gm of merbromin is $.75, what is the cost of 100 gr?

4. Convert 3 gal, 3 qt, 10 fl ℥ to ml.

5. If a preparation contains 2.5 Gm of a drug in 100 ml, how many Gm are contained in each tablespoonful dose?

6. How many gr of a chemical are required to make 250 ml of a solution, each teaspoonful of which will contain 4 mg of the chemical?

7. How many 5 minimum doses are contained in 15 ml of a tincture?

8. If the dose of a drug is 1/10 gr, how many doses are contained in ℥ i?

9. If a medicine is to be taken twice daily, and if 100 ml are to be taken in three days, how many teaspoonfuls should be prescribed for each dose?

10. How many teaspoonfuls per dose must be taken if f ℥ vii of medicine are to be taken three times a day for 6 days?

11. What is the dosage in tablespoonfuls, if 150 ml of a medicine contains 25 doses?

12. If a prescription contains 0.30 Gm of codeine phosphate in 100 ml, how much is contained in each teaspoonful dose?

13. How many grains of a chemical are contained in each capsule if a mixture containing 2 gr of the chemical is divided into 20 capsules?

14. If 250 ml of a cough mixture contain 1 gr of Dilaudid, how much is contained in 2 teaspoonfuls of the mixture?

15. How many grams of a chemical are required to make 200 ml of a mixture, each tablespoonful of which is to contain 12 mg?

16. Rx · Codeine Phosphate   0.30 Gm
          Sodium Citrate   7.50 Gm
          Chloroform   0.95 ml
          Tolu Syrup   QSAD   150.0 ml

Sig: Fl ℥ ss
How many mg of codeine phosphate and how much chloroform are contained in each dose?

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DEPARTMENT OF BIOMEDICAL SCIENCES

PHARMACY SPECIALIST

BLOCK I

10-8

FUNDAMENTALS OF PHARMACY

March 1975

SCHOOL OF HEALTH CARE SCIENCES, USAF
SHEPPARD AIR FORCE BASE, TEXAS

7

Designed For ATC Course Use

DO NOT USE ON THE JOB

FUNDAMENTALS OF PHARMACY

OBJECTIVE

Solve problems pertaining to basic mathematical operations.

INTRODUCTION

Pharmacy, to many of you might mean the corner drug store where you were able to buy just about anything from cosmetics, to magazines, to pop-up toasters. It normally had a high counter, somewhere in the rear of the store, which concealed everything except the head and white coated shoulders of the pharmacist. There were always two or three clerks and the pharmacist who seemed to be concocting some mysterious formula. The Air Force Pharmacy is unlike any pharmacy most of you might be acquainted with. There are no clerks, cosmetics, school supplies; just trained pharmacy personnel, medications and chemicals. You have been selected to serve as a member in one of the most important fields within the medical service. Each year, millions of prescriptions are filled by Air Force pharmacy specialists and technicians around the world. Without the pharmacy service personnel, the overall care of the patients would not be fulfilled. In turn, the mission of the Air Force would be affected. The purpose of this course is to prepare you to effectively meet the demands of modern pharmacy in your role as a Pharmacy Specialist. Today's pharmacy is changing and the emphasis on compounding pills and certain dosage forms, and mysterious formulations is being replaced by subjects such as drug distribution systems, unit doses, strip packaging, drug information centers, drug interactions, I.V. admixtures and drug stability. Today we are increasingly concerned with the patient receiving quality medications. It is not sufficient to accurately weigh some ingredients on a prescription balance and incorporate them into a weighed quantity of ointment base or dissolve them in a flavored vehicle. Hospital pharmacies, large and small, that engage in bulk compounding and prepackaging cannot insure quality products unless they have adequately trained personnel.

INSTRUCTIONS

The instructor supervisor will welcome the class, introduce them to the pharmacy career field and discuss the purpose and policies of the course, including class schedule, graduation date and administrative requirements of the School of Health Care Sciences. He will brief the students on policies of both school and squadron. He will inform them of their responsibilities as students and airmen concerning such items as uniforms, appearance, conduct and behavior. He will issue text books, course materials and select a class leader. The NCOIC will explain course content, examination, critiques, remedial training, counseling, elimination, assignments and course completion.

This supersedes SW 3ABR90530-I-1, dated December 1973

The course supervisor will discuss honor graduates, training objectives, physical facilities and functions and introduce the instructor staff.

INFORMATION

During the many years the pharmacy course has been in operation, certain administrative and scholastic policies (which affect your academic progress, need, activities, and interests) have been established. These policies are briefly outlined below to provide you with a ready reference of your individual inquiries. Also outlined in this section is a brief description of the subject areas covered in this course. The Organization Structure, Duties and Responsibilities and Pharmacy Career Ladder will also be discussed.

ADMINISTRATIVE REQUIREMENTS

Records provide essential information for administering and directing student affairs in the section. Consequently, requested information should be completed and supplied as quickly as possible.

Leave will not normally be granted; however, emergency leave will be processed in the usual manner through your squadron.

Absences from class must be coordinated with the flight or class leader and instructor and approved by the course supervisor.

Sick call will be on an appointment basis through the base dispensary. Appointments will be made by the student squadron orderly room before class in the morning or by the pharmacy training section during school hours.

Telephone calls will be limited to those of emergency nature when originating in the pharmacy training section. Incoming emergency calls will be handled as expeditiously as possible for the benefit of the person concerned. Pay telephones are provided on the first floor of the building for routine calls.

Flight or class leader is selected for each class. The class leader acts as spokesman for the class. He also promotes group spirit and effort. Performance of certain routine duties by the students are essential for efficient classroom administration and housekeeping. The class leader will supervise the details for accomplishing these tasks. A complete briefing on details and housekeeping responsibilities will be given by the staff.

TRAINING MATERIALS

Materials issued for your class use are study guides and workbooks (SW), and pertinent Air Force Publications as well as the following technical references:

2   82

United States Pharmacopoeia
National Formulary
Remington's Pharmaceutical Sciences
Physicians' Desk Reference
Rogers' Inorganic Pharmaceutical Chemistry
Cutting's Handbook of Pharmacology

Study Guides and Workbooks provide, or refer to, general material which supports a unit of instruction. They also contain material concerned with specialized procedures, work to be completed, problems to be solved, and questions to be answered. You must study the applicable guide and references to be prepared for the instruction and discussion which takes place during a specific instructional period.

Air Force Publications and Technical References issued to you are those which support the various units of instruction. The references found in each SW identify the reference applicable to the unit of instruction.

SCHOLASTIC CONDITIONS AFFECTING STUDENT PROGRESS

Grades. You will be graded in both raw and percentage grades. Each block has a minimum passing score. Anytime you receive a score below this fixed grade, you have done unsatisfactory work and will be in danger of being withdrawn from the course. The course supervisor will determine appropriate action in each case of unsatisfactory work accomplishment.

Honor Graduates. The top 10 percent of the class maintaining an academic average above 90 percent throughout the course.

Probationary Continuation is the means by which a student deficient in some aspect of his training may continue with his class in the expectation that the deficiency will be corrected:

Elimination may result from academic deficiency, that is, an average grade in a block of less than the minimum grade set for that block. Additionally, administrative elimination may be due to extended absences (such as leave or hospitalization) punitive actions, factors over which the student had control, (i.e., display of improper conduct, failure to accomplish work assignments, uncooperative attitude), and other controllable actions.

Faculty Board is a fact finding agency which considers students with training deficiencies that seem to warrant termination of training. The board exercises no punitive or administrative action; nevertheless, the board's proceedings may become a basis for such actions.

Remedial Training is conducted for all students with grades of less than 10 percent above the minimum passing grade for the block. Remedial training will be conducted per instructions of the course supervisor.

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Counseling is an integral part of instruction and is employed by the course supervisor or his representative to assist and guide the student. If you encounter problems, academic or otherwise, the course supervisor is available to lend whatever assistance and resources he possesses toward the solution of these problems.

ORGANIZATIONAL STRUCTURE

The Medical Service of the Air Force is made up of the Surgeon General, and the personnel in his office, all other qualified officers and airmen serving in medical career fields, civilian personnel employed to support the Medical Service Mission, and civilian consultants.

The primary mission of the Medical Service is to provide the medical support necessary to maintain the highest possible degree of combat readiness and effectiveness of the Air Force. This mission includes medical support for field operations and combat, medical and dental care, veterinary service, flight medicine, military public health, and occupational medicine for all personnel.

The Director of Base Medical Services has the responsibility of the medical mission at his base. He is the senior Air Force physician of the base medical unit. The Air Force hospital system is represented by installations ranging from small dispensaries manned by one or two doctors to large hospitals with professional staffs numbering the scores. All personnel required to carry out the mission of the base medical services will be under his professional supervision. (Page 10 will show the Hospital/Dispensary Organization Structure. The relationship of professional and support personnel to the Hospital Commander is shown on this chart.)

You are interested in the organization of the Pharmacy Service and its contribution to the medical mission. By referring to page 8 (Organization - Hospital Services) you will see that the Commander of the Base Medical Unit or Director of Base Medical Services has a physician who acts as a coordinator of the professional services in the hospital. This physician is known as the Chief of Hospital Services. The professional departments, such as surgery, nursing, radiology, laboratory, and pharmacy are his responsibilities. Problems associated with the management and administration of the pharmacy should be coordinated with the Chief of Hospital Services. We will examine the organization of the pharmacy services in more detail.

The hospital commander appoints a commissioned officer who is also a graduate, licensed pharmacist as Pharmacy Officer. If a commissioned graduate, licensed pharmacist of the Biomedical Sciences Corps is not available, A Civil Service Employee who is a graduate licensed pharmacist is appointed as Chief of the Pharmacy Service. If no Civil Service Pharmacist is available, the commander will designate a physician as "Pharmacy Officer."

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The Pharmacy Officer will be responsible for the overall mission and operation of the pharmacy and is designated as the consultant in pharmacy for the staff of the medical treatment facility. The Pharmacy Officer will have the assistance of a noncommissioned officer known as the NCOIC of Pharmacy. The NCOIC is responsible to the pharmacy officer for the management and administration functions including the supervision of assigned pharmacy specialists and technicians. Page 9 shows the relationship of the pharmacy service in the hospital.

The pharmacy in an Air Force Hospital has many functions. It provides the hospital staff with information on all drugs stocked in the pharmacy. It stores, manufactures, and dispenses pharmaceuticals to patients. The pharmacy maintains prescribed records of stored and dispensed pharmaceuticals. The pharmacy must comply with the federal regulations governing the storage and issue of specific drugs, narcotics, and poisons. One of the additional functions is to conduct on-the-job training of assigned duty personnel. To provide these services the pharmacy must have well trained personnel.

DUTIES AND RESPONSIBILITIES

PHARMACY SPECIALIST

Specialty Summary

Requisitions, stocks compounds, and dispenses medicinal preparations.

Duties And Responsibilities

COMPOUNDS AND DISPENSES MEDICINAL PREPARATIONS. Interprets prescriptions and formulas to determine content and therapeutic, chemical, and physical compatibility of ingredients. Confers with writer of prescription on any questions that arise to prevent possibility of error in desired therapeutic action. Calculates amounts of ingredients required for prescriptions or formulations. Weighs, measures, and combines drugs and chemicals according to accepted pharmaceutical methods. Prepares, packages or bottles, and labels prescriptions as ordered by physicians, dentists, or veterinarians. Manufactures, labels, and stores preparations according to official United States compendia and other reference literature. Issues medicaments to patients, wards, and clinics.

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85

REQUISITIONS AND STORES PHARMACY SUPPLIES. Inventories drugs and equipment periodically. Ascertains supply requirements and prepares supply requisitions. Receives incoming pharmaceuticals in bulk, separates, and stores. Safeguards items such as chemicals, drugs, biological products, narcotics, and alcohol. Rotates stocks to insure freshness and potency.

PERFORMS GENERAL PHARMACY TASKS. Posts and maintains pharmacy records, including special files required in dispensing of narcotics and alcohol. Cleans and arranges pharmacy, equipment, and supplies.

SUPERVISES PHARMACY PERSONNEL. Assigns work and evaluates performance for attaining desired standards. Conducts on-the-job training in compounding, requisitioning, storing, and dispensing medicinal preparations.

Specialty Qualifications

KNOWLEDGE. Knowledge of principles of chemistry; pharmaceutical arithmetic; pharmacology; and medical ethics is mandatory. Possession of mandatory knowledge will be determined in accordance with AFM 35-1.

EDUCATION. High school courses in biology and chemistry are desirable.

EXPERIENCE. Experiences in functions such as compounding, storing, or dispensing preparations is mandatory.

TRAINING. Completion of a basic pharmacy course is desirable.

OTHER.

1. A minimum aptitude level of General 60 is mandatory.

2. This AFSC may be awarded to WAF airmen.

Speciality Data

1. Grade Spread:
   Sergeant and staff sergeant - - - - - 90550
   Airman first class - - - - - - - - - 90530

2. Related D.O.T. Jobs:
   Pharmacy Clerk - - - - - - - - - - - 074.387
   Pharmaceutical Detail Man - - - - - 266.158

3. Related DOD Occupational Subgroup - - 312

PHARMACY CAREER LADDER

Promotion is a prime area of concern for all of us. The pharmacy field, like most others, requires its personnel to advance to a specific level of proficiency and training in order to qualify for upgrading. Advancement in skill levels are accomplished either through resident schools or dual channel concept of OJT. Specific time requirements between levels must also be met in order for successful upgrading. The specific skill levels, titles, and corresponding ranks are listed below:

90010	Pharmacy Helper	- - - - - - -	Airman
90530	Pharmacy Apprentice	- - - - -	A1C
90550	Pharmacy Specialist	- - - - -	Sgt & SSgt
90570	Pharmacy Technician	- - - - -	TSgt & MSgt
90590	Pharmacy Superintendent	- - -	SMSgt & CMSgt

7

CHART 1

HOSPITAL/DISPENSARY ORGANIZATION STRUCTURE

```
                        ┌─────────────┐
                        │  Commander  │
                        └──────┬──────┘
                               │
┌──────────────┐               │              ┌──────────────────┐
│ Special Staff*├───────────────┼──────────────┤  Administrative  │
└──────────────┘               │              │      Office      │
                               │              ├──────────────────┤
                               │              │  Medical Library │
                               │              └──────────────────┘
```

| Medical Squadron Section | Registrar | Plant Mangement | Materiel | Business Office | Food Services |

| Hospital/ Dispensary Services* | Aerospace Medicine or Aeromedical Services | Physiological Training | Veterinary Services | Dental Services |
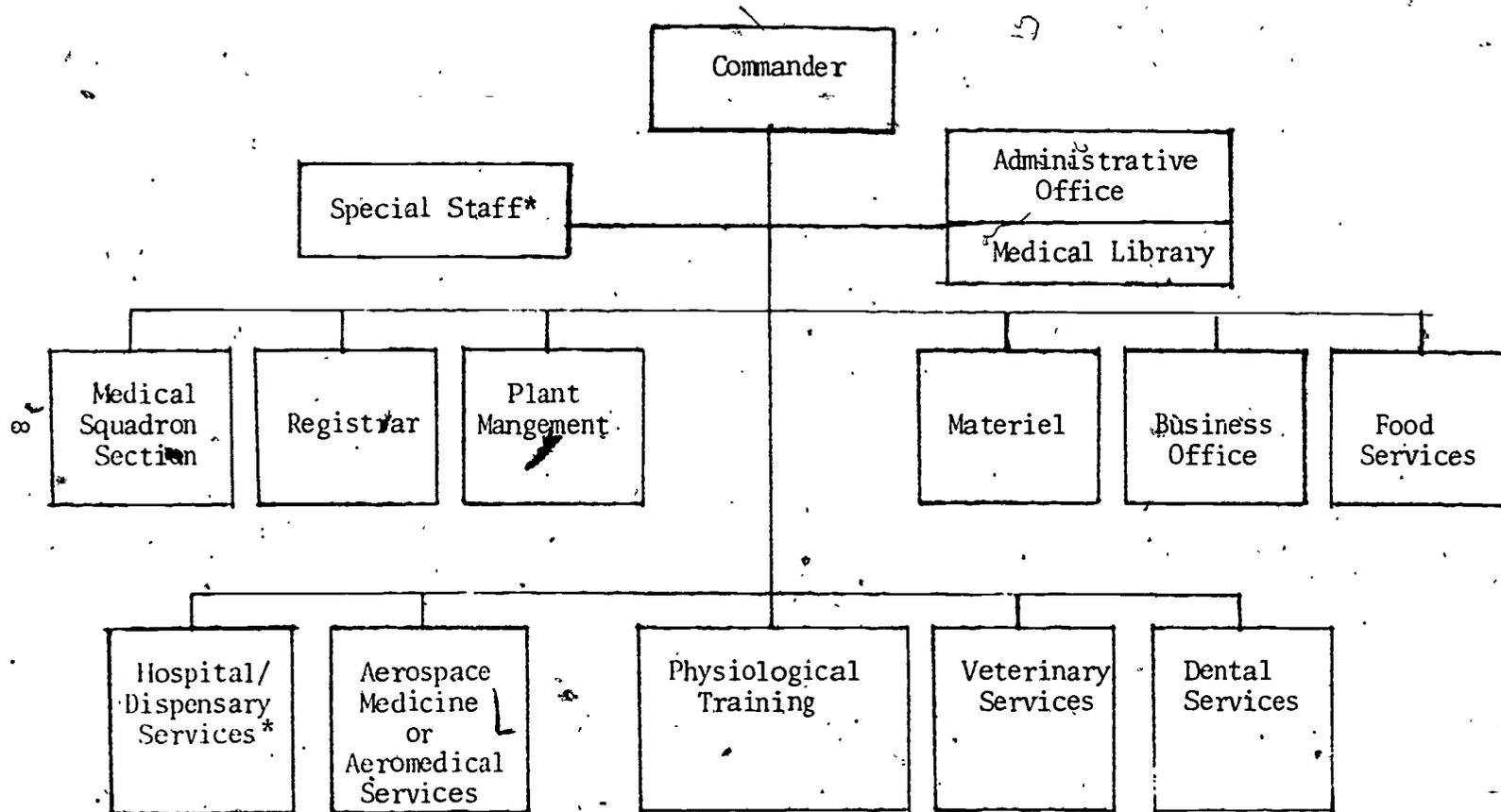
* When authorized by HQ USAF for specialty centers.

CHART 2

ORGANIZATION - HOSPITAL SERVICES

```
                    Command
                       |
               Hospital Services
                       |
   ┌───────────┬───────┼────────────┬──────────┐
Radiology  Histopathology      Nursing Service  Pharmacy
                |                    |
           Laboratory          Nursing Units

   ┌───────────────────┼───────────────────────┐
 Medicine            Surgery            General Therapy
```

9

```
          ┌─────────────────────────┐
          │       COMMANDER         │
          │  BASE MEDICAL  UNIT     │
          └─────────────────────────┘
                      │
          ┌─────────────────────────┐
          │ CHIEF  HOSPITAL SERVICES│
          │ (PROFESSIONAL SERVICES) │
          └─────────────────────────┘
                      │
          ┌─────────────────────────┐
          │   PHARMACY OFFICER/      │
          └─────────────────────────┘
                      │
          ┌─────────────────────────┐
          │         NCOIC           │
          └─────────────────────────┘
                      │
        ┌─────────────┼─────────────────┐
┌──────────────┐ ┌──────────────────┐ ┌──────────────┐
│ OUTPATIENT   │ │ MANUFACTURING    │ │   SUPPLY     │
│ DISPENSING   │ │ INPATIENT        │ │   &          │
│              │ │ DISPENSING       │ │ ADMINISTRATION│
└──────────────┘ └──────────────────┘ └──────────────┘
```

2F- 75-1104

67
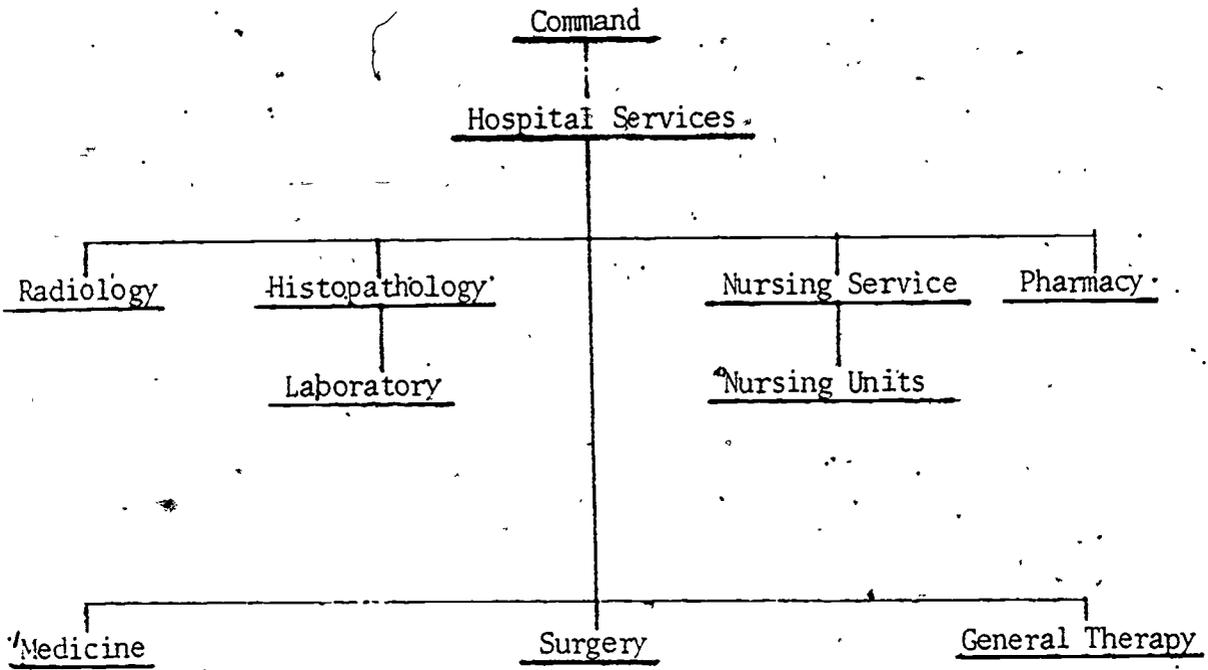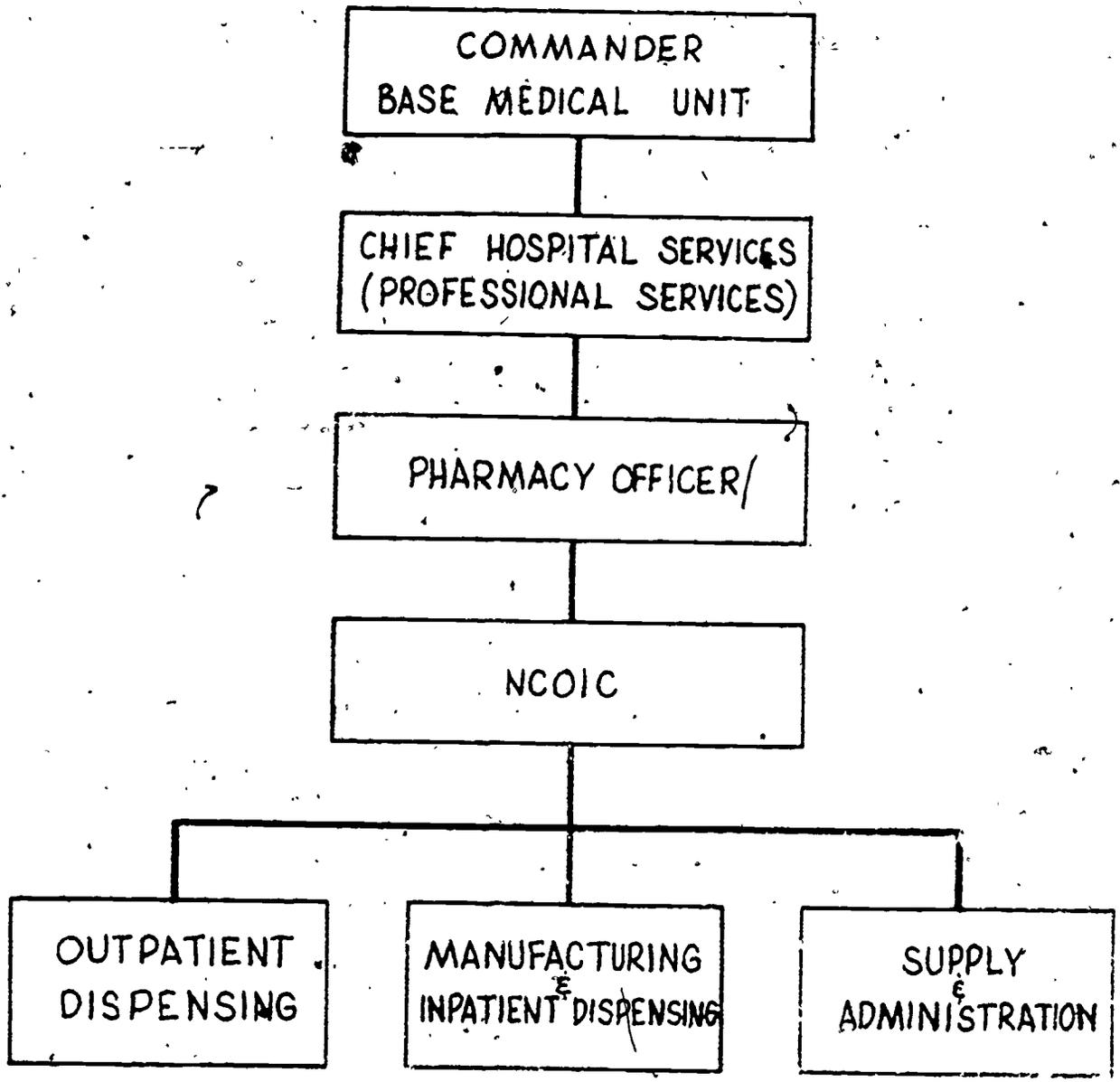
BASIC MATHEMATICAL OPERATIONS

Although, we tend to think of fractions and decimal fractions as a very simple subject, it is the starting point of all math problems. Therefore a review will be advantageous to you as a foundation from which other, more complex, pharmaceutical problems may be worked.

Each type problem you may encounter will be explained by the instructor. Fill in each blank in the example section as the information is given to you. This will assist you in working the practice problems. These problems will be evaluated by the instructor to insure you are working them correctly. Complete all problems assigned. SHOW ALL WORK!

Solve Problems Involving Simple Fractions

1. This is not a test. This is a learning situation. In this PT on fractions, you will be learning at your own speed.

2. Two types of programming are used in this PT.

   a. LINEAR. In this portion, you will go from "frame" to "frame", using a piece of paper to cover upcoming frames and answers. In each frame, you are given information and then a question to answer or a problem to solve. Your answer can be checked to the left of the next frame. "Peeking" is not an advantage. If you make an error, strike out your incorrect answer, reread the frame, and write the correct answer.

   b. SCRAMBLED. In this portion, you will be given problems to solve and asked to select the answer from a list of answers. Circle the answer you choose and go to the page as your answer directs. Follow directions closely. If you select an incorrect answer, do not erase, but put an "X" through the circle. Rework the problem again and circle another answer.

3. READ ALL INFORMATION CAREFULLY. BE SURE YOU UNDERSTAND WHAT IS SAID BEFORE YOU TRY TO ANSWER THE QUESTION. If you wish, you may turn back in the PT for review at any time.

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	1. A fraction is a part of a whole. $\frac{3}{4}$ is a fraction and therefore is a part of a _____.
whole	2. Part of a whole is the definition of a _____.
fraction	3. The definition of a fraction is stated as: _____ of a _____.
part whole	4. Define a fraction. _____
part of a whole	5. Fractions have two parts - - a numerator (above the line) and a denominator (below the line). Example: $\frac{3}{8}$ - - numerator, denominator In the fraction $\frac{2}{3}$, the number 3 below the line is the _____ and the number 2 above the line is the _____.
denominator numerator	6. All fractions have denominators and numerators. In the fractions $\frac{2}{3}$ and $\frac{11}{12}$, the 3 and 12 are _____ and the 2 and 11 are _____.

12 93

A

Wrong! 12 x 3 = 36, but you must now do step 2. Add this product (36) to the numerator; retain the denominator to get the improper fraction. Go back to page 22, Frame 29, and select another answer.

B

Nope! You will still have to go to lower terms. You reduced by dividing two into the numerator and denominator but you must now find a number to further reduce $\frac{21}{27}$ and then you'll have it. Return to page 20A, select the other answer, and continue.

C

$\frac{2}{5}$ is the correct answer.

Now try another problem. $\frac{3}{8} \cdot \frac{2}{5} = $ _____

If your answer is:	Go to page:
$\frac{1}{4}$	29C
4 or $\frac{4}{1}$	37B
$\frac{9}{16}$	32B

13

denominators numerators	7. The denominator tells how many equal parts the whole has been divided into. In the fraction $\frac{9}{10}$, the denominator indicates the whole has been divided into _____ equal parts.
10	8. Under the figures below, write the number that would be used as the denominator of a fraction. a._____ b._____ c._____ d._____
a. 4 b. 2 c. 3 d. 4	9. In the fraction below, circle the denominator and explain what it indicates. $\frac{15}{16}$ _____ _____
16 denominator Tells (indicates) how many parts the whole has been divided into.	10. The numerator (number above the line) of a fraction shows "how many parts of the whole are being considered." In the fraction $\frac{2}{3}$, the numerator indicates that _____ parts of the whole are being considered and the denominator indicates that the whole has divided into _____ equal parts.
2 3	11. In the fraction $\frac{13}{14}$, the number of parts being considered is _____ and the part of the fraction that tells us this is called the _____.

A

Wrong! Multiplication and addition are correct but you must place this sum over the denominator of the fraction. Return to page 21, Frame 29, and select another answer.

B

Right! Now try this. Reduce $\frac{14}{56}$ to its lowest term.

If your answer is:	Go to page:
$\frac{1}{4}$	17B
$\frac{7}{28}$	19B

C

No! You forgot to obtain the reciprocal of the divisor (invert the divisor), before you multiplied. Go back to page 38, frame 57; review the procedure again, then rework the problem from frame 59 again and select the correct answer.

15

96

13. numerator	12. The number of parts being considered is indicated by the _____ of a fraction.
numerator	13. Under the figures below, write the fractions. The number of parts being considered are shaded. a. _____ b. _____ c. _____ d. _____
a. $\frac{1}{3}$ b. $\frac{3}{4}$ c. $\frac{2}{3}$ d. $\frac{1}{4}$	14. In the fraction below, write what each number is called and what it indicates: $\frac{6}{7}$ 6 -- _____ _____ 7 -- _____ _____
6 numerator. Indicates how many parts of the whole are being consid- ered 7 denominator. Indicates how many equal parts the whole has been divided into.	15. There are three types of common fractions -- proper, improper, and mixed numbers. The three types of common fractions are mixed numbers, _____ and _____ fractions.
proper and improper	16. The difference between proper and improper fractions is the size of the numerator. The numerator of an improper fraction is <u>always the</u> <u>same as or larger</u> than the denominator; therefore, in a proper fraction, the numerator is _____ that the <u>denominator</u>.

A

Correct. Now change $15\frac{1}{5}$ to an improper fraction.

If your answer is: Go to page:

$\frac{76}{5}$ 19A

$\frac{75}{5}$ 21A

B

Good! You might have started with dividing by two (2) and doing several steps, but 14 divides into 14 and 56 evenly. To reduce an improper fraction such as $\frac{8}{4}$ or $\frac{9}{5}$, you simply divide the denominator into the numerator. Reduce $\frac{9}{5}$ to its lowest terms.

If your answer is: Go to page:

$\frac{9}{5}$ 21A

$1\frac{4}{5}$ 23B

99

smaller (less than)	17. $\frac{7}{8}$ is a proper fraction because the _____ is _____ than the denominator.
numerator smaller (less)	18. $\frac{8}{7}$ and $\frac{8}{8}$ are improper fractions because the _____ are _____ than the denominators.
numerators are same as or greater (are the same as or larger)	19. In the list below, place a "P" by the proper fractions and "I" by the improper fractions. a. $\frac{12}{17}$ c. $\frac{4}{5}$ b. $\frac{9}{7}$ d. $\frac{12}{12}$
a. P b. I c. P d. I	20. A mixed number is a whole number combined with a proper fraction. $3\frac{5}{6}$ is a whole number (3) and a proper fraction $\frac{(5)}{(6)}$; therefore, $3\frac{5}{6}$ is a _____
mixed number	21. To review definitions, match the following types of fractions with the correct statement or statements by writing the letter of the statement by the number of the fraction. All letters are to be used. 1. Proper fraction 2. Mixed number 3. Improper fraction A. Numerator greater than the denominator B. Numerator less than the denominator C. Whole number and a proper fraction D. Numerator equal to denominator

A

Right! $\frac{76}{5}$ is correct. You can check your answers by changing the improper fraction back to the mixed number. Change $7\frac{1}{4}$ to an improper fraction and check your answer.

$$7\frac{1}{4} = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$
$$\text{(improper fraction)} \quad \text{(mixed number)}$$

Go to page 24, Frame 30, to check answer and continue from there.

B

You reduced - - but not to the lowest terms. Return to page 15B and find the number that will reduce the $\frac{7}{28}$ and then you'll have the correct answer that will allow you to continue.

100

B. 1. C. 2. D. A 3.	22. In the list below, place a "P" by the proper fractions, an "I" by the improper fractions, and a "M" by the mixed numbers. a. $3\frac{1}{2}$ e. $\frac{22}{29}$ b. $\frac{9}{5}$ f. $\frac{7}{7}$ c. $12\frac{2}{3}$ g. $\frac{79}{75}$ d. $\frac{3}{4}$
a. M e. P b. I f. I c. M g. I d. P	23. An improper fraction can be changed to a mixed number by dividing the denominator into the numerator. The fraction $\frac{21}{10}$ can be changed to a mixed number by dividing the numerator <u> (number) </u> by <u> (number) </u> the denominator.

21
 	
 10
	24. To change the improper fraction $\frac{21}{10}$ to a mixed number, follow two steps: (1) Divide the numerator by the denominator to get the whole number:
	
	           $\underline{\quad 2\quad}$ the whole number
	         $10/\overline{21}$
	          $\underline{\cdot 20}$
	          1 the remainder
	
	 (2) Place the remainder over the denominator to get the proper fraction: $\frac{1}{10}$ the proper fraction. Then $\frac{21}{10} =$ <u> (mixed number) </u>

$2\frac{1}{10}$	25. Now change the improper fraction $\frac{26}{5}$ to a mixed number. Show your work. <u> (mixed number) </u>

A

Wrong! You forgot to add the numerator to the product of the whole number times the denominator. If you now see your error, go back to page 17A and select the other answer and follow directions. If you need the rule again, return to page 21, Frame 28, and start again from there.

B

No ... To reduce an improper fraction, you simply change it to a whole number or to a whole number and a fraction (mixed number) by dividing the numerator by the denominator. Now go back to page 17B and reduce properly.

C

Negative. You have simply added numerators retained highest denominator, and reduced. You must change to equivalent fractions. Re-read rule on page 28, Frame 40, and rework problem from page 30, Frame 43, again.

$\frac{5}{5/26}$ $\frac{25}{1}$ $5\frac{1}{5}$ (mixed number)	26. Try another. Change $\frac{54}{11}$ to a mixed number. $$\dfrac{}{} = \dfrac{}{}$$
$4\frac{10}{11}$ - - if you missed this one, re-read and rework Frames 22 thru 26, then continue.	27. An improper fraction can be changed to a mixed number. So can a <u>mixed number be changed to an</u> <u>improper fraction</u>. Therefore, an improper fraction is interchangeable with a _____ number.
mixed	28. Changing mixed numbers to improper fractions requires three steps: Example: Change $4\frac{3}{5}$ to an improper fraction. <u>Step</u> (1) Multiply the whole number by the denominator of the fraction. $4 \times 5 = 20$ (2) Add the product to the numerator. $20 + 3 = 23$. (3) Place the sum over the denominator of the fraction. Then $4\frac{3}{5} = \underline{}$ $ $(improper fraction)
$\frac{23}{5}$	29. Change $12\frac{2}{3}$ to an improper fraction. If your answer is: Go to page: $\qquad\frac{36}{3}\qquad\qquad$ 13A $\qquad\frac{38}{2}\qquad\qquad$ 15A $\qquad\frac{38}{3}\qquad\qquad$ 17A

22

103

A

No! $\frac{2}{4}$ can be reduced to $\frac{1}{2}$ by dividing two (2) into both the numerator and denominator. Remember the rule, a fraction is in its lowest terms only when the number one (1) is the only number that divides evenly into both the numerator and denominator. Return to page 24, Frame 31, and select the correct answer.

B

$1 \frac{4}{5}$ is correct. If we ask you to reduce the fraction $\frac{8}{4}$, would you answer 2? You would have been correct there, too. Now turn to top of page 26, Frame 32, and continue the program.

C

No. You've added numerators but have not changed fractions to equivalent fractions. Read rule again on page 9 Frame 40, then rework problem on page 30, Frame 43. Select another answer.

23

7

ERIC

If you came to this page directly from the previous page, you have not followed the directions given in the previous frame. From this point (unless otherwise directed) in the lesson, you will proceed by the scrambled method. Do Not read the frames in sequence, but after selecting an answer, refer to the proper page or frame as directed. Return to page 22, Frame 29, check your answer, and refer to the page as directed.

$7\frac{1}{4} = \frac{29}{4}$

$\frac{29}{4} = 7\frac{1}{4}$

30. Change each of the following improper fractions to mixed numbers and the mixed numbers to improper fractions:

   a. $1\frac{4}{9}$ c. $10\frac{11}{12}$

   b. $\frac{21}{8}$ d. $\frac{49}{3}$

---

a. $\frac{13}{9}$

b. $2\frac{5}{8}$

c. $\frac{131}{12}$

d. $16\frac{1}{3}$

31. A fraction is in its lowest terms when the number one (1) is the only number that divides evenly into both the numerator and denominator. (NOTE: Dividing both the numerator and denominator by the same number does not change the value of the fraction) Select the fraction below that is in its lowest terms.

   If your answer is: Go to page:

   $\frac{2}{4}$ 23A

   $\frac{6}{9}$ 25A

   $\frac{3}{7}$ 27A

A

Wrong! $\frac{6}{9}$ can be further reduced. Three (3) is the largest number that divides evenly into both the numerator (6) and the denominator (9). $\frac{6}{9}$, then, reduced to lowest possible terms, is $\frac{2}{3}$. Now return to page 24, Frame 31, and select the correct answer.

B

Right! $1\frac{1}{4}$ is the correct answer. Try another, reduce to lowest terms.
Add $\frac{1}{2} + \frac{1}{2} + \frac{4}{5} + \frac{3}{20} = $ _____

25

106

You came from page 23B	**32.** Reduce each of the following fractions to lowest terms: a. $\frac{12}{4}$ = c. $\frac{64}{72}$ = b. $\frac{21}{49}$ = d. $\frac{17}{51}$ =
a. 3 or b. $\frac{3}{7}$ c. $\frac{8}{9}$ d. $\frac{1}{3}$	**33.** To <u>add</u> or <u>subtract</u> fractions, they must be <u>like</u> fractions. Like fractions have the same number for a denominator. $\frac{7}{12} + \frac{5}{12}$ or $\frac{7}{12} - \frac{5}{12}$ are like fractions because they have the same number for a _____
denominator	**34.** Fractions must have like (common) denominators before you can _____ or _____ them.

add
subtract
(any order)
	35. When fractions have common denominators, you add or subtract numerators and retain the common denominator.
	   Example: $\frac{7}{12} + \frac{5}{12} = \frac{12}{12}$ reduced = 1
	   Then $\frac{7}{12} - \frac{5}{12}$ = _____ reduced = _____

$\frac{2}{12}$	**36.** Before fractions with <u>unlike</u> denominators can be added or subtracted, they must be changed to their <u>lowest common denominator</u> (LCD). <u>LCD</u> is the lowest number that is divisible by each denominator. Example: $\frac{2}{5} + \frac{1}{20}$ or $\frac{2}{5} - \frac{1}{20}$ The lowest number divisible by each denominator is 20; therefore, 20 is the _____.

A

$\frac{3}{7}$ is correct. One (1) is the only number that divides evenly into both 3 and 7.

Let's try a larger fraction. Reduce $\frac{42}{54}$ to its lowest terms...

If your answer is:	Go to page:
$\frac{21}{27}$	13B
$\frac{7}{9}$	15B

B

No. Not quite.. Your addition is correct but you must have overlooked the "reduce answers to lowest terms." Go back to page 30, Frame 43, reduce, and pick the correct answer.

C

$\frac{6}{15}$ is wrong. You borrowed one (1) from 16, which gave you the fraction $\frac{15}{15}$, but now you must add $\frac{15}{15} + \frac{8}{15}$, then do your subtraction. Return to page 31A, rework the problem, and select another answer.

27

least or lowest common denominator or (LCD)	37. Again, the lowest number divisible by each denominator of fractions to be added or subtracted is called the _____.
LCD	38. Determine the lowest common denominator (LCD) for these fractions: $\frac{1}{2}$ $\frac{1}{4}$, the LCD is _____. $\frac{2}{7}$ $\frac{1}{42}$, the LCD is _____.
4 42	39. Find the LCD for the fractions below: a. $\frac{5}{8} + \frac{1}{16} + \frac{1}{4}$, the LCD is _____. b. $\frac{4}{7} - \frac{1}{49}$, the LCD is _____.
a. 16 b. 49	40. After the LCD has been determined, change all fractions to equivalent fractions of the same denominator; then add or subtract. Example: $\frac{2}{7} + \frac{1}{42}$, the LCD is 42. To change $\frac{2}{7}$ to LCD 42: Divide 7 into 42; the quotient is 6. Multiply 6 by the numerator 2 and place the product (12) over the LCD. $\frac{2}{7} = \frac{12}{42}$. Now we can add. $\frac{12}{42} + \frac{1}{42} = \frac{13}{42}$ reduced is $\frac{13}{42}$. Change the fractions below so they have the same LCD. a. $\frac{1}{3} + \frac{5}{6} + \frac{1}{12} =$ _____ + _____ + _____ b. $\frac{4}{5} - \frac{1}{3} =$ _____ - _____

A

You have the correct fraction but made a mistake in the addition of whole numbers. Now return to page 33B and work the problem again. Do not just pick the other answer without first re-working the problem to find your error.

B

Incorrect. You've made a mistake someplace in changing fractions to equivalent fractions of the same denominator. Return to page 28, Frame 40, re-read the rule, then go back to page 18B and choose the other answer.

C

$\frac{1}{4}$ is wrong. You did not obtain the reciprocal of the divisor. $\frac{2}{3}$ inverted is $\frac{3}{2}$ and the reciprocal of $\frac{2}{3}$ is also $\frac{3}{2}$.

Go back to page 13C, rework the problem, and select the correct answer.

29

a. $\frac{4}{12} + \frac{10}{12} + \frac{1}{12}$ b. $\frac{12}{15} - \frac{5}{15}$	41. Find the LCD and change the fractions below to equivalent fractions. a. $\frac{1}{9} + \frac{1}{81} + \frac{2}{3} =$ _____ + _____ = _____ b. $\frac{4}{5} - \frac{5}{8} =$ _____ - _____
a. $\frac{9}{81} + \frac{1}{81} + \frac{54}{81}$ b. $\frac{32}{40} - \frac{25}{40}$	42. The rule again for adding and subtracting fractions. (1) Change fractions to common denominators.. (2) Add or subtract numerators. (3) Keep common denominator. (4) Reduce answers to lowest terms. At your left and below are the LCD problems from the last frame. Complete the problems. a. $\frac{9}{81}$ $\frac{1}{81}$ $\frac{54}{81} =$ _____ reduced _____ b. $\frac{32}{40} - \frac{25}{40} =$ _____ reduced _____

$\frac{64}{81}$ reduced is
 	
 $\frac{64}{81}$
 	
 $\frac{7}{40}$ reduced is
 	
 $\frac{7}{40}$
	43. Does it all come back to you now? Solve this problem and reduce answer to lowest terms.
	
	 $\frac{1}{28} + \frac{6}{7} + \frac{5}{14} =$ _____
	
	 If your answer is: Go to page:
	
	    $1\frac{1}{4}$ 25B
	
	    $1\frac{7}{28}$ 27C
	
	    $\frac{12}{28}$ 23C
	
	    $\frac{3}{7}$ 21C

You came from page 28A a. $1\frac{2}{7}$ d. $1\frac{3}{4}$ b. $1\frac{1}{8}$ c. $13\frac{63}{104}$	44. When multiplying two or more fractions, multiply numerators of the fractions to obtain numerator of the product. To obtain the numerator of the product in the problem $\frac{2}{3} \times \frac{2}{3}$, multiply _____ (number) times _____ (number).

A

Very good. Work the following problem by subtracting mixed numbers.

Reduce answer to lowest term. $16 \frac{8}{15} - 15 \frac{3}{5} =$ _____

If your answer is:	Go to page:
$1 \frac{14}{15}$	33A
$\frac{14}{15}$	35A
$\frac{6}{15}$	27C
Can't be solved	37C

B

Good. $1 \frac{19}{20}$ is correct. Now try one on subtraction and reduce answer to lowest terms. $\frac{4}{13} - \frac{3}{39} =$ _____.

If your answer is:	Go to page:
$\frac{3}{13}$	33B
$\frac{3}{39}$	42A

C

No. $6 \frac{29}{36}$ is incorrect. Again you forgot to invert the divisor. The divisor $1 \frac{1}{6}$ is changed to $\frac{7}{6}$ and inverted is $\frac{6}{7}$. Now go back to page 39B and select another answer.

2 2	45. Like the numerator, the denominator of the pro- duct is obtained by multiplying the denominators of the fractions. In the problem $\frac{2}{3} \times \frac{4}{5}$, the numerator of the product is obtained by multi- plying _____ times _____ and the de- nominator is obtained by multiplying _____ times _____.
2 X 4 3 X 5	46. The rule, then, for multiplying fractions is: "Multiply numerators of the fractions to obtain the _____ of the product and multiply the denominators to obtain the _____ of the product." Solve this problem: $\frac{2}{3} \times \frac{2}{5} =$ _____.
numerator denominator $\frac{4}{15}$	47. The word "of" is sometimes used in place of the multiplication sign "X". $\frac{2}{3}$ of 15 = 10 can be written as $\frac{2}{3} \times \frac{15}{1} = \frac{30}{3} = 10$. Solve this problem and reduce: $\frac{5}{8}$ of 40 = _____ reduced _____.
$\frac{200}{8}$ reduced = 25	48. If the problem contains more than two fractions, multiply all the numerators and multiply all the denominators. Example: $\frac{2}{5} \times \frac{1}{3} \times \frac{2}{3} \times \frac{1}{4} = \frac{4}{180}$ reduced $\frac{1}{45}$ Solve this problem: $\frac{3}{5} \times \frac{4}{7} \times \frac{1}{2} =$ _____ reduced = _____

32

A

You've forgotten the rule on borrowing. $16 \frac{8}{15} = 16 \frac{8}{15} = 15 \frac{23}{15}$

$$- 15 \frac{3}{5} = 15 \frac{9}{15} = 15 \frac{9}{15}$$

You cannot subtract $\frac{9}{15}$ from $\frac{8}{15}$, so you have to borrow a whole number (1). $1 = \frac{15}{15}$, which you now add to the $\frac{8}{15}$. Don't forget now that you borrowed a whole number from 16. Go back to page 31A. Rework the problem and select the correct answer.

B

Good. Now for the rule for adding and subtracting mixed numbers:
1. Change fractions to <u>like</u> fractions (LCD). 2. Add/subtract the fractions. 3. Add/subtract the whole numbers. 4. Reduce answers to lowest terms. Example: $1 \frac{1}{3} + 3 \frac{11}{12}$ and $7 \frac{1}{2} - 4 \frac{1}{5}$.

$$1 \frac{1}{3} = 1 \frac{4}{12} \qquad\qquad 7 \frac{1}{2} = 7 \frac{5}{10}$$
$$+ 3 \frac{11}{12} \quad 3 \frac{11}{12} \qquad\qquad - 4 \frac{1}{5} = 4 \frac{2}{10}$$
$$4 \frac{15}{12} = 4 + 1 \frac{3}{12} = 5 \frac{1}{4} \qquad\qquad 3 \frac{3}{10}$$

Now add these fractions: $7 \frac{1}{9} + 6 \frac{5}{18} + \frac{1}{6} = $ _____

If your answer is: Go to page:

$14 \frac{5}{9}$ 29A

$15 \frac{5}{9}$ 31A

33

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$\dfrac{12}{70}$ reduced $= \dfrac{6}{35}$	49. "Cancellation" is a "short cut" used in multiplying fractions. The short cut in multiplying fractions is called _____.
cancellation	50. Cancellation is much the same as reducing. The first step is to select a numerator and denominator that can be divided evenly by the same number. The problem $\dfrac{5}{10} \times \dfrac{2}{5} \times \dfrac{4}{10}$ can be reduced to: $\dfrac{\overset{1}{\cancel{5}}}{\underset{5}{\cancel{10}}} \times \dfrac{\overset{1}{\cancel{2}}}{\underset{1}{\cancel{5}}} \times \dfrac{\overset{2}{\cancel{4}}}{\underset{5}{\cancel{10}}}$. The next step is to multiply the numerators and the denominators $\dfrac{1}{5} \times \dfrac{1}{1} \times \dfrac{2}{5} = \dfrac{2}{25}$ reduced is $\dfrac{2}{25}$. Solve the problem below by cancellation. Show work. $\dfrac{5}{8} \times \dfrac{4}{7} \times \dfrac{1}{5} =$ _____
$\dfrac{\cancel{5}}{\cancel{8}} \times \dfrac{\overset{1}{\cancel{4}}}{7} \times \dfrac{1}{\cancel{5}} = \dfrac{1}{14}$ $2 1$	51. When you use the cancellation method, the basic principle is: Dividing both the numerator and the denominator by the same number does not change the value of a fraction. The value of a fraction is not changed when the _____ and the _____ are _____ by the same number.
numerator denominator (either order) divided	52. In the problem $\dfrac{2}{15} \times \dfrac{3}{8}$, the 2 and 8 can be cancelled by dividing each by _____ and the 3 and 15 cancelled by dividing each by _____. The answer to the problem, then, is _____.

34

A

Very good. The idea here was to see if you remember how to borrow.
Solve the addition and subtraction problems below.   Answers must be
in lowest terms.

a. $\frac{1}{21} + \frac{4}{7} + \frac{2}{3} =$

b. $3\frac{3}{8} - 2\frac{1}{4} =$

c. $11\frac{1}{8} + 1\frac{3}{13} + \frac{1}{2} + \frac{3}{4} =$

d. $14\frac{1}{6} - 12\frac{5}{12} =$

B

5 is the correct answer. Try one more.

$$5\frac{4}{7} \div 3 =$$

If your answer is: Go to page:

$1\frac{6}{7}$ 40B

$16\frac{5}{7}$ 41A

$\frac{13}{7}$ 39A

35

116

2 3 $\frac{1}{20}$	53. In the problem $\frac{10}{13}$ x $\frac{26}{50}$ x $\frac{7}{21}$, the 10 and 50 are cancelled by dividing each by _____ ; the 13 and 26 are cancelled by dividing each by _____ ; and $\frac{7}{21}$ can be reduced to _____ . Now solve the problem, showing your cancellation. $\frac{10}{13}$ x $\frac{26}{50}$ x $\frac{7}{21}$ = _____
10; 13; $\frac{1}{3}$ $\dfrac{\cancel{10}^{\,1}}{\cancel{13}_{\,1}}$ x $\dfrac{\cancel{26}^{\,2}}{\cancel{50}_{\,5}}$ x $\dfrac{\cancel{7}^{\,1}}{\cancel{21}_{\,3}}$ = ans. $\frac{2}{15}$	54. Solve the following problems, using cancellation where applicable. Reduce answers to lowest terms. a. $\frac{2}{5}$ x $\frac{3}{10}$ x $\frac{7}{9}$ = b. $\frac{12}{16}$ x $\frac{8}{24}$ x $\frac{8}{10}$ =
a. $\frac{7}{75}$ b. $\frac{1}{5}$	55. In order to multiply fractions and mixed numbers, the mixed numbers must be changed to improper fractions. Example: $2\frac{1}{2}$ x $\frac{3}{8}$ x $1\frac{1}{3}$ will be changed to $\dfrac{5}{\cancel{2}}$ x $\dfrac{\cancel{3}^{\,1}}{\cancel{8}_{\,2}}$ x $\dfrac{\cancel{4}^{\,1}}{\cancel{3}_{\,1}}$ = $\frac{5}{4}$ reduced is $1\frac{1}{4}$ Solve the following problems, using cancellation where applicable, and reduce answers to lowest terms: a. $3\frac{1}{3}$ x $5\frac{1}{2}$ x $\frac{9}{10}$ = b. $4\frac{1}{2}$ x $3\frac{1}{3}$ x $2\frac{2}{8}$ = c. $\frac{3}{4}$ of 80 =

A

Not quite. $\frac{35}{7}$ is an improper fraction and for the answer to be completely correct (lowest terms), you must now change your answer to a mixed number. Return to page 39B recheck your work, and reduce answer to lowest terms.

B

4 or $\frac{4}{1}$ is incorrect. You obtained the reciprocal of the dividend. You're to obtain the reciprocal of the divisor and then proceed as in multiplication. Now go to page 13C, rework the problem, and select the correct answer.

C

You've forgotten the rule on borrowing. True, you can't subtract $15 \frac{9}{15}$ from $16 \frac{8}{15}$ unless you borrow. Why not take one (1) from 16 and add the fraction $\frac{15}{15}$ to $\frac{8}{15}$? Now you can subtract, but don't forget the (1) you borrowed. Go back to page 31A, rework the problem, and select another answer.

37

a. $16\frac{1}{2}$ b. $33\frac{3}{4}$ c. 60	56. Solve the problems below, cancelling where applicable, and reduce answers to lowest terms. a. $\frac{3}{5}$ of $2\frac{5}{8}$ = b. $3\frac{1}{2} \times 2\frac{1}{4} \times \frac{2}{3}$ = c. $\frac{1}{6}$ of 24 = d. $2\frac{1}{8} \times 3\frac{3}{4} \times 1\frac{1}{3}$ =

a. $1\frac{23}{40}$
 b. $5\frac{1}{4}$
 	
 c. 4
 d. $10\frac{5}{8}$
	57. Dividing common fractions requires two steps:
	 Example: $\frac{2}{7} \div \frac{1}{3}$ =
	    Dividend Divisor
	 (1) Obtain reciprocal of divisor - - $\frac{3}{1}$
	     (invert divisor)
	 (2) Multiply the dividend by the reciprocal of the divisor - - $\frac{2}{7} \times \frac{3}{1} = \frac{6}{7}$
	 Then $\frac{2}{7} \div \frac{1}{3}$ = _____

$\frac{6}{7}$	58. Fill in the steps to find $\frac{5}{9} \div \frac{3}{4}$. (1) Obtain reciprocal of divisor (invert the divisor). _____ (2) Multiply the dividend by the reciprocal of the divisor. _____ Then $\frac{5}{9} \div \frac{3}{4}$ = _____

$\frac{4}{3}$
 	
 $\frac{5}{9} \times \frac{4}{3}$
 	
 $\frac{20}{27}$
	59. Solve this problem: $\frac{3}{10} \div \frac{3}{4}$
	
	 If your answer is: Go to page:
	
	      $\frac{2}{5}$ 13C
	
	      $\frac{9}{40}$ 15C
	
	      $\frac{12}{30}$ 40A

A

$\frac{13}{7}$ is unacceptable, because answers will always be reduced to their lowest terms. Return to page 35B and select the correct answer that is in its lowest terms.

B

$\frac{9}{16}$ is correct.

Dividing with mixed numbers requires three steps: (1) Change the mixed number or mixed numbers to improper fractions. (2) Obtain the reciprocal of the divisor (invert divisor). (3) Multiply the dividend by the reciprocal of the divisor.

Try this problem: $5\frac{5}{6} \div 1\frac{1}{6} =$

If your answer is:	Go to page:
5	35B
$6\frac{29}{36}$	31C
$\frac{35}{7}$	31A

39

A

Not quite right. You must not have cancelled the 3's after obtaining the reciprocal of the divisor and you haven't reduced to the lowest terms. Go back to page 38 frame 59, and correct your mistake. Then select the correct answer.

B

$1 \frac{6}{7}$ is correct. Divide the following fractions and reduce answers to lowest terms:

a. $\frac{5}{8} \div \frac{3}{4} =$

b. $22 \div 6 \frac{7}{8} =$

c. $2 \frac{1}{6} \div 4 \frac{1}{2} =$

d. $\frac{8}{21} \div 3 \frac{3}{7} =$

121

A

No! Does it sound reasonable that 3 is contained in $5\frac{4}{7}$ - - - 16 and

$\frac{5}{7}$ times? You forgot to obtain the reciprocal of the divisor before

you multiplied. Go back to page 35B, invert the divisor, multiply,

and then select the correct answer.

B

Answers from page 40B; a. $\frac{5}{6}$ b. $3\frac{1}{5}$ c. $\frac{13}{27}$ d. $\frac{1}{9}$.

If you had any answers other than those above, you must rework the

problem(s) on page 40B. When you've gotten all correct, solve these

problems:

   a. $5\frac{2}{3} \div 9\frac{5}{9} =$

   b. $5\frac{2}{5} \times 2\frac{1}{2} \times 4\frac{2}{3} =$

   c. $21\frac{1}{16} + 9\frac{3}{8} + 8\frac{1}{2} + \frac{3}{4} =$

   d. $3\frac{3}{16} - 1\frac{3}{4} =$

A

Never! The only way you could have arrived at this answer was to have
reduced the numerator and not the denominator. Return to page 31B,
work the problem again, and select the correct answer.

A

a. $\frac{51}{86}$ b. 63   c. 39 $\frac{11}{16}$ d. 1 $\frac{7}{16}$

If you missed any problem, you must rework and recheck. After all

problems are correct, read the rules again that are on the pages

	Problem:	Go to page:
a.	(division)	39B
b.	(multiplication)	36, Frame 55
c.	(addition)	33B
d.	(subtraction and borrowing)	33A

B

You have completed the Programmed Lesson on fractions. For some, the

program was just a review; for others, it has been a process of

learning.

12:

SELF-TEST ON FRACTIONS

1. Write the definition of a fraction.

    _____

2. Identify the two parts of the fraction $\frac{7}{8}$ and explain what each part
    shows.

    7 - - _____

    _____

    8 - - _____

    _____

3. Identify the proper fractions, the improper fractions, and the mixed
    numbers in the following list by placing a "P" by the proper frac-
    tions, an "I" by the improper fractions, and an "M" by the mixed
    number.

    a. $\frac{15}{16}$ f. $\frac{300}{299}$

    b. $\frac{19}{17}$ g. $\frac{10}{11}$

    c. $2\frac{4}{5}$ h. $\frac{7}{12}$

    d. $\frac{9}{7}$ i. $6\frac{3}{7}$

    e. $77\frac{2}{3}$ j. $\frac{5}{6}$

4. Change the mixed numbers to improper fractions and the improper
    fractions to mixed numbers.

    a. $3\frac{2}{3}$ d. $\frac{19}{15}$

    b. $\frac{11}{10}$ e. $7\frac{7}{8}$

    c. $12\frac{4}{5}$

44   125

5. Reduce the following fractions to their lowest terms:

a. $\frac{18}{81}$

b. $\frac{9}{12}$

c. $\frac{21}{63}$

d. $\frac{3}{7}$

e. $\frac{14}{21}$

f. $\frac{16}{64}$

6. Solve the following ADDITION and SUBTRACTION problems. Reduce answers to lowest terms.

a. $\frac{1}{2} + \frac{1}{2} =$

b. $\frac{5}{7} - \frac{2}{3} =$

c. $\frac{3}{8} + \frac{3}{4} =$

d. $2\frac{3}{8} - 1\frac{5}{8} =$

e. $6\frac{7}{10} - 4\frac{4}{5} =$

f. $11\frac{3}{4} + 19\frac{5}{8} + 9\frac{1}{2} + \frac{3}{16} =$

7. Multiply the following fractions, cancelling where applicable. Reduce answers to lowest terms.

a. $\frac{1}{2} \times \frac{3}{4} \times \frac{2}{3} =$

b. $4\frac{2}{3} \times 5\frac{1}{4} \times 2\frac{2}{3} =$

c. $\frac{3}{4} \times 5\frac{1}{2} =$

d. $\frac{1}{8}$ of $16 =$

8. Divide the following fractions, cancelling where applicable. Reduce answers to lowest terms.

a. $\frac{7}{8} \div \frac{7}{16} =$

b. $15 \div 4\frac{1}{5} =$

c. $4\frac{2}{3} \div 12\frac{4}{9} =$

d. $\frac{4}{5} \div 2\frac{7}{15} =$

GO TO NEXT PAGE FOR ANSWERS.

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ANSWERS TO SELF-TEST

1. A fraction is part of a whole.

2. 7 - - Numerator. Indicates how many parts of the whole are being considered.
   8 - - Denominator. Indicates how many equal parts the whole has been divided into.

3. a. P; b. I; c. M; d. I; e. M; f. I; g. P; h. P; i. M; j. P

4. a. $\frac{11}{3}$; b. $1\frac{1}{10}$; c. $\frac{64}{5}$; d. $1\frac{4}{15}$; e. $\frac{63}{8}$.

5. a. $\frac{2}{9}$; b. $\frac{3}{4}$; c. $\frac{1}{3}$; d. $\frac{3}{7}$; e. $\frac{2}{3}$; f. $\frac{1}{4}$

6. a. 1; b. $\frac{1}{21}$; c. $1\frac{1}{8}$; d. $\frac{3}{4}$; e. $1\frac{9}{10}$; f. $41\frac{1}{16}$

7. a. $\frac{1}{4}$; b. $65\frac{1}{3}$ c. $4\frac{1}{8}$; d. 2

8. a. 2; b. $3\frac{4}{7}$; c. $\frac{3}{8}$; d. $\frac{12}{37}$

127

Solve Problems Involving Decimal Fractions

Directions: Read each frame carefully, then, write in the answer;
be sure that you are satisfied with your answer before
you write it in.

This section was designed to provide you with a review of the
multiplication and division of decimals. When you have completed this
section, you should be able to convert within the system without any
difficulty. Remember:

0.1 one place to right of decimal is 1/10
0.01 two places to right of decimal is 1/100
0.001 three places to right of decimal is 1/1000
0.010 NOTE: This is the same as 1/100. You may drop the last zero.

1. When multiplying decimal numbers, you must remember to count off
the TOTAL number of decimal places in the answer.

EXAMPLE: 1.50   (Contains two places)
         x .5   (Contains one place)
          .750 After adding the places of both parts of the
                problem you can see that the answer must contain
                three places.

2. Work the following problems and place your answers in the blanks
provided.

   a.   7.50   b.   8.471
        x0.4   (   )   x10.12 (   )

3. Work this problem: 3.760
                        x .40   Your answer (   )

4. When multiplying decimal numbers, the problem (multiplier and
multiplicand) and the answer will contain (   ) amount of
number(s) placed to the right of the decimal point.

1

'47

120

5. Study this problem   .364
                     x.02
                     728

You know that there must be five places to the right of the decimal point; therefore, you must add two zeros. The answer, then, would be (   ).

6. Solve this problem: .322   Your answer: (   )
                    x.02

7. To divide a whole number by a decimal; convert the decimal (divisor) to a whole number by moving the decimal all the way to the right. Move the decimal in the whole number (dividend) the same number of places to the right. Divide as usual, placing the decimal directly above the decimal point in the dividend. NOTE THE ARROWS BELOW.

    Example: $\dfrac{356}{.712_\wedge}$ $.712_\wedge\overline{)356.000_\wedge}$

8. Convert this decimal number to a whole number and place the decimal in the answer.

    $\dfrac{4}{0.44}$ $0.44\overline{)\ 4.\ \ }$

9. To check the answer after dividing, multiply the product by the divisor. The answer after multiplying, should be the same as the dividend.

                       162.5   (product)
    EXAMPLE: (divisor)   .04/6.50.0   (dividend)
                            4
                          25
                          24
                          10
                           8
                          20
                          20
                           0

    Checking your answer: 162.5 (product)
                       .04 (divisor) 129
                    6.500 (dividend)

7B 75-1104

10. Solve these problems and check the answers.

    a.   5   b.   8   c.   91.2   d.   .463
)0.44   .55   x   .21   x .02

11. To solve this problem, $\dfrac{3.50}{.02}$ x .02 = 3.50

                175.
     Divide   .02/3.50.   and multiply   175
               2   .02
               15   3.50
               14
                10
                10

     Solve this problem: $\dfrac{4.40}{.02}$ x .3 = (   )

12. To solve the above problem, first (   ) and then (   ).

13. Solve these problems:

     a. $\dfrac{6.50}{.04}$ x .4 = (   )   b. $\dfrac{3.50}{.03}$ x .3 (   )

14. Solve these problems and check the answers. Record your answers below each problem. Remember, you must divide to check your answers.

     a.   0.69.   b.   .256   c.   .756
       x .04   x.57   x.04

130

15. To round off a decimal number, increase the last place number by one when the next figure is five or greater; leave the last place number the same when the next figure is less than five.

Example:

a. Round off 1.876643 to two places after the decimal point. 1.876643. The third place number is five or more, so seven is increased by one, and 1.876643 becomes 1.88.

b. Round off 1.432329 to four places after the decimal point. 1.432329. The fifth place number is four or less, so three remains the same and 1.432329 becomes 1.4323.

c. Round off 1.875429 to four places after the decimal point. 1.875429. The fifth place number is (   ). Since it is less than (   ) 1.875429 becomes (   ). Round off 1.875449 to four places after the decimal point. Answer here. (   ).

16. Round off 3.4357810 to three places after the decimal point.

    Answer here. (   )

17. Round off 12.1314 to two places after the decimal point.

    Answer here. (   )

18. Round off 11.25 to one place after the decimal point.

    Answer here. (   )

19. Solve these problems and round off your answers to one place after the decimal point.

    a. $\dfrac{32.43 \times 2.44}{.02} =$

    b. $\dfrac{2.652 \times 4.345}{.03}$

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7F- 75-1104

W O R K   S H E E T

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ANSWERS TO DECIMAL FRACTION PROGRAMMED TEXT

1. Non response
2. a. 3
   b. 85.72652
3. 1.50400
4. The same
5. .00728
6. .00644
7. No response
8. 0.44/4.00
9. No response
10. a. 11.363 and 5.00
    b. 14.545 and 8.00
    c. 19.152 and 91.2
    d. .00926 and .463
11. 220 and 66.0
12. Divide and multiply
13. a. 162.5 and 65
    b. 116.66 and 34.998
14. a. .0276 and .69
    b. .14592 and .256
    c. .03024 and .756
15. 2; 5; 1.8754; 1.8754
16. 3.436
17. 12.13
18. 11.3
19. a. 1621.5 and 3956.5
    b. 88.4 and 384.1

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Convert Simple Fractions to Decimal Fractions

EXAMPLE: Convert 3/4 to a decimal fraction.

Step 1. Write down the simple fraction: 3/4

Step 2. Divide the numerator by the denominator: $4\overline{)3.000}$

Step 3. Your answer: .75

PRACTICE PROBLEMS

1. Convert 1/20 to a decimal fraction.

2. Convert 1/80 to a decimal fraction.

3. Convert 25/1000 to a decimal fraction.

4. Convert 2/3 to a decimal fraction.

Convert Decimal Fractions To Simple Fractions

    <u>EXAMPLE</u>: Convert 0.06 to a simple fraction.

Step 1. Write down the decimal
           fraction: 0.06

Step 2. This is read as six-
           hundredths. So place $\dfrac{6}{100}$
           the 6 over 100:

Step 3. Reduce this fraction $\dfrac{3}{50}$
           to lowest terms:

Step 4. Your answer: $\dfrac{3}{50}$

PRACTICE PROBLEMS

1. Convert 0.125 to a simple fraction.

2. Convert 0.005 to a simple fraction.

3. Convert 0.250 to a simple fraction.

4. Convert 1.25 to a simple fraction

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Roman Numerals

$$M = 1000$$
$$D = 500$$
$$C = 100$$
$$L = 50$$
$$X = 10$$
$$V = 5$$
$$i = 1$$
$$ss = 1/2$$

PRACTICE PROBLEMS

Convert the following to Arabic numberals:

1. DC = _____

2. XVi = _____

3. CX = _____

4. XL = _____

Convert the following to Roman numerals:

1. 25 = _____

2. 38 = _____

3. 14 = _____

4. 151 = _____

55

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Rearrange Equations

DEFINITION: An equation is a statement of equality.

NOTE: To solve for any term in an equation; that term must stand-alone.

EXAMPLE: Using the equation, $A = \frac{B}{C}$; solve for "B".

Step 1. Always write the complete equation before starting: $A = \frac{B}{C}$

Step 2. Multiply both sides by "C": $AC = \frac{BC}{C}$

Step 3. Cancel the "C's" on the right: $AC = \frac{B\cancel{C}}{\cancel{C}}$

Step 4. Your new equation: $AC = B$

PRACTICE PROBLEMS

1. Solve for X. $A = \frac{X}{Y}$

2. Solve for N $2 = \frac{N}{6}$

3. Solve for Z $4 = \frac{7}{A}$

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Rearrange Equations, Con't

EXAMPLE: Using the equation, $X = \frac{Y}{Z}$, Solve for Z.

Step 1. Write the complete equation: $X = \frac{Y}{Z}$

Step 2. Multiply both sides by "Z": $XZ = \frac{Y}{Z} Z$

Step 3. Cancel the "Z's" on the right side: $XZ = \frac{Y \cancel{Z}}{\cancel{Z}}$

Step 4. Now your equation looks like: $XZ = Y$

Step 5. Divide both sides by "X": $\frac{XZ}{X} = \frac{Y}{X}$

Step 6. Cancel the "X's" on the left side: $\frac{\cancel{X}Z}{\cancel{X}} = \frac{Y}{X}$

Step 7. Your new equation: $Z = \frac{Y}{X}$

PRACTICE PROBLEMS

1. Solve for B. $A = \frac{C}{B}$

2. Solve for N. $3 = \frac{6}{N}$

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DEPARTMENT OF BIOMEDICAL SCIENCES

10-8

PHARMACY SPECIALIST

BLOCK I

FUNDAMENTALS OF PHARMACY

March 1975

SCHOOL OF HEALTH CARE SCIENCES, USAF
SHEPPARD AIR FORCE BASE, TEXAS

—————— Designed For ATC Course Use ——————

DO NOT USE ON THE JOB

FUNDAMENTALS OF PHARMACY

OBJECTIVES

1. Solve problems pertaining to basic mathematical operations, metric system, apthecary system, avoirdupais system, and Ratio and Proportion.

2. Solve problems pertaining to conversion of weights and measures, and calculation of doses.

PROCEDURES

Systems of measurements in 'the the past were based on traditional standards, such as the length of the King's foot or the weight of a grain of wheat. For their time and technology they were adequate. The need for a more exacting and universal system of measurement brought about the creation and standardization of the Metric system.

Instructions

Each type problem you may encounter will be explained by the instructor. Fill in each blank in the example section as the information is given to you. This will assist you in working the practice problems. These problems will be evaluated by the instructor to insure you are working them correctly. Complete all problems assigned. SHOW ALL WORK!

DEFINITION: METER is the basic unit of length (39.37) inches)

Liter is the basic unit of volume. (The volume of the cube of 1/10 of a meter.

Gram is the basic unit of weight (equal to the weight of one cubic centimeter of water at 4 degrees centigrade).

DEFINITION: Latin prefixes:

deci is equal to 1/10 of the basic unit.

centi is equal to 1/100 of the basic unit.

milli is equal to 1/1000 of the basic unit.

micro is equal to 1/1,000,000 of the basic unit.

DEFINITION: GREEK PREFIXES

deka is equal to ten times the basic unit

hecto is equal to one hundred times the basic unit.

kilo is equal to one thousand times the basic unit.

ABBREVIATIONS:

Meter   = M

Liter   = L

Gram   = Gm

deci   = d

centi   = c

milli   = m

micro   = mc

Deka   = D

Hecto   = H

Kilo   = K

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2

Solve Problems Within The Metric System

This is a programmed text to help you to learn the Metric System. Follow the directions carefully and do not "skip around".

Directions: Read each frame carefully, then, write in the answer; be sure that you are satisfied with your answer before you write it in.

1. In the metric system, weight is expressed in grams, linear measurement is expressed in meters, and liquid volume is expressed in liters.

   The system which uses grams, meters and liters is called the ( ) system.

2. The primary units of measurements in the metric system are ( ), ( ), and ( ).

3. Which of the following units of measurement belong to the metric system: (Circle your answers below)

   a. pound,   .d. liter
   b. gram   e. yard
   c. gallon   f. meter

4. The gram, which is a much smaller unit than our commonly used pound, is the basic metric unit used to measure (Circle your answer below)

   a. volume   b. length   c. weight

5. Length, in the household system, is measured in inches, feet, yards, etc. In the metric system, however, the primary unit for the measurement of length is the meter.

   With the metric system, length is measured in ( ).

6. When using the metric system to measure the length of an item, you would record its length as so many ( ).

7. In the metric system, the primary unit of weight is the ( ); the primary unit of length is the ( ).

8. The primary metric unit of measurement used to measure volume is the liter.

3

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Which of the following is used to measure volume in the metric system? (Circle your answer below).

a. pounds   d. grams
b. gallons   e. liters
c. meters   f. inches

9. In the common household system, pints, quarts and gallons are used to measure volume. In the metric system, however, the primary unit used to measure volume is the (   ).

10. When items are weighed by the metric system, their weight is expressed in (   ).

11. The length of an item measured by the metric system is expressed in (   ).

12. The volume of liquids measured by the metric system is expressed in (   ).

13. When metric measurements are written, the amount is written as a numeral followed by the unit. Study these examples:

    Four meters is written as 4 meters.
    Four liters is written as 4 liters.
    Twelve grams is written as 12 grams.

Now write the following measurements:

    a. Four grams   (   )

    b. Eight liters (   )

    c. Nine meters   (   )

14. If the measurement contains a fraction, the fraction is written as a decimal. Study these examples:

    4 1/4 meters is written as 4.25 meters.
    4 3/4 liters is written as 4.75 liters.
    4 1/8 grams is written as 4.125 grams.

Now, write the following measurements.

    a. Five and one-half grams   (   )

    b. Three and one-fourth meters (   ).

    c. Four and three-quarter liters (   )

4

15. Write the primary metric unit used to measure weight, length and volume.

    a. weight (   )

    b. length (   )

    c. volume (   )

16. You should also know the abbreviations for the three basic metric units of measurement. Abbreviations of the basic units are always capitalized.

17. The abbreviation for gram(s) is Gm.

Using the abbreviation, write 12 grams. (   ).

18. The abbreviation for meter(s) is M.

Using the abbreviation, write 2 meters. (   )

19. The abbreviation for liter(s) is L.

Using the abbreviation, write 1 liter. (   )

20. Using abbreviations, write:

    200 liters (   )

    17 meters (   )

    16 grams (   )

21. In addition to the three basic units you have just studied, the metric system has other units which are subdivisions of the basic units. Let us now study some of those subdivisions which are frequently used.

22. The common subdivision of the gram is the milligram (.001 of a gram) The abbreviation for the milligram is mg.

Using the abbreviation, write 12 milligrams. (   )

23. When the prefix milli (m) is used with a basic unit (Gm., L., etc.) and the figure is less than 1000, the amount expressed is less than the basic unit.

Example: 500 mg. = .5 of a gram
            250 ml. = .25 of a liter
            700 mm. = .7 of a meter

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24. When the prefix milli (m) is used with a basic unit and the figure is greater than 1000, the amount expressed is more than the basic unit.

    EXAMPLE: 1,500 mg. = 1.5 grams
              2,500 ml. = 2.5 liters
              1,700 mm. = 1.7 meters

    Complete the following:

    a. 350 milligrams = (   ) grams

    b. 2,300 milliliters = (   ) liters

    c. 1,800 milligrams = (   ) grams

    d. 300 millimeters = (   ) meters

    e. 450 milliliters = (   ) liters

25. A meter may be divided into 100 parts; each part, then is one centimeter (.01 of a meter). The abbreviation for centimeter is cm. The abbreviation for cubic centimeter is cc.

    Using the abbreviation, write 1 centimeter. (   )

    Using the abbreviation, write 4 cubic centimeters. (   )

26. Using the abbreviation, write 500 cubic centimeters. (   )

    Using the abbreviation, write 400 cubic centimeters. (   )

27. The common subdivision of the liter is the milliliter, or .001 of a liter. The abbreviation for milliliter is ml.

    Using the abbreviation, write 200 milliliters (   )

28. Using the abbreviation, write 4 milliliters. (   )

29. Write the abbreviations for meter (   ), gram (   ), liter (   ), cubic centimeter (   ), milliliter (   ), milligram (   ) and centimeter (   ).

6

30. Using the correct abbreviations, rewrite each of the following:

    a. 15 cubic centimeters (   )

    b. 10 grams (   )

    c. 9 milligrams (   ).

    d. 5 liters (   )

    e. 1 cubic centimeter (   )

    f. 17 milliliters (   )

    g. 14 centimeters (   )

31. Just as it has subdivisions to express measurements less than the primary units, the metric system also has units to express measurements larger than the primary units. Those larger units are expressed by the prefix kilo which means 1,000. For example, 1 kilometer = 1,000 meters, 1 kilogram = 1,000 grams, and 1 kiloliter = 1000 liters. The prefix that means 1,000 is (   ).

32. The abbreviation of kilogram is $\underline{Kg}$, kilometer is $\underline{Km}$ and kiloliter is Kl. Abbreviations of prefixes whose values are larger than the basic units. (Circle your answer below)

    a. are capitalized   b. are not capitalized

33. A length of 5,000 meters expressed in kilometers would be written as 5 (   ).

34. An object that weighs 1 kilogram weighs how many grams? (   )

35. As you have already learned, an item which is shorter, or which weighs less than the primary unit may be expressed by the prefix milli. A milligram is .001 of a gram. How many milligrams are required to make up one gram? (Circle your answer below)

    a. 10   c. 1,000
    b. 100   d. 10,000

7,

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36. A kiloliter is equal to (   ) liters. A milliliter is equal
to what part of a liter?   (   )

37. To express 1,000 grams, 1,000 liters and 1,000 meters, you may use
the same prefix which is (   )

38. To express .001 of a gram, .001 of a liter and .001 of a meter,
you may use the prefix (   ).

39. As you recall, 1 milliliter is used to express .001 of a liter.
Another way to express that same amount is 1 cubic centimeter,
abbreviated 1 cc. This is true because 1 cc. occupies the same
space and has the same volume as 1 milliliter.

One cc. is (   ) one milliliter.

40. Do not get the two prefixes confused. Remember that the prefix
milli means .001; the prefix centi means .01.

In the spaces below, write five cubic centimeters and eight
centimeters using abbreviations.

(   ) (   )

41. To convert grams to milligrams, multiply the number of grams by 1000
or move the decimal three places to the right.

Example: 0.15 Gm. = 150 mg.

       0.15
     x 1,000
     Ø150.00

42. Convert 2.5 grams to milligrams. (   )

8

43. To convert milligrams to grams, divide the number of grams by 1000 or move the decimal three places to the left.

EXAMPLE: 150 mg. = 0.15 Gm.

$$\begin{array}{r} 0.15 \\ 1000\overline{)150.00} \\ \underline{100.0} \\ 5000 \\ \underline{5000} \end{array}$$

850 mg. = (   ) Gm.

44. Now that you know the prefixes, work the following problems for practice. Check your responses.

   a. 500 milligrams is the same as (   ) grams.

   b. 2 grams is the same as (   ) milligrams.

   c. 500 centigrams is the same as (   ) milligrams.

   d. 350 milligrams is the same as (   ) centigrams.

   e. 250 milliliters is the same as (   ) liters.

   f. 180 liters is the same as (   ) milliliters.

   g. 420 millimeters is the same as (   ) meters.

   h. 3.5 meters is the same as (   ) millimeters.

   i. 500 kilograms is the same as (   ) grams.

   j. 4,500 grams is the same as (   ) kilograms.

   k. 1 kilogram is the same as (   ) centigrams.

   l. 2,500 centiliters is the same as (   ) kiloliters.

   m. 3.5 kiloliters is the same as (   ) liters.

   n. 1.6 meters is the same as (   ) kilometers.

9

Answers for Metric System

1. metric
2. grams, meters liters
3. gram; liter; meter
4. weight
5. meters
6. meters
7. gram, meter
8. liters
9. liter
10. grams
11. meters
12. liters
13. 4 grams; 8 liters; 9 meters
14. 5.5 grams; 3.25 meters; 4.75 liters
15. grams; meters; liters
16. No response
17. 12 Gm.
18. 2M
19. 1 L.
20. 200 L; 17M; 16 Gm
21. No response
22. 12 mg
23. No response
24. a. .35
    b. 2.3
    c. 1.8
    d. .3
    e. .45
25. 1 cm; 4 cc
26. 500 cc; 400 cc
27. 200 ml
28. 4 ml

29. M; Gm; L; cc; ml; mg; cm
30. a. 15 cc
    b. 10 Gm
    c. 9 mg
    d. 5 L
    e. 1 cc
    f. 17 ml
    g. 14 cm
31. kilo
32. are; are not
33. kilometers
34. 1,000
35. 1,000
36. 1,000; .001
37. kilo
38. milli
39. equal to (or same as)
40. 5 cc; 8 cm
41. No response
42. 2.5 Gm.
    $$\frac{1000}{2500.0} = 2500 \text{ mg.}$$
43. .850
44. a. .5 grams
    b. 2,000
    c. 5,000
    d. 35
    e. .25
    f. 180,000
    g. .42
    h. 3,500
    i. 500,000
    j. 4.5
    k. 100,000
    l. .025
    m. 3,500
    n. .0016

APOTHECARY SYSTEM

PROCEDURES

One of the oldest system of weights and measures is the Apothecary system and although antiquated and no longer official it is still used extensively in medicine. Therefore your complete comprehension is necessary.

Instructions

Each type of problem you may encounter will be explained by the instructor. Fill in each blank in the example section as the information is given to you. This will assist you in working the practice problems. These problems will be evaluated by the instructor to insure you are working them correctly. Complete all problems assigned. SHOW ALL WORK!

APOTHECARY TABLE OF WEIGHTS

20 grains	1 scruple
3 scruples	1 drachm
8 drachms	1 ounce
12 ounce	1 pound

APOTHECARY TABLE OF FLUID MEASURE (VOLUME)

60 minims	1 fluidrachm
8 fluidrachms	1 fluidounce
16 fluidounces	1 pint
2 pints	1 quart
4 quarts	1 gallon

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DEFINITION OF APOTHECARY SYMBOLS

MINIM . . . . mx

FLUIDRACHM . . . . fl ℥

FLUIDOUNCE . . . . fl ℥

PINT . . . . .pt., ◉

QUART . . . . qt

GALLON . . . . C or Cong

GRAIN . . . . .gr

SCRUPLE . . . . ℈

DRACHM. .DRAM . . . . ℥

OUNCE . . . . ℥

POUND . . . .℔

15

Restate To A Lower Denomination In The Apothecary System

EXAMPLE: Reduce 3 fl ℥ 2 fl ℨ to mx

Step 1. Copy the value from the problem carefully,   3 fl ℥ 2 fl ℨ

NOTE: Each value will be reduced separately

Step 2. First reduce the 2 fl ℨ How many mx are in each fl ℨ ? _____ How many fl ℨ are you reducing? _____ Multiply 60 times 2 to find the number of mx in 2 fl ℨ .

$$\begin{array}{r} 60 \\ \times\ 2 \\ \hline 120 \end{array}$$

Step 3. Rewrite the problem using 120 mx for the 2 fl ℨ   3 fl ℥ 120 mx

Step 4. Now reduce the 3 fl ℥ How many mx are in each fl ℥ ? _____ . How many fl ℥ are you changing? ____ Multiply 480 times 3 to find the number of mx in 3 fl ℥ .

$$\begin{array}{r} 480 \\ \times\ 3 \\ \hline 1440 \end{array}$$

Step 5. Rewrite the problem using 1440 mx for the 3 fl ℥

Step 6. Add up the mx and your answer is: 1560 mx

.13

PRACTICE PROBLEMS

1. Convert the following to a lower denomination in the Apothecary System.

   a. Cong ii, pt ii, fl ℥ii to   fl ℥

   b. ℥xvi,   ℥xxxii to gr

   c. ℈iii, mx 480 to fl ℥

   d. ℔ss, ℥xxiv to ℥

Restate To A Higher Denomination In The Apothecary System

    EXAMPLE: Change 5840 gr to weighable units.

Step 1. Copy the values from the
          problem carefully.   5840 gr

Step 2. Study this number. What is
          the largest unit that this
          could be changed to? _____
          How many grains does this
          unit contain? _____

Step 3. Now to find the number of
          pounds, divide 5760 into
          5840. The number of pounds
          in 5840 gr is _____ and
          the number of grains left
          over is   80
          Now the amount is rewritten
          using the pound and grains.

$$\begin{array}{r} 1 \\ 5760\,\overline{)5840} \\ 5760 \\ \hline 80 \text{ gr left} \end{array}$$

1 lb. 80 gr.

Step 4. Study the 80 gr. What is
          the largest unit that this amount
          can be changed to? _____
          How many grains does 1
          dram contain? _____

Step 5. Now to find the number of
          drams, divide 60 into 80.
          The number of drams in
          80 gr. is _____ and the
          number of grains left over
          is, _____.

$$\begin{array}{r} 1 \\ 60\,\overline{)80} \\ 60 \\ \hline 20 \text{ gr left} \end{array}$$

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Step 6. Now rewrite the problem again
using the pound, dram and grains   1 lb   1 ʒ 20 gr

Step 7. Study the 20 gr. What is the
largest unit that this can be
changed to? _____
How many grains does this
unit have in it? _____

Step 8. Now to find the number of scruples
in 20 gr, divide 20 into 20.
The number of scruples is _____.

Step 9. Rewrite the problem
using the number of
scruples. Your answer.   1 lb   1 ʒ   1 ϶

16   155

PRACTICE PROBLEMS

1. Convert the following to weighable Apothecary units.

a. 3440 gr.

b. 1650 gr.

c. 950 gr.

d. 695 gr.

17

AVOIRDUPOLIS SYSTEM

PROCEDURES

The Avoirdupois System is the official system of commerce and you are indirectly related to commerce in ordering bulk drugs through medical supply channels. You must have a complete understanding of this system to facilitate transactions with supply.

Instructions

Each type problem you may encounter will be explained by the instructor. Fill in each blank in the example section as the information is given to you. This will assist you in working the practice problems. These problems will be evaluated by the instructor to insure you are working them correctly. Complete problems assigned. SHOW ALL WORK!

AVOIRDUPOIS TABLE OF WEIGHT

437.5 grains . . . . 1 ounce
16 ounces . . . . 1 pound

Definition of Avoirdupois Symbols

grain . . . . gr
ounce . . . . oz
pound . . . . lb

To restate Avoirdupois units to a higher or lower denomination follow the same procedures you used in restating within the Apothecary System.

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PRACTICE PROBLEMS

1. Reduce the following to weighable Avoirdupois denominations.

    a. 7540 gr _____

    b. 1560 gr _____

    c. 856 gr _____

    d. 466 gr _____

2. How many 10 grain capsules can be made from 1/2 lb of iron crystals?

3. How many 5 grain capsules of Aspirin can be made from 4 oz of Aspirin powder?

4. How many 1/2 gr tablets of Codeine can be made from 1/8 oz of codeine powder?

5. How many grains of chemical are left in a 1 oz bottle after enough of it has been used to make 2000 tablets each containing 1/200 grain of the chemical.

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RATIO AND PROPORTION

If it were possible to choose the most useful method of solving mathematical problems, ratio and proportion would probably be selected. Nearly 80 percent of the problems you will encounter in Pharmacy can be solved using this method.

Instructions

Each type of problem you may encounter will be explained by the instructor. Fill in each blank in the example section as the information is given to you. This will assist you in working the practice problems. These problems will be evaluated by the instructor to insure you are working them correctly. Complete all problems assigned. SHOW ALL WORK!

DEFINITION: A ratio is the numerical comparison of two similar quantities.

DEFINITION: A proportion is a statement of the equality of two ratios.

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Solving Problems Using Ratio and Proportion

EXAMPLE: How many feet per second is a car traveling
at 90 mph, if at 60 mph it is traveling 88
feet per second?

Step 1. Read the question. Determine
what is asked (the number of
feet per second at 90mph) and
call this the "problem".
Now determine what information
is given (88 feet per second
at 60 mph).

Step 2. Write the "problem" on one line,　　　90 mph　　X ft/sec
using "X" for the unknown.

Step 3. Write the given information on
the line under the problem. Be
sure to place 60 mph under the
90 mph (the first ratio) and the　　　90 mph　　X ft/sec
88 ft/sec under the "X" ft/sec　　　60 mph　　88 ft/sec
(the second ratio)

Step 4. Now draw a line between the
90 mph and the 60 mph and
another line between the "X"　　　$\dfrac{90 \text{ mph}}{60 \text{ mph}} = \dfrac{X \text{ ft/sec}}{88 \text{ ft/sec}}$
ft/sec and the 88 ft/sec. Then
place an equal sign in the center.

Step 5. Cross multiply (90 times 88 and　　　$60 \cdot X = 90 \cdot 88$
60 times "X"). Giving the
products. (Note: the ft/sec　　　$60 \, X = 7920$
and the mph are not used here)

Step 6. Divide by the number next to　　　$X = \dfrac{7920}{60}$
the "X"

Step 7. Your answer
(Note: the ft/sec is placed　　　$X = 132 \text{ ft/sec}$
next to the answer because
"X" is the number of ft/sec)

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PRACTICE PROBLEMS

MAKE VALID RATIOS BETWEEN THESE QUANTITIES

1. 1 yard and 2 feet _____

2. 4 hours and 120 minutes _____

3. 2 feet and 6 inches _____

4. 100 Grams and 10 Kilograms _____

5. Butter sells 3 lb. for 98¢. How much will 2 lb. cost?

6. A drug cost $6.98 for 12 ounces. How much will three and 3/4 ounces cost the pharmacist?

7. 20 gallons of gasoline will run your car 235 miles. How far should you go on six and 1/2 gallons?

8. The airliner travels 600 mph and you will fly 1230 miles. How long will your trip be?

9. The item sells for $4.25 a dozen and you only have $2.00. How many can you buy?

23

CONVERSION OF WEIGHTS AND MEASURES

PROCEDURES

Even though AFM 168-4 states that all prescriptions should be written in the Metric System, some physicians will continue to write in one of the other systems. The responsibility will rest on you to convert these prescriptions to the Metric System.

Instructions

Each type of problem you may encounter will be explained by the instructor. Fill in each blank in the example section as the information is given to you. This will assist you in working the practice problems. These problems will be evaluated by the instructor to insure you are working them correctly. Complete all problems assigned. SHOW ALL WORK!

CONVERSION EQUIVALENTS:

```
    64.8 mg  = 1 gr.
     1 Gm.   = 15.432 gr.
   31.1 Gm.  = 1 ounce (Apoth)
  28.35 Gm.  = 1 oz. (Av.)
    454 Gm.  = 1 lb. (Av)
     1 Kg.   = 2.2 lb. (Av)
     1 ml.   = 16.23 minim
  29.57 ml.  = 1 fl ounce (Apoth)
    473 ml.  = 1 pint
```

COMMON EQUIVALENTS:

```
  1 Teaspoonful   = 1 dram = 5 ml
  1 Tablespoonful = 1/2 fl ounce = 15 ml
```

NOTE: The common equivalents are used only when interpreting prescriptions.

24

Convert From The Common Systems to The Metric System

    EXAMPLE: Convert 4 fl ℥ to ml.

Step 1. Identify the problem; in this case it is to convert 4 fl℥ to ml. Write the problem down, use an "X" for the unknown.

$$4 \text{ fl℥} = x \text{ ml.}$$

Step 2. Be sure that the common system quantity is in one denomination, make any changes now.

$$4 \text{ fl℥} = x \text{ ml.}$$

Step 3. Choose a conversion equivalent that possesses both the denominations present in the problem. In this case use,
$$1 \text{ fl℥} = 29.57 \text{ ml.}$$

Step 4. Write the conversion equivalent under the problem. Be sure to place the 1 fl℥ under the 4 fl℥ and the 29.57 ml. under the x ml.

$$4 \text{ fl℥} = x \text{ ml.}$$
$$1 \text{ fl℥} = 29.57 \text{ ml}$$

Step 5. Draw a line between the fl℥'s and another between the ml's.

$$\frac{4 \text{ fl℥}}{1 \text{ fl℥}} = \frac{x \text{ ml.}}{29.57 \text{ ml.}}$$

Step 6. Cross multiply

$$1x = 118.28$$

           Divide; by the number next to the "x"

$$\frac{1x}{1} = \frac{118.28}{1}$$

Step 7. Your answer, be sure to attach the proper "label" to it.

$$x = 118.28 \text{ ml.}$$

25

164

PRACTICE PROBLEMS

1. How many grams are in 246 grains?

2. How many ml are contained in f℥ii?

3. Convert one dram and 20 minims to ml.

4. Convert 3 gallons, 1 pint, 10 f℥ to ml.

5. A formula for a cough syrup calls for 1/8 gr of Codeine phosphate per fluid dram. How many grams would be used in preparing a pint of this cough syrup?

26

165

6. Convert 1/1000 gr to mcg.

7. If fl ʒ i of a cough syrup contains 10 gr of Sodium Citrate how many grams will it contain?

8. A prescription calls for 3/4 gr of a medication, how many mg will be dispensed?

9. Convert 3 ℔, 15 ʒ, 6 ℈ to grams.

10. How many 500 mg doses could be obtained from 3/4 lb of a drug?

27

166

Convert From The Metric System To The Common Systems

EXAMPLE: Convert 324 mg. to gr.

Step 1. Identify the problem;
in this case it is to
convert 324mg. to gr.
Write it down, use an
"x" for the unknown:

$$324 \text{ mg.} = x \text{ gr.}$$

Step 2. Choose a conversion
equivalent that possesses
both the denominations
present in the problem.
In this case use;
64.8 mg. = 1 gr:

Step 3. Write the conversion
equivalent under the
problem. Be sure to
place 64.8 mg under
the "x" gr:

$$324 \text{ mg.} = x \text{ gr.}$$
$$64.8 \text{ mg} = 1 \text{ gr.}$$

Step 4. Draw a line between the
two mg's and another between
the two gr's:

$$\frac{324 \text{ mg.}}{64.8 \text{mg.}} = \frac{x \text{ gr.}}{1 \text{ gr.}}$$

Step 5. Solve by the ratio and
proportion method.

$$\frac{324 \text{ mg,}}{64.8 \text{mg.}} = \frac{x \text{ gr,}}{1 \text{ gr.}}$$

Cross multiply:

$$64.8x = 324$$

Divide by the number
next to the "x":

$$x = \frac{324}{64.8}$$

Step 6. Your answer, be sure
to attach the proper
"label" to it:

$$x = 5 \text{ gr,}$$

28   167

PRACTICE PROBLEMS

1. Convert 250 ml to fluid ounces.

2. Convert 4.5 liters to fluid ounces.

3. How many mg are there in 6 1/2 ʒ ?

4. Convert 6.6 pounds to kilograms.

29

5. How many 6.5 mg tablets can be obtained from 1/2 ounce (Apoth) of a chemical?

6. If a mixture weighing 30 grams is divided into 100 doses, how many grains will each dose weigh?

7. How many 1/8 gr tablets can be made from 3 grams of drug?

8. A certain drug is available in 16.2 mg tablets. Express this as a fraction of a grain.

9. How many teaspoonfuls are there in 0.5 Kiloliters and 500 milliliters?

CALCULATION OF DOSES

PROCEDURES

Everytime you fill a prescription you must determine many things within a few minutes. Has the doctor prescribed enough medication or the right strength medication or could this prescription be for a child, how much would he get? In many instances the Physician will leave the variables for you to calculate.

Instructions

Each type of problem you may encounter will be explained by the instructor. Fill in each blank in example section as the information is given to you. This will assist you in working the practice problems. These problems will be evaluated by the instructor to insure you are working them correctly. Complete all problems assigned. SHOW ALL WORK!

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DEFINITION: A <u>DOSE</u> is the amount of preparation a patient takes at one time.

The formulas used in calculating

1. The number of dose

   Number of dose = $\dfrac{\text{Total preparation}}{\text{Size of each dose}}$

2. The size of each dose

   Size of each dose = $\dfrac{\text{Total preparation}}{\text{Number of doses}}$

3. The total preparation

   Total preparation = Number of doses X each dose

The formulas used in calculating children's dosages

1. Young's rule

   $\dfrac{\text{Age in years}}{\text{Age in years} + 12}$ X Adult dose = Childs dose

2. Clark's rule

   Child's dose = $\dfrac{\text{Weight in pounds X adult dose}}{150}$

32

Calculation Of The Number Of Doses In A Preparation

> EXAMPLE: Find the number of doses in 120 ml. if each dose is one teaspoonful (5 ml.).

Step 1. Write the complete formula:

$$\# = \frac{Total}{Size}$$

Step 2. Assign values to the appropriate terms:

Total = 120 ml.
Size = 5 ml.
\# = X

Step 3. Rewrite the formula, substituting the assigned values for the terms:

$$X = \frac{120}{5}$$

Step 4. Solve by the process indicated:

$$X = \frac{120}{5}$$

Step 5. Your answer:

$$X = 24 \text{ doses}$$

PRACTICE PROBLEMS

33

PRACTICE PROBLEMS

1. How many 15 minim doses are contained in 60 ml of a tincture?

2. If 180 ml of medicine is to be taken and each dose contains 2 tablespoonfuls, how many doses will this 180 ml contain?

3. How many 250 mgm doses can be obtained from one-half ounce (apoth) of a chemical?

4. The physician prescribes 8 fluid ounces (apoth) of Penicillin to be take in 10 ml doses. How many doses will the patient receive?

5. How many ℥ss doses could you get from one pound (apoth) of a drug?

34

Calculate The Size Of Each Dose

EXAMPLE: What is the size of each dose if a patient is given
300 ml. and instructed to take the medicine once
daily for 20 days?

Step 1. Write the complete
formula: Size = $\frac{Total}{\#}$

Step 2. Assign values to the
appropriate terms:

Total = 300
# = 20

Step 3. Rewrite the formula,
Substituting the assigned   Size = $\frac{300}{20}$
values for the terms:

Step 4. Solve by the process
indicated.   Size = $\frac{300}{20}$

Step 5. Your Answer: Size = 15 ml. or
1 tablespoonful

35

174

PRACTICE PROBLEMS

1. What is the dose a patient will take if he receives 3 grams and is told to take it four times a day?

2. 20 doses are to be obtained from ℥iss of a chemical. How many mg is each dose?

3. 40 grams of a drug are to be divided into 500 doses. What is the strength of each dose?

4. One pound (Apoth) of chemical will make 60 doses. How many mg will each dose contain?

5. 6 fl ℥ are to be divided into 20 doses. How many ml will each dose be?

36   *175*

EXAMPLE: How many ml. should be dispensed if the patient is to take 2 teaspoonfuls three times a day for one day?

Step 1. Write the complete formula:

$$\# = \frac{Total}{Size} \qquad Total = Size \times \#$$

Step 2. Assign values to the appropriate terms:

Size = 2 teasp. = 10 ml
# = 3 (doses)

Step 3. Rewrite the formula, substituting the assigned values for the terms:

Total = 10 X 3

Step 4. Solve by the process indicated:

Total = 10 X 3

Step 5. Your Answer:

Total = 30 ml.

PRACTICE PROBLEMS

1. The prescription calls for the patient to take one teaspoonful four
   times a day for ten days. How many ml will you dispense?

2. The dose is one tablespoonful every six hours for one week. How
   many ml will you dispense?

3. The patient uses ℥ ii of a powder three times a day for soaks.
   He is to use this for 12 days. How many grams will be dispensed?

4. The patient will take 350 mg in each dose six doses a day for
   14 days. How many total grams will be received?

5. 0.3 mg is the dose to be taken daily for 30 days. How many grams
   - will you dispense?

38.

Calculate the Dose Of A Drug When Given The Patients Weight and The Amount Of Drug Required Per Kilogram Of Body Weight.

EXAMPLE: The dose of a drug is 10 mg./1 Kg. How much should a patient weighing 154 lb. take?

Step 1. Convert the patient's weight in Kg:

154 lb = 70 Kg.

Step 2. Write down the given dose:

10 mg / 1 Kg.

Step 3. Write the patient's weight in Kg. under the 1 Kg. Then write "x" mg under the 10 mg:

10 mg. / 1 Kg.
x mg. / 70 Kg.

Step 4. Draw a line between the mg's and another between the Kg's:

$$\frac{10 \text{ mg.}}{x \text{ mg.}} / \frac{1 \text{ Kg.}}{70 \text{ Kg.}}$$

Step 5. Solve by the ratio and proportion method:

$$\frac{10 \text{ mg.}}{x \text{ mg.}} = \frac{1 \text{ Kg.}}{70 \text{ Kg}}$$

Cross-multiply

$$1x = 700$$

Divide by the number next to the "x":

$$x = \frac{700}{1}$$

Step 6. Your Answer

$$x = 700 \text{ mg}$$

39

170

PRACTICE PROBLEMS

1. The patient weighs 190 pounds and the dose of the drug is 0.5 mg/Kilogram of body weight. How many mg will the patient take?

2. The average dose is 6.3 mg/Kilogram of body weight and the patient weighs 97 pounds. How many mg will she take?

3. The dose is 1/4 gr./kilogram of body weight. The patient weighs 127 pounds. How many mg will he take?

4. The average dose is 1/8 gr/Kilogram of body weight to be taken every six hours for 10 days. The patient weighs 81 Kilograms. How many total grams will the patient take?

40

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Calculation Of Children's Doses Using Young's Rule

YOUNG'S RULE $\dfrac{\text{AGE IN YEARS}}{\text{AGE IN YEARS} + 12}$ X ADULT DOSE = CHILD's DOSE

EXAMPLE: How many mg. of a medication should a 4 year old child take if the adult dose is 250 mg?

Step 1. Write the complete formula.

$\text{Child's Dose} = \dfrac{\text{Age}}{\text{Age} + 12} \times \text{Adult Dose}$

Step 2. Assign values to the appropriate terms.

Age = 4
Adult Dose = 250
Child's Dose =

Step 3. Rewrite the formula, substituting the assigned values for the terms.

$CD = \dfrac{4}{4 + 12} \times 250$

Step 4. Solve by the processes indicated.

$CD = \dfrac{4}{16} \times 250$

Reduce fraction

$CD = \dfrac{1}{4} \times 250$

Multiply

$CD = \dfrac{1}{4} \times \dfrac{250}{1}$

Divide

$CD = \dfrac{250}{4}$

Step 5. Your answer

$CD = 62.5$ mg.

41

180

PRACTICE PROBLEMS

1. If the usual adult dose of a drug in 0.25 Gm., what is the dose for a 9 year old child?

2. If the usual adult dose of a liquid medication is 5ml., how many ml. should a child 8 years old be given?

3. The adult dose is .6 Gm. How many mg. should a 2 year old child take?

4. A child of 10 years would take how many mg of a medication having the adult dose of 250 mg.

5. An adult would take a tablespoonful of this medication; how many ml. should a 5 year old take?

6. If the adult dose of a medication is 7 gr., how many milligrams should a 9 year old child take?

181

Calculation Of Children's Doses Using Clark's Rule

<u>CLARK's RULE</u>

CHILD'S DOSE = $\dfrac{\text{WEIGHT IN POUNDS X ADULT DOSE}}{150}$

<u>EXAMPLE:</u> An infant weighing 30 lbs will receive how many mg of a medication having an adult dose of 500 mg?

Step 1. Write the complete formula.

Child's Dose = $\dfrac{\text{Weight x Adult Dose}}{150}$

Step 2. Assign values to the appropriate terms.

Weight = 30

Adult Dose = 500

Child's Dose = ChD.

Step 3. Rewrite the formula, substituting the assigned values for the terms.

ChD = $\dfrac{30 \times 500}{150}$

Step 4. Solve by the processes indicated.

ChD = $\dfrac{30 \times 500}{150}$

Multiply

ChD = $\dfrac{30 \times 500}{150}$

Divide

ChD = $\dfrac{15000}{150}$

Step 5. Your answer.

ChD = 100 mg

43

PRACTICE PROBLEMS

1. The adult dose of a medication is 324 mg. How many mg will a 60 lb child take?

2. A child weighs 25 lbs. and is 18 months old. The adult dose is two tablespoonfuls. What is the childs dose?

3. A child weighing 83 lbs. would take how many mg if the adult dose is 5 gr?

4. An infant weighs 15 lbs. and the adult dose is 100 mg. What is the childs dose?

5. How many ml does a 55 lb child take if the adult dose is 2 teaspoonsful?

6. One Gram is the adult dose. How many mg does a 46 lb child take?

44

ADDITIONAL PRACTICE PROBLEMS FOR BASIC MATHEMATICAL OPERATIONS

1. Add: $5/6 + 1/2 + 1/6 + 1/3$ =   Answer _____

2. Subtract: 7/8 from 16 =   :   Answer _____

3. Divide 3/10 by 1/5 =   Answer _____

4. Convert 2/5 to a decimal fraction.   Answer _____

5. Add: $.15 + 3.14 + 13.25 + 0.034$ =   Answer _____

6. Multiply: 6.42×3.8 Answer _____

18.4

7. Convert .75 to a common fraction.   Answer _____

8. Write the following in arabic numbers :   Answer _____

      xii = _____

      ix   = _____

      xxvi = _____

      MCMLX = _____

      XLiX = _____

      MXL = _____

9. Write the following as Roman numerals: Answer _____

     19 = _____

     54 = _____

    400 = _____

     34 = _____

     75 = _____

  1970 = _____

10. Rearrange this formula to solve for C: Answer _____

    $A = B \times C$

11. Rearrange this formula to solve for B   Answer _____

    $A = \dfrac{B}{C}$

46

12. Multiply: 2156 times 1.0023   Answer _____

13. Divide 1.01 by .98   Answer _____

ADDITIONAL PROBLEMS FOR THE METRIC SYSTEM

14. Convert the following to milligrams:

    5 Grams   = _____

    50 decigrams   = _____

    10 micrograms = _____

    3 centigrams   = _____

    .5 Grams   = _____

15. Add the following and express your answer in Grams:

50 mg + 300 cg + 20 dg + 10 Gm =

                           Answer _____

16. Add the following and express your answer in milligrams:

.6 Gm + 0.25 cg + 0.125 Gm + 0.5 dg

                           Answer _____

47

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ADDITIONAL PRACTICE PROBLEMS FOR THE METRIC SYSTEM

1. Convert the following to milligrams:

   5 grams = _____   3 centigrams = _____

   50 decigrams = _____   10 Dekagrams = _____

2. Add the following and express the answer in grams:

   50 milligrams + 300 centigrams + 25 decigrams + 30 grams

   Answer _____

3. Add the following and express the following in milligrams:

   0.6 grams + 0.25 centigrams + 0.125 grams + 0.5 decigrams

   Answer _____

4. Perform the following indicated problems:

   Subtract 32 mg from 1.2 grams

   Answer _____

   Multiply 10 Kilograms X 8 and express the answer as grams.

   Answer _____

   Divide 45 Grams by 3.4 and express the answer in milligrams.

   Answer _____

48

187

5. Restate the following:

125 mcg to milligrams = _____

85 deciliters to milliliters = _____

125 hectograms to centigrams = _____

6. Without reference write the prefixes of the metric system and what part or parts of the basic unit each represents.

49

ADDITIONAL PRACTICE PROBLEMS FOR THE APOTHECARY SYSTEM

1. Reduce the following to grains

   a. ℥ ii, ℨ iss

   b. ℥ iv ℨ iv gr iv

2. Restate the following in weighable Apothecary denominations.

   a. 158 gr _____

   b. 175 gr _____

   c. 75 gr _____

3. Reduce the following to minims.

   a. ⊙ ii, fl ℨ v

   b. qt i, ⊙ ss, fl ℨ v̈ii

4. Convert the following to fl ℨ

   a. mx 120, fl ℥ 16, ⊙ iv

   b. qt iii, f℥ viii fl ℨ ii ss

50

5. Add: 1 ℔ ℨ 2 ℥ 3 qt 1   to 2 ℔ ℥ 15 ℥ 7 ℈ 3

Answer _____

6. Subtract: 2 Gal - 3 qt, 2 pt, 10 fl ℥ , 6 f ℥

Answer _____

7. How many bottles, each containing fl ℥ iv, can be obtained from
   f ℥ ii of Iodine Tincture?

Answer _____

8. How many gr 1/4 tablets can be made from ℥ 1/8 of Morphine Sulfate?

Answer _____

51

190

9. A cough syrup contains ℈ ss of ammonia chloride in fl ℥ ·iv. How many grains should be used in preparing one gallon of the syrup?

Answer _____

10. What is the volume in fluid ounces of a mixture containing 1/2 gallon of one liquid, one pint of another and fl ℥ 96 of a third?

Answer _____

11. A pharmacist had 1/2 gallon of alcohol. At different times he dispensed f ℥ iss, ⊙ i, f ℥ iv. What volume was left?

.Answer _____

52

19ı

ADDITIONAL PRACTICE PROBLEMS FOR THE AVOIRDUPOIS SYSTEM

1. How many 1/120 grain tablets can be made from 1/8 oz of a powder?

    Answer _____

2. How much chemical is left in a 1 1/2 oz bottle after enough has been taken out to make 1000 tablets of 1/100 grain each?

    Answer _____

3. How many 1/4 gr capsules can you make from 1 1/4 oz of a chemical?

    Answer _____

4. How many 2 grain tablets could be made from 2 oz of Aspirin powder?

    Answer _____

5. How many grains are left in a 1/4 lb bottle after enough of it has been used to make 150 tablets, each containing 1/300 gr.?

    Answer _____

ADDITIONAL PRACTICE PROBLEMS FOR RATIO AND PROPORTION

1. If cold capsules were 12 for $1.98, (b) 25 for $3.25 and (c) 100 for $10.95, which would be the best buy?

Answer _____

2. A formula for 1250 capsules calls for 3.25 Gms of a chemical. How much of the chemical would be used to make 350 capsules?

Answer _____

3. If 125 gallons of a mouth rinse contains 20 Grams of a coloring agent how many Grams will 160 gallons contain?

Answer _____

4. If 3 doses of a liquid preparation contain 7.5 grains of a substance, how many grains will 32 doses contain?

Answer _____

5. If 50 tablets contain 0.625 grams of an active ingredient, how many tablets can be prepared from 31.25 grams of the ingredient?

Answer _____

6. How many grains of a substance are needed for 350 tablets if 75 tablets contain 3 grains of the substance?

54   Answer _____

ADDITIONAL PRACTICE PROBLEMS FOR CONVERSION OF WEIGHT AND MEASURES

1. Convert 50 lb (AV) to Kg.

   Answer _____

2. How many grains are in a .5 Gm tablet.

   Answer _____

3. How many Kg. do you weigh?

   Answer _____

4. How many ml are there in 3 fl ℥ ?

   Answer _____

5. 1/200 gr is equivalent to how many mcg?

   Answer _____

194

6. Convert 5000 ml to Apothecary units.

Answer _____

7. Compare an Apothecary grain to an Avoirdupois grain.

Answer _____

8. What is the difference, in grams, between an Apothecary pound and an Avoirdupois pound?

Answer _____

9. Convert 1 lb 2 oz (AV) to Apothecary units.

Answer _____

10. How many grains are there in 25 mcg?

Answer _____

56

11. A doctor orders a patient to take three 1/8 gr. tablets per day. How many mg. will this equal per day?

Answer _____

12. How many ml will the patient take daily?
    Sig: Take fl ℥ii daily

Answer _____

13. What directions will you give the patient for the prescription?
    Sig: 2.5 ml daily

Answer _____

14. A doctor orders 12 fl ℥ be given to a patient. How many ml. will you dispense?

Answer _____

15. How many ml are there in 20 gals?

Answer _____

57

193

16. A 4 fl.℥ prescription bottle will hold how many ml?

Answer _____

17. A 2 ℥ powder jar will hold how many grams?

Answer _____

18. Convert 1/4 gr to mg.

Answer _____

19. Convert 1 qt to liters.

Answer _____

20. How many grains are in a .250 Gm tablet?

Answer _____

58.

ADDITIONAL PRACTICE PROBLEMS FOR CALCULATION OF DOSES

1. How many doses will this prescription contain?

   ETH   120 ml

   Sig: ℥ i qid

   Answer _____

2. How many doses will this prescription contain?

   Tetracycline Tab   250 mg
                      #40
   Sig 500 mg qid

   Answer _____

3. How many doses will this prescription contain?

   Atarax Syrup   16 fl ℥

   Sig: ℥ ii q 4h

   Answer _____

4. What is the size of each dose in this prescription?

Kaopectate   1 pt

Sig: Divide equally into 32 doses

Answer _____

5. How many grams should you dispense for this prescription?

PenVK   125 mg

Sig: tab $\overline{TT}$ qid x 10 d

Answer _____

6. How many fl $\frac{3}{5}$ should you dispense for this prescription?

Tetracycline Syrup

Sig: $\frac{3}{5}$ Tid for 2 weeks

Answer _____

60'

7. How many Grams should you dispense for this prescription?

    Valium   5 mg

    Sig: 2.5 mg at bedtime for 5 days

                                                    Answer _____

8. The dose of a drug is 1/10 gr. per Kg. of body weight. How
   many milligrams should be given to a person weighing 70 Kg.

                                                    Answer _____

9. The adult dose is 500 mg, how much should be given to a 50 pound child?

                                                    Answer _____

10. The adult dose is 30 ml. How much should be given to a 6 year old?

                                                    Answer _____

200

11. If the usual adult dose of a drug is 0.25 Gm what is the dose
for a child 9 years old?

Answer _____

12. If the usual adult dose of paregoric is 5 ml what is the dose
for a child 8 years old?

Answer _____

13. If the usual dose for an adult is .6 Gm what is the dose for a
2 year old child?

Answer _____

14. The usual dose of a certain solution is 0.5 ml. (a) what is the
dose for a child 4 years old? Answer _____ (b) if the
solution is to be dispensed in a dropper bottle, the dropper of
which calibrates 24 drops per ml, how many drops should be given
to obtain the correct dose for the child?

Answer _____

15. The usual dose of a drug is 1/60 grain for an adult, (a) calculate
the dose for a 25-lb child (b) the dose for an infant of 1 year
and (c) the dose for a child weighing 50 lb.

Answer _____

Answer _____

Answer _____

62

16. The usual adult dose of a drug is 0.6 Gm. What is the dose for a child weighing 20 lbs? A child weighing 10 lbs?

Answer _____

Answer _____

202

ATC-SHEPPARD AFB TEX. 75-1 59

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Technical Training

10-8

Pharmacy Specialist

PHARMACEUTICAL CALCULATIONS, I

March 1976

SCHOOL OF HEALTH CARE SCIENCES, USAF
Department of Biomedical Sciences
Sheppard Air Force Base. Texas 76311

Designed for ATC Course Use

DO NOT USE ON THE JOB

PHARMACEUTICAL CALCULATIONS I

OBJECTIVES

●   Solve problems pertaining to basic mathematical operations, metric system, apothecary system, avoirdupois system, and ratio and proportion.

›   Solve problems pertaining to conversion of weights and measures, and calculations of doses.

INTRODUCTION

· Systems of measurements in the past were based on traditional standards, such as the length of the King's foot or the weight of a grain of wheat. For their time and technology they were adequate. The need for a more exacting and universal system of measurement brought about the creation and standardization of the Metric System.

INFORMATION

MEASUREMENT

Definitions·

   Meter is the basic unit of length (39.37 inches)

   Liter is the basic unit of volume. (The volume of the cube is 1/10 of a meter.)

   Gram is the basic unit of weight (equal to the weight of one cubic centimeter of water at 4 degrees centigrade).

   LATIN PREFIXES

   deci is equal to 1/10 of the basic unit.

   centi is equal to 1/100 of the basic unit.

   milli is equal to 1/1000 of the basic unit.

   micro is equal to 1/1,000,000 of the basic unit.

   GREEK PREFIXES

   deka is equal to ten times the basic unit.

   hecto is equal to one hundred times the basic unit.

   kilo is equal to one thousand times the basic unit.

Abbreviations

   Meter = M

   Liter = L

This supersedes WB 3ABR90530-I-1, March 1975

Gram = Gm

deci = d

centi = c

milli = m

micro = mc

Deka = D

Hecto = H

Kilo = K

2

INSTRUCTIONS.

Each type problem you may encounter will be explained by the instructor. Fill in each blank in the example section as the information is given to you. This will assist you in working the practice problems. These problems will be evaluated by the instructor to insure oyou are working them correctly. Complete all problems assigned. SHOW ALL WORK!

This Study Guide Workbook is to help you learn the metric system. Follow the directions carefully and do not "skip around."

Directions: Read each problem carefully, then write in the answer: Be sure that you are satisfied with your answer before you write it in.

1. In the metric system, weight is expressed in grams, linear measurement is expressed in meters, and liquid volume is expressed in liters.

    The system which uses grams, meters and liters is called the (   ) system.

2. The primary units of measurements in the metric system are (   ), (   ), and (   ).

3. Which of the following units of measurement belong to the metric system? (Circle your answers below.)

    a. pound   d. liter
    b. gram   e. yard
    c. gallon   f. meter

4. The gram, which is a much smaller unit than our commonly used pound, is the basic metric unit used to measure   (Circle your answer below.)

    a. volume   b. length   c. weight

5. Length, in the household system, is measured in inches, feet, yards, etc. In the metric system, however, the primary unit for the measurement of length is the meter.

    With the metric system, length is measure in (   ).

6. When using the metric system to measure the length os an item, you would record its length as so many (   ).

7. In the metric system, the primary unit of weight is the (   ); the primary unit of length is the (   ).

8. The primary metric unit of measurement used to measure volume is the liter.

    Which of the following is used to measure volume in the metric system? (Circle your answer below.)

    a. pounds   d. grams
    b. gallons   e. liters
    c. meters   f. inches

9. In the common household system, pints, quarts and gallons are used to measure volume. In the metric system, however, the primary unit used to measure volume is the (   ).

10 When items are weighed by the metric system, their weight is expressed in (   ).

3

11. The length of an item measured by the metric system is expressed in ( ).

12. The volume of liquids measured by the metric system is expressed in ( ).

13. When metric measurements are written, the amount is written as a numeral followed by the unit. Study these examples:

Four meters is written as 4 meters.
Four liters is written as 4 liters.
Twelve grams is written as 12 grams.

Now write the following measurements:

a. Four grams ( )

b. Eight liters ( )

c. Nine meters ( )

14. If the measurement contains a fraction, the fraction is written as a decimal. Study these examples:

4 1/4 meters is written as 4.25 meters.
4 3/4 liters is written as 4.75 liters.
4 1/8 grams is written as 4.125 grams.

Now, write the following measurements.

a. Five and one-half grams ( )

b. Three and one-fourth meters ( )

c. Four and three-quarter liters ( )

15. Write the primary metric unit used to measure weight, length and volume.

a. weight ( )

b. length ( )

c. volume ( )

16. You should also know the abbreviations for the three basic metric units of measurement. Abbreviations of the basic units are always capitalized.

17. The abbreviation for gram(s) is Gm.

Using the abbreviation, write 12 grams. ( )

18. The abbreviation for meter(s) is M.

Using the abbreviation, write 2 meters. ( )

19. The abbreviation for liter(s) is L.

Using the abbreviation, write 1 liter. ( )

20. Using abbreviations, write:

200 liters ( ) 17 meters ( ) 16 grams ( )

21. In addition to the three basic units you have just studied, the metric system has other units which are subdivisions of the basic units. Let us now study some of those subdivisions which are frequently used.

22. The common subdivision of the gram is the milligram (.001 of a gram). The abbreviation for the milligram is mg.

   Using the abbreviation, write 12 milligrams. (   )

23. When the prefix <u>milli</u> (m) is used with a basic unit (Gm., L., etc.) and the figure is less than 1000, the amount expressed is less than the basic unit.

   Example: 500 mg =   .5 of a gram
              250 ml =   .25 of a liter
              700 mm =   .7 of a meter

24. When the prefix <u>milli</u> (m) is used with a basic unit and the figure is greater than 1000, the amount expressed is more than the basic unit.

   Example: 1,500 mg = 1.5 grams
              2,500 ml = 2.5 liters
              1,700 mm = 1.7 meters

   Complete the following:

   a. 350 milligrams = (   ) grams

   b. 2,300 milliliters = (   ) liters

   c. 1,800 milligrams = (   ) grams

   d. 300 millimeters = (   ) meters

   e. 450 milliliters = (   ) liters

25. A meter may be divided into 100 parts; each part then is one centimeter (.01 of a meter). The abbreviation for centimeter is cm. The abbreviation for cubic centimeter is cc.

   Using the abbreviation, write 1 centimeter. (   )

   Using the abbreviation, write 4 cubic centimeters. (   )

26. Using the abbreviation, write 500 cubic centimeters. (   )

   Using the abbreviation, write 400 cubic centimeters. (   )

27. The common subdivision of the liter is the milliliter, or .001 of a liter. The abbreviation for milliliter is ml.

   Using the abbreviation, write 200 milliliters. (   )

28. Using the abbreviation, write 4 milliliters. (   )

5

29. Write the abbreviations for meter (   )   gram (   )
    liter (   )   cubic centimeter (   )   milliliter
    (   )   milligram (   )   and centimeter (   ).

30. Using the correct abbreviations, rewrite each of the following:

    a. 15 cubic centimeters (   )

    b. 10 grams (   )

    c. 9 milligrams (   )

    d. 5 liters (   )

    e. 1 cubic centimeter (   )

    f. 17 milliliters (   )

    g. 14 centimeters (   )

31. Just as it has subdivisions to express measurements less than the primary units, the metric system also has units to express measurements larger than the primary units. Those larger units are expressed by the prefix kilo which means 1,000. For example, 1 kilometer = 1,000 meters, 1 kilogram - 1,000 grams, and 1 kiloliter = 1,000 liters. The prefix that means 1,000 is (   )

32. The abbreviation of kilogram is Kg, kilometer is Km, and kiloliter is Kl. Abbreviations of prefixes whose values are larger than the basic units: (Circle your answer below.)

    a. are capitalized   b. are not capitalized

33. A length of 5,000 meters expressed in kilometers would be written as 5 (   ).

34. An object that weighs 1 kilogram weighs how many grams? (   )

35. As you have already learned, an item which is shorter, or which weighs less than the primary unit may be expressed by the prefix milli. A milligram is .001 of a gram. How many milligrams are required to make up one gram? (Circle your answer below.)

    a. 10   c. 1.000
    b. 100   d. 10,000

36. A kiloliter is equal to (   ) liters. A milliliter is equal to what part of a liter? (   )

37. To express 1,000 grams, 1,000 liters and 1,000 meters, you may use the same prefix, which is (   )

38. To express .001 of a gram, .001 of a liter and .001 of a meter, you may use the prefix (   ).

39. As you recall, 1 milliliter is used to express .001 of a liter. Another way to express that same amount is 1 cubic centimeter, abbreviated 1 cc. This is true because 1 cc occupies the same space and has the same volume as 1 milliliter.

    One cc is (   ) one milliliter.

40. Do not get the two prefixes confused. Remember that the prefix <u>milli</u> means .001; the prefix <u>centi</u> means .01.

In the spaces below, write five cubic centimeters and eight centimeters using abbreviations.

(   )   (   )

41. To convert grams to milligrams, multiply the number of grams by 1,000 or move the decimal three places to the right.

Example: 0.15 Gm = 150 mg

$$\begin{array}{r} 0.15 \\ \times\ 1,000 \\ \hline 0150.00 \end{array}$$

42. Convert 2.5 grams to milligrams. (   )

43 To convert milligrams to grams, divide the number of grams by 1,000 or move the decimal three places to the left.

Example: 150 mg = 0.15 Gm

$$\begin{array}{r} 0.15 \\ 1000)\overline{150.00} \\ 100.0 \\ \hline 50\ 00 \\ 50\ 00 \end{array}$$

850 mg = (   ) Gm

44. Now that you know the prefixes, work the following problems for practice. Check your responses.

    a. 500 milligrams is the same as (   ) grams.

    b. 2 grams is the same as (   ) milligrams.

    c. 500 centigrams is the same as (   ) milligrams.

    d. 350 milligrams is the same as (   ) centigrams.

    e. 250 milliliters is the same as (   ) liters.

    f. 180 liters is the same as (   ) milliliters.

    g. 420 millimeters is the same as (   ) meters.

    h. 3.5 meters is the same as (   ) millimeters.

    i. 500 kilograms is the same as (   ) grams.

    j. 4,500 grams is the same as (   ) kilograms.

    k. 1 kilogram is the same as (   ) centigrams.

    l. 2,500 centiliters is the same as (   ) kiloliters.

    m. 3.5 kiloliters is the same as (   ) liters.

    n. 1.6 meters is the same as (   ) kilometers.

7

Answers for Metric System

1.	metric		27.	200 ml
2.	grams, meters, liters		28.	4 ml
3.	gram; liter; meter		29.	M; Gm; L; cc; ml; mg; cm
4.	weight		30.	a. 15 cc
5.	meters			b. 10 Gm
6.	meters			c. 9 mg
7.	gram, meter			d. 5 L
				e. 1 cc
				f. 17 ml
				g. 14 cm
8.	liters		31.	kilo
9.	liter		32.	are; are not
10.	grams		33.	kilometers
11.	meters		34.	1,000
12.	liters		35.	1,000
13.	4 grams; 8 liters; 9 meters		36.	1,000; .001
14.	5.5 grams; 3.25 meters; 4.75 liters		37.	kilo
15.	grams; meters; liters		38.	milli
16.	No response		39.	equal to (or same as)
17.	12 Gm.		40.	5 cc, 8 cm
18.	2M		41	No response
19.	1 L.		42.	2.5 Gm.
20.	200 L; 17M; 16 Gm			$\dfrac{1000}{2500.0}$ = 2500 mg.
21.	No response		43.	.850
22.	12 mg		44.	a. .5 grams
23.	No response			b. 2,000
24.	a. .35			c. 5,000
	b. 2.3			d. 35
	c. 1.8			e. .25
	d. .3			f. 180,000
	e. .45			g. .42
25.	1 cm; 4 cc			h. 3,500
				i. 500,000
26.	500 cc; 400 cc			j. 4.5
				k. 100,000
				l. .025
				m. 3.500
				n. .0016

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APOTHECARY SYSTEM

One of the oldest system of weights and measures is the Apothecary system and although antiquated and no longer official it is still used extensively in medicine. Therefore your complete comprehension is necessary.

APOTHECARY TABLE OF WEIGHTS

20 grains	1 scruple
3 scruples	1 drachm
8 drachms	1 ounce
12 ounces	1 pound

APOTHECARY TABLE OF FLUID MEASURE (VOLUME)

60 minims	1 fluidrachm
3 fluidrachms	1 fluidounce
16 fluidounces	1 pint
2 pints	1 quart
4 quarts	1 gallon

Definition of Apothecary Symbols

Minim	mx
Fluidrachm	fl ʒ
Fluidounce	fl ʒ
Pint	pt., ⊙
Quart	qt
Gallon	C or Cong
Grain	gr
Scruple	℈
Drachm, Dram	ʒ
Ounce	℥
Pound	℔

INSTRUCTIONS

Each type of problem you may encounter will be explained by the instructor. Fill in each blank in the example section as the information is given to you. This will assist you in working the practice problems. These problems will be evaluated by the instructor to insure you are working them correctly. Complete all problems assigned. SHOW ALL WORK!

9

Restate To A Lower Denomination In The Apothecary System

E   Example: Reduce 3 fl ℥   2 fl ℨ   to mx

Step 1.   Copy the value from the problem carefully,   3 fl ℥   2 fl ℨ

NOTE: Each value will be reduced separately.

Step 2.   First reduce the 2 fl ℨ.
How many mx are in each
fl ℨ? _____   How many
fl ℨ are you reducing? ____
Multiply 60 times 2 to
find the number of mx in
2 fl ℨ.

$$\begin{array}{r} 60 \\ \times\ 2 \\ \hline 120 \end{array}$$

Step 3.   Rewrite the problem using
120 mx for the 2 fl ℨ.   3 fl ℥ 120 mx

Step 4.   Now reduce the 3 fl ℥.
How many mx are in each
fl ℥? _____   How
many fl ℥ are you chang-
ing? ____   Multiply 480
times 3 to find the number
of mx in 3 fl ℥.

$$\begin{array}{r} 480 \\ \times\ 3 \\ \hline 1440 \end{array}$$

Step 5.   Rewrite the problem using
1440 mx for the 3 fl ℥.

Step 6.   Add up the mx and your answer is: 1560 mx

Practice Problems

1.   Convert the following to a lower denomination in the Apothecary System.

a.   Cong ii, pt ii, fl ℥ii to   fl ℨ

b.   ℥ xvi, ℨ xxxii   to gr

10

c. ℥iii, mx 480 to fl ℥

c. ℔ ss, ℥xxiv to ℥

Restate To A Lower Denomination In The Apothecary System

Example: Change 5840 gr to weighable units.

Step 1. Copy the values from the problem carefully.   5840 gr

Step 2. Study this number. What is the largest
unit that this could be changed to?
How many grains does this unit contain?

Step 3. Now to find the number of pounds, divide
5760 into 5840. The number of pounds in
5840 gr is _____ and the number of
grains left over is __80__. Now the
amount is rewritten using the pound and
grains.

$$\begin{array}{r} 1 \\ 5760\overline{)5840} \\ \underline{5760} \\ 80 \text{ gr left} \end{array}$$

1 lb. 80 gr.

Step 4. Study the 80 gr. What is the largest
unit that this amount can be changed
to? _____ How many grains does 1
dram contain? _____

Step 5. Now to find the number of drams, divide
60 into 80. The number of drams in
80 gr. is _____ and the number
of grains left over is _____.

$$\begin{array}{r} 1 \\ 60\overline{)80} \\ \underline{60} \\ 20 \text{ gr left} \end{array}$$

Step 6. Now rewrite the problem again using the
pound, dram and grains.

1 lb   1 ℥   20 gr

11

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Step 7. Study the 20 gr. What is the largest
unit that this can be changed to?
_____ How many grains
does this unit have in it? _____

Step 8. Now to find the number of scruples in
20 gr, divide 20 into 20. The number
of scruples is _____.

Step 9. Rewrite the problem using the number
of scruples. Your answer: 1 lb   1 ℥ 1Ə

Practice Problems

1. Convert the following to weighable Apothecary units.

a. 3440 gr.

b. 1650 gr.

c. 950 gr.

d. 695 gr.

12

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AVOIRDUPOIS SYSTEM

The Avoirdupois System is the official system of commerce and you are indirectly related to commerce in ordering bulk drugs through medical supply channels. You must have a complete understanding of this system ot facilitate transactions with supply.

AVOIRDUPOIS TABLE OF WEIGHT

437.5 grains . . . . 1 ounce
16 ounces . . . . 1 pound

Definition Of Avoirdupois Symbols

grain . . . . gr
ounce . . . . oz
pound . . . . lb

To restate Avoirdupois units to a higher or lower denomination, follow the procedure as you used in restating within the Apotnecary System.

INSTRUCTIONS

Each type problem you may encounter will be explained by the instructor. Fill in each blank in the example section as the information is given to you. This will assist you in working the practice problems. These problems will be evaluated by the instructor to insure you are working them correctly. Complete problems assigned. SHOW ALL WORK!

Practice Problems

1. Reduce the following to weighable Avoirdupois denominations.

   a. 7540 gr _____

   b. 1560 gr _____

   c. 856 gr _____

   d. 466 gr _____

2. How many 10 grain capsules can be made from 1/2 lb of iron crystals?

3. How many 5 grain capsules os aspirin can be made from 4 oz of aspirin powder?

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4.   How many 1/2 gr tablets of codeine can be made from 1/8 ox of codeine powder?

5.   How many grains of chemical are left in a 1 oz bottle after enough of it has been used to make 2000 tablets each containing 1/200 grain of the chemical?

14

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RATIO AND PROPORTION

If it were possible to choose the most useful method of solving mathematical problems, ratio and proportion would probably be selected. Nearly 80 percent of the problems you will encounter in Pharmacy can be solved using this method.

Definitions

A ratio is the numerical comparison of two similar quantities.

A proportion is a statement of the equality of two ratios.

INSTRUCTIONS

Each type of problem you may encounter will be explained by the instructor. Fill in each blank in the example section as the information is given to you. This will assist you in working the practice problems. These problems will be evaluated by the instructor to insure you are working them correctly. Complete all problems assigned. SHOW ALL WORK.

Solving Problems Using Ratio and Proportion

Example: How many feet per second is a car traveling at 90 mph, if at 60 mph it is traveling 88 feet per second?

Step 1. Read the question. Determine what is asked (the number of feet per second at 90 mph) and call this the "problem." Now determine what information is given (88 feet per second at 60 mph).

Step 2. Write the "problem" on one line, using "X" for the unknown.

90 mph   X ft/sec

Step 3. Write the given information on the line under the problem. Be sure to place 60 mph under the 90 mph (the first ratio) and the 88 ft/sec under the "X" ft/sec (the second ratio).

90 mph   X ft/sec
60 mph   88 ft/sec

Step 4. Now draw a line between the 90 mph and the 60 mph and another line between the "X" ft/sec and the 88 ft/sec. Then place an equal sign in the center.

$$\frac{90 \text{ mph}}{60 \text{ mph}} = \frac{X \text{ ft/sec}}{88 \text{ ft/sec}}$$

Step 5. Cross multiply (90 times 88 and 60 times "X"), giving the products. (Note: the ft/sec and the mph are not used here.)

$$60 \cdot X = 90 \cdot 88$$
$$60 X = 7920$$

Step 6. Divide by the number next to the "X."

$$X = \frac{7920}{60}$$

15.

Step 7. Your answer
(Note: the ft/sec is placed next to
the answer because "X" is the number
of ft/sec.)

$X = 132$ ft/sec

Practice Problems

Make valid ratios between these quantities.

1. 1 yard and 2 feet _____

2. 4 hours and 120 minutes _____

3. 2 feet and 6 inches _____

4. 100 Grams and 10 Kilograms _____

5. Butter sells 3 lb. for 98¢. How much will 2 lb. cost?

6. A drug costs $6.98 for 12 ounces. How much will three and 3/4 ounces cost the pharmacist?

16

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7. Twenty gallons of gasoline will run your car 235 miles. How far should you go on six and 1/2 gallons?

8. The airliner travels 600 mph and you will fly 1230 miles. How long will your trip be?

9. The item sells for $4.25 a dozen and you only have $2.00. How many can you buy?

17

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CONVERSION OF WEIGHTS AND MEASURES

Even though AFM 168-4 states that all prescriptions should be written in the Metric System, some physicians will continue to write in one of the other systems. The responsibility will rest on you to convert these prescriptions to the Metric System.

CONVERSION EQUIVALENTS:

$$64.8 \text{ mg} = 1 \text{ gr.}$$
$$1 \text{ Gm} = 15.432 \text{ gr,}$$
$$31.1 \text{ Gm} = 1 \text{ ounce (Apoth)}$$
$$28.35 \text{ Gm} = 1 \text{ oz (Av)}$$
$$454 \text{ Gm} = 1 \text{ lb (Av)}$$
$$1 \text{ Kg} = 2.2 \text{ lb (Av)}$$
$$1 \text{ ml} = 16.23 \text{ minim}$$
$$29.57 \text{ ml} = 1 \text{ fl ounce (Apoth)}$$
$$473 \text{ Ml} = 1 \text{ pint}$$

COMMON EQUIVALENTS:

$$1 \text{ Teaspoonful} = 1 \text{ dram} = 5 \text{ ml}$$
$$1 \text{ Tablespoonful} = 1/2 \text{ fl ounce} - 15 \text{ ml}$$

NOTE: The common equivalents are used only when interpreting prescriptions.

INSTRUCTIONS

Each type of problems you may encounter will be explained by the instructor. Fill in each blank in the example section as the information is given to you. This will assist you in working the practice problems. These problems will be evaluated by the instructor to insure you are working them correctly. Complete all problems assigned. SHOW ALL WORK!

Convert From The Common Systems To The Metric System

Example: Convert 4 fl ʒ to ml.

Step 1. Identify the problem; in this case it
is to convert 4 fl ʒ to ml. Write
the problem down, use an "X" for the
unknown.   4 fl ʒ = x ml.

Step 2. Be sure that the common system quantity
is in one denomination. Make any
changes now.   4 fl ʒ = x ml.

Step 3. Choose a conversion equivalent that
possesses both the denominations
present in the problem. In this case
use 1 fl ʒ = 29.57 ml.

Step 4. Write the conversion equivalent under
the problem. Be sure to place the   4 fl ʒ = x ml.
1 fl ʒ under the 4 fl ʒ and the   1 fl ʒ = 29.57 ml.
29.57 ml. under the x ml.

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Step 5. Draw a line between the fl ℥'s
and another between the ml's.

$$\frac{4 \text{ fl } ℥}{1 \text{ fl } ℥} = \frac{x \text{ ml.}}{29.57 \text{ ml.}}$$

Step 6. Cross multiply.

$1x = 118.28$

Divide by the number next to the "X"

$$\frac{1x}{1} = \frac{118.28}{1}$$

Step 7. Your answer. Be sure to attach
the proper "label" to it.

$x = 118.28 \text{ ml.}$

Practice Problems

1. How many grams are in 246 grains?

2. How many ml are contained in fl ℥ ii?

3. Convert one dram and 20 minims to ml.

4. Convert 3 gallons, 1 pint, 10 fl ℥ to ml.

19

222

5. A formula for a cough syrup calls for 1/8 gr of codeine phosphate per fluid dram. How many grams would be used in preparing a pint of this cough syrup?

6. Convert 1/1000 gr to mcg.

7. If fl ℨ i of a cough syrup contains 10 gr of sodium citrate, how many grams will it contain?

8. A prescription calls for 3/4 gr of a medication. How many mg will be dispensed?

9. Convert 3 lb, 15 ℨ, 6 ℨ to grams.

10. How many 500 mg doses could be obtained from 3/4 lb of a drug?

20

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Convert From The Metric System To The Common Systems

Example: Convert 324 mg. to gr.

Step 1. Identify the problem. In this case it
is to convert 324 mg. to gr. Write it
down. Use an "x" for the unknown.   324 mg. =   x gr.

Step 2. Choose a conversion equivalent that
possesses both the denominations present
in the problem.· In this case use:
64.8 mg. = 1 gr.

Step 3. Write the conversion equivalent under
the problem. Be sure to place 64.8 mg   324 mg. = x gr.
under the "x" gr.   64.8 mg = 1 gr.

Step 4. Draw a line between the two mg's and $\frac{324 \text{ mg.}}{64.8 \text{ mg.}} = \frac{x \text{ gr.}}{1 \text{ gr.}}$
another between the two gr's.

Step 5. Solve by the ratio and proportion method. $\frac{324 \text{ mg.}}{64.8 \text{ mg.}} = \frac{x \text{ gr.}}{1 \text{ gr.}}$
method.

         Cross multiply.   64.8x = 324

         Divide by the number next to the "x". $x = \frac{324}{64.8}$

Step 6. Your answer. Be sure to attach the   x = 5 gr.
proper "label" to it.

Practice Problems

1. Convert 250 ml to fluid ounces.

2. Convert 4.5 liters to fluid ounces.

21

3. How many mg are there in 6 1/2 ℥ ?

4. Convert 6.6 pounds to kilograms.

5. How many 6.5 mg tablets can be obtained from 1/2 ounce (Apoth) of a chemical?

6. If a mixture weighing 30 grams is divided into 100 doses, how many grains will each dose weigh?

22

7   How many 1/8 gr tablets can be made from 3 grams of drug?

8.   A certain drug is available in 16.2 mg tablets. Express this as a fraction of a grain.

9.   How many teaspoonfuls are there in 0.5 kiloliters and 500 milliliters.

23

CALCULATION OF DOSES

Everytime you fill a prescription you must determine many things within a few minutes Has the doctor prescribed enough medication or the right strength medication or could this prescription be for a child? How much would he get? In many instances the physician will leave the variables for you to calculate.

INSTRUCTIONS

Each type of problem you may encounter will be explained by the instructor. Fill in each blank in example section as the information is given to you. This will assist you in working the practice problems. These problems will be evaluated by the instructor to insure you are working them correctly. Complete all problems assigned. SHOW ALL WORK!

Definition

A dose is the amount of preparation a patient takes at one time.

Formulas Used In Calculating

1. The number of dose

    Number of dose = $\frac{\text{Total preparation}}{\text{Size of each dose}}$

2. The size of each dose

    Size of each dose = $\frac{\text{Total preparation}}{\text{Number of doses}}$

3. The total preparation

    Total preparation = Number of doses x each dose

Formulas Used In Calculating Children's Dosages

1. Young's rule

    $\frac{\text{Age in years}}{\text{Age in years} + 12}$ X Adult dose = Child's dose

2. Clark's rule

    Child's dose = $\frac{\text{Weight in pounds X adult dose}}{150}$

Calculation Of The Number Of Doses In A Preparation

Example: Find the number of doses in 120 ml: if each dose is one teaspoonful (5 ml).

Step 1. Write the complete formula.   # = $\frac{\text{Total}}{\text{Size}}$

Step 2. Assign values to the appropriate
         terms.

         Total = 120 ml.
         Size =   5 ml.
         #   =   X

24 .

227

Step 3. Rewrite the formula, substituting   / $X = \dfrac{120}{5}$
the assigned values for the terms.

Step 4. Solve by the process indicated. $X = \dfrac{120}{5}$

Step 5. Your answer: $X = 24$ doses

Practice Problems

1. How many 15 minim doses are contained in 60 ml of a tincture?

2. If 180 ml of medicine is to be taken and each dose contains 2 tablespoonfuls, how many doses will this 180 ml contain?

3. How many 250 mgm doses can be obtained from one-half ounce (Apoth) of a chemical?

4. The physician prescribes 8 fluid ounces (Apoth) of penicillin to be taken in 10 ml doses. How many doses will the patient receive?

5. How many ℥ss doses could you get from one pound (Apoth) of a drug?

25

Calculate The Size Of Each Dose

Example: What is the size of each dose if a patient is given 300 ml. and instructed to take the medicine once daily for 20 days?

Step 1. Write the complete formula.   Size = $\frac{Total}{\#}$

Step 2. Assign values to the appropriate terms:

Total = 300
  #   = 20

Step 3. Rewrite the formula, substituting   Size = $\frac{300}{20}$
        the assigned values for the terms.

Step 4. Solve by the process indicated.   Size = $\frac{300}{20}$

Step 5. Your answer: Size = 15 ml. or 1 tablespoonful

Practice Problems

1. What is the dose a patient will take if he receives 3 grams and is told to take it four times a day?

2. Twenty doses are to be obtained from $\frac{3}{5}$ iss of a chemical. How many mg is each dose?

26   220

Calculate The Total Amount Of A Preparation

Example: How many ml. should be dispensed if the patient is to take 2 teaspoonfuls three times a day for one day?

Step 1. Write the complete formula. $\# = \dfrac{Total}{Size}$ Total = Size $\times$ #

STep 2. Assign values to the appropriate terms.

Size = 2 teaspoonful = 10 ml
# = 3 (doses)

Step 3. Rewrite the formula, substituting the assigned values for the terms   Total = 10 X 3

Step 4. Solve by the process indicated.   Total = 10 X 3

Step 5. Your answer: Total = 30 ml.

Practice Problems

1. The prescription calls for the patient to take one teaspoonful four times a day for ten days. How many ml will you dispense?

2. The dose is one tablespoonful every six hours for one week. How many ml will you dispense?

28

230

3. The patient uses ℥ii of a powder three times a day for soaks. He is to use this for 12 days. How many grams will be dispensed?

4. The patient will take 350 mg in each dose six doses a day for 14 days. How many total grams will be received?

5. 0.3 mg is the dose to be taken daily for 30 days. How many grams will you dispense?

231

29

3. The patient uses ℥ ii of a powder three times a day for soaks. He is to use this for 12 days. How many grams will be dispensed?

4. The patient will take 350 mg in each dose six doses a day for 14 days. How many total grams will be received?

5. 0.3 mg is the dose to be taken daily for 30 days. How many grams will you dispense?

29

Calculate The Dose Of A Drug When Given The Patient's Weight And The Amount Of Drug Required For Kilogram Of Body Weight

Example: The dose of a drug is 10 mg/1 Kg. How much should a patient weighing 154 lb. take?

Step 1.	Convert the patient's weight in Kg.	154 lb = 70 Kg.
Step 2.	Write down the given dose.	10 mg/1 Kg
Step 3.	Write the patient's weight in Kg. under the 1 Kg. Then write "x" mg under the 10 mg.	10 mg./1 Kg. x mg./70 Kg.
Step 4.	Draw a line between the mg's and another between the Kg's.	$\dfrac{10 \text{ mg.}}{x \text{ mg.}} / \dfrac{1 \text{ Kg.}}{70 \text{ Kg.}}$
Step 5.	Solve by the ratio and proportion method.	$\dfrac{10 \text{ mg.}}{x \text{ mg.}} = \dfrac{1 \text{ Kg.}}{70 \text{ Kg.}}$
	Cross multiply.	1x = 700
	Divide by the number next to the "x."	$x = \dfrac{700}{1.}$
Step 6.	Your answer:	x = 700 mg

Practice Problems

1. The patient weighs 190 pounds and the dose of the drug is 0.5 mg/Kilogram of body weight. How many mg will the patient take?

2. The average dose is 6.3 mg/Kilogram of body weight and the patient weighs 97 pounds. How many mg will the patient take?

233

3. The dose is 1/4 gr/Kilogram of body weight. The patient weighs 127 pounds. How many mg will the patient take?

4. The average dose is 1/8 gr/Kilogram of body weight to be taken every six hours for 10 days. The patient weighs 81 Kilograms. How many total grams will the patient take?

31

Calculation Of Children's Doses Using Young's Rule

Young's rule: $\dfrac{\text{Age In Years}}{\text{Age In Years} + 12}$ X Adult Dose = Child's Dose

Example: How many mg of a medication should a 4 year old child take if the adult dose is 250 mg?

Step 1. Write the complete formula.

Child's Dose = $\dfrac{\text{Age}}{\text{Age} + 12}$ X Adult Dose

Step 2. Assign values to the appropriate terms.

Age = 4
Adult Dose = 250
Child's Dose =

Step 3. Rewrite the formula, substituting the assigned values for the terms.

$CD = \dfrac{4}{4 + 12}$ x 250

Step 4. Solve by the processes indicated.

$CD = \dfrac{4}{16}$ x 250

Reduce fraction

$CD = \dfrac{1}{4}$ x 250

Multiply

$CD = \dfrac{1}{4} \times \dfrac{250}{1}$

Divide

$CD = \dfrac{250}{4}$

Step 5. Your answer:

$CD = 62.5$ mg.

Practice Problems

1. If the usual adult dose of a drug is 0.25 Gm., what is the dose for a 9 year old child?

2. If the usual adult dose of a liquid medication is 5 ml., how many ml. should a child 8 years old be given?

32

3. The adult dose is .6 Gm. How many mg should a 2 year old child take?

4. A child of 10 years would take how many mg of a medication having the adult of 250 mg.

5. An adult would take a tablespoonful of this medication. How many ml should a 5 year old take?

6. If the adult dose of a medication is 7 gr., how many milligrams should a 9 year old child take?

33

Calculation Of Children's Doses Using Clark's Rule

Clark's rule: Child's Dose = $\dfrac{\text{Weight In Pounds X Adult Dose}}{150}$

Example: An infant weighing 30 lbs will receive how many mg of a medication having an adult dose of 500 mg?

Step 1. Write the complete formula.   Child's Dose = $\dfrac{\text{Weight} \quad x \quad \text{Adult Dose}}{150}$

Step 2. Assign values to the appropriate terms.

Weight = 30
Adult Dose = 500
Child's Dose = ChD

Step 3. Rewrite the formula, substituting the assigned values for the terms.   ChD = $\dfrac{30 \times 500}{150}$

Step 4. Solve by the processes indicated.   Chd = $\dfrac{30 \times 500}{150}$

Multiply   ChD = $\dfrac{30 \times 500}{150}$

Divide   ChD = $\dfrac{15000}{150}$

Step 5. Your answer: ChD = 100 mg

Practice Problems

1. The adult dose of a medication is 324 mg. How many mg will a 60 lb child take?

2. A child weighs 25 lbs. and is 18 months old. The adult dose is two tablespoonfuls. What is the child's dose?

34

237

3. A child weighing 83 lbs. would take how many mg if the adult dose is 5 gr?

4. An infant weighs 15 lbs. and the adult dose is 100 mg. What is the child's dose?

5. How many ml does a 55 lb child take if the adult dose is 2 teaspoonsful?

6. One Gram is the adult dose. How many mg does a 46 lb child take?

35

Additional Practice Problems For Basic Mathematical Operations

1. Add: 5/6 + 1/2 + 1/6 + 1/3 =   Answer _____

2. Subtract: 7/8 from 16 =   Answer _____

3. Divide: 3/10 by 1/5 =   Answer _____

4. Convert 2/5 to a decimal fraction.   Answer _____

5. Add: .15 + 3.14 + 13.25 + 0.034 =   Answer _____

6. Multiply: 6.42 x 3.8 =   Answer _____

36   233

7. Convert .75 to a common fraction.   Answer _____

8. Write the following in arabic numbers:

    xii   = _____

    ix   = _____

    xxvi = _____

    MCMLX = _____

    XLix = _____

    MXL   = _____

9. Write the following as Roman numerals:

    19   = _____

    54   = _____

    400   = _____

    34   = _____

    75   = _____

    1970 = _____

10. Rearrange this formula to solve for C: Answer _____

    A = B x C

11. Rearrange this formula to solve for B: Answer _____

    $A = \dfrac{B}{C}$

37

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12. Multiply: 2156 times 1.0023   Answer _____

13. Divide 1.01 by .98   Answer _____

Additional Problems For The Metric System

14. Convert the following to milligrams:

    5 Grams   = _____

    50 decigrams   = _____

    10 micrograms   = _____

    3 centigrams   = _____

    .5 Grams   = _____

15. Add the following and express your answer in Grams: Answer _____

    50 mg + 300 cg + 20 dg + 10 Gm =

16. Add the following and express your answer in   Answer _____
    milligrams:

    .6 Gm + 0.25 cg + 0.125 Gm = 0.5 dg

24₁

Additional Practice Problems For The Metric System

1.   Convert the following to milligrams:

5 grams = _____   3 centigrams = _____

50 decigrams = _____   10 Dekagrams = _____

2.   Add the following and express the answer in grams: Answer _____

50 milligrams + 300 centigrams + 25 decigrams + 30 grams

3.   Add the following and expresssthe following in   Answer _____
      milligrams:

0.6 grams + 0.25 centigrams + 0.125 grams + 0.5 decigrams

4.   Perform the following indicated problems: Answer _____

      Subtract 32 mg from 1.2 grams

      Multiply 10 Kilograms X 8 and express the answer   Answer _____
      in grams.

      Divide 45 Grams by 3.4 and express the answer   Answer _____
      in milligrams.

5. Restate the following:

125 mcg to milligrams = _____

85 deciliters to milliliters = _____

125 hectograms to centigrams = _____

6. Without reference, write the prefixes of the metric system and what part or parts of the basic unit each represents.

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Additional Practice Problems For The Apothecary System

1. Reduce the following to grains:

    a. ℥ ii, ℥ iss

    b. ℥ iv ℥ iv gr iv

2. Restate the following in weighable Apothecary denominations:

    a. 158 gr _____

    b. 175 gr _____

    c. 75 gr _____

3. Reduce the following to minims:

    a. ○ ii, fl ℥ v

    b. qt i, ○ ss, fl ℥ vii

4. Convert the following to fl ℥ :

    a. mx 120, fl ℥ 16, ○ iv

    b. qt iii, fl ℥ viii, fl ℥ ii ss

5. Add: 1 ℔ ℥ 2, ℥ 3 gr 1 to 2 ℔ ℥ 15, ℥ 7 gr 3

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6. Subtract:
    2 Gal - 3 qt, 2 pt, 10 fl ℥, 6 fl ℥   Answer _____

7. How many bottles, each containing fl ℥ iv,   Answer _____
    can be obtained from fl ℥ ii of iodine tincture?

8. How many gr 1/4 tablets can be made from ℥ 1/8   Answer _____
    of morphine sulfate?

9. A cough syrup contins ℈ ss of ammonia chloride in   Answer _____
    fl ℥ iv. How many grains should be used in
    preparing one gallon of the syrup?

10. What is the volume in fluid ounces of a mixture   Answer _____
containing 1/2 gallon of one liquid, one pint of another
and fl ℥ 96 of a third?

11. A pharmacist had 1/2 gallon of alcohol. At   Answer _____
different times he dispensed f ℥ iss, ℥ i,
f ℥ iv. What volume was left?

Additional Practice Problems For The Avoirdupois System

1. How many 1/120 grain tablets can be made from 1/8 oz of a powder?   Answer _____

2. How much chemical is left in a 1 1/2 oz bottle after enough has been taken out to make 1000 tablets of 1/100 grain each?   Answer _____

3. How many 1/4 gr capsules can you make from 1 1/4 oz of a chemical?   Answer _____

4. How many 2 grain tablets could be made from 2 oz of aspirin powder?   Answer _____

5. How many grains are left in a 1/4 lb bottle after enough of it has been used to make 150 tablets, each containing 1/300 gr?   Answer _____

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Additional Practice Problems For Ratio And Proportion

1. If cold capsules were (a) 12 for $1.98, (b) 25 for $3.25, and (c) 100 for $10.95, which would be the best buy?

Answer _____

2. A formula for 1250 capsules calls for 3.25 Gms of a chemical. How much of the chemical would be used to make 350 capsules? ..

Answer _____

3. If 125 gallons of a mouth rinse contains 20 Grams of a coloring agent, how many Grams will 160 gallons contain?

Answer _____

4. If 3 doses of a liquid preparation contain 7.5 grains of a substance, how many grains will 32 doses contain?

Answer _____

5. If 50 tablets contain 0.625 grams of an active ingredient, how many tablets can be prepared from 31.25 grams of the ingredient?

Answer _____

6. How many grains of a substance are needed for 350 tablets if 75 tablets contain 3 grains of the substance?

Answer _____

Additional Practice Problems For Conversion Of Weight And Measures

1. Convert 50 lb (AV) to Kg.   Answer _____

2. How many grains are in a .5 Gm tablet?   Answer _____

3. How many Kg do you weigh?   Answer _____

4. How many ml are there in 3 fl ℥ ?   Answer _____

5. 1/200 gr is equivalent to how many mcg?   Answer _____

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6. Convert 5000 ml to Apothecary units. Answer _____

7. Compare an Apothecary grain to an Avoirdupois grain. Answer _____

8. What is the difference, in grams, between an Apothecary pound and an Avoirdupois pound? Answer _____

9. Convert 1 lb 2 oz (AV) to Apothecary units. Answer _____

10. How many grains are there in 25 mcg? Answer _____

47

11. A doctor orders a patient to take three 1/8 gr tablets. per day. How many mg. will this equal per day?

Answer _____

.12. How many ml will the patient take daily?
Sig: Take fl ℥ ii daily

Answer _____

13. What directions will you give the patient for this prescription?
Sig: 2.5 ml daily

Answer _____

14. A doctor orders 12 fl ℥ be given to a patient. How many ml. will you dispense?

Answer _____

15. How many ml are there in 20 gals?

Answer _____

48   251

16. A 4 fl ℥ prescription bottle will hold how many ml?   Answer _____

17. A 2 ℥ powder jar will hold how many grams?   Answer _____

18. Convert 1/4 gr to mg.   Answer _____

19. Convert 1 qt to liters.   Answer _____

20. How many grains are in a .250 Gm tablet?   Answer _____

49

252

pp

Additional Practice Problems For Calculation Of Doses

1. How many doses will this prescription contain?   Answer _____

   ETH   120 ml

   Sig: ℥ⅰ qid

2. How many doses will this prescription contain?   Answer _____

   Tetracycline Tab   250 mg
                      #40
   Sig: 500 mg qid

3. How many doses will this prescription contain?   Answer _____

   Atarax Syrup   16 fl ℥.

   Sig: ℥ⅱ q 4h

4. What is the size of each dose in this prescription?   Answer _____

   Kaopectate   1 pt

   Sig: Divide equally into 32 doses

5. How many grams should you dispense for this   Answer _____
   prescription?

   PenVK   125 mg

   Sig: tab $\overline{ii}$ qid x 10 d

6. How many fl $\mathfrak{z}$ should you dispense for this   Answer _____
   prescription?

   Tetracycline Syrup

   Sig: $\mathfrak{z}\overline{i}$ Tid for 2 weeks

7. How many Grams should you dispense for this prescription?

    Answer _____

    Valium   5 mg

    Sig: 2.5 mg at bedtime for 5 days

8. The dose of a drug is 1/10 gr per Kg. of body weight. How many milligrams should be given to a person weighing 70 Kg?

    Answer _____

9. The adult dose is 500 mg. How much should be given to a 50 pound child?

    Answer _____

10. The adult dose is 30 ml. How much should be given to a 6 year old?

    Answer _____

255

11.   If the usual adult dose of a drug is 0.25 Gm,   Answer _____
      what is the dose for a child 9 years old?

12.   If the usual adult dose os paregoric is 5 ml,   Answer _____
      what is the dose for a child 8 years old?

13.   If the usual dose for an adult is .6 Gm,   Answer _____
      what is the dose for a 2 year old child?

14.   The usual dose of a certain solution is 0.5 ml.
      (a)   What is the dose for a child 4 years old?   Answer _____

      (b)   If the solution is to be dispensed in a   Answer _____
      dropper bottle, the dropper of which calibrates
      24 drops per ml, how many drops should be
      given to obtain the correct dose for the child?

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15. The usual dose of a drug is 1/60 grain for an adult.

    (a) Calculate the dose for a 25 lb child.   Answer _____

    (b) The dose for an infant of 1 year.   Answer _____

    (c) The dose for a child weighing 50 lb.   Answer _____

16. The usual adult dose of a drug is 0.6 Gm.   Answer _____
What is the dose for a child weighing
20 lbs? A child weighing 10 lbs?   Answer _____

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DEPARTMENT OF BIOMEDICAL SCIENCES

10-8

PHARMACY SPECIALIST

FUNDAMENTALS OF PHARMACY

May 1975

SCHOOL OF HEALTH CARE SCIENCES, USAF
SHEPPARD AIR FORCE BASE, TEXAS

―――――― Designed For ATC Course Use ――――――

DO NOT USE ON THE JOB

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PURPOSE OF STUDY GUIDES, WORKBOOKS, PROGRAMMED TEXTS AND HANDOUTS

Study Guides, Workbooks, Programmed Texts and Handouts are training publications authorized by Air Training Command (ATC) for student use in ATC courses.

The STUDY GUIDE (SG) presents the information you need to complete the unit of instruction, or makes assignments for you to read in other publications which contain the required information.

The WORKBOOK (WB) contains work procedures designed to help you achieve the learning objectives of the unit of instruction. Knowledge acquired from using the study guide will help you perform the missions or exercises, solve the problems, or answer questions presented in the workbook.

The STUDY GUIDE AND WORKBOOK (SW) contains both SG and WB material under one cover. The two training publications are combined when the WB is not designed for you to write in, or when both SG and WB are issued for you to keep.

The PROGRAMMED TEXT (PT) presents information in planned steps with provisions for you to actively respond to each step. You are given immediate knowledge of the correctness of each response. PTs may either replace or augment SGs and WBs.

The HANDOUT (HO) contains supplementary training materials in the form of flow charts, block diagrams, printouts, case problems, tables, forms, charts, and similar materials.

Training publications are designed for ATC course use only. They are updated as necessary for training purposes, but are NOT to be used on the job as authoritative references in preference to Technical Orders or other official publications.

Department of Biomedical Sciences
School of Health Care Sciences, USAF
Sheppard Air Force Base, Texas

WB 3ABR90530-I-3
May 1975

FUNDAMENTALS OF PHARMACY

OBJECTIVE

Given information pertaining to pharmaceutical organic chemistry complete questions in SW 3ABR90530-I-3 to classify organic compounds shown in the instructional guidance and describe their properties. Each day you will review the material presented in class, then answer the appropriate questions pertaining to that day's lecture.

EQUIPMENT

Selected flipcharts

Selected transparencies

Overhead projector

PROCEDURE

Defining and Identifying Organic Chemistry and Compounds

The object of this lesson is to acquaint you with some basic fundamentals of pharmaceutical organic chemistry. Specifically, you will:

1. Identify

   a. The definition of organic chemistry.

   b. Three sources of organic compounds.

   c. Selected properties of organic compounds.

   d. Principles and types of covalent bonding.

   e. Types of molecular formulas used in organic chemistry.

2. Identify and define the types of carbon atoms.

This supersedes WB 3ABR90530-I-3, April 1974.

QUESTIONS

1. _____ _____ - The study of Carbon.

2. _____ - The study
of compounds containing Carbon and Hydrogen and their derivatives.

3. _____ - Organic compounds obtained from plant and animal sources.

4. _____ - Compounds made entirely from raw elements or by
chemical action of naturally occurring compounds to form different compounds.

5. _____ - A combination of natural substances and
synthetic compounds.

6. _____ compounds are the most important source for pharma-
ceuticals.

7. The three sources of organic compounds are:

   a.

   b.

   c.

8. General properties of organic compounds as compared to inorganic compounds.

   a.

   b.

   c.

   d.

   e.

   f.

   g.

9. _____ - A type of chemical bonding in which each atom
donates one or more valence electrons to be shared by the two.

10. _____ is the principle type of bonding found in organic
compounds.

1F- 75-1348

11. _____ bonding between two carbon atoms signifies the sharing of two electrons.

12. C - C is an example of a _____ bond.

13. _____ bonding between two carbon atoms signifies the sharing of four electrons.

14. C = C is an example of a _____ bond.

15. _____ bonding between two carbon atoms signifies the sharing of six electrons.

16. C ≡ C is an example of a _____ bond.

17. The three types of covalent bonding are:

   a.

   b.

   c.

18. _____ molecular formulas show the complete atomic relation-ship.

19. _____ molecular formulas show partial atomic relationship.

20. _____ molecular formulas show NO atomic relationship.

21. Identify the following types of molecular formulas.

   a. $CH_3 - CH_2 - CH_3$ _____

   b.
   $$
   \begin{array}{ccccccc}
    & H & & H & & H & \\
    & | & & | & & | & \\
   H & - & C & - & C & - & C & - & H \\
    & | & & | & & | & \\
    & H & & H & & H &
   \end{array}
   $$
   _____
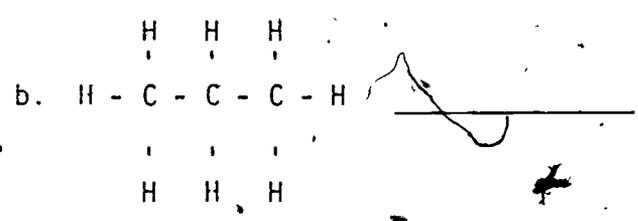
   c. C_3H_8 _____

22. The best way to show the complete atomic relationship of a molecule is by the use of the _____ formula.

23. _____ - Two or more compounds with the same empirical formula but different graphic structure and physical properties.

3

24. _____ Carbon Atoms have one of its valence electrons satisfied by another carbon atom.

25. _____ Carbon Atoms have two of its valence electrons satisfied by two other carbon atoms.

26. _____ Carbon Atoms have three of its valence electrons satisfied by three other carbon atoms.

27. The three types of carbon atoms are:

a.

b.

c.

28. Name each type of carbon atom in the following illustration.
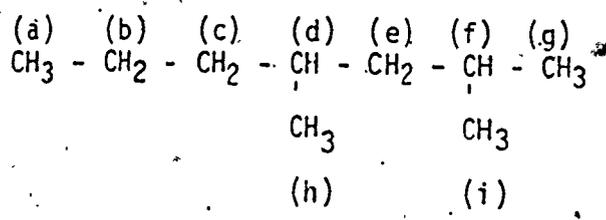
```
 (a)    (b)    (c)    (d)   (e)   (f)  (g)
CH3 - CH2 - CH2 - CH - CH2 - CH - CH3
                   |          |
                  CH3        CH3
                  (h)        (i)
```

a.

b.

c.

d.

e.

f.

g.

h.

i.

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4

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ALIPHATIC HYDROCARBONS

The purpose of this lesson is to acquaint you with the classification and properties of Aliphatic Hydrocarbons and will further acquaint you with basic fundamentals of pharmaceutical organic chemistry. Specifically you will:

1. Define

    a. Hydrocarbon

    b. Aliphatic.Hydrocarbon

    c. Radical

2. Identify

    a. Classifications of Aliphatic Hydrocarbons

    b. General Formulas

    c. Selected properties

3. Identify selected pharmaceuticals belonging to these classes.

4. Using selected rules of the IUC System to name organic compounds.

5

QUESTIONS

1. _____ - Compounds which contain ONLY carbon and hydrogen.

2. _____ _____ - Compounds which contain ONLY carbon and hydrogen and are formed in straight or branched open chains.

3.
```
                          H
                          |
       H    H    H    H  H-C-H
       |    |    |    |   |
  H -  C -  C -  C -  C -  C - H
       |    |    |    |    |
       H    H  H-C-H  H    H
                |
              H-C-H
                |
                H
```
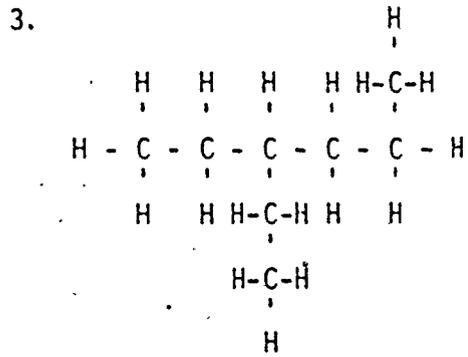
The above example is an _____ _____.

4. Are Aliphatic Hydrocarbons cyclic in structure? · YES or NO

5. _____ is the principle source of the Aliphatic Hydrocarbons.

6. _____ - A group that preserves its identity throughout a reaction.

6

7. List the General formulas for each of the following series, the

ALKANES

General Formula _____

General Properties

a. _____
b. _____
c. _____
d. _____
e. _____
f. _____
_____
_____
_____

ALKENES
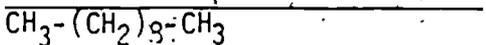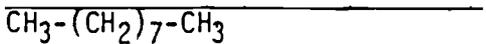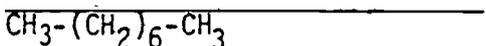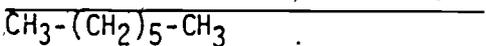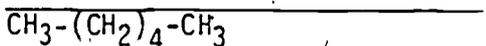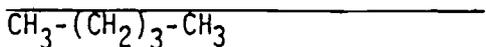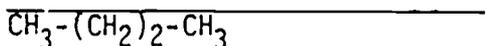
General Formula _____

General Properties

a. _____
b. _____

ALKANE (Methane) SERIES

CH_4 _____

CH_3-CH_3 _____

$CH_3-CH_2-CH_3$ _____

$CH_3-(CH_2)_2-CH_3$ _____

$CH_3-(CH_2)_3-CH_3$ _____

$CH_3-(CH_2)_4-CH_3$ _____

$CH_3-(CH_2)_5-CH_3$ _____

$CH_3-(CH_2)_6-CH_3$ _____

$CH_3-(CH_2)_7-CH_3$ _____

$CH_3-(CH_2)_9-CH_3$ _____

ALKENE (Olefin) SERIES

$CH_2=CH_2$ _____

$CH_2=CH-CH_3$ _____

$CH_2=CH-CH_2-CH_3$ _____

$CH_2=CH-(CH_2)_2-CH_3$ _____

$CH_2=CH-(CH_2)_3-CH_3$ _____

$CH_2=CH-(CH_2)_4-CH_3$ _____

$CH_2=CH-(CH_2)_5-CH_3$ _____

$CH_2=CH-(CH_2)_6-CH_3$ _____

$CH_2=CH-(CH_2)_7-CH_3$ _____

8
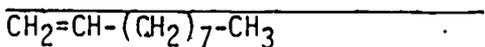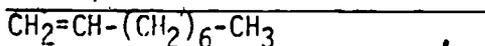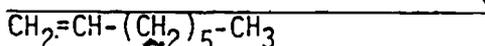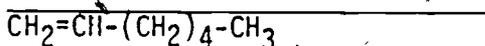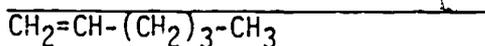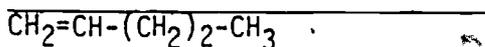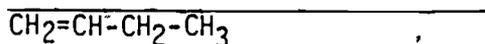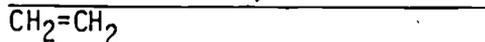
general properties of each and name the member of each series.

ALKYNES	RADICAL
General Formula _____	General Formula _____
General Properties	General Properties
a. _____	_____
b. _____	_____

ALKYNE (Acetylene) SERIES

$CH \equiv CH$ _____

$CH \equiv C-CH_3$ _____

$CH \equiv C-CH_2-CH_3$ _____

$CH \equiv C-(CH_2)_2-CH_3$ _____

$CH \equiv C-(CH_2)_3-CH_3$ _____

$CH \equiv C-(CH_2)_4-CH_3$ _____

$CH \equiv C-(CH_2)_5-CH_3$ _____

$CH \equiv C-(CH_2)_6-CH_3$ _____

$CH \equiv C-(CH_2)_7-CH_3$ _____

ALKYLS

CH_3- _____

CH_3-CH_2- _____

$CH_3-CH_2-CH_2-$ _____

$CH_3-(CH_2)_2-CH_2-$ _____

$CH_3-(CH_2)_3-CH_2-$ _____

$CH_3-(CH_2)_4-CH_2-$ _____

$CH_3-(CH_2)_5-CH_2-$ _____

$CH_3-(CH_2)_6-CH_2-$ _____

$CH_3-(CH_2)_7-CH_2-$ _____

$CH_3-(CH_2)_8-CH_2-$ _____

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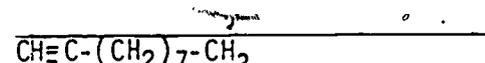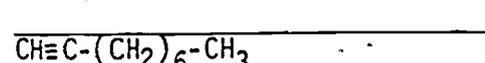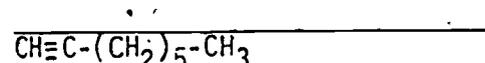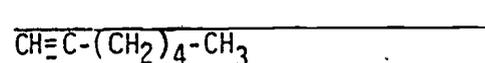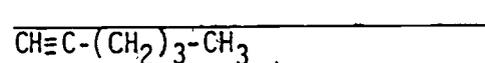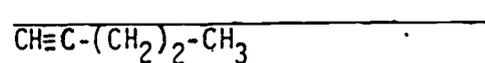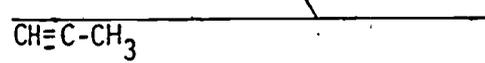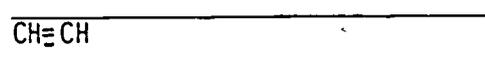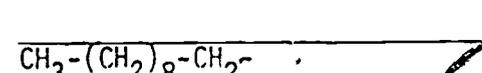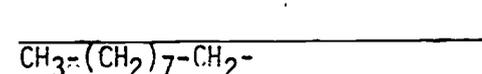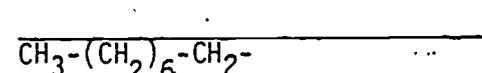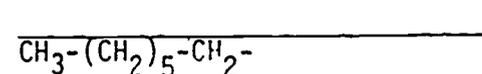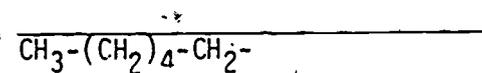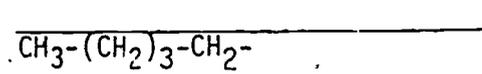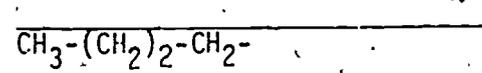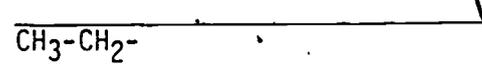
8. _____ Series are compounds built of the same elements with similar chemical and physical properties varying regularly from member to member by a common amount (CH_2).

9. A _____ is a member within the series.

10. The _____ are the least reactive of the Aliphatic Hydrocarbons because of hydrogen saturation and single bonds.

11. The ANE ending identifies the _____ Series.

12. The _____ are the most reactive Aliphatic Hydrocarbons because of a triple bond.

13. The _____ are derived from the Alkanes and have double bonds.

14. In naming the radicals, the base name is derived from the Alkanes and the ending is changed to _____.

15. Three important pharmaceuticals belonging to the Aliphatic Hydrocarbon class.

   a. Light Mineral Oil N.F. (Light Petrolatum)

      Use: _____

   b. Mineral Oil U.S.P. (Heavy Petrolatum)

      Use: _____

   c. White Petrolatum U.S.P. (Petrolatum or Vaseline)

      Use: _____

16. The pharmaceutical that is never taken internally and is used in cosmetics is _____.

17. The Aliphatic Hydrocarbon which is used as an ointment base and is a pharmaceutical necessity is _____.

18. The pharmaceutical Aliphatic Hydrocarbon which is used as a laxative is _____.

The following questions are to be answered by using the IUC System in naming organic compounds.

19. Identify the _____ continuous chain of carbon atoms in the formula. This chain will then be called the _____ and named by its respective _____ name.

20. What is the base name for the following compound?

$CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$ _____ _____
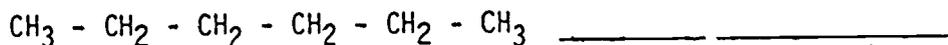
21. The names of the branched radicals are named as <u>prefixes</u> to the _____ name.

22. What is the name of the radical attached to the base of the following compound?

$CH_3 - CH_2 - CH - CH_2 - CH_2 - CH_3$ _____ hexane
$\quad\quad\quad\quad\quad | $
$\quad\quad\quad\quad\quad CH_3$
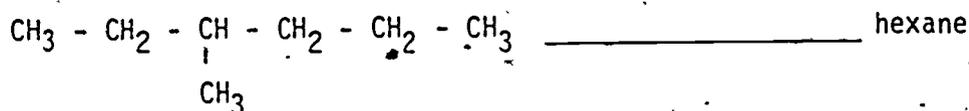
23. Number the _____ atoms from the end which will give the _____ _____ their lowest number.

24. From which end of the following compound would you number?

(A) $\quad\quad\quad\quad\quad\quad\quad\quad$ (B)
$CH_3 - CH_2 - CH_2 - CH - CH_2 - CH_3$ _____
$\quad\quad\quad\quad\quad\quad\quad\quad | $
$\quad\quad\quad\quad\quad\quad\quad CH_2$
$\quad\quad\quad\quad\quad\quad\quad\quad | $
$\quad\quad\quad\quad\quad\quad\quad CH_3$
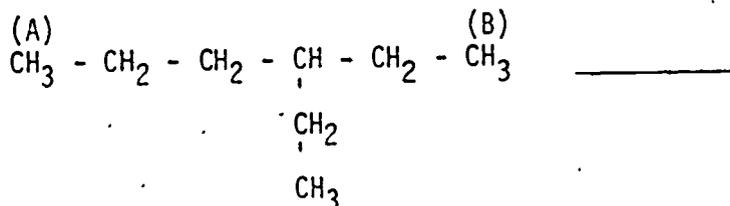
25. The position of the radical is indicated by the _____ of the <u>carbon atom</u> to which it is attached.

26. What would be the number that is attached to the following named compound?

$CH_3 - CH_2 - CH - CH_2 - CH_2 - CH_3$ _____ - Methylhexane
$\quad\quad\quad\quad\quad | $
$\quad\quad\quad\quad\quad CH_3$
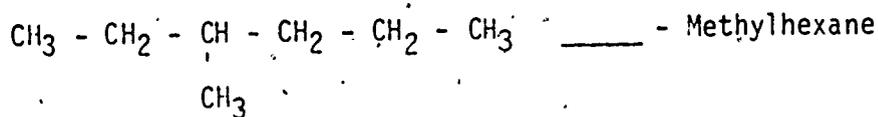
27. If _____ radicals are attached to the same <u>carbon atom</u>, the number of the <u>carbon atom</u> to which they are attached is <u>repeated</u> and the <u>numerical prefix</u> is added to the radical name.

28. Place the proper information in the blanks for the following compound.

$$CH_3 - CH_2 - \overset{\overset{\displaystyle CH_3}{|}}{\underset{\underset{\displaystyle CH_3}{|}}{C}} - CH_2 - CH_2 - CH_3 \quad \underline{\quad}, \underline{\quad} - \underline{\quad} \text{ methylhexane}$$
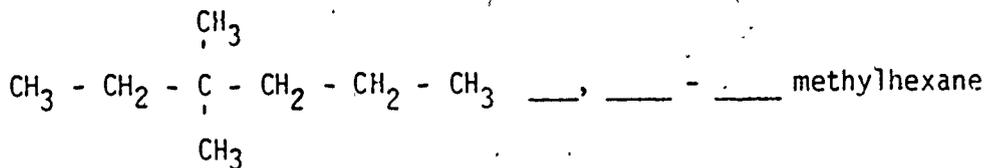
29. If _____ radicals are attached to either the same or different carbons, the position of each radical is indicated by the number of the carbon atom to which it is attached and named in alphabetical order.

30. Complete the blanks in naming the following compound.

$$CH_3 - CH_2 - \overset{\overset{\displaystyle CH_3}{|}}{\underset{\underset{\displaystyle CH_3}{|} \ \underset{\underset{\displaystyle CH_3}{|}}{CH_2}}{C}} - CH - CH_2 - CH_3 \quad \underline{\quad} - \underline{\quad\quad} \underline{\quad}, \underline{\quad} \text{ Di } \underline{\quad} \text{hexane}$$
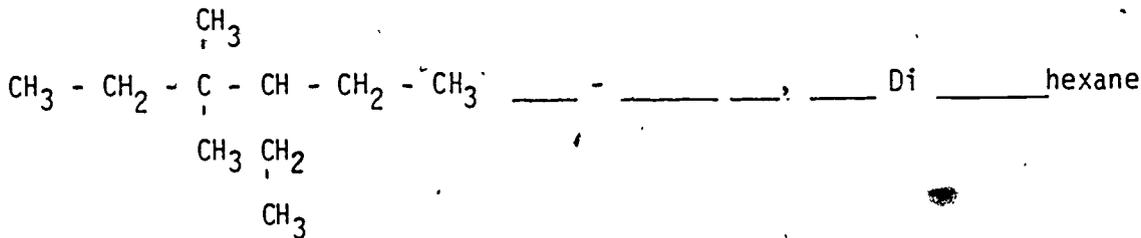
31. If the compound contains a _____ bond, the position of the bond is indicated by the number of the carbon atom which contains the multiple bond closest to a terminal carbon atom, included in the name and the base will be given its respective Alkene or Alkyne name.

32. Name the following compound.

$$CH_3 - CH = CH - \overset{\overset{\displaystyle CH_3}{|}}{\underset{\underset{\displaystyle CH_3}{|}}{C}} - \overset{}{\underset{\underset{\underset{\displaystyle CH_3}{|}}{CH_2}}{\underset{|}{CH}}} - CH_2 - CH_3 \qquad \underline{\quad\quad\quad\quad\quad}$$

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INFORMATION
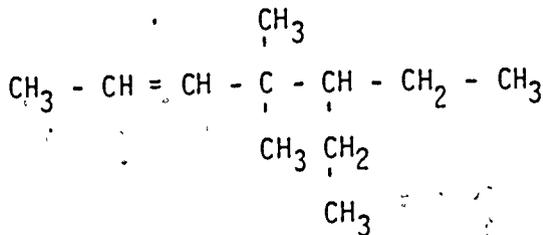
ALCOHOLS, ALDEHYDES, KETONES AND ETHERS

The purpose of this lesson is to acquaint you with the properties and uses of the alcohols, aldehydes, ketones, and ethers and will further acquaint you with basic fundamentals of pharmaceutical organic chemistry. Specifically, you will identify and

1. Define and give general formulas for the following:

   a. Alcohols

   b. Aldehydes

   c. Ketones

   d. Ethers

2. Select properties of these classes.

3. Select pharmaceuticals belonging to these classes and their uses.

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QUESTIONS

1. _____ - Compounds consisting of two distinct parts, an aliphatic radical and a hydroxyl radical.

2. _____ is the formula for the hydroxyl radical.

3. _____ is the general formula for alcohols.

4. _____ are alcohols which contain one hydroxyl (OH) radical per molecule.

5. List three types of monohydroxy alcohols and define each.

a. _____ The hydroxyl (OH) radical is attached to a primary carbon atom.

b. _____ The hydroxyl (OH) radical is attached to a secondary carbon atom.

c. _____ The hydroxyl (OH) radical is attached to tertiary carbon atom.

6. Monohydroxy alcohols are classified by the manner of which the hydroxyl group is _____.

7. _____ are alcohols which contain two or more hydroxyl (OH) radicals per molecule.

8. Identify the following monohydroxy alcohols.

a.
$$CH_3$$
$$CH_3 - C - CH_2 - CH_3$$ _____
$$OH$$

b. $CH_3 - CH_2 - CH - CH_2 - OH$ _____
$$CH_3$$

c. $CH_3 - CH - CH - CH_3$ _____
$$CH_3 \quad OH$$

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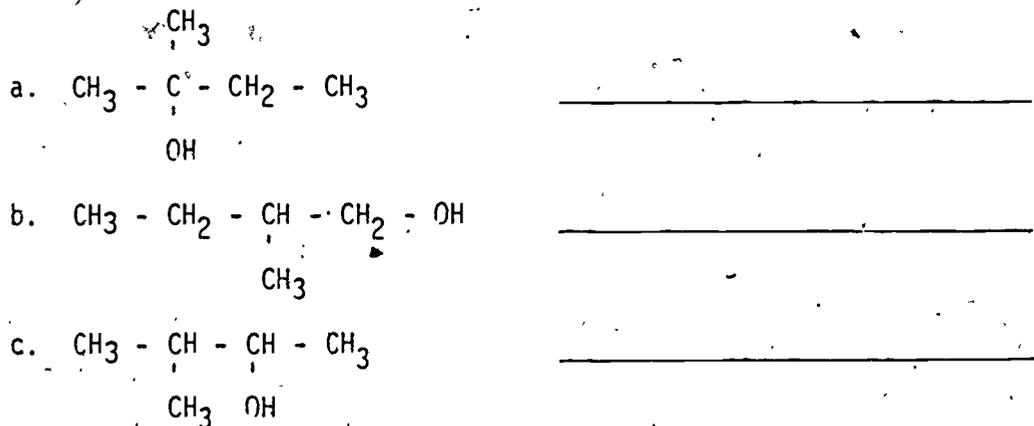
9. Identify the following alcohol.

$$OH \quad OH \quad OH$$
$$CH_2 - CH - CH_2$$ _____
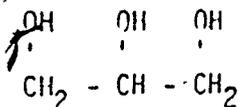
10. Increasing the length of the hydrocarbon chain, _____ its solubility in water, and solubility in organic solvents increases.

11. Increasing the number of hydroxyl (OH) radicals per molecule _____ its solubility in water.

12. Alcohols become _____ with the increase of the hydroxy (OH) radicals.

13. Alcohols are _____ up to 11 carbon atoms, and become _____ after 12 carbon atoms.

14. The following is a list of five important compounds classified as alcohols and give their use.

    a. Methyl Alcohol (Methanol or Wood Alcohol)

       (1) Never used in compounding because it is extremely poisonous, both internally and externally.

       (2) Use: _____

    b. Alcohol U.S.P. (Ethyl Alcohol, Ethanol or Grain Alcohol)

       Use: _____

    c. Isopropyl Alcohol N.F. (Isopropanol)

       Use: _____

    d. Glycerin U.S.P. (Glycerol)

       Use: _____

    e. Propylene Glycol U.S.P.

       (1) Substitute for Glycerin

       (2) Use: _____

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15. The alcohol that is used as a vehicle for <u>internal</u> and <u>external</u> use and a solvent is _____.

16. The alcohol that is NEVER used in compounding is _____.

17. An alcohol that is used as a sweetening vehicle and solvent is

_____.

18. _____ are the oxidation products of primary alcohols.

19. _____ is the general formula for Aldehydes.

20. _____ is a <u>Carbonyl Radical</u> and is always present in Aldehydes.

21. Aldehydes are soluble in _____ _____ and only slightly soluble in _____.

22. Aldehydes with lower molecular weight are colorless _____ having a _____ odor.

23. Under two carbon atoms Aldehydes are a _____ with a choking, painful odor.

24. Two selected pharmaceuticals belonging to this class are:

    a. Formaldehyde Solution U.S.P. (Formalin)

       (1) Subject to polymerization

       (2) Use: _____

    b. Chloral Hydrate U.S.P. ("Mickey Finn")

       Use: _____

25. _____ are the oxidation products of secondary alcohols.

26. _____ is the general formula for Ketones.

27. Ketones are _____ reactive than Aldehydes.

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28. Low molecular weight Ketones are _____ and have pungent odors,. but high molecular weight Ketones may be either _____ or _____

29. The radical that is always present in Aldehydes and Ketones is

_____ .

30. Two selected pharmaceuticals belonging to the Ketone class are:

    a. Acetone N.F. (Dimethyl Ketone)

      Use: _____

    b. Camphor U.S.P.

      (1) Forms eutectic mixtures

      (2) Use: _____

31. _____ are the dehydration products of two alcohols.

32. _____ is the general formula for Ethers.

33. Ethers are _____ reactive than Ketones and Aldehydes but are good organic _____ but are not very soluble in water.

34. As the molecular weight increases, Ethers become:

    a. _____

    b. _____

    c. _____

35. Two selected pharmaceuticals belonging to the Ether class are:

    a. Ether U.S.P. (Ethyl Ether)

      Use: _____

    b. Ethyl Oxide N.F.

      (1) The same as Ether U.S.P., except it contains impurities (96 - 97% Ether).

      (2) Use: _____

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INFORMATION

ALIPHATIC ACIDS, ESTERS, FATS AND FIXED OILS, AND SALTS

The purpose of this lesson is to acquaint you with the properties and uses of organic acids and their derivatives, and will further acquaint you with basic fundamentals of pharmaceutical organic chemistry. Specifically, you will identify:

1. Define and give general formulas for the following:

    a. Acids

    b. Esters

    c. Salts

2. Selected properties of these classes.

3. Selected pharmaceuticals belonging to these classes and their uses.

QUESTIONS

1. _____ - Compounds which contain an <u>aliphatic</u>
<u>radical</u> and one or more <u>carboxyl radicals</u> per molecule.

2. _____ is the general formula for Aliphatic Acids.

$$\begin{matrix} O \\ || \end{matrix}$$

3. - C - OH is the general formula for a _____ radical.

4. - OH is the general formula for a _____ radical.

5. Types of aliphatic acids

    a. _____ are assigned to the number of carboxylic acid to
get its name.

    b. The prefixes are as follows:

        (1) _____ - The acid contains <u>one</u> carboxyl radical per
molecule.

        (2) _____ - The acid contains <u>two</u> carboxyl radicals per
molecule.

        (3) _____ - The acid contains <u>three</u> carboxyl radicals per
molecule.

        (4) _____ - The acid contains <u>many</u> carboxyl radicals per
molecule.

6. The _____ tell how many carboxyl radicals per molecule.

7. In general, organic acids are _____ acids.

8. The solubility in water of organic acids _____ as the
molecular weight increases.

9. Acids react with metals and bases or other alkalies to produce
_____.

10. Organic acids are strong acids. (TRUE) (FALSE)

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11. Three selected pharmaceuticals belonging to the Aliphatic Acid class are:

    a. Acetic Acid U.S.P. 36 - 37% (Vinegar)

        Use: _____

    b. Trichloroacetic Acid U.S.P.

        (1) Strongest of the organic carboxylic acids.

        (2) Use: _____

    c. Undecylenic Acid N.F. 1 - 10% (One of the active ingredients in Desenex (2%) Foot Powder and Ointment)

        Use: _____

12. _____ - Products formed from the reaction between an alcohol and an acid, an acid chloride or an acid anhydride.

13. _____ is the general formula for Esters.

14. Esters can be either _____ or _____.

15. Esters are essentially _____ in water, but may hydrolyze when exposed to moisture for a period of time.

16. Esters may be either fats or fixed oils.

    a. Both are _____ esters of fatty acids.

    b. They are distinguished by their _____ range (20°C).

17. _____ are solid glyceryl esters.

18. _____ _____ are liquid glyceryl esters.

19. Three selected pharmaceuticals belonging to the Ester, Fats and Fixed oils class are:

    a. Glyceryl Trinitrate U.S.P. (Nitroglycerin)

        Use: _____

b. Castor Oil U.S.P.

   (1) Fixed oil

   (2) Use: _____

c. Theobroma Oil U.S.P. (Cocoa Butter)

   (1) Fat

   (2) Use: _____

20. _____ - Products formed from the reaction between organic acids with metals and bases or other alkalies, or salts of weaker acids.

21. _____ is the general formula for Salts.

22. Salts can be identified by _____ bonding.

23. Salts are _____ crystal solids.

24. Salts have _____ melting points (300°C - 400°C).

25. Because salts possess ionic bonding they are soluble in water and _____ in organic solvents.

26. Two selected pharmaceuticals belonging to the Salt class are:

a. Zinc Undecylenate N.F. (Another ingredient in Desenex 20%).

   Use: _____

b. Magnesium Sulfate U.S.P. (Epsom Salts)

   Use: _____

SURFACTANTS

The purpose of this lesson is to acquaint you with the classification and properties of surface active agents used in pharmacy and will further acquaint you with basic fundamentals of pharmaceutical organic chemistry. Specifically, you will:

1. Define surface tension.

2. Define surfactants.

3. Identify selected properties and classification of surfactants:

   a. Anionic

   b. Cationic

   c. Nonionic

4. Identify selected pharmaceuticals belonging to these classes and their uses.

QUESTIONS

1. _____ _____ - The attraction of molecules in a liquid (cohesion).

2. _____ - Or surface acting agents are intended to modify the <u>surface tension</u> of a liquid in contact with other liquids or solids.

3. _____ surfactants owe their action to the negative charged portion of the molecule.

4. Anionic surfactants affect the _____ portion of a dipolar molecule.

5. The _____ of anionic surfactants in water is greatly influenced by the length of the _____ _____, and they are _____ with cationic surfactants.

6. Three selected pharmaceuticals belonging to the Anionic Surfactants class are:

    a. Official Soaps (All are cleansing agents)

        (1). Hard Soap N.F. (Castile soap)

        (2) Green Soap N.F. (Medicinal Soft Soap)

        (3) Detergents

    b. Dioctyl Sodium Sulfosuccinate N.F. (Colace)

      Use: _____

    c. Dioctyl Calcium Sulfosuccinate N.F. (Surfak)

      Use: _____

7. _____ surfactants owe their action to the positive charged portion of the molecule.

8. Cationic surfactants affect the _____ portion of a dipolar molecule.

9. Cationic surfactants are _____, _____, and
_____.

10. Cationic surfactants are incompatible with _____ surfactants.

11. Two selected pharmaceuticals belonging to the Cationic Surfactants class are:

    a. Benzalkonium Chloride Solution U.S.P. (Zephiran)

    Use: _____

    b. Cetyl Pyridinium Chloride N.F. (Cepacol)

    Use: _____

12. _____ surfactants are those which carry NO ionic effect.

13. If non-ionic surfactants carry no charge, they DO NOT _____.

14. Non-ionic surfactants may be either _____ (water loving) or _____ (oil loving).

15. Two selected pharmaceuticals belonging to the Non-ionic Surfactants class are:

    a. Polysorbate 80 U.S.P. (Tween 80)

    Use: _____

    b. Sorbitan Monooleate (Span)

    Use: _____

16. Anionic surfactants are _____ with Cationic surfactants.

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INFORMATION

AROMATIC HYDROCARBONS

The purpose of this lesson is to acquaint you with the properties and uses of aromatic hydrocarbons and will further acquaint you with basic fundamentals of pharmaceutical organic chemistry. Specifically, you will identify and:

1. Define and give a general formula for aromatic hydrocarbons..

2. Select general properties of aromatic hydrocarbons.

3. Select pharmaceuticals belonging to this class and their uses.

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1. _____ _____ - Compounds which have six
carbon atoms, three double bonds, and three single bonds.

2. The example below is the _____ formula for an aromatic hydro-
carbon.

$$H - C \overset{\displaystyle H}{\underset{\displaystyle }{}} \ C = C - H$$

H - C ⫴ C - H

H = C ⫴ C - H
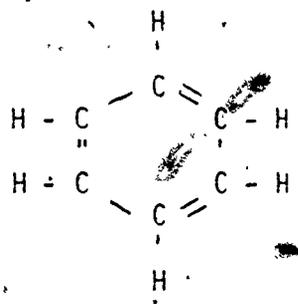
This structure is also known
as the _____ ring.

3. $C_6H_{2n} - 6$ is the general formula for _____ _____ .

4. _____ _____ is the principle source of aromatic hydrocarbons.

5. Liquid aromatic hydrocarbons are _____ than water, and
have _____ _____ odors.

6. Solid aromatic hydrocarbons have _____ odors.

7. The three types of hydrogen substitution on the Benzene ring are as
follows:

a. _____ - A single hydrogen is replaced by an
element of radical.

b. _____ - Two hydrogens are replaced by an element
or radical. This can bring about three possible isomers.

(1) _____ "straight line"

(2) _____ "beyond"

(3) _____ "opposite"

c. _____ - Three hydrogens are replaced by an element
or radical. This also brings about three possible isomers.

28.

8. Identify the type of substitution and name the compound.
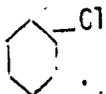
Example: [Cl structure]   Monosubstitution   Chlorobenzene

a. _____   _____
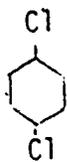
b. _____   _____
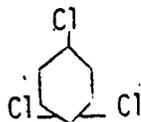
c. _____   _____
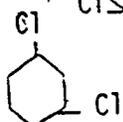
d. _____   _____
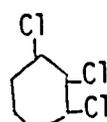
e. _____   _____
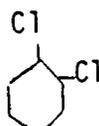
f. _____   _____
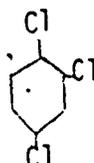
9. In naming compounds of Disubstitution the prefix that is added to the element or radical is

a. Meta (m) meaning _____.

b. Ortho (o) meaning _____.

c. Para (p) meaning _____.

10. When using _____ substitution of hydrogen on the Benzene ring, the prefix tri- is given to the base name and the appropriate three numbers are given to designate the carbon atom to which each substitution the element or radical is attached.

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11. Six selected pharmaceuticals belonging to the Aromatic Hydrocarbon class are:

    a. Benzene (Benzol)

        Use: _____

    b. Toluene

        Use: _____

    c. Xylene (Xylol)

        Use: _____

    d. Naphthalene (Sublimes)

        Use: _____

    e. Anthracene

        Structure:
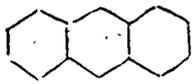
        Use: _____

    f. Phenanthrene

        (1) Isomer of Anthracene

        (2) Structure:

        (3) Use: _____

INFORMATION
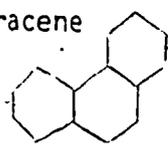
AROMATIC ACIDS AND DERIVATIVES

The purpose of this lesson is to acquaint you with the properties and uses of the more common aromatic acids, esters, and salts and will further acquaint you with basic fundamentals of organic pharmaceutical chemistry. Specifically, you will identify:

1. Define and give general formula representing aromatic acids.

2. Selected general properties of aromatic acids.

3. Selected pharmaceuticals belonging to this class and their uses.

QUESTIONS

1. _____ _____ - Compounds which contain an <u>aromatic radical</u> and a <u>carboxyl radical</u>.

2. The aromatic radical (R) represents the _____ ring.

$$\begin{matrix} O \\ \| \end{matrix}$$

3. - C - OH is the _____ radical.

4. _____ is the general formula for Aromatic Acids.

5. Most Aromatic Acids are NOT soluble in water, but they react with bases to produce water _____ salts.

6. Four selected pharmaceuticals belonging to the Aromatic Acid class are:

    a. Benzoic Acid U.S.P.

       Use: _____

    b. Salicylic Acid U.S.P.

       Use: _____

    c. Methyparaben and Propylparaben

       Use: _____

    d. Aspirin U.S.P. (Acetylsalicylic Acid)

       (1) Aspirin is unstable if moist, it slowly hydrolyzes into

          (a) _____

          (b) _____

       (2) Use: _____

7. _____ are items which lessen pain.

8. _____ are items which reduce temperature.

9. _____ are items which remove the outer horny layer of skin.

10. If Aspirin is stored improperly, it will hydrolyze into _____ and _____.

11. If you open a new bottle of Aspirin and it smells of Vinegar would you use it or dispense it to a patient? YES NO

INFORMATION

ALIPHATIC AND AROMATIC HALOGENATED COMPOUNDS

The purpose of this lesson is to acquaint you with the properties and uses of aliphatic and aromatic halogenated compounds and will further acquaint you with basic fundamentals of pharmaceutical organic chemistry. Specifically, you will identify:

1. Define and give general formulas representing aliphatic and aromatic halogenated compounds.

2. Selected general properties of aliphatic and aromatic halogenated compounds.

3. Selected pharmaceuticals belonging to these classes and their uses.

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QUESTIONS

1. List the four Halogens learned in inorganic chemistry.

a. _____

b. _____

c. _____

d. _____

2. _____ are compounds which a Halogen has replaced a hydrogen.

3. _____ halides are the combination of an aliphatic radical and a halogen.

4. _____ is the general formula for Alkyl halides.

5. Alkyl halides are _____ compounds.

6. Alkyl halides have physical states of either a _____ or _____.

7. Alkyl halides possess a _____ sweet odor and taste and they are _____ with water?

8. The alkyl halides are less _____ than their corresponding hydrocarbons and become even lesser as the degree of halogenation increases.

9. Two selected pharmaceuticals belonging to the Aliphatic Halogenated (Alkyl Halides) class are:

a. Chloroform N.F.

(1) Air, sunlight or open flame causes chloroform to oxidize into _____ _____ and hydrogen chloride.

(2) Use: _____

b. Halothane U.S.P. (Fluothane)

Use: _____

10. Another name for an aliphatic halogenated compound is _____

_____

11. _____ halides are the combination of an aromatic radical and a halogen.

12. _____ is the general formula for Aryl halides.

13. Aryl halides have a _____ but not unpleasant odor and are the most _____ of the halogenated compounds.

14. Three selected pharmaceuticals belonging to the Aryl Halides class are:

    a. Gamma Benzene Hexachloride U.S.P. (Kwell)

       Use: _____

    b. Chlorophenothane U.S.P. (DDT)

       Use: _____

    c. Iodochlorhydroxyquin U.S.P. (Vioform)

       Use: _____

15. Alkyl Halides represent an _____ halogenated compound.

16. Aryl Halides represent an _____ halogenated compound.

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INFORMATION

AMINES AND AMIDES

The purpose of this lesson is to acquaint you with the properties and uses of amines and amides and will further acquaint you with basic fundamentals of pharmaceutical organic chemistry. Specifically, you will identify:

1. Define and give general formulas representing:

   a. Ammonia

   b. Ammonium Radical

   c. Amino Radical

   d. Amines

   e. Amides

2. Selected general properties of the Amines and Amides.

3. Classify and select pharmaceuticals belonging to the amines and amides. and their uses:

   a. Analgesics

   b. Local Anesthetics

   c. Barbiturates

   d. Antihistamines

   e. Sulfonamides

   f. Autonomic Nervous System Drugs

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QUESTIONS

1. _____ is Nitrogen (valence 3) with all its available electrons bonded by hydrogen.

2. _____ is the general formula for Ammonia.

3. _____ radical is Nitrogen (valence 5) bonded by four hydrogens and donating an electron for ionic bonding.

   Example: - NH_4^+

4. _____ radical in Nitrogen (valence 3) bonded with two hydrogens with an available electron for bonding with an element or radical.

5. _____ is the general formula for an amino radical.

6. _____ are derivatives of ammonia by replacement of a hydrogen by an aliphatic (alkyl) radical.

7. _____ is the general formula for Amines.

8. _____ are derivatives of ammonia by replacement of a hydrogen by an ACYL Radical.

9. $-\overset{\overset{\text{O}}{\|}}{\text{C}}-NH_2$ is the general formula for an _____ Radical.

10. The general formula for the _____ is $RCONH_2$. This is represented graphically:

    R - C - N - H
        ‖
        O   H
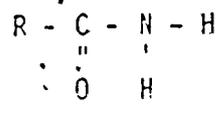
    _____ Radical

11. Amines are _____ and _____ in aqueous solutions.

12. Amines react with acids to produce _____.

13. Amides are _____ and _____ in aqueous solutions as a result of hydrolysis.

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14. _____ are drugs which lessen pain.

15. Two selected pharmaceuticals belonging to the Analgesic class are:

    a. Phenacetin U.S.P. (Acetophenetidin)

    b. Acetaminophen N.F. (Tylenol, Tempra)

16. _____ _____ are compounds which render nerve fibers temporarily incapable of conducting impulses.

17. Two selected pharmaceuticals belonging to the Local Anesthetics class are:

    a. Procaine Hydrochloride U.S.P. (Novocaine)

       (1) Least _____ and most widely used.

       (2) Use: _____

    b. Lidocaine Hydrochloride U.S.P. (Xylocaine)

       (1) Twice as potent and no more _____ than Procaine.

       (2) Use: _____

18. _____ are related to the Amines and Amides and are used as sedatives and hypnotics.

19. _____ the act or process of calming.

20. _____ an item that induces sleep.

21. Five selected pharmaceuticals belonging to the Barbiturate class are:

    a. Phenobarbital U.S.P. (Luminal)

       (1) Long-acting

       (2) Use: _____

    b. Sodium Amobarbital U.S.P. (Amytal Sodium)

       (1) Intermediate-acting

       (2) Use: _____

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c. Sodium Pentobarbital U.S.P. (Nembutal)

  (1) Short-acting

  (2) Use: _____

d. Secobarbital U.S.P. (Seconal)

  (1) Short-acting

  (2) Use: _____

e. Thiopental Sodium U.S.P. (Pentothal Sodium)

  (1) Ultra Short-acting

  (2) Use: _____

22. _____ are synthetic derivatives of <u>ethanolamine</u> which prevents the effects of histamine.

23. Two selected pharmaceuticals belonging to the Antihistamine class are:

  a. Diphenhydramine Hydrochloride U.S.P. (Benadryl)

  Use: _____

  b. Chlorpheniramine Maleate U.S.P. (Chlor-Trimeton Maleate)

  Use: _____

24. _____ are synthetic derivatives of p-aminobenzene-sulfonamide which are used for their antimicrobial properties.

25. Two selected pharmaceuticals belonging to the Sulfonamide class are:

  a. Sulfisoxazole U.S.P. (Gantrisin)

  (1) Oral tablets

  (2) Use: _____

  b. Acetyl Sulfisoxazole N.F. (Gantrisin)

  (1) A tasteless, pediatric suspension (liquid)

  (2) Use: _____

26. _____ (ANS) drugs stimulate the
sympathetic and parasympathetic nervous system.

27. _____ hormones stimulate the sympathetic nervous
system and are similar in structure to the natural occurring Epinephrine.

28. Three selected pharmaceuticals exhibiting Sympathetic action are:

    a. Epinephrine U.S.P., (Adrenalin)

       Use: _____

    b. Ephedrine Sulfate U.S.P.

       Use: _____

    c. Phenylephrine Hydrochloride U.S.P. (Neo-synephrine)

       Use: _____

29. _____ hormones stimulate the parasympathetic
nervous system and are similar in structure to the natural occurring
Acetylcholine.

30. Two selected pharmaceuticals belonging to the Parasympathetic Hormone
class are:

    a. Bethanechol Chloride U.S.P. (Urecholine Chloride)

       (1) Comes in oral tablets and injection.

       (2) Use: _____

    b. Methacholine Chloride N.F. (Mecholyl Chloride)

       (1) Injection Only

       (2) Use: _____

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31. The six classifications of Amines and Amides mentioned have been:

a.

b.

c.

d.

e.

f.
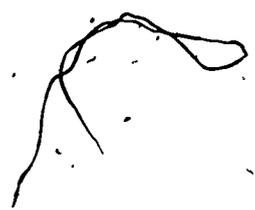
32. Drugs which lessen pain are _____

33. Drugs that calm are called _____

34. Drugs that induce sleep are called _____

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INFORMATION

AMINO ACIDS AND PROTEINS

The purpose of this lesson is to acquaint you with the properties and uses of amino acids and proteins and will further acquaint you with basic fundamentals of pharmaceutical organic chemistry. Specifically, you will identify:

1. Define and give general formula representing amino acids.

2. Define:

    a. Peptides

    b. Proteins

3. Selected properties of proteins.

4. Selected pharmaceuticals belonging to the protein class and their use.

QUESTIONS

1. _____ are difunctional compounds containing an amino radical and an acid radical.

2. R - NH$_2$ is the _____ radical.

3. R - C - OH is the _____ radical.
$$\overset{O}{\overset{\|}{}}$$

$$R - \overset{\overset{H}{|}}{C} - \overset{\overset{O}{\|}}{C} - OH$$
4. R - C - C - OH is the general formula for an _____ _____.
   NH$_2$

5. _____ are the combination of two or more amino acids with the removal of a water molecule. This loss of water molecule and combination (continuous) is known as the Peptide Linkage.

6. _____ are polypeptides forming high molecular weight polymers of amino acids by the peptide linkage.

7. All proteins contain the following elements:

   a.

   b.

   c.

   d.

8. Some proteins contain:

   a.

   b.

9. Most proteins are _____ in water but not in organic solvents.

10. Proteins are subject to _____ or salting-out.

11. Two selected pharmaceuticals belonging to the Protein class are:

    a. Fibrinogen U.S.P.

       (1) Fibrinogen + Fibrin = _____

       (2) Use: _____

    b. Protamine Sulfate Injection U.S.P.

       (1) Obtained from the sperm of salmon.

       (2) Use: _____

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INFORMATION

CARBOHYDRATES

The purpose of this lesson is to acquaint you with the properties and uses of carbohydrates and will further acquaint you with basic fundamentals of pharmaceutical organic chemistry. Specifically, you will identify and:

1. Define carbohydrates.

2. Classify selected properties of carbohydrates:

   a. Monosaccharides

   b. Disaccharides

   c. Polysaccharides

3. Select pharmaceuticals belonging to these classes and their uses.

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QUESTIONS

1. _____ are aldehydes or <u>ketone</u> derivatives of higher polyhydric alcohols. . .

2. $R - \overset{\overset{O}{\|}}{C} - H$ is the general formula for _____

3. $R - \overset{\overset{O}{\|}}{C} - R$ is the general formula for _____

4. _____ is one classification of carbohydrates.

5. The two types of <u>sugars</u> are:

   a. _____ - The simplest of all sugars; they cannot be broken down into simpler sugars.

   b. _____ are sugars which contain two molecules of the same or different monosaccharides.

6. _____ is the other classification of carbohydrates.

7. <u>Non-sugars</u> are called _____

8. _____ are complex molecules composed of many monosaccharides.

9. The two major classes of carbohydrates are:

   a.

   b.

10. Monosaccharides are subject to _____

11. Monosaccharides are _____ solids, water _____, and have a _____ taste.

12. Disaccharides are subject to _____

13. Disaccharides are _____ solids, water _____, and have a _____ taste.

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14. Polysaccharides are subject to _____.

15. Polysaccharides are _____ solids, many are
_____ in water and they are _____.

16. Two selected pharmaceuticals belonging to the monosaccharides class are:

    a. Dextrose U.S.P. (Glucose)

        (1) _____ found circulating in the blood of animals.

        (2) Use: _____

    b. Fructose N.F. (Levulose)

        (1) Metabolized more rapidly than glucose

        (2) Use: _____

17. Two selected pharmaceuticals belonging to the disaccharides class are:

    a. Sucrose U.S.P. (Sugar)

        Use: _____

    b. Lactose U.S.P. (Milk Sugar)

        Use: _____

18. Two selected pharmaceuticals belonging to the polysaccharides class are:

    a. Starch U.S.P. (Corn Starch)

        Use: _____

    b. Acacia U.S.P. (Gum Arabic)

        Use: _____

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GLYCOSIDES

The purpose of this lesson is to acquaint you with the properties and uses of glycosides and will further acquaint you with basic fundamentals of pharmaceutical organic chemistry. Specifically, you will identify and:

1. Define glycosides.

2. Select properties of glycosides.

3. Classify selected pharmaceuticals belonging to these classes and their uses:

   a. Cardiac

   b. Cathartic

QUESTIONS

1. _____ are complex compounds consisting of a combination of hydroxyl compounds and sugars.

2. Glycosides are colorless or white, _____ soluble <u>extracts</u>.

3. Glycosides may be _____ soluble and they are _____ active.

4. _____ glycosides have a highly specific action on the heart muscle, they increase tone, excitability and contractability.

5. Three selected pharmaceuticals belonging to the cardiac glycoside class are:

    a. Digitalis U.S.P. (Foxglove, Whole Leaf)

      Use: _____

    b. Digitoxin U.S.P. (Crystodigin)

      Use: _____

    c. Digoxin U.S.P. (Lanoxin)

      Use: _____

6. _____ glycosides are used widely as they produce catharsis.

7. Two selected pharmaceuticals belonging to the cathartic glycoside class are:

    a. Cascara Sagrade U.S.P. (Dogwood)

      Use: _____

    b. Senna N.F. (Senokot)

      Use: _____

8. The two types of glycosides are:

    a.

    b.

INFORMATION

ALKALOIDS

The purpose of this lesson is to acquaint you with the properties and uses of alkaloids and will further acquaint you with basic fundamentals of pharmaceutical organic chemistry. Specifically, you will identify and:

1. Define alkaloids.

2. Select properties of alkaloids.

3. Classify selected pharmaceuticals belonging to each class and their uses:

    a. Opium derivatives

    b. Cinchona derivatives

    c. Solanaceious derivatives

    d. Xanthine derivatives

    e. Ergot derivatives

QUESTIONS

1. _____ are complex (plant) compounds containing nitrogen, which gives them their alkali-like properties.

2. Most alkaloids are of plant origin and usually ending in _____.

3. Because alkaloids are of plant origin they are generally _____ in water and _____ in organic solvents.

4. Alkaloids have many _____.

5. Alkaloids react with acids to form _____ soluble salts.

6. Since alkaloids are of plant origin, they have at least the following elements:

    a.

    b.

    c.

    d.

7. _____ Compounds which are obtained from the poppy plant (King of the Alkaloids).

8. Five selected pharmaceuticals belonging to the opium derivative class are:

    a. Morphine Sulfate U.S.P.

       (1) Phenantherine derivative

       (2) Use: _____

    b. Codeine N.F. (Methylmorphine)

       (1) Phenantherine derivative

       (2) Use: _____

    c. Hydromorphone Hydrochloride N.F. (Dilaudid)

       (1) Phenantherine derivative

       (2) Use: _____

d. Meperidine Hydrochloride U.S.P.   (Demerol)

    (1) Phenantherine derivative

    (2) Use: _____

9. _____ Compounds which contain the Quinoline structure as their base.

10. Two selected pharmaceuticals belonging to the cinchona derivative class are:

    a. Quinine Sulfate U.S.P.

        Use: _____

    b. Quinidine Sulfate U.S.P.

        Use: _____

11. _____ Compounds characterized by the presence of <u>tropine</u> in the structure.

12. Two selected pharmaceuticals belonging to the solonaceous derivative class are:

    a. Atropine Sulfate U.S.P.

        Use: _____

    b. Cocaine U.S.P.

        (1) First _____ anesthetic

        (2) Derived from the _____ leaf.

        (3) Use: _____

13. _____ Compounds which contain the <u>purine</u> molecule as their base.

14. Two selected pharmaceuticals belonging to the xanthine derivative
class are:

    a. Theophylline U.S.P. (Elixophyllin)

       Use: _____

    b. Caffeine U.S.P.

       Use: _____

15. _____ Compounds which contain Lysergic
Acid molecule as their base.

16. Two selected pharmaceuticals belonging to the ergot derivative class
are:

    a. Ergonovine Maleate U.S.P. (Ergotrate Maleate)

       Use: _____

    b. Ergotamine Tartrate U.S.P. (Gynergen)

       Use: _____

INFORMATION

STEROIDS

The purpose of this lesson is to acquaint you with the properties and uses of steroids and will further acquaint you with basic fundamentals of pharmaceutical organic chemistry. Specifically, you will identify and:

1. Define the basic structure of steroids.

2. Classify selected pharmaceuticals belonging to each class and their uses:

    a.   Adrenal Cortex Hormones

    b.   Bile Salts

    c.   Sterols

    d.   Sex Hormones

        (1) Female

        (2) Male

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QUESTIONS

1. _____ Compounds which have the perhydrocyclopentanophen-
anthrene structure as their base.

2. Draw the perhydrocyclopentanophenanthrene structure:

3. Two selected pharmaceuticals belonging to the adrenal cortex hormone class
are:

   a. Cortisone Acetate U.S.P.

      Use: _____

   b. Dexamethasone U.S.P. (Decadron)

      (1) Synthetic

      (2) Use: _____

4. Two selected pharmaceuticals belonging to the bile salt class are:

   a. Ox Bile Extract N.F.

      Use: _____

   b. Dehydrocholic Acid N.F. (Decholin)

      Use: _____

5. Two selected pharmaceuticals belonging to the sterol class are:

   a. Cholesterol U.S.P. (Cholesterin)

      Use: _____

   b. Sitosterols N.F. (Cytellin)

      Use: _____

6. Sex hormones are divided into two categories, female and male. Female
hormones are subdivided into two categories which are called _____
and _____.

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7. Male hormones are called _____

8. Five selected pharmaceuticals belonging to the sex hormone class are:

   a. Female:

     (1) Estradiol Valerate U.S.P. (Delestrogen)

       Use: _____

     (2) Conjugated Estrogens U.S.P. (Premarin)

       Use: _____

     (3) Progesterone N.F. (Proluton)

       Use: _____

   b. Male:

     (1) Testosterone N.F. (Androlin)

       (a) Injection ONLY (ineffective orally)

       (b) Use: _____

     (2) Methyltestosterone N.F. (Metandren)

       (a) Effective orally

       (b) Use: _____

9. The four classes of steroids are:

   a.

   b.

   c.

   d.

10. Androgens are _____ sex hormones.

11. The two types of female sex hormones are:

   a.

   b.

INFORMATION

MISCELLANEOUS ORGANIC COMPOUNDS

The purpose of this lesson is to acquaint you with the properties and uses of miscellaneous organic compounds and will further acquaint you with basic fundamentals of pharmaceutical organic chemistry. Specifically, you will identify and:

1. Define

   a. Phehothiazine derivatives

   b. Oral hypoglycemic agents

   c. Antibiotics

2. Classify selected pharmaceuticals belonging to each class and their uses.

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QUESTIONS

1. _____ Compounds which have the
phenothiazine structure as their base.

2. Three selected pharmaceuticals belonging to the phenothiazine derivative
class are:

a. Chlorpromazine U.S.P. (Thorazine)

Use: _____

b. Prochlorperazine N.F. (Compazine)

Use: _____

c. Thioridazine Hydrochloride U.S.P. (Mellaril)

Use: _____

3. Phenothiazine derivatives are all used as major _____.

4. _____ Compounds which are
similar in structure to sulfanilamide, and stimulate the release of insulin
from the pancreas.

5. Two selected pharmaceuticals belonging to the oral hypoglycemic agent
class are:

a. Chlorpropamide U.S.P. (Diabinese)

Use: _____

b. Tolbutamide U.S.P. (Orinase)

Use: _____

6. _____ Compounds derived from or produced by a living
organism and which inhibit the growth of an organism.

7. Three different types of antibiotics and selected pharmaceuticals belong-
ing to each class are:

a. Penicillins:

(1) Ampicillin U.S.P. (Polycillin)

(2) Procaine Penicillin G U.S.P. (Injection form)

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(3) Potassium phenoxymethyl Penicillin U.S.P. (Pen VK and others)

— (a) Oral form (Tablets and suspensions)

(b) Resistant to _____ in the stomach.

b. Tetracyclines: (Broad spectrum antibiotics)

(1) Tetracycline U.S.P. (Achromycin)

(2) Oxytetracycline Hydrochloride U.S.P. (Terramycin HCl)

(3) Chlortetracycline Hydrochloride U.S.P. (Aureomycin HCl)

(4) Demethylchlortetracycline HCl N.F. (Declomycin)

c. Miscellaneous Antibiotics:

(1) Erythromycin U.S.P. (Erythrocin, Ilotycin)

(a) A back-up drug for _____.

(b) A drug used for patients who have an allergic reaction or are known to react to _____.

(2) Chloramphenicol U.S.P. (Chloromycetin)

(a) A _____ antibiotic

(b) Chloramphenicol has many dangerous side effects:

1 Leukopenia -

2 Agranulocytosis -

3 Agranulocytopenia -

4 Aplastic Anemia

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GLOSSARY OF TERMS

ACYL RADICAL - Represented by $CONH_2$, double bonded oxygen.

ALCOHOLS - R-OH, Organic compounds which contain the hydrocarbon chain and one or more hydroxyl groups.

ALDEHYDES - RCOH, double bonded oxygen, and are the oxidation products of primary alcohols.

ALIPHATIC ACIDS - Organic compounds which contain one or more carboxyl groups in the molecule.

ALIPHATIC HYDROCARBONS - Compounds which contain only Carbon and Hydrogen and are formed in straight or branched open chains.

ALKALOIDS - Complex organic compounds containing Nitrogen which gives them their alkali-like properties.

ALKANES - $C_nH_{2n} + 2$, also known as the Methane series or the Paraffins.

ALKENES - C_nH_{2n}, also known as the Olefins, name is derived from the Alkanes by changing the ending to ENE and have a double bond.

ALKYNES - $C_nH_{2n} - 2$, name is derived from the Alkanes by changing the ending to YNE and has a triple bond.

ALKYL HALIDES - Replacement of a hydrogen atom by a Halogen atom on the hydrocarbon chain.

ALKYL RADICAL - Any one of the hydrocarbon radicals of the general formula $C_nH_{2n} + 1$ and named by the alkane it resembles by changing the ANE ending to YL.

AMIDES - Derivatives of ammonia by replacement of a hydrogen atom by an ACYL group.

AMINES - Derivatives of ammonia by replacement of a hydrogen atom by an ALKYL group.

AMINO ACIDS - Difunctional organic compounds containing an amino group and an acid group.

AMINO RADICAL - Nitrogen (valence state 3) bonded by two hydrogens and an available electron for bonding with another atom or group of atoms. General formula NH_2.

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AMMONIA - Nitrogen (valence state 3) with all of its available electrons bonded by hydrogen. General formula NH_3.

AMMONIUM RADICAL - Nitrogen (valence state 5) bonded by four hydrogen atoms and donating an electron for ionic bonding. General formula NH_4^+.

ANALGESICS - Drugs which lessen pain through systemic action.

ANTIHISTAMINES - Synthetic derivatives of ethanolamine which prevent the effects of histamine.

AROMATIC ACIDS - Compounds which contain an aromatic ring and a CARBOXYL group.

* AROMATIC HYDROCARBONS - Compounds which have six carbon atoms, six hydrogen atoms, three double bonds and three single bonds. General formula C_nH_{2n-6}.

ARYL HALIDES - Replacement of a hydrogen atom by a Halogen atom on the aromatic ring.

BARBITURATES - A group of related amines and amides that are used as sedatives and hypnotics.

CARBOHYDRATES - Aldehyde or Ketone derivatives of high polyhydric alcohols, classified as sugars or non-sugars.

CARBONYL GROUP - Represented by $\begin{matrix} O \\ \| \\ -C- \end{matrix}$

CARBOXYL GROUP - Represented by $\begin{matrix} O \\ \| \\ -C-OH \end{matrix}$

CARDIAC GLYCOSIDES - Those glycosides which affect the cardiac muscle.

COVALENT BONDING - Chemical bonding in which each atom denotes one or more valence electrons to be shared by the two atoms.

DEHYDRATION - Loss of a water molecule.

DISACCHARIDES - Sugars which contain two molecules of the same or different monosaccharides.

DISUBSTITUTION - Replacement of two atoms.

ESTER - Products formed from the reaction between an alcohol and an acid or an acid chloride or an acid anhydride. General formula PCOOR.

ETHERS - R-O-R, Dehydration products of two alcohols.

GLYCOSIDES - Complex organic plant principles resulting from the combination of hydroxyl compounds and sugars.

HALOGENS - Florine, Chlorine, Bromine, and Iodine.

HOMOLOGOUS SERIES - Each member of the series differs from the next by a set amount (CH_2).

HYDROCARBON - Compounds which contain ONLY Carbon and Hydrogen

HYDROLYZE - Addition of a water molecule.

HYDROXYL GROUP - Represented by -OH.

ISOMERS - Two or more compounds with the same empirical formula but different graphic structures and physical properties.

IUC SYSTEM - International Union of Chemist System for naming organic compounds.

LOCAL ANESTHETICS - Compounds which render nerve fibers temporarily incapable of conducting impulses.

KETONES - RCOR, Oxidation products of secondary alcohols.

META - (m) Means beyond.

MONOSACCHARIDES - The simplest of all sugars which cannot be broken down into simple sugars.

MONOSUBSTITUTION - Single replacement of an atom.

NON-SUGARS - Polysaccharides.

ORGANIC CHEMISTRY - The study of Carbon.

ORGANIC PHARMACEUTICAL CHEMISTRY - The study of compounds containing Carbon and Hydrogen and their derivatives.

ORTHO - (o) Means straight line.

PARA - (p) Means opposite.

PEPTIDES - Combination of two or more amino acids with the removal of a water molecule.

POLYMERS - The product resulting when two or more molecules of the same substance combine.

POLYSACCHARIDES - Non-sugars, complex molecules composed of many monosaccharides.

PROTEINS - Polypeptides forming high molecular polymers of amino acids by the peptide linkage.

RADICAL - A group that preserves its identity throughout a reaction.

SALTS - Products formed from the reaction between organic acids and metals or bases.

STEROIDS - Organic compounds which have the perhydrocyclopentanophenanthrene structure as their base.

SULFONAMIDES - Drugs which interfere with the metabolic process of bacteria and are synthetic derivatives of para-aminobenzene sulfonamide.

SURFACE ACTIVE AGENT - See Surfactants.

SURFACE TENSION - The attraction of molecules in a liquid.

SURFACTANTS - Compounds which are intended to modify the surface tension of a liquid in contact with other liquids or solids.

SUGARS - Monosaccharides and disaccharides.

TRISUBSTITUTION - The replacement of three atoms.

VALENCE - The combining capacity of an atom.

SOLUBILITY CHART

DEGREE OF SOLUBILITY	PARTS OF SOLVENT FOR ONE PART OF SOLUTE
Very soluble	Less than 1
Freely soluble	From 1 to 10
Soluble	From 10 to 30
Sparingly soluble	From 30 to 100
Slightly soluble	From 100 to 1,000
Very slightly soluble	From 1,000 to 10,000
Practically insoluble or insoluble	More than 10,000

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SPARE THE MAN

10-8.

Department of Medicine
School of Health Care Sciences

Medical Service Fundamentals

PREFIXES, ROOTS AND SUFFIXES
OF MEDICAL TERMINOLOGY

April 1974

Sheppard Air Force Base, Texas

74-S-63

PURPOSE OF STUDY GUIDES, WORKBOOKS, PROGRAMMED TEXTS AND HANDOUTS

Study Guides, Workbooks, Programmed Texts. and Handouts are training publications authorized by Air Training Command (ATC) for student use in ATC courses.

.The STUDY GUIDE (SG) presents the information you need to complete the unit of instruction, or makes assignments for you to read in other publications which contain the required information.

The WORKBOOK (WB) contains work procedures designed to help you achieve the learning objectives of the unit of instruction. Knowledge acquired from using the study guide will help you perform the missions or exercises, solve the problems, or answer questions presented in the workbook.

The STUDY GUIDE AND WORKBOOK (SW) contains both SG and WB material under one cover.. The two training publications are combined when the WB is not designed for you to write in, or when both SG and WB are issued for you to keep.

The PROGRAMMED TEXT (PT) presents information in planned steps with provisions for you to actively respond to each step. You are given immediate knowledge of the correctness of each response. PTs may either replace or augment SGs and WBs.

The HANDOUT (HO) contains supplementary training materials in the form of flow charts, block diagrams, printouts, case problems, tables, forms, charts, and similar materials.

Training publications are designed for ATC course use only. They are updated as necessary for training purposes, but are NOT to be used on the job as authoritative references in preference to Technical Orders or other official publications.

Department of Medicine
School of Health Care Sciences
Sheppard Air Force Base, Texas

PT 3AQR90010-1-2a
April 1974

PREFIXES, ROOTS AND SUFFIXES OF MEDICAL TERMINOLOGY

This program is an introduction to medical terminology. Although it is not a complete dictionary of medical terms, it does contain a selection of the most common prefixes, roots and suffixes.

The program is not a magical device that will automatically teach you anything. You can only learn medical terminology by applying yourself to the program.

As a medical technician, you will be expected to use medical terminology in dealing with doctors, nurses and other technicians. This is necessary because medicine, like other professions, has its own working language.

Medical terminology was not designed to confuse laymen; instead it was designed to provide uniformity in the meaning of terms. In early medicine, there was little uniformity; consequently, confusion resulted when different words were used to describe the same structure or condition.

Eventually, Greek and Latin words were adopted and certain principles of medical terminology evolved. Those principles are:

1. Each part should have one name only.

2. The names should be as short and simple as possible.

3. Related structures should have similar names.

4. Adjectives, with few exceptions, should be in opposing pairs.

This program will teach you the basic terminology and show you how these principles are applied.

If you have prior knowledge of the terms taught in the program, you may be able to by-pass many, if not all, of the frames. If you feel that you already have a good understanding of medical terminology, turn to page 34, frame 211 and complete the frame according to instructions. Additional instructions will be found in Appendix I located in the back of the program.

If you do not have prior knowledge or if you feel you need the review, begin the program now at frame 1.

This supersedes SW 3AQR90010-1-2

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NOTE TO THE STUDENT

This program is an introduction to medical terminology. Although it is not a complete dictionary of medical terms, it does contain a selection of the most common prefixes, roots and suffixes.

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1. Anatomy is a study of the structures of the human body. The arm is a structure of the human body. A study of the structure of the arm, then would be a study of _____.

2. (anatomy) The leg, like the arm, is also a _____ of the _____ body.

3. (structure, human) Anatomy is the study of the _____ of the _____ body.

4. (structures, human) Physiology is a study of the functions of the human body. Digestion, respiration and reproduction are all _____ of the human body.

5. (functions) Anatomy is a study of the _____ of the human body. _____ is a study of the _____ of the human body.

6. (structures, Physiology, functions) Movement is a _____ of the human body. A study of movement would be a study of _____.

7. (function, physiology) A study of the structure of the ribs would be a study of _____.

8. (anatomy) Physiology is a study of the (_____ structures, _____ functions) of the human body.

9. (functions) Define anatomy. _____

_____

_____

10. (A study of the structures of the human body) Define physiology.

_____

_____

_____

1
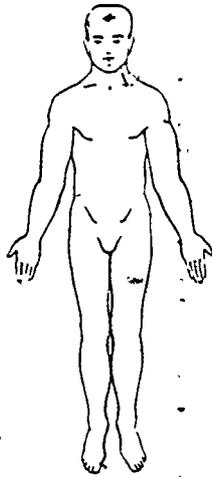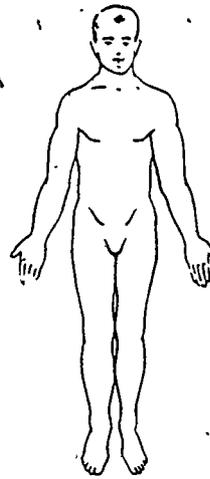
A.   B.

11. (a study of the functions of the human body) Whenever dealing with the human body, references are made with the body in the normal anatomical position. The normal anatomical position has the body at the position of attention with the palms facing forward. Which figure is the normal anatomical position? (_____both,_____A, _____B, _____neither).

12. (both) The normal anatomical position has the body at the position of (_____attention, _____rest) with the palms facing (_____rearward, _____forward).

13. (attention, forward) The normal anatomical position is

a. the position of rest with the palms facing forward.

b. the position of attention with the palms facing backward.

c. the position of rest with the palms facing forward.

d. the position of attention with the palms facing forward.

14. (d, the position of attention with the palms facing forward). For positive identification and location of specific parts of the body, the human form is divided by three anatomical planes. The mid-sagittal or mid-line, transverse, and coronal or frontal are all _____ planes.
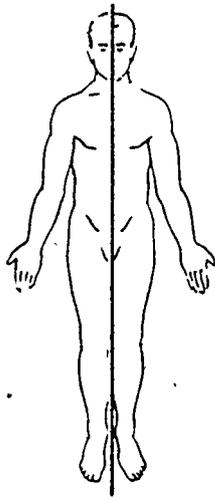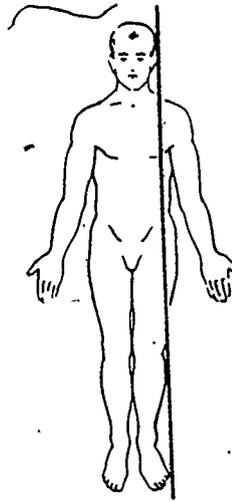

A.   B.

15. (anatomical) The mid-sagittal plane is an imaginary plane which extends the length of the body and divides the body into equal right and left portions. Which drawing above depicts the mid-sagittal plane?
(_____both, _____A, _____B, _____neither)

3
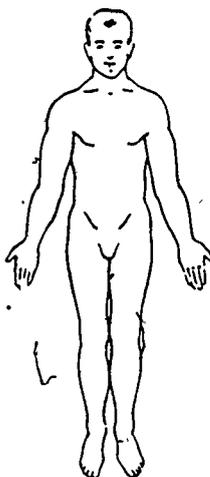
16. (A) Draw in the mid-sagittal plane on the figure above.

17. The mid-sagittal plane is an imaginary plane which extends the

   a. width of the body and divides the body into a top and bottom section.

   b. length of the body and divides the body into equal right and left portions.

   c. length of the body, separating the front of the body from the rear of the body.
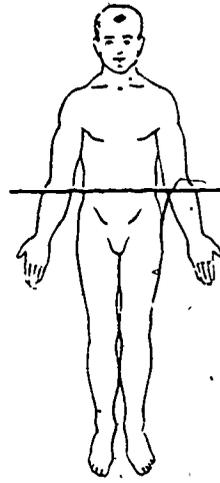
A.   B.

18.   (b)   A transverse plane is an imaginary plane which extends the
width of any section of the body and divides the body into a top and
bottom section.   Which illustration above indicates a transverse
plane? (____both, _____A, _____B, _____neither)
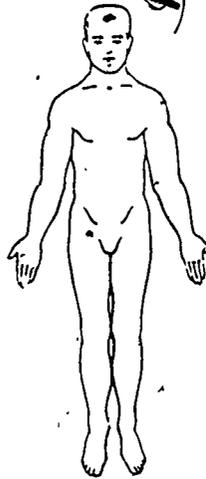
19.   (B)   Draw in a transverse plane on the figure above.

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22. (B) Draw in a coronal plane on the figure above.

23. A coronal plane is an imaginary plane extending the

    a. width of the body and divides the body into a top and bottom section.

    b. length of the body and divides the body into equal right and left portions.

   c. length of the body, separating the front of the body from the rear of the body.

7
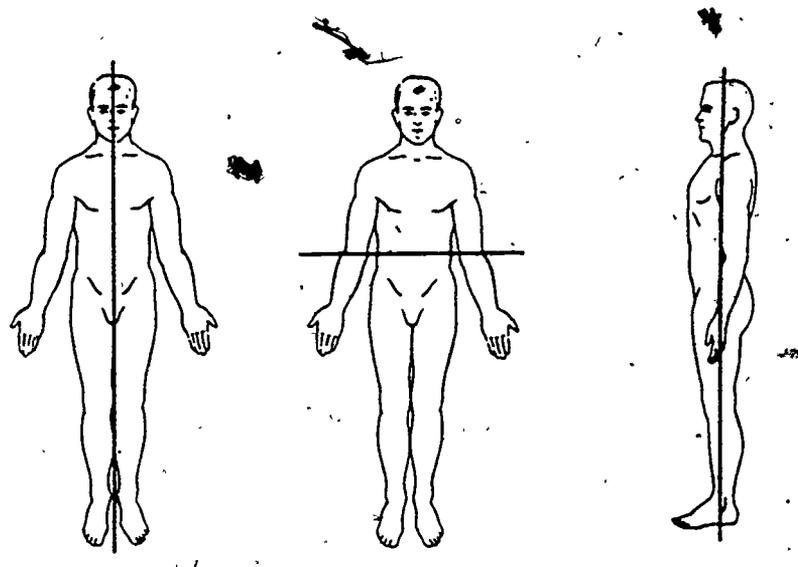
A _____ B _____ C _____

24. (c) Label the planes indicated on the drawings above as mid-sagittal,
plane, transverse plane, coronal plane.

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8

MEDIAL

LATERAL
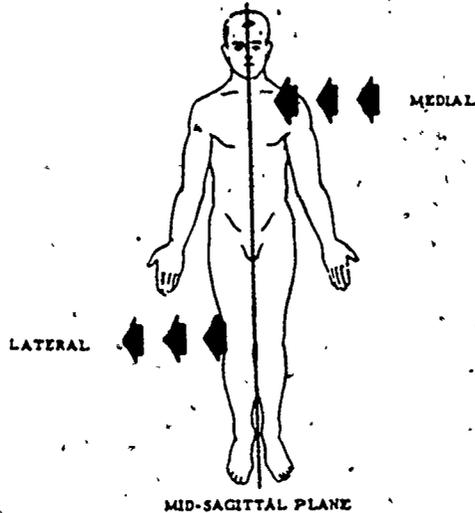
MID-SAGITTAL PLANE

25. (A-mid-sagittal, B-transverse, C-coronal) The mid-sagittal plane has two terms of location connected with it. A part is said to be medial if it is located closer to the mid-sagittal plane than another part. The nose is medial (closer to the mid-sagittal plane) to the ear. The eye would be _____ to the ear.

26. (medial) The tip of the nose is _____ to the eye.

27. (medial) A part is said to be lateral if it is farther from the mid-sagittal plane than another part. The eye is medial to the ear, but the ear is _____ to the eye.

28. (lateral) The tip of the nose is medial to the eye, but the eye is _____ to the tip of the nose.

29. (lateral) The eyes are _____ compared to the ears, but compared to the nose, the eyes are _____.

30. (medial, lateral) Two terms of location connected with the mid-sagittal plane are _____ and _____.

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SUPERIOR

INFERIOR
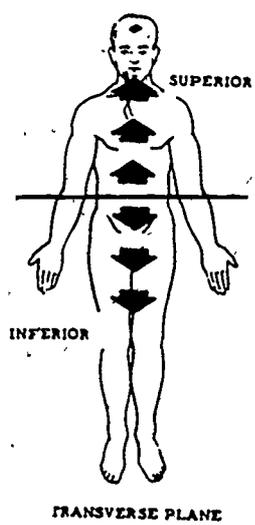
TRANSVERSE PLANE

31. (lateral, medial) A transverse plane gives us two terms of location: superior, meaning above, and inferior, meaning below. A thing that is better or above something else is said to be _____.

32. (superior) Something that is inferior is (_____above, _____below) standard.
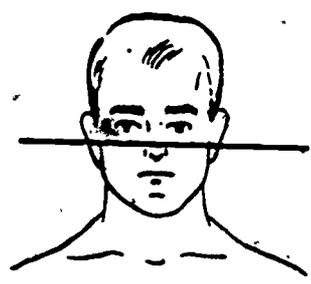
33. (below) With a transverse plane located as in the drawing, the forehead is _____ to the chin.

34. (superior) The two terms of location used in reference to a transverse plane are _____ and _____.

35. (superior, inferior) The two terms of location used in reference to the mid-sagittal plane are _____ and _____.

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ANTERIOR

POSTERIOR

CORONAL
(FRONTAL) PLANE
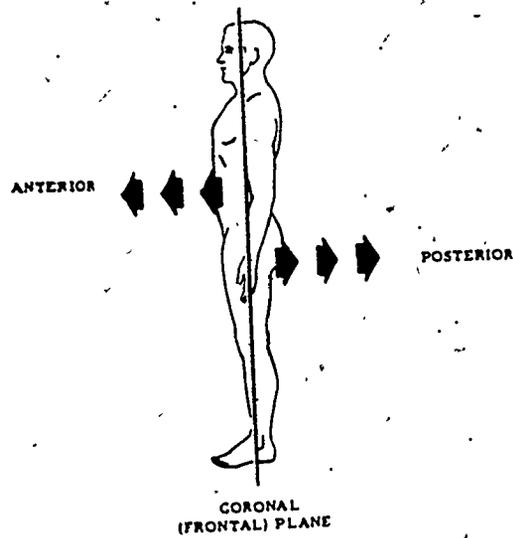
36. '(medial, lateral)   A coronal plane has two terms of location,
anterior, meaning in front, and posterior, meaning in back.   The nose
would be located (_____anterior, _____posterior) to the back of the
head.

37   (anterior)   With a coronal plane located as in the drawing, the
buttocks are located _____ to the nose,

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CORONAL
(FRONTAL) PLANE

38. (posterior) The two terms of location connected with a coronal plane
are _____ and _____.

39. (anterior, posterior) The terms of location connected with the mid-
sagittal plane are _____ and _____. The terms of
location connected with a transverse plane are _____ and
_____. The terms of location connected with a coronal
plane are _____ and _____.

40. (lateral-medial, superior-inferior, anterior-posterior) A point of
origin is the beginning of an extremity or system: for example, the
mouth is the point of origin for the digestive system, the shoulders
would be the point of origin for the _____; while the thigh
would be the _____ of _____ for the legs.

41. (arms, point, origin) Two terms of location connected with the points
of origin are proximal and distal. If proximal means closest to, then
distal must mean _____ from.

42. (farthest) When discussing a part and making reference to the point
of origin, the terms _____, meaning closest to, and _____,
meaning farthest from, are used.

43. (proximal, distal) The shoulder is the point of origin for the upper
extremities. The elbow is closer to the shoulder than the hand. There-
fore, the elbow is _____ to the hand.

44. (proximal) In the same light, the hand would be _____ to the
elbow.

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45. (distal) The point of origin is the beginning of a system or extremity. Two terms of location are _____, meaning closest to the point of origin and _____, meaning farthest from the point of origin.

46. (proximal, distal) An article that is close by is in close proximity or _____.

47. (proximal) An article that is not close by is distant, or _____.

48. (distal) Proximal and distal are used as terms of relationship, i. e., the elbow is distal to the shoulder, but the shoulder is proximal to the arm. Enter the word distal or proximal below.

    a. The elbow is _____ to the wrist.
    b. The fingers are _____ to the elbow.
    c. The wrist is _____ to the elbow.
    d. The knee is _____ to the heel.

49. (proximal, distal, distal, proximal) Unilateral means pertaining to or affecting only one side. A pain that affects only one arm would be a _____ pain.

50. (unilateral) The removal of one leg could be considered to be a _____ amputation.

51. (unilateral) Bilateral, however, means pertaining to or affecting both sides of the body. Dislocating both shoulders would be a _____ dislocation.

52. (bilateral) The amputation of one arm would be a _____ amputation, while the amputation of both legs would be a _____ amputation.

53. (unilateral, bilateral) Unilateral means pertaining to or affecting _____ side, while bilateral means pertaining to or affecting _____ sides.

54. (one, both) A part that is closest to the point of origin is _____.

55. (proximal) A part that is farthest away from the point of origin is _____.

56. (distal) An item that pertains to or affects only one side of the body is _____, while an item that pertains to or affects both sides of the body is _____.

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57. (unilateral, bilateral) Terms of location may sometimes be used together. You have two eyes, so the eyes are (_____unilateral, _____bilateral). The eyes are located above the tip of the nose, so the eyes are (_____superior, _____inferior) to the tip of the nose. The eyes are also located behind the tip of the nose, or the eyes are (_____ anterior, _____posterior) to the tip of the nose. In addition, the eyes are farther from the mid-line than the tip of the nose, so the eyes are (_____lateral, _____medial) to the tip of the nose.

58. (bilateral, superior, posterior, lateral) Using this terminology, you can say the eyes are _____ and the eyes are to the tip of the nose _____, _____, and _____.

59. (bilateral, superior, posterior, lateral) The eye to the ear is (circle the letter that is completely correct)

    a. anterior - lateral
    b. posterior - medial
    c. anterior - medial
    d. posterior - lateral

60. (c) The foot to the knee is

    a. superior
    b. inferior
    c. medial
    d. lateral
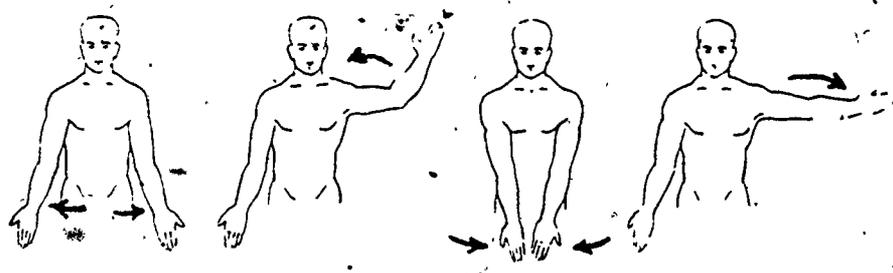
61. (b) There are four more terms you must learn; these are the terms of movement. Abduction is a movement away from the mid-line. Adduction is a movement toward the mid-line. Flexion is the shortening or closing of an angle. Extension is the lengthening or opening of an angle. Label the drawings: Adduction, Abduction, Flexion, Extension. Note to student: The arrows on all drawings indicate the direction the arm has moved.

62. (1-Abduction, 2-Flexion, 3-Adduction, 4-Extension) In placing your left hand over your heart, you moved the tips of your fingers toward the mid-sagittal plane. You could say you (_____ adducted, _____ abducted) your finger tips.

63. (adducted) A dope addict is drawn towards the dope. A movement towards the mid-line is _____.

64. (adduction) When a person is kidnapped, he is said to have been abducted. Movement away from the mid-line is _____.

65. (abduction) In bringing the hand to the forehead as in the military hand salute, the tips of the fingers are _____, but the elbow is _____. (Consider all movement from the normal anatomical position.)

66. (adducted, abducted) When you contract your arm muscles, the angle formed by the arm and forearm is (_____ increased; _____ decreased).

A.   B.   C.
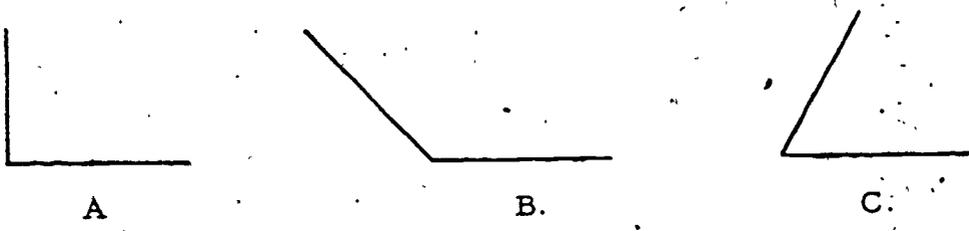
67. (decreased) Flexion is the closing or decreasing of an angle. Starting with the 90° angle of figure A, which angle, B or C, is an example of flexion?

A

68. (C) Drawing A depicts _____.

A.   B.   C.
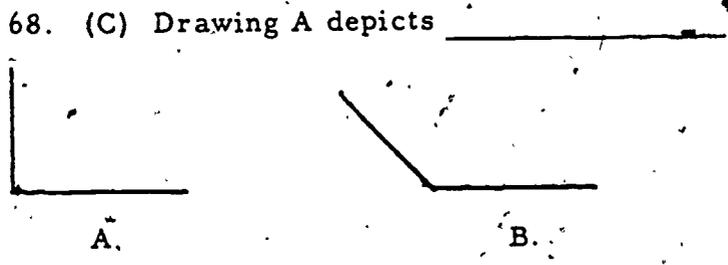
69. (flexion) Extension is the opening or lengthening of an angle. Beginning with the angle in A, which angle, B or C, depicts extension?

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A.

B.
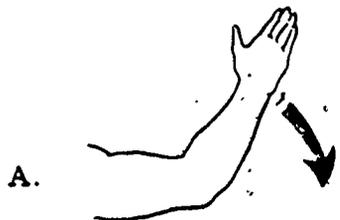
70. (B) Which drawing is an example of flexion? (____both, ____A, ____B, ____neither).

A.

B.
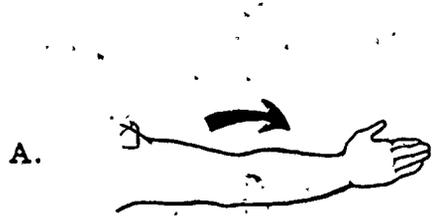
71. (neither) Which drawing is an example of extension? (____both, ____A, ____B, ____neither)
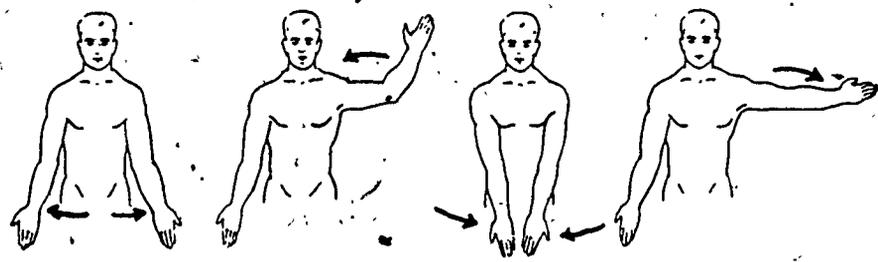
1_____, 2_____, 3_____, 4_____

72. (both) Label the drawings above as flexion, extension, adduction or abduction.

73. (1-abduction, 2-flexion, 3-adduction, 4-extension) Medical terminology is made up from Latin and Greek roots, suffixes, and prefixes. Learning these roots, suffixes, and prefixes will enable you to understand and form many medical words. Many medical words are formed using _____ and _____ _____, _____ and _____.

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74. (Latin, Greek roots, suffixes, prefixes) A prefix is a word used to modify the meaning of the word to which it is attached. It is always placed before the word it modifies. For example, prepaid means paid before. The prefix added to paid in this example is _____.

75. (pre) The prefix meaning without is a or an. Which word or words below mean without something.

a. abrachia   c. abacterial
b. anemia   d. diplogen

76. (a, b, c) Abrachia, anemia, abacterial all have a prefix which means _____.

77. (without) The prefix a is used when the root or suffix begins with a consonant. The prefix an is used when the root or suffix begins with a vowel. By adding the proper prefix, change each of the following words into a new form that means without.

1. _____ typical   4. _____ oxia
2. _____ symmetrical   5. _____ otia
3. _____ omaly   6. _____ febrile

78. (1-a, 2-a, 3-an, 4-an, 5-an, 6-a) Which word below could mean without arms?

a. gelatinase   b. abrachia

79. (b) Which word below could mean without blood?

a. anemia   b. napex

80. (a) The prefix ad means to or at. Drawing toward the mid-line is

a. abduction   b. adduction

81. (b) When one substance sticks to another substance, it is said to

a. adhere   b. abort

82. (a) At the mouth would be

a. aboral   b. adoral

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83. (b) The prefix meaning without is

    a. ad   b. a   c. an

84. (b, c) The prefix meaning to or at is _____

    a. ad   b. a   c. an

85. (a) The prefix meaning before is ante. For each of the following, fill in the word that gives the meaning of the prefix.

    a. antenatal   _____ birth
    b. anesthesia   _____ sense of touch or pain
    c. antecubital   _____ forearm
    d. aphagia   _____ power of swallowing
    e. adrenal   _____ kidney
    f. apnea   _____ breathing
    g. anoxia   _____ oxygen
    h. adneural   _____ nerve

86. (a-before, b.- without, c-before, d-without, e-to the (at the), f-without, g-without, h-to the (at the)) Before the arm (forearm) is

    a. abrachial   b. anbrachial
    c. antebrachial   d. adbrachial

87. (c) Antefebrile would mean

    a. after the onset of fever   b. before the onset of fever

88. (b) Epi, inter, and intra are three words with similar meanings. They are sometimes difficult to separate. Epi means on or upon, inter means between, and intra means within. Upon the spine is

    a. interspinal   b. intraspinal   c. epispinal

89. (c) Epicostal means

    a. within a rib   b. upon a rib   c. between the ribs

90. (b) Inter and intra are the ones most easily mixed up. Inter and enter sound alike; when you enter a gate, you walk between the posts. Between the ribs is

    a. intercostal   b. intracostal   c. epicostal

91. (a) Upon the skin is _____ while between two or more cartilages would be _____.

    a. interchondral   b. epidermal

92. (b, a) <u>Intra</u> means within. Within the skull is _____ and upon the skull is _____.

    a. epicranium   b. intracranial

93. (b, a) Fill in the blanks with the correct prefix to match each meaning.

    a. _____ cardium - upon the heart
    b. _____ venous - within the vein
    c. _____ costal - upon the rib
    d. _____ cellular - between the cells
    e. _____ cellular - within the cells
    f. _____ muscular - between muscles

94. (a-epi, b-intra, c-epi, d-inter, e-intra, f-inter) <u>Erythr/o</u> means red. A common word is erythrocyte, meaning _____ blood cell.

95. (red) The abbreviation RBC is frequently used for red blood cell. A red blood cell, then, may be either abbreviated RBC or written _____ cyte.

96. (erythro) Erythrocyte may be abbreviated _____ or written out as _____ blood cell.

97. (RBC, red) <u>Leuk/o</u> and <u>leuc/o</u> mean white. A leukocyte is a _____ blood cell.

98. (white) An abbreviation, WBC, may also be used instead of the prefix-root combination. WBC or _____ cyte means _____ blood cell.

99. (leuko, white) White blood cell may be abbreviated as _____ or written as _____ cyte.

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100. (WBC, leuko) You have seen that some prefixes end with the letter o as in leuk/o or erythr/o. Here is the rule for using such prefixes: Add the o when the root or suffix begins with a consonant; drop the o when the root or suffix begins with a vowel. Complete the words below by adding a or an where needed and by retaining or dropping the o in erythr/o and leuk/o.

     a. leuk_____cyte b. erythr_____emia c. erythro_____cyte

     d. (a)(an) emic   e. (a)(an) symmetrical f. (a)(an) brachi

101. (a-leukocyte, b-erythremia, c-erythrocyte, d-anemic, e-asymmetrical, f-abrachi) Complete the words below using the prefixes you have learned.

     a. _____costal - between the ribs
     b. _____sexual - without sex
     c. _____blast - a red forming cell
     d. _____neural - upon the nerve
     e. _____emia - white blood disease
     f. _____cranial - within the skull
     g. _____renal - to the kidney
     h. _____emia - without blood
     i. _____brachium - before the arm

102. (a-inter, b-a, c-erythro, d-epi, e-leuk, f-intra, g-ad, h-an, i-ante) Intracranial and endocranial mean the same (inside or within) Inside the skull is _____ or _____.

     a. intracranial   b. endocranial
     c. epicranial

103. (a, b) Endoscopy means a visual examination

     a. within   b. inside
     c. upon   d. between

104. (a, b) Match the items in column A with the correct meaning in column B.

          A   B
     1. intercostal _____   a. upon the skin
     2. intracranial _____   b. within the skull
     3. epidermis _____   c. inside the heart
     4. endocardial _____   d. between the ribs

Note to student: Although Intra is Latin and Endo is Greek, both meaning within, Intra is usually used to mean within or among while Endo denotes inside or inner.

105. (1-d, 2-b, 3-a, 4-c) Peri means around, retro means behind. Around the heart is

    a. retrocardial   b. pericardial

106. (b) Retronasal means

    a. behind the nose   b. upon the nose
    c. around the nose

107. (a) Perirectal means _____ the rectum, while retro-ocular means _____ the eye.

108. (around, behind) A country that is retrogressive may soon be (___ ahead ___ behind) a similar country that is progressive.

109. (behind) An inflammation around the brain is

    a. retropharyngitis   b. periencephalitis
    c. endocarditis

110. (b) Label the items "around" or "behind" as applicable.

    a. retrorectal _____   b. periapical _____
    c. peribronchial _____   d. retrodural _____

111. (a-behind, b-around, c-around, d-behind) Bi means two. Bicuspid means _____ cusps.

112. (two) Section means to cut. Cutting into two parts would be

_____ .

113. (bisection) The biceps brachii muscle has _____ heads.

114. (two) Bio is a prefix meaning life. A study of life is

    a. hematology   b. neurology
    c. biology

115. (c) Biogenous means

    a. producing disease   b. producing life
    c. producing death

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116. (b) An examination to determine if life is still present would be

a. endoscopy   b. bioscopy

117. (b) Hem/o or hemat means blood. Hematology is a study of
_____.

118. (blood) Stasis means standing still. Blood that is standing still
would be in a condition of _____ stasis.

119. (hemo) A hemocytoblast is a _____ forming cell.
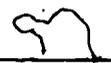
120. (blood) Hyper and hypo are two prefixes. Hyper means above or an
excess; hypo, then, means the opposite, or

a. above or excess   b. normal
c. below or deficient

121. (c) Hypertension describes a person who has

a. more tension than normal
b. less tension than normal
c. normal tension

122. (a) A hypodermic needle is a needle that goes

a. above the skin   b. below the skin

123. (b) Indicate the meaning of the following words by placing the letter
"A" for above and "B" for below, after each word.

a. hyperacute   b. hyperacid   c. hypochondriac
d. hyperalgia   e. hypomorph   f. hypotension

124. (a-A, b-A, c-B, d-A, e-B, f-B) Sub is a prefix meaning under.
Sub costal would mean _____ the ribs.

125. (under) Glossal refers to the tongue. Under the tongue would be
_____.

126. (subglossal) Under the shoulder blade would be _____ scapular.

127. (sub) Pneum/o means air, breath or lung. Pneumonitis is an
inflammation of the _____.

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128. (lung) Pneumothorax means there is _____ in the chest.

129. (air) Ectomy refers to the surgical removal of a part. Removal of a lung would be a _____ectomy.

130. (pneum) Listed below are medical words without their prefixes. Add the prefix to make each word mean what the lay term indicates.

a. _____brachia - without arms
b. _____renal - to the kidney
c. _____gastric - upon the stomach
d. _____costal - between the ribs
e. _____cyte - white blood cell
f. _____uria - without urine
g. _____cranial - within the skull
h. _____cardial - around the heart
i. _____cervical - behind the cervix uteri
j. _____cardial - inside the heart
k. _____logy - a study of life
l. _____section - cut in two
m. _____logy - a study of blood
n. _____tension - over tensed
o. _____dermic - beneath the skin
p. _____hepatic - under the liver
q. _____onitis - inflammation of the lung
r. _____cyte - red blood cell
s. _____partum - before childbirth

Check the confirmation. Any words you missed or had difficulty with, review before going on.

131. (a-a, b-ad, c-epi, d-inter, e-leuko, f-an, g-intra, h-peri, i-retro, j-endo, k-bio, l-bi, m-hemato, n-hyper, o-hypo, p-sub, q-pneum, r-erythro, s-ante) Periosteum means

    a. behind the bone   b. upon the bone
    c. around the bone   d. within the bone

132. (c) Within the cartilage is

    a. perichondrial   b. interchondral   c. intrachondrial

133. (c) Epicardial means

    a. within the heart   b. upon the heart
    c. around the heart

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134. (b) Pericardial means

    a. around the heart   b. upon the heart
    c. inside the heart

135. (a) Inside the heart is _____ or _____ .

    a. intracardial   b. pericardial
    c. epicardial   d. endocardial

136. (a, d) Retrocardiac means

    a. below the heart   b. above the heart.
    c. within the heart   d. behind the heart

137. (d) Cost is the medical term for rib. Upon the ribs is

    a. epicostal   b. intracostal

138. (a) Between the ribs is

    a. intercostal   b. intracostal

139. (a) A form referring to the inner surface of the ribs would be

    a. epicostal   b. intercostal   c. intracostal

140. (c) Cyte is the suffix meaning cell. The most commonly used words employing "cyte" are "leukocyte" and "erythrocyte". These words mean (select two)

    a. bone cells   b. red cells
    c. white cells   d. muscle cells

141. (b, c) A red blood cell having no hemoglobin is called a/an

    a. alymphocyte   b. anerythrocyte

142. (b) Intraleukocytic means

    a. upon a leukocyte   b. inside a leukocyte
    c. within a leukocyte   d. below a leukocyte

143. (b, c) Myo is the medical term for muscle. Myocardium is a/an

    a. arm muscle   b. neck muscle
    c. heart muscle   d. head muscle

144. (c) A cell of the muscular tissue is called

    a. myocardium   b. myocyte

145. (b) Ren and nephr both mean kidney. Nephr is used most often.
Which of the words below pertain to the kidney or heart?

    both _____, a _____, b _____, neither _____

    a. nephrocardiac   b. renicardiac

146. (both) The most common form for kidney is

    a. ren   b. nephr

147. (b) Intrarenal means

    a. within the kidney   b. inside the kidney
    c. upon the kidney

148. (a-b) Around the kidney is

    a. peribrachial   b. pericostal
    c. perirenal   d. pericardial

149. (c) Endonephritis, renal, intrarenal, perirenal, nephrectomy
Looking at the words above, select the correct statement or state-
ments that tell how and when ren and nephro are used.

    a. Ren is always used as a word ending.
    b. Nephr is always used as a word beginning.
    c. Ren is never used as a word beginning
    d. Nephr is never used as a word ending.
    e. Ren is usually used as a word ending with the suffix al.

150. (d, e) Oste is the medical term for bone. Removing a bone is
accomplished through a/an

    a. cardiectomy   b. pneumonectomy
    c. nephrectomy   d. ostectomy

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151. (d) Ostealgia would be a

    a. headache
    c. pain in the bone

    b. pain in the arm
    d. pain in the neck

152. (c) Osteopathy is a

    a. disease of the skin
    c. disease of the bone

    b. disease of the arm

153. (d) <u>Neuro</u> is the medical term for nerve. A neurocyte would be

    a. muscle cell
    c. clotting cell

    b. blood cell
    d. nerve cell

154. (d) Within a nerve is

    a. subneural
    c. endoneural

    b. adneural
    d. epineural

155. (c) Subneural means

    a. around an arm
    c. upon an arm

    b. upon a nerve
    d. under a nerve

156. (d) <u>Thrombo</u> is the medical term for clot. A thrombocyte is a blood platelet or

    a. red cell
    c. clotting cell

    b. white cell

157. (c) A blood clot within the heart is

    a. thrombo-endarteritis
    c. thrombo-embolism

    b. thrombocytopenia
    d. thrombo-endocarditis

158. (d) Producing a clot is

    a. thrombogenic

    b. thrombocyte

159. (a) You have learned many words. To help you retain this knowledge, the next four frames consist of a review. Column A contains medical terminology and Column B contains lay terminology. Match the medical term with the correct lay term.

A

1. extension _____
2. anatomy _____
3. physiology _____
4. normal anatomical position ___
5. mid-sagittal plane _____
6. transverse plane _____
7. coronal plane _____
8. abduction _____
9. adduction _____
10. flexion _____

B

a. a study of the functions of the body
b. an imaginary plane which divides the body into equal right and left halves
c. an imaginary plane which divides the body into a front and back section
d. a study of the structures of the body
e. movement toward the mid-line
f. lengthening of an angle
g. movement away from the mid-line
h. the position of attention with the palms facing forward
i. the shortening of an angle
j. an imaginary plane which divides the body into a top and bottom section

160. (1-f, 2-d, 3-a, 4-h, 5-b, 6-j, 7-c, 8-g, 9-e, 10-i). Continue as in the preceding frame.

1. medial _____
2. lateral _____
3. superior _____
4. inferior _____
5. anterior _____
6. posterior _____
7. proximal _____
8. distal _____
9. unilateral _____
10. bilateral _____

a. above the transverse plane
b. in front of the coronal plane
c. closest to the point of origin
d. pertaining to or affecting but one side
e. pertaining to or affecting both sides
f. nearest to the mid-line
g. farthest from the point of origin
h. below the transverse plane
i. in back of the coronal plane
j. farthest from the mid line

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161. (1-f, 2-j, 3-a, 4-h, 5-b, 6-i, 7-c, 8-g, 9-d, 10-e) Continue as
in the preceding frame.

1. abrachial _____	a. situated upon a rib
2. anerythrocyte _____	b. red blood cell
3. adneural _____	c. within the heart
4. epicostal _____	d. white blood cell
5. erythrocyte _____	e. around the kidney
6. interrenal _____	f. without red cells
7. leukocyte _____	g. to a nerve
8. intracardiac _____	h. behind the heart
9. perinephric _____	i. without arms
10. retrocardiac _____	j. between the kidneys

162. (1-i, 2-f, 3-g, 4-a, 5-b, 6-j, 7-d, 8-c, 9-e, 10-h) Continue as
in the preceding frame.

1. endocardial _____	a. destructive to living organisms
2. bilateral _____	b. excess in the number of white blood cells
3. biocidal _____	
4. hematology _____	c. under the rib
5. hyperleukocytosis _____	d. pertaining to the heart and lungs
6. hypoleukocytosis _____	e. inside the heart
7. subcostal _____	f. a nerve cell
8. pneumocardial _____	g. deficiency of white blood cells
9. neurocyte _____	h. a blood platlet (clotting cell)
10. thrombocyte _____	i. a study of blood
	j. pertaining to both sides

163. (1-e, 2-j, 3-a, 4-i, 5-b, 6-g, 7-c, 8-d, 9-f, 10-h) Hepat is a
root meaning liver. A patient with an inflammed liver would have

a. neuritis   b. hepatitis
c. carditis   d. nephritis

164. (b) Any disease of the liver would be

a. hepatopathy   b. osteopathy

165. (a) A removal of a portion of the liver would require a

a. hepatopathy   b. cardiectomy
c. hepatectomy   d. ostectomy

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166. (c) Cephal means head. Medically speaking, if you had a headache you would have
    a. neuralgia   b. cardialgia
    c. cephalalgia   d. myalgia

167. (c) Any disease of the head would be classified as

    a. cephalopathy   b. hepatitis
    c. neurology   d. osteopathy

168. (a) A headless body would be

    a. bicephalus   b. acephalia

169. (b) Chondri is a root meaning cartilage. Under the cartilage is

    a. hypochondrium   b. hypochondroplasia
    c. intrachondrial   d. subchondral

170. (d) A cartilage cell is a

    a. chondralgia   b. chondrocyte
    c. chondroblast   d. chondritis

171. (b) Cartilage is formed through a process called

    a. myogenesis   b. osteogenesis
    c. neurogenesis   d. chondrogenesis

172. (d) The root form for stomach is gastr. An inflammation of the stomach is

    a. nephritis   b. gastritis
    c. cephalitis   d. neuritis

173. (b) A word which means pertaining to the heart and stomach is

    a. gastroacephalus   b. gastrocardiac
    c. gastrohepatic   d. gastronephritis

174. (b) Which word means an inflammation of the stomach and kidney?

    a. gastrointestinal   b. gastrologist
    c. gastronephritis   d. gastrohepatitis

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175. (c) <u>Arter</u> means artery. Arteriorenal would be an _____
of the _____ .

176. (artery, kidney) Arteritis would be an inflammation of the

_____ .

177. (arteries) <u>Stenosis</u> means narrowing. Arteriostenosis means
a narrowing of the _____ .

178. (arteries) <u>Crani</u> means skull. A craniectomy would be a surgical
_____ of the _____ .

179. (removal, skull) <u>Crani</u> or <u>cranium</u> means _____ .

180. (skull) <u>Pathy</u> means disease. A craniopathy would be a _____
of the _____ .

181. (disease, skull) <u>Derma</u> or <u>dermat/o</u> means skin; neur/o means
nerve; logy means a study of. Dermatoneurology refers to a
_____ of the _____ and the _____ .

182. (study, nerves, skin) <u>Itis</u> means an inflamed condition or inflam-
mation. Dermatitis refers to an _____ of the _____ .

183. (inflammation, skin) Under the skin is

    a. intradermic   b. hypodermic
    c. subdermic   d. epidermic

184. (b-c) <u>Aden</u> is a root meaning gland. A gland can be removed by a/an

    a. neurectomy   b. adenectomy
    c. arterectomy   d. nephrectomy

185. (b) An inflammation of the tissues around a gland would be

    a. pericarditis   b. periarteritis
    c. periadenitis   d. periangiitis

186. (c) A condition of enlarged glands would be

    a. hyperadenosis   b. hypoadenia

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187. (a) The medical root meaning fat is <u>adip</u>. The condition of a person who is extremely fat is described as

    a. hyperalgesia   b. hyperalgia
    c. hyperadiposis   d. hyperadenosis

188. (c) Fat is usually painful to the fat man. A neurotic state in which there are painful areas of fat is

    a. neuralgia   b. adipositis
    c. neuritis   d. adiposalgia

189. (d) Inflammation of the fatty tissue is called

    a. neuritis   b. adipositis
    c. nephritis   d. carditis

190. (b) Producing fat or fatness is

    a. cytogenic   b. myogenic
    c. adipogenic   d. ovigenic

191. (c) A <u>duct</u> is a tube or passage. An egg tube would be an

    a. ovicapsule   b. oviferous
    c. oviform   d. oviduct

192. (d) A gland having no excretory passage would be a _____ less gland.

193. (ductless) Either tube or passage is meant by the stem

    a. duct   b. ovi
    c. nephro   d. osteo

194. (a) Time for a review. The words in column A are lay terms. The words in column B are medical terms. Match the lay terms to the medical terms.

A	B
1. an inflammation of the liver ____	a. hypochondrial
2. without a head ____	b. intra-arterial
3. below the cartilage ____	c. perigastrium
4. around the stomach ____	d. hepatitis
5. within the artery ____	e. acephalic

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195. (1-d, 2-e, 3-a, 4-c, 5-b) Complete the next five words as in
     the last frame.

A	B
1. egg passage____	a. adipose
2. fat____	b. cranium
3. inflamed skin____	c. adenal
4. skull____	d. dermatitis
5. gland____	e. oviduct

196. (1-e, 2-a, 3-d, 4-b, 5-c) Ophthalm is a root meaning eye. An
     eye is surgically removed by a/an

     a. otectomy   b. myectomy
     c. nephrectomy   d. ophthalmectomy

197. (d) An inflammation of the eye is

     a. ophthalmitis   b. neuritis
     c. nephritis   d. carditis

198. (a) The study of the eye is called

     a. neurology   b. hematology
     c. gastrology   d. ophthalmology

199. (d) /Ot is a root word meaning ear. A visual examination of the
     ear is a/an
         a. endoscopy   b. otoscopy

200. (b) A pain in the ear is

     a. neuralgia   b. myalgia
     c. otalgia   d. nephralgia

201. (c) Any disease of the ear is called

     a. ophthalmopathy   b. myopathy
     c. neuropathy   d. otopathy

202. (d) Ov is the root word for egg. An egg tube is a/an

     a. oviduct   b. oviferous
     c. ovigenesis   d. ovination

203. (a) To bear eggs would be

     a. ovogenous   b. oviferous

204. (b) An egg cell is an

     a. ovigerm   b. ovocyte
     c. oviform

205. (b) <u>Vas</u> is the root word meaning vessel. Any nerve and vessel disease would be

     a. vasalgia   b. neuropathy
     c. vasorrhaphy   d. vasoneuropathy

206. (d) A pain in a vessel is

     a. neuralgia   b. vasalgia
     c. myalgia   d. nephralgia

207. (b) Any nerve and blood vessel disease is called

     a. vasoneuropathy   b. nephropathy
     c. myoneurosis   d. pneumonopathy

208. (a) <u>Cyst</u> is the root word meaning bladder. Within the bladder is

     a. acystic   b. intracystic
     c. pericystic   d. epicystic

209. (b) An inflammation inside the bladder is

     a. epicystitis   b. pericystitis
     c. endocystitis   d. hypocytosis

210. (c) Inflammation of tissues around the bladder is called

     a. cystitis   b. pericystitis
     c. epicystitis   d. pericarditis

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211. (b) The next group of frames is a review of all the words you have learned. Match the lay term of column A with the medical term of column B.

A		B	
1.	the study of the structures of the human body _____	a.	normal anatomical position
2.	the study of the functions of the human body _____	b.	coronal plane
3.	the position of attention with the palms facing forward _____	c.	medial
4.	the plane that divides the body into equal right and left halves ___	d.	transverse plane
5.	the plane which divides the body into top and bottom sections _____	e.	lateral
6.	the plane which divides the body into front and back sections _____	f.	mid-sagittal plane
7.	closest to the mid-saggital plane _____	g.	anatomy
8.	farthest from the mid-sagittal plane _____	h.	physiology

212. (1-g, 2-h, 3-a, 4-f, 5-d, 6-b, 7-c, 8-e) Correct any errors and continue with the next series.

1. above the transverse plane _____	a.	inferior
2. below the transverse plane _____	b.	proximal
3. in front of coronal plane _____	c.	posterior
4. in back of coronal plane _____	d.	unilateral
5. closest to the point of origin _____	e.	superior
6. farthest from the point of origin _____	f.	bilateral
		g.	distal
7. affecting one side of the body		
8. affecting both sides of the body	h.	anterior

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3. extreme fatness _____   c. antebrachium

4. administered below the skin _____   d. biology

5. under the liver _____   e. myocardium

6. a surgical removal of a lung _____   f. hematology

7. forearm _____   g. sub-hepatic

8. a heart muscle _____   h. hyperadiposis

216. (1-d, 2-f, 3-h, 4-a, 5-g, 6-b, 7-c, 8-e) Correct any errors and continue with the next series.

1. under the ribs _____   a. myocyte

2. muscle cell _____   b. osteopathy

3. surgical removal of a kidney _____   c. neuritis

4. bone disease _____   d. hepatitis

5. pertaining to the kidneys and heart _____   e. thrombocyte

6. inflammation of the nerves _____   f. subcostal

7. blood clotting cell _____   g. nephrectomy

8. inflammation of the liver _____   h. renicardiac

217. (1-f, 2-a, 3-g, 4-b, 5-h, 6-c, 7-e, 8-d) Correct any errors and continue with the next series.

1. without a head _____   a. hypochondrial

2. below the cartilage _____   b. arteriology

3. behind the stomach _____   c. intracranial

4. a study of the arteries _____   d. adenitis

5. within the skull _____   e. adiposis

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213. (1-e, 2-a, 3-h, 4-c, 5-b, 6-g, 7-d, 8-f) Correct any errors and continue with the next series.

1. movement from or away from mid line ___ a. acephalic

2. movement to or toward mid line _____ b. epicostal

3. shortening of an angle _____ c. adduction

4. lengthening of an angle _____ d. adoral

5. without a head _____ e. anemia

6. without blood _____ f. flexion

7. to the mouth _____ g. abduction

8. upon a rib h. extension

214. (1-g, 2-c, 3-f, 4-h, 5-a, 6-e, 7-d, 8-b) Correct any errors and continue with the next series.

1. red blood cell _____ a. leukocyte

2. between the ribs _____ b. pericardium

3. white blood cell _____ c. retronasal

4. within the skull _____ d. intercostal

5. a membranous sac around the heart _____ e. endoneurium

6. behind the nose f. bisection

7. inside the nerve _____ g. erythrocyte

8. cut in two _____ h. intracranium

215. (1-g, 2-d, 3-a, 4-h, 5-b, 6-c, 7-e, 8-f) Correct any errors and continue with the next series.

1. a study of life _____ a. hypodermic

2. a study of blood _____ b. pneumectomy

6. inflammation under the tongue_____ f. acephalic

7. inflammation of a gland_____ g. subglossitis

8. condition of being fat_____ h. retrogastric

218. (1-f, 2-a, 3-h, 4-b, 5-c, 6-g, 7-d, 8-e) Correct any errors and continue with the next series.

1. egg tube_____ a. ophthalmectomy

2. the surgical removal of an eye_____ b. oviform

3. pain in the ear_____ c. vasalgia

4. egg-shaped_____ d. oviduct

5. pain in vessels_____ e. cystectomy

6. removal of a bladder_____ f. otalgia

219. (1-d, 2-a, 3-f, 4-b, 5-c, 6-e) Blast is a word suffix (ending) meaning forming cell. A red forming cell is a/an

 a. leukocyte   b. erythroblast
 c. leukoblast   d. erythrocyte

220. (b) Muscle tissue is formed from a

 a. neuroblast   b. thromboblast
 c. myoblast   d. osteoblast

221. (c) A white forming cell is a/an

 a. leukocyte   b. erythroblast
 c. leukoblast   d. nephrectomy

222. (c) Ectomy attached to a word means a surgical removal of that part. A surgical removal of the liver would be a

 a. hepatectomy   b. hepatotomy

223. (a) Removing a part of the heart is accomplished through a

 a. carditis   b. cardiotomy
 c. cardiectomy   d. cardiataxia

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224. (c) A kidney is removed through a

    a. hepatectomy .   b. nephrectomy.
    c. arterectomy   d. vasectomy

225. (b) Hemat was the prefix meaning blood; emia is the suffix meaning condition of the _____ .

226. (blood) The word which means a person is deficient or without blood is

    a. erythrocyte   b. hypoleukocytosis
    c. hyperleukocytosis   d. anemia

227. (d) A condition of the white blood cells is called

    a. erythremia.   b. leukemia

228. (b) Itis is a suffix meaning inflammation. Inflammation of the nerves is

    a. hepatitis   b. nephritis
    c. neuritis   d. carditis

229. (c) Inflammation of the liver is

    a. hepatitis   b. nephritis
    c. neuritis   d. carditis

230. (a) An inflammed kidney would be called nephr_____ .

231. (itis) Logy is a suffix meaning a study of. A study of the blood is

    a. cardiology   b. hematology
    c. nephrology   d. myology

232. (b) A study of the nerves would be called neuro_____ .

233. (logy) Myology is a _____ of the _____ .

234. (study, muscle) Pathy is the suffix meaning disease. A disease of the eye would be

    a. otopathy   b. myopathy
    c. cardiopathy   d. ophthalmopathy

235. (d) Any disease of the bone is called

    a. osteitis   b. ostalgia
    c. osteopathy   d. ostectomy

236. (c) A study of disease is called

    a. pathology   b. myology

237. (a) A condition is indicated by the suffix <u>osis</u>. A nerve condition is

    a. neuritis   b. neurosis   c. neurectomy

238. (b) A condition of a heart muscle would be

    a. myocardium   b. myocardosis
    c. myocardial   d. myocele

239. (b) <u>Scopy</u> means a visual examination of. A visual examination inside a part is performed by a/an

    a. episcopy   b. endoscopy
    c. periscopy   d. dermatoscopy

240. (b) A visual examination of the eye is performed by a/an

    a. otoscopy   b. cardioscopy   c. ophthalmoscopy

241. (c) The suffix _____ is used to indicate a visual examination.

242. (scopy) <u>Stasis</u> is a suffix meaning stoppage or standing still. A stoppage of blood is called

    a. hemostasis   b. intestinal stasis   c. ileal stasis

243. (a) Stoppage of the flow of fluid from the kidneys is

    a. hemostasis   b. urine stasis

244. (b) When the eyes are fixed in one place it is called

    a. hemostasis   b. venous stasis   c. ophthalmostasis

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245. (c) To the words below add the appropriate ending.

a.	erythro _____	red forming cell
b.	aden _____	surgical removal of a gland
c.	leuk _____	condition of white blood cells
d.	neur _____	inflammation of a nerve
e.	hemato _____	study of blood
f.	osteo _____	bone disease
g.	nephr _____	condition of the kidney
h.	endo _____	visual examination inside
i.	hemo _____	standing or stopped blood

Review any endings you may have missed.

246. (a-blast, b-ectomy, c-emia, d-itis, e-logy, f-path, g-osis, h-scopy, i-stasis) Tomy means surgical incision. A surgical incision into a bladder is a

a. cystotomy   b. myotomy

247. (a) There are three word endings which, when used, place the word in a class, i.e., noun, adjective, past participle. There is a fourth word ending which indicates pertaining to. These word endings are as follows:

Noun - um or ium. For a word not ending with a vowel, use "ium". If the word ends with a vowel, use "um".

Adjective - al

Past participle - ion

Pertaining to - ac

Remember the word noun ends in un, so you add _____ or _____.

248. (um, ium) Make nouns from the following words by adding the correct suffix to each.

cardi _____

gastri _____

chondri _____

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249. (cardium, gastrium, chondrium) To form a noun, you add
_____ or _____.

250. (um, ium) An adjective describes something and is formed by adding al. Make the following words adjectives.

  cardi_____
  ren _____
  brachi_____

251. (cardial, renal, brachial) An adjective is formed by adding _____.

252. (al) The past participle is formed by adding ion; it indicates something that has already happened. Make the following words past participles.

  adduct._____
  flex_____
  abduct_____

253. (adduction, flexion, abduction) Past participles are formed by adding _____.

254. (ion) Pertaining to is denoted by ac. Make each of the following words mean "pertaining to."

  cardi_____
  chondri_____
  brachi_____

255. (cardiac, chondriac, brachiac) The suffix meaning pertaining to is _____.

256. (ac) Complete the following, adding the ending called for

  a. cardi_____   noun
  b. brachi_____   adjective
  c. gastr_____   noun
  d. ren_____   adjective
  e. chondri_____   pertaining to
  f. flex_____   past participle
  g. cardi_____   pertaining to
  h. adduct_____   past participle

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257. (a-um, b-al, c-ium, d-al, e-ac, f-ion, g-ac, h-ion) <u>Ante</u> is a prefix meaning before. The forearm is also called the

    a. antecardium   b. antefebrile
    c. antenatal   d. antebrachium

258. (d) Before the heart would be

    a. antebrachium   b. antecardium
    c. anticibum

259. (b) If mortem means death, before death is _____ mortem.

260. (ante) <u>Gen</u> means to produce. Producing eggs is ___

    a. oviduct   b. oviform
    c. ovigenetic

261. (c) The word below that means producing life is

    a. biochemistry   b. biology
    c. biocidal   d. biogenous

262. (d) Producing cells is called

    a. cytogenous   b. erythrocyte
    c. myocyte   d. cytoglobin

263. (a) <u>Algia</u> is a suffix meaning pain. A headache would be

    a. neuralgia   b. cephalgia
    c. adenalgia   d. gastralgia

264. (b) A pain in the nerves is

    a. neuritis   b. neurosis
    c. neuralgia   d. neurology

265. (c) Painful glands might be described as

    a. adenalgia   b. adenitis
    c. adenosis   d. adenology

266. (a) The following is a review of all the words you have learned. You should be able to translate all the medical terminology into lay terminology with little difficulty. Review any words with which you have difficulty. When you complete this program, your instructor will give you additional instructions. Match the terminology in column A with the lay term in column B.

1. erythroblastosis _____
2. gastrotomy _____
3. hyperemia _____
4. pericardectomy _____
5. osteochondrosis _____
6. erythrodermatitis _____
7. hematocytoblast _____

a. excessive blood
b. inflammation of the skin with redness
c. a condition of red forming cells
d. a condition of the cartilage and bone
e. forming blood cells
f. surgical removal of the sac around the heart
g. cutting the stomach

267. (1-c, 2-g, 3-a, 4-f, 5-d, 6-b, 7-e) Continue with the following words.

1. hypochondrium _____
2. subdermal _____
3. pneumocardial _____
4. periophthalmitis _____
5. brachiocephalic _____
6. anhepatogenic _____
7. athrombosis _____

a. pertaining to the lungs and the heart
b. pertaining to the arms and head
c. under the cartilage (ribs)
d. not originating in the liver
e. an inflammation of the tissues around the eye
f. a condition in which the blood does not clot
g. under the skin

268. (1-c, 2-g, 3-a, 4-e, 5-b, 6-d, 7-f) Continue with the following words.

1. endoneural _____
2. perinephritis _____
3. retro-ocular _____
4. bilateral ophthalmitis _____
5. biology _____
6. subhepatic _____
7. hepatoscopy _____
8. hemostasis _____

a. inflammation of both eyes
b. study of life
c. inflammation of the sac around the kidney
d. beneath the liver
e. situated within a nerve
f. standing blood
g. examination of the liver
h. behind the eye

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269. (1-e, 2-c, 3-h, 4-a, 5-b, 6-d, 7-g, 8-f) Continue with the following words.

1. thrombocyte _____
2. adduction _____
3. adiposis _____
4. arteriology _____
5. epicystitis _____
6. intracranial _____
7. epidermosis _____

a. a condition of fat
b. inflammation of the structures above the bladder
c. within the skull
d. moving toward the mid-line
e. a condition of the upper layer of skin
f. a cell that helps form a clot
g. a study of the arteries

270. (1-f, 2-d, 3-a, 4-g, 5-b, 6-c, 7-e) Continue with the following words.

1. anatomy _____
2. physiology _____
3. normal anatomical position _____
4. mid-sagittal plane _____
5. transverse plane _____
6. coronal plane _____

a. position of attention with palms facing outward
b. imaginary plane that divides the body into front and back sections
c. imaginary plane that divides body into upper and lower sections
d. study of functions of body
e. imaginary plane that divides the body into equal right and left sections
f. study of structures of the body

271. (1-f, 2-d, 3-a, 4-e, 5-c, 6-b) Continue with the following words.

1. leukocytology _____
2. intercostal _____
3. oviduct _____
4. otitis _____
5. vasotomy _____
6. cystectomy _____
7. antebrachium _____

a. an egg-conveying tube
b. a study of white blood cells
c. the surgical removal of a bladder
d. inflammation of the ear
e. before the arm (forearm)
f. cutting of a vessel
g. between the ribs

272. (1-b, 2-g, 3-a, 4-d, 5-f, 6-c, 7-e) Continue with the following words.

1. medial _____   a. above the transverse plane
2. lateral _____   b. closest to point of origin
3. superior _____   c. farthest from the mid-line
4. inferior _____   d. in back of the coronal plane
5. anterior _____   e. below the transverse plane
6. posterior _____   f. closest to the mid-line
7. proximal _____   g. farthest from point of origin
8. distal _____   h. in front of the coronal plane

273. (1-f, 2-c, 3-a, 4-e, 5-h, 6-d, 7-b, 8-g) Continue with the following words.

1. unilateral _____   a. movement toward mid-line
2. bilateral _____   b. closing an angle
3. abduction _____   c. opening an angle
4. adduction _____   d. pertaining to or affecting both sides
5. flexion _____   e. movement from mid-line
6. extension _____   f. pertaining to or affecting one side

274. (1-f, 2-d, 3-e, 4-a, 5-b, 6-c) You will be tested on _every_ word
taught in this program. Review any words with which you have
experienced difficulty. When you are ready, raise your hand and
your instructor will give you the examination.

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APPENDIX I

Frame 211. If you were able to complete this frame without error, continue with frame 212. Return to this page when you complete frame 212. If you made any errors, return to frame 1 and take the program.

Frame 212. If you were able to complete this frame without error, continue with frame 213. Return to this page when you complete frame 213. If you made any errors, return to page 10, frame 31, and begin the program.

Frame 213. If you were able to complete this frame without error, continue with frame 214. Return to this page when you complete frame 214. If you made any errors, return to page 14, frame 61, and begin the program.

Frame 214. If you were able to complete this frame without error, continue with frame 215. Return to this page when you complete frame 215. If you made any errors, return to page 19, frame 94, and begin the program.

Frame 215. If you were able to complete this frame without error, continue with frame 216. Return to this page when you complete frame 216. If you made any errors, return to page 21, frame 114, and begin the program.

Frame 216. If you were able to complete this frame without error, continue with frame 217. Return to this page when you complete frame 217. If you made any errors, return to page 24, frame 137, and begin the program.

Frame 217. If you were able to complete this frame without error, continue with frame 218. Return to this page when you complete frame 218. If you made any errors, return to page 29, frame 166, and begin the program.

Frame 218. If you were able to complete this frame without error, continue with frame 245, page 40 Return to this page when you complete frame 245. If you made any error, return to page 31, frame 191, and begin the program.

Frame 245. If you were able to complete this frame without error, turn to page 43 and complete frames 266 through 274. Return to this page when you complete this series of frames. If you made any errors, return to page 37, frame 219, and begin the program.

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Frames 266 through 274. If you were able to complete this series of frames and you made no more than 10 errors, you are ready to take the final test. If you made more than 10 errors, return to page 37, Frame 219, and begin the program.

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Technical Training

10-8

Pharmacy Specialist Course

PHARMACEUTICAL INORGANIC CHEMISTRY

January 1976

SCHOOL OF HEALTH CARE SCIENCES, USAF
Department of Biomedical Sciences
Sheppard Air Force Base, Texas   76311

——— Designed For ATC Course Use ———

DO NOT USE ON THE JOB

PHARMACEUTICAL INORGANIC CHEMISTRY

OBJECTIVE

Identify the basic concepts, principles, and definitions of pharmaceutical inorganic chemistry. Select the properties of pharmaceutical inorganic chemical elements and compounds. Given the names of specific inorganic elements, correctly write and balance simple chemical equations. Given the necessary data, correctly calculate the milliequivalent concentration of electrolyte solutions.

INTRODUCTION

Chemistry plays many roles in pharmaceutical work. Many of the prescriptions you will be filling will contain two or more ingredients. Sometimes these ingredients will undergo a chemical or physical change. This block of hours will make you aware of these possibilities and provide you with the knowledge to be able to take preventive action. As a result, you will save time and embarrassment by not having to remake the preparation and avoid the possibility of harming yourself or the patient.

PROCEDURES

BASIC CONCEPTS OF INORGANIC CHEMISTRY

QUESTIONS

1. _____ - The study of composition and change in composition of matter.

2. _____ - The science dealing with the elements and mineral matter.

3. _____ - Anything visible or invisible which occupies space and has mass.

4. _____ - Matter which cannot be broken down into simpler matter by ordinary chemical means.

5. _____ - Elements are composed of minute indivisible particles called atoms.

6. _____ - The smallest particle of an element that has the properties of the element and can enter into combination with other elements.

7. _____ - Matter composed of two or more elements combined chemically in definite proportions.

8. _____ - The smallest particle of a compound that can exist and retain the properties of the compound.

COMPOSITION AND PROPERTIES OF MATTER

QUESTIONS

1. Physical States of Matter

    a. _____ - Has a definite shape and volume.

This supersedes WB 3ABR90530-I-1, October 1974.

b. _____ - Has a definite volume but takes the shape of any container into which it is placed.

c. _____ - Has neither a definite volume or shape. Assumes both the shape and volume of the container into which it is placed.

2. _____ - The capacity to do work.

3. _____ - Energy in motion.

4. _____ - Stored and latent energy.

CLASSIFICATION OF THE ELEMENTS

QUESTIONS

1. _____ - Centrally dense part of an atom that contains the proton and neutron.

2. _____ - Positively charged particle inside the nucleus.

3. _____ - Neutrally charged particle inside the nucleus.

4. _____ - Negatively charged particle orbiting the nucleus.

5. _____ - The number of protons in the nucleus.

6. _____ - A relative system of weight for elements based on carbon 12; equal to the number of protons plus the number of neutrons in the nucleus.

7. _____ - Atoms that have the same atomic number and properties but different atomic weights.

8. _____ - The combining capacity of an element.

9. _____ - The number of electrons of an element involved in the formation of a compound.

10. _____ - Process involving the loss of electrons by an atom accompanied by a gain in the positive valence number.

11. _____ - Process involving the gain of electrons by an atom resulting in a decrease in the positive valence number.

12. _____ - The chemical properties of the elements are periodic functions of their atomic numbers.

13. Lustrous elements which conduct electricity and heat, can be drawn into a fine wire (ductility) or hammered into thin sheets (malleability) are called _____

14. An element that is a nonconductor of heat and electricity, brittle, and has no characteristic luster is a _____

15. An element that exhibits properties of both metals and nonmetals is a _____

_____

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16. Using a periodic chart of the elements, list the symbol, atomic weight, and atomic number (rounded off to the nearest whole number) of the following elements.

		SYMBOL	ATOMIC WEIGHT	ATOMIC NUMBER
a.	Oxygen	_____	_____	_____
b.	Hydrogen	_____	_____	_____
c.	Iron	_____	_____	_____
d.	Mercury	_____	_____	_____
e.	Potassium	_____	_____	_____
f.	Silver	_____	_____	_____
g.	Sodium	_____	_____	_____
h.	Calcium	_____	_____	_____
i.	Chlorine	_____	_____	_____
j.	Carbon	_____	_____	_____
k.	Copper	_____	_____	_____
l.	Gold	_____	_____	_____
m.	Phosphorous	_____	_____	_____
n.	Nitrogen	_____	_____	_____
o.	Bromine	_____	_____	_____
p.	Iodine	_____	_____	_____
q.	Fluorine	_____	_____	_____

17. List the names of the elements corresponding to the following atomic weights.

		NAME OF ELEMENT
a.	40.08	_____
b.	74.922	_____
c.	15.9994	_____
d.	39.948	_____
e.	65.37	_____
f.	39.102	_____
g.	1.00797	_____
h.	4.0026	_____

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NAME OF ELEMENT

j.	10.811	_____
i.	35.435	_____
k.	24.312	_____
l.	6.939	_____
m.	22.9898	_____
n.	12.01115	_____
o.	14.0067	_____
p.	18.9984	_____
q.	26.9815	_____

18. If the atomic weight of an element is 35 and its atomic number is 17, how many neutrons are contained within the nucleus of its atom? Show work below.

NAMING INORGANIC COMPOUNDS AND FORMULAS

1. _____ - A combination of symbols representing compounds.

2. _____ - Indicates the number of times the atom (or radical) of the element whose symbol immediately precedes it occurs in the molecule.

3. _____ - Groups of atoms which act or react as a single atom.

4. _____ - An atom or group of atoms (radical) that carry an electrical charge.

5. _____ - The process of dissociation of a substance into its ions.

6. _____ - A condition of net positive charge.

7. _____ - A condition of net negative charge.

8. _____ - Any substance which dissociates into two or more ions when dissolved in water.

9. _____ _____ - The linkage which holds atoms together in a chemical compound.

a. _____ or _____ - A type of bonding in compounds in which oppositely charged atoms are held together by attraction.

b. _____ - A type of bond in compounds in which pairs of electrons are shared between atoms.

10. The sum of the atomic weights in a chemical formula is the _____ _____.

11. A chemical compound that contains only two elements is termed a' _____ _____.

12. _____ - A compound that contains three elements.

13. Rules of cross valence.

    a. List the symbols of the _____ or _____ involved and their _____ numbers.

    b. Write simple formula inserting _____ above symbols in formula.

    c. Take the valence of the element or radical on the left and make it the _____ of the element or radical on the _____.

    d. Take the _____ of the element or radical on the _____ and make it the subscript of the _____ or radical on the left.

14. An acid is a compound which contains no _____ ion other than _____.

15. A _____ contains no _____ ion other than hydroxide (OH-).

16. A _____ contains positive ions other than _____ and negative ions other than _____.

17. The method of determining acid-base concentration is by measuring _____.

18. The definition of pH is a scale from _____ to _____ indicating the _____ (measure of H+ concentration) of a solution.

    a. An acid solution has a pH _____ than 7.

    b. A basic solution has a pH _____ than 7.

    c. A neutral solution has a pH _____ to 7.

19. pH scale:

```
                              _____
0 |_____|     7     |_____| 14
```
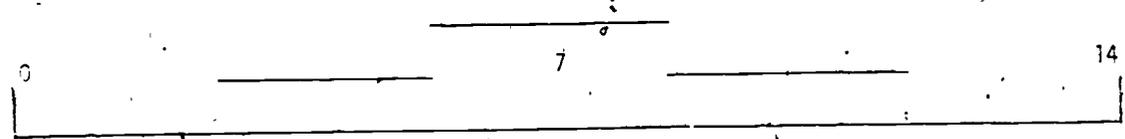
20. Methods of measuring pH.

    a. _____ - A pH meter is used to measure electrical conductivity of a solution. The electrical conductivity or a solution is dependent on the concentration of ions.

    b. _____ - Different dyes which change color at different pH values are used as the measuring device.

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21. Rules for naming binary compounds.

ACIDS

a. _____ portion - no name is applied to this portion of the molecule (H+ ion).

b. _____ portion.

   (1) Prefix the name stem of the electronegative element with _____.

   (2) Suffix the name stem of the electronegative element with _____.

   (3) Add the word _____ after the above name.

SALTS

a. Electropositive portion - write out in full the _____ of the element.

b. Electronegative portion - _____ the name stem of the element with _____.

22. Rules for naming ternary compounds.

ACIDS

a. _____ portion - no name is applied to this portion of the molecule (H+ ion).

b. Electronegative portion

   (1) For ternary acids made from radicals containing the most common number of oxygen atoms (most common radical), _____ the name stem of the _____ element in the molecule with _____.

   (2) The acid containing one more oxygen atom than the most common radical retains the suffix _____ and has the prefix _____ added to the name stem of the _____ element.

   (3) For the acid containing one less oxygen atom than the most common radical, the suffix _____ is changed to _____. No prefix.

   (4) The acid containing two less oxygen atoms than the most common radical retains the suffix _____ and has the prefix _____ added to the name stem of the _____ element.

SALTS

a. Electropositive portion - write out in full the _____ of the element.

b. _____ portion.

   (1) Use the same rules pertaining to the number of oxygen atoms in radicals as used in naming acids except:

     (a) Change suffix _____ to _____.

     (b) Change suffix _____ to _____.

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(2) Retain in every case the _____ that was attached to the acid if any.

c. When a salt (binary or ternary) contains a metal (electropositive element) with more than one valence, suffixes must be applied to the name of the metal to indicate which valence is used. The higher valence is indicated by the suffix _____ on the name of the metal. The lower valence is indicated by the suffix _____ on the name of the metal.

BASES

a. Write out in full the name of the _____ element of radical.

b. Always name the OH radical (electronegative portion) _____ for all bases.

23. Compute the molecular weight of the following compounds.

  a. AgCl   d. Fe(OH)$_3$

  b. BiCl$_3$ e. Ca$_3$(PO$_4$)2

  c. H$_2$CO$_3$ f. H$_2$SO$_4$

24. A solution with a pH of 7.2 would be slightly _____.

25. A solution with a pH of 5.6 would be slightly _____ while a pH of 2 would indicate a strong _____ solution.

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TABLE OF COMMONLY-USED VALENCES

NAME	SYMBOL	VALENCES		NAME	SYMBOL	VALENCES
Acetate Radical	$C_2H_3O_2$	-1		Lithium	Li	+1
Aluminum	Al	+3		Magnesium	Mg	+2
Ammonium	NH_4	+1		Manganese	Mn	+2
Barium	Ba	+2		Mercury	Hg	+1, +2
Bicarbonate Radical	HCO_3	-1		Nitrate Radical	NO_3	-1
Bismuth	Bi	+3		Nitrogen	N	+3, +5
Bromine	Br	-1		Oxygen	O	-2
Calcium	Ca	+2		Manganate Radical	MnO_3	-1
Carbon	C	+2, +4		Phosphorous	P	+3, +5
Carbonate Radical	CO_3	-2		Phosphate Radical	PO_4	-3
Chlorine	Cl	-1		Potassium	K	+1
Chlorate Radical	ClO_3	-1		Silver	Ag	+1
Copper	Cu	+1, +2		Sodium	Na	+1
Flourine	F	-1		Sulfate Radical	SO_4	-2
Hydrogen	H	+1		Sulfur	S	-2
Hydroxide Radical	OH	-1		Tin	Sn	+2, +4
Iodine	I	-1		Zinc	Zn	+2
Iron	Fe	+2, +3				
Lead	Pb	+2				

WRITING AND BALANCING EQUATIONS

QUESTIONS

1. Write the chemical symbol for the following:

   a. Heat _____

   b. Gas _____

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c. Precipitate _____

d. Direct Current _____

e. Reaction gone to completion _____

2. List the names and symbols of the diatomic elements.

　　a.

　　b.

　　c.

　　d.

　　e.

　　f.

　　g.

3. When two or more substances combine to form a more complex substance we call this a
_____ reaction.

General formula:

4. When a substance is broken down into two or more simple substances, this is called a
_____ reaction.

General formula:

5. Rules for decomposition

a. Metallic carbonates when heated form _____ _____
and _____ _____.

b. Metallic chlorates when heated decompose into _____ _____
and _____.

c. Some oxides when heated _____.

d. The process of decomposing water into hydrogen and oxygen by passing an electrical
current through it is called _____.

6. During a reaction when a single element is replaced by a more active element, this
type of reaction is termed _____ _____.

General formula:

7. When two compounds exchange positive ions to form two new compounds, this is termed a
_____ _____ reaction.

General formula:

8. Procedure for writing equations.

a. Change _____ statement (equation) to _____ statement
(symbols and formulas: XX →).

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b. Check for _____; _____. If there are any, add a subscript of two to them.

c. Predict resulting _____ (⟶ XX).

d. Check for _____ _____.

e. Write correct formulas for _____ using _____ (cross valence).

9. Procedure for balancing equations.

   a. Do not change the _____ (subscripts) of any compound in the equation.

   b. Alter the number of _____ to balance the equation by adding _____ (2X, 3X, etc.) to the molecules.

10. Complete and balance the following equations using the correct chemical symbols, valences and formulas. Do work on separate paper and record answers below.

   a. Sodium + Chlorine

   b. Magnesium · Oxygen

   c. Iron (ferrous) + Sulfur

   d. Hydrogen + Chlorine

   e. Sodium + Hydrochloric acid

   g. Potassium Iodide + Chlorine

   h. Barium Chloride + Magnesium Sulfate

   i. Calcium Chloride + Magnesium Sulfate

   j. Hydrochloric acid + Sodium Hydroxide

   k. Zinc Chloride + Sodium Sulfate

MOLAR, NORMAL, AND MILLIEQUIVALENT SOLUTIONS

QUESTIONS

1. _____ - a liquid consisting of a mixture of two or more substances which are molecularly dispersed through one another in a _____ manner. A solution consists of:

2. _____ - the substance dissolved in solution.

3. _____ - the medium (_____) in which the substance (solute) is dissolved.

4. _____ (GMW) - the molecular weight of a substance expressed in grams. One GMW of a substance equals one _____ of a substance. GMW and mole are used interchangeably.

5. _____ - contains one GMW of solute in enough solvent to make one _____ of solution.

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6. _____ - the number of moles (GMWs) of solute per liter of solution.

7. Formula for solving molarity problems:

number of _____ (GMWs)

M (_____) = ─────────────────────────────

number _____ of solution

8. _____ (GEW) - gram molecular weight divided by the valence of the electropositive element in the molecule.

9. _____ - contains one GEW of solute in enough solvent to make one liter of _____.

10. _____ - the number of GEWs of a solute per liter of solution.

11. Formula for solving normality problems:

number of _____

N (_____) = ─────────────────────────────

number _____ of solution

12. _____ (mEqwt) - the amount in grams or milligrams of a solute equal to 1/1000 of its gram equivalent weight (GEW).

13. Formulas for solving milliequivalent problems:

a. Solve for number of milliequivalents in a solution.

mg of solute in solution

* ─────── wts. _____

mg per mEqwt of solute

b. Solve for number of milliequivalents in a specified volume of solution.

(1) Solve for _____ of milliequivalents in solution.

(2) Divide number of milliequivalents in solution by number of _____ of solution - answer in milliequivalents per milliliter.

OXYGEN, HYDROGEN, WATER, AND PEROXIDES

QUESTIONS

1. Oxygen is a _____ and _____ gas which is _____ in water.

2. Oxygen is a _____ nonmetal and during a chemical reaction it acts as a _____ agent.

3. Oxygen will _____ combustion but it is not _____.

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4. Oxygen is an allotropic element which means that it _____ in more than one _____.

5. List the names and symbols of the three allotropic forms of oxygen.

   a.

   b.

   c.

6. List the two properties of hydrogen that are similar to oxygen.

   a.

   b.

7. Hydrogen unlike oxygen is _____ flammable and a good _____ agent.

8. Water is a _____, _____ and _____ liquid.

9. Water freezes at _____ degrees C. and _____ F. and boils at _____ degrees C. and _____ degrees F. It is most dense at _____ degrees C.

10. Water combines directly with _____ oxides to form _____ and with _____ oxides to form _____ It is a very _____ compound.

11. Peroxides are _____ compounds whose decomposition yields _____ _____.

12. Peroxides are _____ _____ agent.

13. The uses of the three allotropic forms of oxygen are:

   a. Oxygen (O_2) -

   b. Ozone (O_3) -

   c. Nascent Oxygen (0) -

14. Dilute Hydrochloric Acid is a _____ used for the treatment of achlorhydria and hypochlorhydria.

15. The percentage strength of dilute HCl is 10 percent - it is used as a _____

16. Only _____ is used as a solvent in pharmaceutical work.

17. _____ _____ - 3 percent is used as an oxidizing agent and _____.

18. Zinc Peroxide is used as a bacteriocide in the control of surgical _____ and in a 40 percent suspension as a _____ agent.

ALKALI METALS (GROUP IA) AND ALKALINE EARTH METALS (GROUP IIA)

QUESTIONS

1. The members of the alkali metals that have compounds related to pharmacy are:

   a.

b.

c.

2. The selected properties of Lithium (Li) are that it is the _____ of all metals, has a _____ luster and has a valence of +1 which makes it _____.

3. Sodium like lithium is a _____ metal with _____ _____ luster. It is also _____, with a valence of +1.

4. Sodium will react with water to decompose it into sodium hydroxide and hydrogen gas. Write and balance the equation for this reaction in the space below.

5. Potassium is a light metal with _____. It is also _____ (valence of +1) and like sodium it will _____ water.

6. _____ - used to treat hyperactive states of mannic depression and schizophrenia.

7. The sodium compound that is used as a systemic and nonsystemic antacid is _____.

8. _____ _____ is used as a bacteriostatic and antiseptic.

9. Sodium _____ is used primarily as a urine _____.

10. Sodium Chloride is used as an _____ _____ and to produce _____.

11. Sodium Hypochlorite, a popular bleaching agent is used for its _____ properties.

12. _____ _____ is used by lab technicians to prevent coagulation of _____ samples and as a systemic _____ to relieve mild acidosis.

13. Sodium _____ is a _____ with iodine and a source of the _____ ion.

14. Sodium Nitrate is used as an antidote for _____.

15. Sodium Phosphate is a saline _____ and is also used treating _____ poisoning.

16. Sodium _____ is used with sodium nitrite to treat _____ poisoning and also used as an _____ wash.

17. Potassium _____ is an _____ replenisher and _____.

18. An oxidizing anti-infective is _____ _____.

19. The members of the alkaline earth metals that have compounds related to pharmacy are:

a.

b.

c.

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20. Magnesium is a silvery-white metal whose ion is an _____ of many enzyme systems in the body.

21. Magnesium is vital for the function of the _____ system.

22. Calcium ion is indispensable in the function of the _____ and _____ nervous systems. It is also a factor in blood _____ and in the formation of the _____ and like tissue.

23. Soluble barium salts in the body are _____.

24. Magnesium carbonate is used for:

   a.

   b.

   c.

25. Magnesium _____ and magnesium _____ are both used as _____ antacids and saline _____.

26. Magnesium _____ (Epsom Salt) is a _____ _____ and anti-_____.

27. Talc is the common name for _____ _____. It is used for:

   a.

   b.

   c.

28. _____ _____ has mild _____ qualities and is a nonsystemic _____.

29. Magnesium carbonate, magnesium hydroxide, magnesium oxide and magnesium sulfate can all be used as saline _____.

30. _____ a dentifrice and nonsystemic antacid.

31. Calcium _____ and calcium _____ are both electrolyte _____.

32. Calcium Hydroxide, commonly called _____ _____ is used as an _____, a _____, and an _____ _____.

33. Calcium Phosphate is a _____ of _____.

34. _____ _____ is a radiopaque media in X-ray.

HALOGENS

QUESTIONS

1. The members of the halogens are:

   a.

14

b.

c.

2. Fluorine is a pale _____ _____ which is irritating to _____, _____, and _____ _____.

3. Fluorine is a univalent element that is the _____ active halogen and a powerful _____ agent.

4. List the general properties of chlorine.

a.

b.

c.

d.

5. Iodine is a bluish black _____ whose most common valence is _____. It serves as an _____ agent and is the _____ active halogen.

6. Fluorine, chlorine, bromine and iodine all exist in nature as _____ elements.

7. List the two selected fluorine compounds and their uses.

a.

b.

8. What halogen combines with hydrogen to form a diluted compound used as a stomachic in the treatment of achlorhydria and hypochlorhydria? _____.

9. What two chlorine compounds are used as electrolyte replenishers?

a.

b.

10. Elemental iodine is used as an _____ externally and internally in the treatment of _____.

11. A compound used as an expectorant in bronchitis and asthma and in the prevention of goiter is _____.

12. _____ _____ increases the solubility of iodine in tinctures and solutions.

SULFUR, NITROGEN AND BORON

QUESTIONS

1. The selected properties of sulfur are:

a.

b.

c.

d.

2. Nitrogen is a _____, _____, and _____ gas which is chemically _____ at room temperature. It is also classed as a _____

3. Boron is classed as a _____. It has a valence of _____ and is a brown to brownish black. _____ or _____.

4. Compounds of sulfur and their uses.

a. _____ - saline cathartic, anti-inflammatory.

b. _____ - parasiticide, fungicide, germicide, and keratolytic.

c. _____ - antidote for cyanide, antiseptic wash

d. _____ - parasiticide, fungicide, and germicide because of ability to form hydrogen sulfide on contact with skin. Keratolytic.

5. List the uses of ammonium chloride.

a.

b.

6. Nitrogen _____ oxidation of parenteral solutions.

7. Nitrous Oxide (laughing gas) is used as a _____ _____.

8. Sodium _____ is an antidote for cyanide.

9. _____ _____ is a nonirritating mild antiseptic.

10. Sodium Borate (Borax) is used as an _____ and _____ in cosmetics.

MISCELLANEOUS INORGANIC ELEMENTS

QUESTIONS

1. High concentrations of aluminum salts in solution will _____.

2. Dilute solutions of soluble aluminum salts when applied topically, cause _____ of blood vessels.

3. The bismuth ion is a _____ poison.

4. _____ iron (Fe $^{+2}$) is essential to the hemoglobin of the blood.

5. _____ iron (Fe^{+3}) is mainly used externally, as it is a _____ poison.

6. Both the silver and zinc ions are _____ poisons.

7. The two aluminum compounds used as astringents are _____ and _____.

16

385

8. _____ is a nonsystemic antacid and a protective for _____.

9. Two aluminum and magnesium preps used as nonsystemic antacids are:

   a.

   b.

10. _____ _____ - Bentonite (suspending agent) Kaolin (adsorbant)

11. _____ _____ is used internally for the treatment of dysentery, enteritis, and ulcerative colitis.

12. Two iron compound used as hematinics are:

   a.

   b.

13. _____ _____ is an anti-infective used opthalmically in a one percent solution in newborn babies to combat gonorrhea.

14. _____ _____ is an astringent for _____ and _____. It has powerful escharotic (scab-forming) action.

15. A mild antiseptic and astringent is _____ _____.

16. Zinc _____ is an _____ _____ and emetic.

17

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Technical Training

Fundamentals of Pharmacy

PHARMACEUTICAL INORGANIC CHEMISTRY

January 1976.

SCHOOL OF HEALTH CARE SCIENCES, USAF
Department of Biomedical Sciences
Sheppard Air Force Base, Texas 76311

———————— Designed For ATC Course Use ————————

DO NOT USE ON THE JOB

PHARMACEUTICAL INORGANIC CHEMISTRY

Inorganic Chemistry Pharmaceuticals by Most Common Class

1. ABSORBENT - Kaolin

2. ANESTHETIC (General) - Nitrous Oxide

3. ANTACID - Aluminum Hydroxide (nonsystemic)
   Aluminum Hydroxide with Magnesium Hydroxide (nonsystemic)
   Aluminum Hydroxide with Magnesium Trisilicate (nonsystemic)
   Magnesium Hydroxide (nonsystemic)
   Magnesium Oxide (nonsystemic) - saline cathartic
   Sodium Bicarbonate

4. ANTI-INFLAMMATORY AGENT - Magnesium Sulfate (in hypertonic solution) - saline cathartic

5. ANTISEPTIC - Hydrogen Peroxide (3%) - oxidizing agent
   Sodium Thiosulfate - saline cathartic, antidote for cyanide

6. ASTRINGENT - Aluminum Chloride
   Ferric Chloride
   Zinc Oxide - antiseptic
   Zinc Sulfate (opthalmic)

7. BUFFERING AGENT - Boric Acid - mild antiseptic

8. CATHARTIC - Magnesium Trisilicate (mild) - nonsystemic antacid

9. DENTAL PROPHYLAXIS - Sodium Fluoride - rat and roach poison
   Stannous Fluoride

10. DIARRHEA - Bismuth Subcarbonate = dysentery, enteritis, ulcerative colitis

11. ELECTROLYTE REPLENISHER - Calcium Chloride
    Potassium Chloride - diuretic
    Sodium Chloride

12. EMULSIFYING AGENT - Calcium Hydroxide - astringent, protective

13. EXPECTORANT - Ammonium Chloride - diuretic

14. FILTERING AGENT - Magnesium Silicate (talc) - dusting powder, dispersing agent

15. FUNGICIDE - Elemental Iodine - treatment and prevention of goiter
    Sulfur - germicide because of ability to form hydrogen sulfide
    Sulfurated Potash - germicide

16. GERMICIDE - Nascent Oxygen (O)
    Ozone (O_3)

17. GONORRHEAL INFECTIONS - Silver Nitrate (1% solution used for newborn babies)

1

18. HEMATINIC - Ferrous Iron aids formation of hemoglobin of the blood
    Ferrous Sulfate

19. HYPERACTIVE STATES OF MANNIC DEPRESSION - Lithium Carbonate

20. OXIDATION RETARDATION OF PARENTERAL SOLUTIONS - Nitrogen

21. OXIDIZING ANTI-INFECTIVE AGENT - Potassium Permanganate

22. RESPIRATORY FAILURE TREATMENT - Oxygen (O_2)

23. SOLUBILIZING AGENT WITH IODINE - Sodium Iodide

24. SOLVENT, UNIVERSAL - Water (very stable)
    Purified Water USP (only one used as a solvent in the pharmacy)

25. STOMACHIC - Dilute Hydrochloric Acid (for achlorhydria and hypochlorhydria)

26. URINE ACIDIFIER - Sodium Biphosphate - mild, saline cathartic

27. VASODILATOR - Sodium Nitrate - anti-rust agent

28. X-RAY MEDIA - Barium Sulfate (used in large doses)

390

Molar, Normal and Milliequivalent Solutions

31. If 6 moles of sodium chloride is dissolved in enough water to make 3 liters of solution, what would be the molarity of the solution? (2)

32. What is the molarity of a 5 liter solution containing 3.2 moles of potassium permanganate? (.64)

33. If a 250ml solution contains 4.9 moles of $MgSO_4$, what is the molarity of the solution? (19.6)

34. What is the molarity of a solution containing 2.5 moles of $AgNO_3$ in 3.5 liters of total solution? (.714)

35. If a 1580ml solution contains 5.5 moles of NaCl, what is the molarity of the solution? (3.481)

36. If 1 GEW of potassium chloride is dissolved in enough water to make 500ml of solution, what is the normality? (4)

37. What is the normality of a solution containing 4 GEWs of HCl in 250 ml of total solution? (16)

5

38 What is the normality of a 4 liter solution that contains 4 GMW of $MgSO_4$? (.5)

39 If you put 13.5 GMWs of $AlCl_3$ in a container and q.s. to 4500ml, what would be the normality of the solution? (1)

40. If you have a 3 liter solution that has a normality of 2, how many GEW of solute were added to it? (6)

41. A 1 ml ampul contains .444 Gm of KCl. How many milliequivalents of KCl are there in the ampul? (6)

42 7.4 Gm of KCl is used to make a 5ml solution. Find the number of milliequivalents per milliliter. (20)

43. 2.4 Gm of $MgSO_4$ is used to make a 5ml solution. Find the number of milliequivalents per milliliter. (8)

44 A 5 ml ampul contains 2.96 Gm of KCl. How many milliequivalents of KCl are there per milliliter? (6)

45. A 100 ml ampul contains 8.88 Gm of NaCl. How many milliequivalents of NaCl are there per milliliter? (1.531)

DEPARTMENT OF BIOMEDICAL SCIENCES

FUNDAMENTALS OF PHARMACY

PHARMACEUTICAL INORGANIC CHEMISTRY

December 1974

SCHOOL OF HEALTH CARE SCIENCES, USAF
SHEPPARD AIR FORCE BASE, TEXAS

———— Designed For ATC Course Use ————

DO NOT USE ON THE JOB

PURPOSE OF STUDY GUIDES, WORKBOOKS, PROGRAMMED TEXTS AND HANDOUTS

Study Guides, Workbooks, Programmed Texts and Handouts are the only publications authorized by Air Training Command (ATC) for student use in ATC courses.

The STUDY GUIDE (SG) presents the information you need to complete the unit of instruction, or makes assignments for you to read in other publications which contain the required information.

The WORKBOOK (WB) contains work procedures designed to help you achieve the learning objectives of the unit of instruction. Knowledge acquired from using the study guide will help you perform the missions or exercises, solve the problems, or answer questions presented in the workbook.

The STUDY GUIDE AND WORKBOOK (SW) contains both SG and WB material under one cover. The two training publications are combined when the WB is not designed for you to write in. or when both SG and WB are issued for you to keep.

The PROGRAMMED TEXT (PT) presents information in planned steps with provisions for you to actively respond to each step. You are given immediate knowledge of the correctness of each response. PTs may either replace or augment SGs and WBs.

The HANDOUT (HO) contains supplementary training materials in the form of flow charts, block diagrams, printouts, case problems, tables. forms, charts, and similar materials.

Training publications are designed for ATC course use only. They are updated as necessary for training purposes, but are NOT to be used on the job as authoritative references in preference to Technical Orders or other official publications.

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   Aluminum Hydroxide with Magnesium Trisilicate (nonsystemic)
   Magnesium Hydroxide (nonsystemic)
   Magnesium Oxide (nonsystemic) -- saline cathartic
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2

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29. Name the following compounds.

a. HCl

b. HBr

c. H_2S

d. $HClO$

e. $HClO_2$

f. $HClO_3$

g. $HClO_4$

h. H_2SO_3

i. H_2SO_4

j. HNO_3

k. HNO_2

l. $NaOH$

m. $NaCl$

n. Na_2S

o. $NaClO_3$

p. $NaClO_2$

q. $NaClO_4$

r. $KMnO_4$

s. Na_2CO_3

t. $NaHCO_3$

u. H_2CO_3

v. NH_4OH

w. $Fe(OH)_3$

x. $FeCl_3$

y. $CaCO_3$

z. $Bi_2(CO_3)_3$

aa. $Ca(C_2H_3O_2)_2$

bb. KI

cc. Al_2O_3

dd. $Ca_3(PO_4)_2$

ee. $ZnSO_4$

ff. $AgCl$

gg. $NaNO_3$

hh. $HC_2H_3O_2$

ii. NH_4NO_3

jj. H_3PO_4

kk. K_3PO_4

ll. KNO_3

mm. $Cu(NO_3)_2$

nn. $Al(NO_3)_3$

oo. $AgSO_4$

pp. $FeCl_2$

qq. $CuSO_4$

rr. FeS

ss. $MnSO_4$

tt. HI

uu. $KMnO_4$

vv. $Al_2(SO_4)_3$

ww. $Al(OH)_3$

xx. $Ca(OH)_2$

3

30. Write the formula for the following compounds:

a. Sodium Chloride

b. Sulfuric Acid

c. Sodium Bicarbonate

d. Calcium Carbonate

e. Aluminum Oxide

f. Calcium Phosphate

g. Zinc Sulfate

h. Aluminum Hydroxide

i. Potassium Iodide

j. Magnesium Sulfate

k. Phosphoric Acid

l. Sodium Bromide

m. Ferric Chloride

n. Hypochlorous Acid

o. Sodium Perchlorate

p. Sulfurous Acid

q. Sodium Hydroxide

r. Nitric Acid

s. Carbonic Acid

t. Potassium Permanganate

u. Hydrobromic Acid

v. Ferrous Chloride

w. Cupric Sulfate

x. Aluminum Nitrate

y. Cupric Nitrate

z. Sodium Carbonate

aa. Ferric Hydroxide

bb. Cuprous Sulfate

cc. Manganese Hydroxide

dd. Silver Chloride

4

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37. What is the normality of a solution containing 4 GEWs of HCl in 250 ml of total solution? (16)

5

38. What is the normality of a 4 liter solution that contains 4 GMW of $MgSO_4$? (.5)

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40. If you have a 3 liter solution that has a normality of 2, how many GEW of solute were added to it? (6)

41. A 1ml ampul contains .444 Gm of KCl. How many milliequivalents of KCl are there in the ampul? (6)

42. 7.4 Gm of KCl is used to make a 5ml solution. Find the number of milliequivalents per milliliter. (20)

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44. A 5 ml ampul contains 2.96 Gm of KCl. How many milliequivalents of KCl are there per milliliter? (8)

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6

318

APPROVAL OFFICE AND DATE	INSTRUCTOR	
MSgt ? Aug 75 Wilson		
COURSE NUMBER	COURSE TITLE	
3ABR90530	Pharmacy Specialist	
BLOCK NUMBER	BLOCK TITLE	
II	Pharmacology	
LESSON TITLE		
Anatomy and Physiology(Cells, Tissues and Glands)		

LESSON DURATION

CLASSROOM/Laboratory	Complementary	TOTAL
2 Hours	0	2 Hours

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
8	18 July 75	1b

STS/CTS REFERENCE

NUMBER	DATE
STS 905X0	28 Feb 75

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE
	3 2 AUG 1975		
	6 OCT 1975		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
None	NA	NA	Transparency Set #1 Anatomy & Physiology FA Anatomical Chart HO 3ABR90530-II-1 PT 3ABR90530-II-1b

CRITERION OBJECTIVES AND TEACHING STEPS

1b. Identify selected cells, tissues and glands pertaining to the human body.

   (Teaching steps listed in Part II)

9

ATC FORM

APPROVAL OFFICE AND DATE	INSTRUCTOR
MSDB/22 Aug 75	

COURSE NUMBER	COURSE TITLE
3ABR90530	Pharmacy Specialist

BLOCK NUMBER	BLOCK TITLE
II	Pharmacology

LESSON TITLE

Anatomy and Physiology (Muscular System)

LESSON DURATION

CLASSROOM/Laboratory	COMPLEMENTARY	TOTAL
2 Hours	0	2 Hours

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
8	18 July 75	1c.

STS/CTS REFERENCE

NUMBER	DATE
STS 905X0	28 Feb 75

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE
	2 AUG 1975		
	6 OCT 1975		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
NONE	NA	NA	Transparency Set #1 Anatomy & Physiology FA Anatomical Chart HO 3ABR90530-II-1 PT 3ABR90530-II-1b

CRITERION OBJECTIVES AND TEACHING STEPS

1c. Identify selected basic facts and terms about the muscular system.

(Teaching Steps listed in Part II)

ATC FORM 770

LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE	INSTRUCTOR
MSDB/22 Aug 75 Wilson	
COURSE NUMBER 3ABR90530	**COURSE TITLE** Pharmacy Specialist
BLOCK NUMBER II	**BLOCK TITLE** Pharmacology

LESSON TITLE
Anatomy and Physiology(Skeletal System)

LESSON DURATION

CLASSROOM/Laboratory 1 Hour	xxxxxxxxx Complementary 0	TOTAL 1 Hour

POI REFERENCE

PAGE NUMBER 8	PAGE DATE 18 July 75	PARAGRAPH 1d.

STS/CTS REFERENCE

NUMBER STS 905X0	DATE 28 Feb 75

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE
	2 AUG 1975		
	2 OCT 1975		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
None	NA	NA	Transparency set #1 Anatomy & Physiology FA Anatomical Chart HO 3ABR90530-II-1 PT 3ABR90530-II-1b

CRITERION OBJECTIVES AND TEACHING STEPS

1d. Identify selected basic facts and terms about the skeletal system.

(Teaching steps listed in Part II)

400

LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE MSDB/22 Aug 75. Wilson	INSTRUCTOR		
COURSE NUMBER 3ABR90530 /	COURSE TITLE Pharmacy Specialist		
BLOCK NUMBER II	BLOCK TITLE Pharmacology		
LESSON TITLE Anatomy & Physiology(Nervous system)			

LESSON DURATION

CLASSROOM/Laboratory 3 Hours	LABORATORY Complementary 0	TOTAL 3 hours

POI REFERENCE

PAGE NUMBER 3	PAGE DATE 18 July 75	PARAGRAPH 1a

STS/CTS REFERENCE

NUMBER STS 90530	DATE 28 Feb 75

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE
	2 2 AUG 1975		
	6 OCT 1975		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
None	NA	NA	Transparency Set #1 Anatomy & Physiology FA Anatomical Chart HO 3ABR90530-II-1 PT 3ABR90530-II-1b Mental Hygiene (Audio Tape)

CRITERION OBJECTIVES AND TEACHING STEPS

1a. Identify selected basic facts and terms about the nervous system.

(Teaching Steps Listed in Part II)

ATC FORM

LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE	INSTRUCTOR
MSDB/22 Aug 75 Wilson	

COURSE NUMBER	COURSE TITLE
3ABR90530	Pharmacy Specialist

BLOCK NUMBER	BLOCK TITLE
II	Pharmacology

LESSON TITLE

Anatomy and Physiology(Circulatory System)

LESSON DURATION

CLASSROOM /Laboratory	LABORATORY XXXXXXXXX Complementary	TOTAL
2 hours	0	2 Hours

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
8	18 July 75	1f

STS/CTS REFERENCE

NUMBER	DATE
STS 905X0	28 Feb 75

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE
	2 8 AUG 1975		
	9 OCT 1975		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
None	NA	NA	Transparency Set #1 Anatomy & Physiology FA Anatomical Chart HO 3ABR90530-II-1 PT 3ABR90530-II-1b

CRITERION OBJECTIVES AND TEACHING STEPS

1f. Identify selected basic facts and terms about the circulatory system.

   (Teaching steps listed in Part II)

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LESSON PLAN (Part I, General)

383

INSTRUCTOR

COURSE TITLE
Pharmacy Specialist

BLOCK TITLE
Pharmacology

LESSON DURATION

CLASSROOM / laboratory	xxxxxxxx Complementary	TOTAL
1 Hour	0	1 Hour

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
8	18 July 75	1g

STS/CTS REFERENCE

NUMBER	DATE
STS 905X0	23 Feb 75

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE
	2 2 AUG 1975		
	1975		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
NONE	NA	NA	Transparency Set #1 Anatomy & Physiology FA Anatomical Chart HO 3ABR90530-II-1 PT 3ABR90530-II-1b

CRITERION OBJECTIVES AND TEACHING STEPS

1g. Identify selected basic facts and terms about the respiratory system.

(Teaching Steps listed in Part II)

ATC FORM

LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE	INSTRUCTOR
MSDB/22 ~75 *Wilson*	
COURSE NUMBER	COURSE TITLE
3ABR90530	Pharmacy Specialist
BLOCK NUMBER	BLOCK TITLE
II	Pharmacology

LESSON TITLE

Anatomy and Physiology(digestive System)

LESSON DURATION

CLASSROOM /Laboratory	LABORATORY Complementary	TOTAL
2 Hours	0	2 Hours

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
8	18 July 75	1b

STS/CTS REFERENCE

NUMBER	DATE
STS 90530	28 Feb 75

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE
[signature]	2 2 AUG 1975		
[signature]	SEPT 1975		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
NONE	NA	NA	Transparency Set #1 Anatomy & Physiology FA Anatomical Chart HO 3ABR90530-II-1 PT 3ABR90530-II-1b

CRITERION OBJECTIVES AND TEACHING STEPS

1h. Identify the selected basic facts and terms about the digestive system.

   (Teaching Steps listed in Part II)

407

APPROVAL OFFICE AND DATE *Wilson*	INSTRUCTOR		
COURSE NUMBER 7	COURSE TITLE Pharmacy Specialist		
BLOCK NUMBER II	BLOCK TITLE ...Specialist		
LESSON TITLE Anatomy & Physiology (Endocrine Systems)	Pharmacology		
AIM			LESSON DURATION

CLASSROOM Laboratory	LABORATORY Complementary	TOTAL 1 Hour
1 hour	POI REFERENCE	~~1 hour~~

PAGE NUMBER	PAGE DATE	PARAGRAPH
3	18 June/73 REFERENCE	11

NUMBER		DATE	
STS 90530	SUPERVISOR APPROVAL FEB 75		

SIGNATURE	DATE	SIGNATURE	DATE
[signature]	JUL 1975		
[signature]	1975		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
NONE	NA	NA	Transparency Set #1 Anatomy & Physiology TX Anatomical Chart ID 3AER90530-II-1 PT 3AER90530-II-1b

CRITERION OBJECTIVES AND TEACHING STEPS

11. Identify selected basic facts and terms about the endocrine system.

 (Teaching steps listed in Part II)

ATC/ FORM II

405

LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE	INSTRUCTOR
MODB/22 Aug 75 Wilson	

COURSE NUMBER	COURSE TITLE
3ABR90530	Pharmacy Specialist

BLOCK NUMBER	BLOCK TITLE
II	Pharmacology

LESSON TITLE

Anatomy and Physiology(Urinary System)

LESSON DURATION

CLASSROOM/Laboratory	~~xxxxxxxxxxx~~ Complementary	TOTAL
1 Hour	0	1 Hour

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
8	13 July 75	1j

STS/CTS REFERENCE

NUMBER	DATE
STS 905X0	28 Feb 75

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE
	2 2 AUG 1975		
	6 OCT 1979		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
NONE	NA	NA	Transparency Set #1 Anatomy & Physiology FA Anatomical Chart HO 3ABR90530-II-1 PT 3ABR90530-II-1b

CRITERION OBJECTIVES AND TEACHING STEPS

1j. Identify selected basic facts and terms about the urinary system.

(Teaching stepslisted in Part II)

400

LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE	INSTRUCTOR
:SPT/22 Aug 75 _Wilson_	

COURSE NUMBER	COURSE TITLE
3ABR90530	Pharmacy Specialist

BLOCK NUMBER	BLOCK TITLE
II	Pharmacology

LESSON TITLE
Anatomy & Physiology(Reproductive System)

LESSON DURATION

CLASSROOM/Laboratory	※ PORTIONX Complementary	TOTAL
1 Hour	0	1 Hour

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
9	18 Jul 75	1k

STS/CTS REFERENCE

NUMBER	DATE
STS 905X0	28 Feb 75

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE
	AUG 1975		
	OCT 1975		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
NONE	na	na	Transparency Set #1 Anatomy & Physiology FA Anatomical Chart HO 3ABR90530-II-1 PT 3ABR90530-II-1b

CRITERION OBJECTIVES AND TEACHING STEPS

1k. Identify selected basic facts and terms about the reproductive system.

(Teaching Steps listed in Part II)

LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE	INSTRUCTOR
Wilson	
COURSE NUMBER	COURSE TITLE Pharmacy Specialist
BLOCK NUMBER	BLOCK TITLE Physiology
LESSON TITLE Physiology (Eye & Ear)	

CLASSROOM	LESSON DURATION xxxxxxxxxxLaboratory Supplementary		
2 hrs	LABORATORY	0	TOTAL hours 2 hours

POI REFERENCE

PAGE NUMBER	DATE 15 July 75	PARAGRAPH II

STS/CTS REFERENCE

NUMBER STS 905X0	DATE 28 Feb 75

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE
	2 AUG 1975		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
NONE	na	na	Transparency Set #1 Anatomy & Physiology FA Anatomical Chart HO 3ABR90530-II-1 PT 3ABR90530-II-1b

CRITERION OBJECTIVES AND TEACHING STEPS

11. Identify selected basic facts and terms about the eye and ear.

   (Teaching steps listed in Part II)

411

TC FORM

LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE MSDB _16 Aug 74_	**INSTRUCTOR**
COURSE NUMBER 3ABR90530	**COURSE TITLE** Pharmacy Specialist
BLOCK NUMBER II	**BLOCK TITLE** Pharmacology

LESSON TITLE
Drug Abuse

LESSON DURATION

CLASSROOM/Laboratory	xxxxxxxxxxxx Complementary	TOTAL
42 hrs/0 hrs	0 hrs	42 hrs

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
p. 10	18 July 75	4a

STS/CTS REFERENCE

NUMBER	
STS 905X0	28 Feb 75

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE
[signature]	16 Aug 74	_[signature]_	6 OCT 75
[signature]	_[illegible]_		
[signature]	8 Aug 5		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
NA	NA	NA	Drug Abuse Transparency Set 1 Films: Weed, Acid, Last Minute to Choose Hooks, The Perfect Drug, Speedscene, Drug Abuse, Problems of Amphetamine Abuse WB3ABR90530-II Pharmacology

CRITERION OBJECTIVES AND TEACHING STEPS

4a. Describe the drugs subject to abuse and the symptoms of drug abuse.

(Teaching steps listed in Part II)

AT

LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE MSDB *M E E Aug 74* 16	INSTRUCTOR
COURSE NUMBER 3ABR90530	COURSE TITLE Pharmacy Specialist
BLOCK NUMBER II	BLOCK TITLE Pharmacology

LESSON TITLE
Pharmaceutical and Medicinal Agents

LESSON DURATION

CLASSROOM/Laboratory 20 hrs/0 hrs	Complementary 8 hrs	TOTAL 28 hrs

POI REFERENCE

PAGE NUMBER 8 C	P 18 July 75	PARAGRAPH 5a

STS/CTS REFERENCE

NUMBER STS 905X0	28 Feb 75	

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE
signature	16 Aug 74	*signature*	6 OCT 1975
signature	16 Feb 3		
signature	8 Aug 3		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
NA	NA	NA	WB3ABR90530-II-1 Pharmacology Pharmacology Transparency Set #2 Films: The Digestive System & Ascariasis

CRITERION OBJECTIVES AND TEACHING STEPS

5a. Classify and describe the properties of locally acting drugs, gastro-intestinal drugs, local anesthetics and anti-infective drugs.

(Teaching steps listed in Part II)

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APPROVAL OFFICE AND DATE	INSTRUCTOR
MSDB *Wilson 27 Sept 74*	

COURSE NUMBER	COURSE TITLE
3ABR90530	Pharmacy Specialist

BLOCK NUMBER	BLOCK TITLE
11	Pharmacology

LESSON TITLE
Pharmaceutical and Medicinal Agents

LESSON DURATION

CLASSROOM/Laboratory	Complementary	TOTAL
10 Hrs/0 Hrs	4 Hrs	14 Hrs

POI REFERENCE

PAGE NUMBER	PAGE C	PARAGRAPH
8 /C	18 July 75	58.6656

STS/CTS REFERENCE

NUMBER	
STS 905X0	28 Feb 75

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE
Eudeqemer	27 Sept 7	*Eudeqemer*	6 OCT 1975
Eudeqemer	27 MAR 5		
Eudeqemer	12 Sept 5		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
NA	NA	NA	WB 3ABR90530-II-1 Pharmacology Pharmacology Transparency Set #3 Films: Fundamentals of the Nervous System; Halothane, Abnormal Behavior.

CRITERION OBJECTIVES AND TEACHING STEPS

9b. Classify and describe the properties of drugs acting on the central nervous system.

(Teaching steps listed in Part II)

ATC FORM 111

GPO 1972 779-386/23

LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE	INSTRUCTOR
Wilson 29 Oct 79	

COURSE NUMBER	COURSE TITLE
3ABR90530	Pharmacy Specialist

BLOCK NUMBER	BLOCK TITLE
II	Pharmacology

LESSON TITLE
Pharmaceutical and Medicinal Agents

LESSON DURATION

CLASSROOM/laboratory	Complementary	TOTAL
16 hrs/0 hrs	6 hrs	22 hrs

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
11	18 Jul 75	5c

STS/CTS REFERENCE

NUMBER	DATE
STS905X0	28 Feb 75

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE
E.W.B...	24 Oct 7		
E.W....	24 April 75		
E. Wegen	6 Oct 5		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
NA	NA	NA	WB3ABR90530-II-1 Pharmacology; Pharmacology Transparency Set #4; Films:Work of the Heart; The Blood; Common Heart Disorders; Congestive Heart Failure

CRITERION OBJECTIVES AND TEACHING STEPS

5c. Classify and describe the properties of drugs acting on the autonomic nervous system and circulatory system.

(Teaching steps listed in Part II)

415

392
c

APPROVAL OF FILE AND DATE	INSTRUCTOR		
Wilson 25 Nov 75			
COURSE NUMBER	COURSE TITLE	Pharmacy Specialist	
3ALR'			
BLOCK NUMBER	BLOCK TITLE	Pharmacology	
11			

LESSON TITLE
Pharmaceutical and Medicinal Agents

LESSON DURATION

CLASSROOM / Laboratory	Complementary	TOTAL
16hrs/0 hrs	6 hrs	22 hrs

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
11	18 July 75	5d

STS/CTS REFERENCE

NUMBER	DATE
STS 905X0	28 Feb 75

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE
C Wegener	2 Dec 75		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS, AND UNCLASSIFIED MATERIAL
NA	NA	NA	WB3ALR90530-II-1 Pharmacology Pharmacology Transparency Set #5 Films; Endocrine System, Menstrual Cycle, Vitamins and Some Deficiency Diseases, Immunization

CRITERION OBJECTIVES AND TEACHING STEPS

5d. Classify and describe the properties of drugs acting on the endocrine system and miscellaneous therapeutic drugs.

(Teaching steps listed in Part II)

ATC FORM

LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE	INSTRUCTOR
TGPB/19 Nov 7~ *Wilson*	
COURSE NUMBER	COURSE TITLE
AB R90530	Pharmacy Specialist
BLOCK NUMBER	BLOCK TITLE
11	Pharmacology
LESSON TITLE	
Dispensing Laboratory	

LESSON DURATION

CLASSROOM/Laboratory	~~XXXXXXXXXXX~~ Complementary	TOTAL
0/42	14	56

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
11	18 July 1975	6a, b, c, d.

STS/CTS REFERENCE

NUMBER	DATE
STS 905X0	28 Feb 75

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE
[signature]	20 Nov 3		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
Typewriter Numbering Machines Prescription Files Prescriptions Drugs References Telephones			

CRITERION OBJECTIVES AND TEACHING STEPS

6a. Given instructor assistance and placed in the dispensing pharmacy (model pharmacy and pharmacology research area), correctly interpret, fill and label prescriptions in accordance with AFM 168-4 and complete handouts for locally acting drugs, gastro-intestinal drugs, local anesthetics and anti-infective drugs.

6b. Given instructor assistance and placed in the dispensing pharmacy (model pharmacy and pharmacology research area), correctly interpret, fill and label prescriptions in accordance with AFM 168-4 and complete handouts for drugs acting on the central nervous system.

6c. Given instructor assistance and placed in the dispensing pharmacy (model pharmacy and pharmacology research area), correctly interpret, fill and label prescriptions in accordance with AFM 168-4 and complete handouts for drugs acting on the autonomic nervous system and circulatory system.

6d. Given instructor assistance and placed in the dispensing pharmacy (model pharmacy and pharmacology research area), correctly interpret, fill and label prescriptions in accordance with AFM 168-4 and complete handouts for drugs acting on the endocrine system and miscellaneous.

   (Teaching steps ......)   417

HANDOUTS, II - 3 through 7

Course 10-8

Department of Biomedical Science
School of Health Care Sciences, USAF
Sheppard AFB, Texas

HANDOUT 3ABR90530-II-3
November 1974

PHARMACOLOGY

1. Match Column A with Column B

COLUMN A		COLUMN B
1. Alphabetical index of brand names (PDR)	_____	a. Nerve damage may occur
2. Drug Classification Index (PDR)	_____	b. Combination drug
		c. Green pages
3. Surfak	_____	d. Inhibitory effect on the nervous system
4. DBI-TD	_____	e. Time released
5. Robitussin-DM	_____	f. Remington's Pharmaceutical Sciences
6. Alphabetical listing according to generic name only (Index)	_____	g. Dryness of the mouth
7. Indications	_____	h. Uses
8. Precautions	_____	i. Not to be used for patients with cardiac disorders
9. Action	_____	j. 240mg red gelatin capsule
10. Adverse reaction	_____	k. Pink pages
11. Contraindication	_____	

2. Using the Product Identification Section of the PDR, describe the Norgesic tablet.

3. a. In Remington's Pharmaceutical Science, the alphabetical listing of generic names is located in the (front/back) of the book.

   b. In the PDR, drugs are indexed in the (front/back) of the book.

4. In Section Five of the PDR (Product Information), drugs are listed alphabetically according to brand name. They are listed alphabetically within the heading of a specific _____ also appearing in alphabetical order.

5. List two references which specify whether or not a drug is a controlled item.

   a. _____

   b. _____

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6. Determine the schedule for each of the following drugs:

   a. Decadron _____

   b. Phelantin _____

   c. Solfo-Serpine _____

   d. Biphetamine _____

   e. Ambar _____

7. Using the Federal Supply Catalog determine which of the following drugs is a controlled item.

   a. Methylphenidate HCl Tablets USP_____

   b. Sodium Amobarbital capsules USP_____

   c. Prednisolone $NaPO_4$ Inj. USP_____

   d. Thiopental anesthesia kit _____

   e. Reserpine tablets USP _____

8. Trade names (are/are not) given in the Remington's Pharmaceutical Sciences.

9. What is the name for Diethylpropion which indicates, in detail, it's chemical structure? _____ (use Remington's)

10. What topic heading in Remington's Pharmaceutical Science contains adverse reactions, uses, precautions and warnings for a particular drug?

   a. Uses

   b. How supplied

   c. Dose

   d. Descriptions

11. Using the PDR and Remington's Pharmaceutical Sciences, give a trade name for each of the following generic names.

   a. Phenylephrine _____

   b. Phenobarbital _____

   c. Pheniramine _____

   d. Phenacitin _____

12. Draw the symbol, located at either the upper or lower right of a drug's name, which indicates that this name is a trade name?

Department of Biomedical Science
School of Health Care Sciences, USAF
Sheppard AFB, Texas

PHARMACOLOGY

A. Aniline Derivative
B. Aniline Oerivative, causes Methemoglobinemia
C. Anti-depressant, Monomine Oxidase Inhibitor
D. Anti-Depressant, Nonmonomine Oxidase Inhibitor
E. Cerebral Stimulant
F. Found in coffee
G. Intermediate Acting Barbiturate
H. Long Acting Barbiturate
I. Major Tranquilizer, Phenothiazine Derivative
J. Major Tranquilizer, Non-Phenothiazine Derivative
K. Minor Tranquilizer
L. Non-Barbiturate Sedative Hypnotic
M. Non-Opiate Analgesic, Narcotic
N. Non-Opiate Analgesic, Treat Heroin Addiction
O. Opiate Analgesic
P. Pyrazolon Derivative, Causes Agranulocytosis
Q. Salicylate
R. Semi-Synthetic Opiate
S. Semi-Synthetic Opiate, Narcotic Antagonist
T. Short Acting Barbiturate
U. Treat Grand Mal Epilepsy
V. Treat Petit Mal Epilepsy
W. Ultra Short Acting Barbiturate

1. Acetophenetidin	26. Hypan	51. Tridione
2. Amytal	27. Indocin	52. Trilafon
3. Ascriptin	28. Librium	53. Tylenol
4. Atarax	29. Lorfan	54. Valium
5. Aventyl	30. Luminal	55. Vistaril
6. Azolid	31. Mebaral	56. Vivactil
7. Beta Chlor	32. Mellaril	57. Zactane
8. Bufferin	33. Methylmorphine	58. Zarontin
9. Butazolidin	34. Miltown	
10. Caffeine Citrated	35. Mysoline	
11. Cendex	36. Nalline	
12. Compazine	37. Noludar	
13. Daro Tab	38. Nembutal	
14. Darvon	39. Oxalid	
15. Demerol	40. Paracetaldehyde	
16. Dexedrine	41. Parnate	
17. Dihycon	42. Pentothal	
18. Dilantin	43. Ritalin	
19. Dilaudid	44. Seconal	
20. Dimindol	45. Somnos	
21. Dolophine	46. Sparine	
22. Doriden	47. Stelazine	
23. Elavil	48. Tandearil	
24. Equanil	49. Thorazine	
25. Haldol	50. Tofranil	

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CNS STIMULANTS

_____ Caffeine
_____ Dextroamphetamine

CNS DEPRESSANTS

_____ Amobarbital   _____ Paraldehyde
_____ Chloral Betaine   _____ Phenobarbital
_____ Glutethimide   _____ Pentobarbital
_____ Methyprylon   _____ Secobarbital
_____ Mephobarbital   _____ Thipental

NON-NARCOTIC· ANALGESIC

_____ Acetaminophen   _____ Oxyphenbutazone
_____ Aspirin   _____ Phenacetin
_____ Ethoheptazine   _____ Phenylbutazone
_____ Indomethacin   _____ Propoxyphene

NARCOTIC ANALGESIC

_____ Codeine   _____ Meperidine
_____ Hydromorphone   _____ Methadone
_____ Levallorphan   _____ Nalorphine

ANTIEPILEPTICS.

_____ Diphenylhydantoin   _____ Primidone
_____ Ethosuximide   _____ Trimethadione

PSYCHOTHERAPEUTICS

_____ Amitriptyline   _____ Nortriptyline
_____ Chlordiazepoxide   _____ Perphenazine
_____ Chlorpromazine   _____ Prochlorperazine
_____ Diazepam   _____ Promazine
_____ Haloperidol   _____ Protriptyline
_____ Hydroxyzine   _____ Thioridazine
_____ Methylphenidate   _____ Tranylcypromine
_____ Meprobamate   _____ Trifluoperazine
_____ Imipramine

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Department of Biomedical Sciences
School of Health Care Sciences, USAF
Sheppard Air Force Base, Texas

HANDOUT 3ABR90530-II-5
November 1974

PHARMACOLOGY

CARDIAC GLYCOSIDES

_____ Digitoxin
_____ Digoxin

Antiarrhythmia

_____ Quinidine
_____ Procainamide

CORONARY VASODILATORS

_____ Nitroglycerin
_____ Pentaerythritol Tetranitrate

HYPERTENSION

_____ Reserpine
_____ Isoxsuprine
_____ Hydralazine
_____ Methyldopa
_____ Guanethadine

HEMATINICS

_____ Ferrous Sulfate
_____ Ferrous Fumerate and
_____ Dioctyl Sodium Sulfosuccinate

COAGULANTS

_____ Manadione Sodium
_____ Menadione

ANTICOAGULANTS

_____ Warfarin Sodium
_____ Heparin Sodium
_____ Bishydroxycoumarin

1. Aldomet
2. Apresoline
3. Coumadin
4. Crystodigin
5. Davoxin
6. Dicumarol
7. Ferro-Sequels
8. Glyceryl Trinitrate
9. Ismelin
10. Lanoxin
11. Lipo-Heparin
12. Myodigin
13. Panheprin
14. Peritrate
15. Pentritol
16. Pronestyl
17. Purodigin
18. Sandril
19. Saroxin
20. Serfin
21. Serpasil
22. Vasodilan

SYMPATHOMIMETIC DRUGS (Adrenergic)

_____ Epinephrine
_____ Levarterenol
_____ Metaraminol
_____ Phenylephrine
_____ Phenylpropanalamine
_____ Dextroamphetamine
_____ Diethylpropion
_____ Phenmetrazine
_____ Nylidrin
_____ Isoproterenol

SYMPATHOLYTIC DRUGS (Adrenergic Blocking)

_____ Tolazoline
_____ Phentolamine
_____ Ergotamine
_____ Ergotamine with Caffeine
_____ Methysergide

PARASYMPATHOMIMETIC DRUGS (Cholinergic)

_____ Bethanechol
_____ Neostigmine

PARASYMPATHOLYTIC DRUGS (Cholinergic Blocking)

_____ Propantheline
_____ Benztropine
_____ Dicyclomine
_____ Trihexyphenidyl

MUSCLE RELAXANTS

_____ Meprobamate
_____ Mephenesin
_____ Methocarbamol
_____ Carisprodol
_____ Chlorzoxazone
_____ Succinycholine

1. Adrenalin
2. Anectine
3. Aramine
4. Arlidin
5. Artane
6. Bentyl
7. Caffergot
8. Cogentin
9. Dexedrine
10. Equanil
11. Gynergen
12. Isuprel
13. Levophed
14. Miltown
15. Norisodrine
16. Paraflex
17. Pipanol
18. Preludin
19. Pressonex
20. Priscoline
21. Probanthine
22. Propadrine
23. Prostigmin
24. Quelicin
25. Rela
26. Regitine
27. Robaxin
28. Sansert
29. Soma
30. Sucostrin
31. Tenuate
32. Tolseram
33. Tolserol
34. Tremin
35. Urecholine

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2

a. Antiarrhythmia
b. Appetite depressant
c. Asthma
d. Causes constipation
e. Central acting muscle relaxant
f. Central acting muscle relaxant, chief use as tranquilizer
g. Diagnosis of pheochromocytoma
h. Elevate blood pressure during shock
i. Hematinic
j. Narcolepsy
k. Nasal decongestant
l. Neuromuscular blocking agent, used in surgery
m. Ocular decongestant
n. Parkinson's disease
o. Possibility of hemorrhage
p. Prophylaxis for migraine headache
q. Toxicity called CHINCHONISM
r. Treat angina pectoris
s. Treat congestive heart failure
t. Treat migraine headaches
u. Used during blood transfusions
v. Treat moderately severe hypertension
w. Treat myasthenia gravis
x. Treat severe hypertension, ganglionic blocker
y. Treat urinary retention
z. Treatment of peptic ulcer
aa. Treat mild hypertension
bb. Used with local anesthetics
cc. Vasodilator in peripheral vascular disease
dd. Vitamin K injectable
ee. Vitamin K oral

3

Department of Biomedical Sciences   HANDOUT 3ABR90530-II-6
School of Health Care Sciences, USAF   November 1974
Sheppard Air Force Base, Texas

PHARMACOLOGY

ENDOCRINE AND MISCELLANEOUS WORKSHEET

a. Most common glucocorticoid
b. Treats prostate cancer
c. Passive immunity
d. Active immunity
e. Suppresses uterine contraction
f. Used in emergency treatment of diabetic coma
g. Treatment of mild diabetes mellitus
h. Oral form of testosterone
i. Treatment of hyperthyroidism
j. Most commonly used insulin preparation
k. Synthetic thyroid
l. Used to increase the absorption of drugs
m. Antitussive with local anesthetic effect
n. Most potent diuretics
o. Aldosterone antagonist
p. Toxin
q. Sedative expectorant
r. Not ot be used in combination with oxytocin
s. Used to treat motion sickness
t. Treats beri-beri
u. Needed for the prevention of night blindness
v. Treats pellegra
w. Anabolic agent
x. Sequential oral contraceptive
y. Treats menopausal symptoms and dysmenorrhea
z. Antiemetic, augment and potentiate the CNS depressants

1. Aldactone	22. Dymelor	43. Nilevar	65. Riboflavin
2. Alpha-tocopheryl	23. Elase	44. Norlestrin	66. Romilar
3. Aristocort	24. Enovid E	45. NPH Iletin	67. Sabin (Oral)
4. Ascorbic acid	25. Estinyl	46. Oleovitamin	68. Shick Test
5. Benadryl	26. Ergotrate	47. Oncovin	69. Spartocin
6. Bonine	27. Guaiacol	48. Oracon	70. Stilbesterol
7. Chlortrimeton	28. Lasix	49. Oreton	71. Synalar
8. Cortone	29. Lente Iletin	50. Ortho-Novum	72. Tapazole
9. Cortril	30. Leukeran	51. Ovulen	73. TAT
10. Cyanocobalamin	31. Medrol	52. Parathormone	74. Temaril
11. Cytomel	32. Menadione	53. Periactin	75. Terpinol
12. Cytoxan	33. Mercuhydrin	54. Phenergan	76. Theelin
13. DBI	34. Methergine	55. Pitocin	77. Thiamine
14. Decadron	35. Methotrexate	56. PPD	78. Thiomerin
15. Diabinese	36. Metandren	57. Premarin	79. Thytropar
16. Diamox	37. Meticortelone	58. Provera	80. Tolinase
17. Dick Test	38. Meticorten	59. Purinethol	81. TNTC
18. Dimetane	39. Mustargen	60. Pyribenzamine	82. Varidase
19. Diuril	40. Myleran	61. Pyridoxine	83. Wydase
20. DPT	41. Neutrapen	62. PZI Iletin	
21. Dramamine	42. Niacin	63. Regular Iletin	

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ENDOCRINE AND MISCELLANEOUS WORKSHEET

Adrenal Hormones

_____ Cortisone

_____ Hydrocortisone

_____ Prednisone

_____ Prednisolone

_____ Methylprednisolone

_____ Methylprednisolone

_____ Dexamethasone

_____ Fluocinalone

_____ Triamcinalone

Insulin Hormones

_____ Regular Insulin

_____ Protamine Zinc Insulin

_____ Isophane Insulin

_____ Insulin Zinc Suspension

Oral Hypoglycemics

_____ Acetohexamide

_____ Chlorpropamide

_____ Tolazamide

_____ Phenformin

Thyroid Hormones

_____ Thyroid USP

_____ Liothyronine

_____ Thyrotropin

Antithyroid Hormones

_____ Propylthiouracil

_____ Methimazole

Parathyroid Hormone

_____ Parathyroid Inj.

Androgen Drugs

_____ Testosterone

_____ Methyltestosterone

_____ Norethandrolone

Estrogen and Progesterone Drugs

_____ Ethinyl Estradiol

_____ Estrone

_____ Conjugated Estrogens

_____ Diethylstilbesterol

_____ Medroxyprogesterone

_____ Ethinyl Estradiol and Dimethisterone with Ethinyl Estradiol

_____ Ethynodiol Diacetate and Mestranol

_____ Norethynodrel and Mestranol

_____ Norethindrone and Mestranol

_____ Norethindrone Acetate and Ethinyl Estradiol

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ENDOCRINE AND MISCELLANEOUS WORKSHEET

Dietary Supplements

_____ Vitamine A

_____ Vitamin E

_____ Vitamin K

_____ Vitamin B$_1$

_____ Vitamin C.

_____ Nicotinic Acid

_____ Vitamin B$_6$

_____ Vitamin B$_2$

_____ Vitamin B$_{12}$

Immunological Agents

_____ Polio Vaccine

_____ Diptheria Toxin USP

_____ Scarlet Fever Streptococcus Toxin USP

_____ Purified Protein Derivative of Tuberculin USP

_____ Diptheria and Tetanus Toxoids and Pertussis Vaccine

_____ Tetanus Antitoxin USP

Diuretics

_____ Mercaptomerin

_____ Meralluride

_____ Chlorothiazide

_____ Furosemide

_____ Spironalactone

_____ Acetazolamide

Expectorants and Antitussives

_____ Potassium Iodide

_____ Ammonium Chloride

_____ Glyceryl Guaiacolate

_____ Terpin Hydrate

_____ Dextromethorphan

_____ Benzonatate

Oxytocics

_____ Ergonovine

_____ Methylergonovine

_____ Sparteine Sulfate

_____ Oxytocin

Enzymes

_____ Hyaluronidase

_____ Penicillinase

_____ Fibrinolysin and Desoxyribonuclease

_____ Streptokinase-Streptodornase

Antineoplastic Agents

_____ Aminopterin

_____ Busulfan

_____ Mercaptopurine

_____ Methchlorethamine

_____ Chlorambucil

_____ Cyclophosphamide

_____ Vincristine

_____ Estrogens

3

ENDOCRINE AND MISCELLANEOUS WORKSHEET

Antihistamines

_____Diphenhydramine

_____Tripelennamine

_____Chlorpheniramine

_____Brompheniramine

_____Dimenhydrinate

_____Meclizine

_____Promethazine

_____Trimeprazine

_____Cyproheptadine

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Department of Biomedical Sciences
School of Health Care Sciences, USAF
Sheppard Air Force Base, Texas

PHARMACOLOGY

(ENDOCRINE AND MISCELLANEOUS WORKSHEET)

Match Generic names in COLUMN A with drug categories in COLUMN B

COLUMN A

1. Prednisolone..................... _____
2. Ammonium Chloride.............. _____
3. Dexamethasone................... _____
4. Propylthiouracil............... _____
5. Fluocinolone.................... _____
6. Methylprednisolone............. _____
7. Busulfan........................ _____
8. Dextromethorphan............... _____
9. Furosemide...................... _____
10. Brompheniramine................ _____
11. Estrone......................... _____
12. Protamine Zinc Insulin......... _____
13. Folic Acid...................... _____
14. Acetazolamide................... _____
15. Mercaptopurine.................. _____
16. Ergonovine...................... _____
17. Cyclophosphamide................ _____
18. Chlorpheniramine................ _____
19. Vincristine..................... _____
20. Nicotinic Acid.................. _____
21. Fibrinolysin and
    Desoxyribonuclease............. _____
22. Ethinyl Estradiol............... _____
23. Insulin Zinc Suspension........ _____
24. Methchlorethamine.............. _____
25. Methimazole..................... _____
26. Prednisone...................... _____
27. Streptokinase-Streptornase.... _____
28. Aminopterin..................... _____
29. Diphenhydramine................ _____
30. Triamcinolone................... _____
31. Testosterone.................... _____
32. Mannitol Inj. .... _____
33. Codene.......................... _____
34. Penicillinase................... _____
35. Methylergonovine................ _____
36. Androgens....................... _____
37. Conjugated Estrogens........... _____
38. Oxytocin........................ _____
39. Ethynodiol Diacetate
    and Mestranol.................. _____
40. Potassium Iodide............... _____
41. Chlorambucil.................... _____
42. Tripelennamine.................. _____
43. Chlorothiazide.................. _____
44. Medroxyprogesterone............ _____

COLUMN B

a. Adrenal Hormone
b. Antithyroid Hormone
c. Androgen Drug
d. Estrogen
e. Progesterone
f. Dietary Supplement
g. Antihistamine
h. Antitussive
i. Sedative Expectorant
j. Oxytocic
k. Enzyme
l. Antineoplastic agent
m. Acidifying diuretic
n. Osmotic ciuretic
o. Carbonic Anhydrase
p. Onset 4-6 hrs., duration 24-43 hrs
   (Insulin)
q. Onset 2 hrs., duration 16-24 hrs
   (Insulin)
r. Oral contraceptive
s. Thiazide diuretic
t. Miscellaneous diuretic

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10-8

Technical Training

Pharmacy Specialist

PHARMACOLOGY

October 1975

SCHOOL OF HEALTH CARE SCIENCES, USAF
Department of Biomedical Sciences
Sheppard Air Force Base, Texas 76311

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Department of Biomedical Sciences
School of Health Care Sciences, USAF
Sheppard Air Force Base, Texas 76311

WB 3ABR90530-II-1
October 1975

PHARMACOLOGY

OBJECTIVE

Given information pertaining to pharmacological principles of selected drug groups, complete questions in WB 3ABR90530-II pertinent to each day's instruction.

EQUIPMENT

Selected Transparencies
Overhead Projector
Selected Motion Pictures
Motion Picture Projectors

PROCEDURE

Define and identify selected drugs in relation to their groups.

The object of this lesson is to acquaint you with the primary drug groups and their actions.

INSTRUCTIONS

For the most part, answers to the following questions must be obtained from the class lecture. Remington's Pharmaceutical Sciences and Cutting's Handbook of Pharmacology contain useful, supplementary information. By completing the workbook you will more easily understand the lesson. You will also have an excellent source of review material for the test.

STUDY REFERENCES

1. Remington's Pharmaceutical Sciences.

2. Cutting's Handbook of Pharmacology.

This supersedes WB 3ABR90530-II-1, October 1974

QUESTIONS

1. Define Pharmacology.

2. Define a drug

3. List six general drug uses.

4. Name four sources of drugs.

   SOURCES

   a. _____

   b. _____

   c. _____

   d. _____

5. Broadly speaking, medications may be administered externally or

_____

6. Ointments, creams, and lotions are examples of _____ drug administration.

7. The simplest, most painless way to give a drug internally is _____

8. List two advantages and two disadvantages of administering drugs orally.

   ADVANTAGES

   a. _____

   b. _____

   DISADVANTAGES

   a. _____

   b. _____

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9. Drugs are inserted into the rectum in the form of _____
   or _____.

10. Parenteral refers to the administration of drugs by _____.

11. List two advantages and two disadvantages of administering drugs by injection.

    ADVANTAGES

    a. _____

    b. _____

    DISADVANTAGES

    a. _____

    b. _____

12. Sublingual medications are placed under the _____, whereas
    buccal medications are placed between the _____ and
    the _____.

13. Three factors which determine how often a drug must be administered are

    absorption, _____,   and _____.

14. List five overall effects of drug action.

    a. _____

    b. _____

    c. _____

    d. _____

    e. _____

15. A drug which stimulates a cell function does so by _____
    the activity of cells.

16. Drugs which produce sleep are examples of drugs acting by _____.
    The activity of cells is _____ in this method of drug action.

17. A third method of drug action is irritation which causes _____
    of cells.

18. Insulin and Thyroid administration are examples of _____
    action.

19. Penicillin is an example of a drug which acts by_____.

20. List four types of drug action:

a. _____

b. _____

c. _____

d. _____

21. In reflex action, the effects are produced as a result of a local _____.

22. Before general action is produced, the drug must be absorbed into the

_____.

23. The type of action produced only at the point of contact is _____.

24. An undesirable or secondary effect of a drug is called a _____
action.

25. List six factors which modify the action or dose of a drug.

a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

26. These factors alter the _____ of a drug necessary to
produce the desired results.

27. A drug interaction is when the effect of one drug _____ or

_____ the effects of another drug.

28. _____ is when two drugs exert a greater combined
effect than either one by itself.

29. _____ is when the effect of one drug cancels or
reduces the effects of the other drug.

30. Drug interactions may be either _____ or _____.

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TOXICOLOGY

QUESTIONS

1. Toxicology is the science of _____.

2. Explain cumulative effect of poison.

3. Define acute poisoning.

4. Chronic poison is the condition brought, on by taking _____
doses of a poison or as a result of the _____ of a poison
over a _____ _____.

5. Hydrochloric acid, Phenol, and Sodium Hydroxide are examples of corrosive
poisons. This type of poison _____ or _____
body tissues at the point of contact.

6. Zinc Sulfate, Silver Nitrate, and Iodine are examples of irritant
poisons. This type of poison sets up an _____ process
at the point of contact. They do not directly destroy body tissue.

7. The two types of neurotic poisons are _____ and

_____. They act on the central nervous system.

8. Gaseous poisons may destroy the capability of the blood to carry _____
and may _____ or _____ the tissues of
the air passages, lungs and skin.

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9. NEVER induce vomiting or use a stomach tube when _____ poisons have been ingested. In this type of poisoning there is a danger of rupturing the weakened wall of the stomach or esophagus.

10. When poisoning is due to irritants or neurotics, remove the poison from the stomach as soon as possible by inducing _____ or by gastric tube.

11. In the case of gaseous poisoning, get the victim into fresh air and start _____ _____ promptly if patient is not breathing.

12. A clearing house for poison information is called a _____ _____. It provides valuable information on the treatment of poisonings. Every medical facility should try to utilize the service nearest them.

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DRUG ABUSE

QUESTIONS

1. This lesson is concerned with drugs subject to abuse which act on the central nervous system to produce changes in mood and _____ .

2. When it takes a larger dose of a drug to produce the same effects as the original dose, we can say the person has developed a _____ .

3. In habituation the harmful effects of a drug are primarily on the _____ . There is little or no physical dependence; however, psychic dependence does occur.

4. Physical dependence is a component of the condition known as addiction. In this condition the harmful effects of the drug are on _____ as well as the individual.

5. List three basic causes of drug abuse.

a. _____

b. _____

c. _____

6. List the six groups of drugs subject to abuse.

a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

7. Narcotics are used in medicine to relieve or modify _____ _____ , suppress _____ , and control _____ .

8. Narcotics are used illegally for their ability to produce a feeling of _____ and an escape from _____ .

9. The primary class of drugs in the depressant category are the _____ .

10. Barbiturates are used in medicine for their _____ and _____ effects.

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11. Barbiturates are abused for their _____ effects.

12. Amphetamines are used in medicine to _____ mood,

suppress _____, and to treat _____.

13. Stimulants are abused for their mood _____ effects

and their ability to overcome _____.

14. Hallucinogenic drugs cause distortions of _____,

dream _____, and radically alter _____

_____.

15. Hallucinogenic drugs have a legitimate medical use.

    True _____   False _____

16. Marijuana is abused for its _____ and _____
effects.

17. LSD is abused for its so-called "_____"
effects.

18. There is a danger of _____ in inhaling solvent fumes.

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LOCALLY ACTING DRUGS

QUESTIONS

1. The outer integument or covering of the body, consisting of two basic layers of tissue is the definition of _____.

2. The external or outer surface of the skin is the _____.

3. The bottom layer of skin that contains blood and lymph vessels, hair follicles, sebaceous glands, and sweat glands is the _____.

4. The functions of skin are _____, heat regulation, prevention of bacterial invasion, metabolic processes, and excretion.

5. Melanin prevents tissue damage caused by _____ light.

6. The body excretes waxes and oils through the _____ glands located in the skin.

7. The tissue lining the cavities and canals of the body is called _____

_____.

8. Mucous membranes are more _____ than skin and have mucous glands rather than cutaneous glands.

9. The functions of mucous membranes are protection, secretion, and _____.

10. Bland, fatty, or oleaginous substances that soften the skin and protect the skin are called _____.

11. List three emollients.

    a.

    b.

    c.

12. Demulcents are protective agents which are employed primarily to alleviate irritation and protect the _____ _____.

13. List three demulcents.

    a.

    b.

    c.

14. Flexible Collodion USP and Absorbable Gelatin Film (Gelfilm) are classified as _____.

15. Protectives are administered to the _____ to form an adherent, continuous coat which may be either flexible or semi-rigid, depending on the substances and the manner in which they are applied.

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16. Locally applied protein precipitants that contract and wrinkle the skin or tissues are classified as _____.

17. List two astringents

    a.

    b.

18. _____ _____ are used to remove unwanted substances and microorganisms from living tissue and inanimate objects.

19. Detergents, Solvents, and Abrasives are all examples of _____ agents.

20. Which of the above remove unwanted substances by mechanical action?

21. Keratolytics _____ the horny layer of skin where most fungi and bacteria reside.

22. Most keratolytics are _____.

23. List three keratolytics.

    a.

    b.

    c.

24. Irritants are drugs which act locally on the skin and mucous membranes to promote healing by increasing _____ flow to the injured area.

25. List five irritants.

    a.

    b.

    c.

    d.

    e.

26. Certain relatively indifferent (inert and insoluble) substances that are used to protect epithelial surfaces, ulcers, and wounds by the absorption of skin moisture and decreasing friction are called _____.

27. List three absorbents

    a.

    b.

    c.

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GASTROINTESTINAL DRUGS

QUESTIONS

1. The Gastrointestinal system acts on food both _____ and chemically.

2. Food and drug absorption takes place in the _____ intestine.

3. Food and drug enter the bloodstream through millions of tiny fernlike projections in the small intestine called _____.

4. _____ are drugs promoting or aiding the digestive processes in the gastrointestinal tract.

5. Hydrochloric Acid (HCl), Bile, Bile Salts, and Bile Acids are classified as

_____.

6. Which digestant can cause damage to the teeth if not taken properly?

7. Bile has a variety of functions but the most important is the digestion of

_____ and fat soluble vitamins. Also, it reduces surface tension of fats and activates pancreatic _____.

8. Pepsin, Pancreatin, and Papain are digestive enzymes. (True) (False)

9. Gastric Antacids are agents that neutralize or remove _____ from gastric contents.

10. Sodium Bicarbonate is highly soluble, acts immediately, causes rebound hyper-acidity, and is absorbed _____.

11. Aluminum, Calcium, and Magnesium salts are used as nonsystemic _____.

12. Activated Charcoal USP, Kaolin NF, and Pectin NF are all examples of

_____.

13. Kaopectate is used to treat diarrhea and is a combination of Kaolin and

_____.

14. Drugs that facilitate the passage and elimination of feces from the colon and rectum are called _____.

15. List the five classes of cathartics.

    a.

    b.

    c.

    d.

    e.

16. Cascara Sagrada USP, Senna NF, Castor Oil USP, and Bisacodyl NF are all
_____ cathartics.

17. Magnesium Sulfate USP, Milk of Magnesia USP, and Fleet Enema are all
_____ cathartics.

18. Psyllium Hydrophilic Mucilloid (Metamucil) is a _____
_____ bulk cathartic.

19. Mineral Oil USP (Heavy Liquid Petrolatum) and Cottonseed Oil USP are
_____ cathartics.

20. Dioctyl Calcium Sulfosuccinate NF (Surfak) and Dioctyl Sodium Sulfosuccinate
USP (Colace) are _____ softeners or "surface-
acting" agents.

21. An emetic is a drug which induces _____.

22. _____ HCl is a systemic emetic that acts
directly by stimulating the medulla oblongata and is given by injection.

23. Sodium Chloride USP (Table Salt), and Cupric Sulfate NF (Copper Sulfate) are
nonsystemic emetics that act directly on the stomach lining to cause _____
_____ to the gastric mucosa.

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LOCAL ANESTHETICS

QUESTIONS

1. Local Anesthetics are drugs which produce a condition of anesthesia in a

_____ area around the site of application or injection
of the drug. They interfere with the initiation and transmission of the nerve impulse.

2. Pain is a specific _____ experience which is separate
from those which mediate other sensations such as touch, pressure, heat and cold.

3. Sensory nerve fibers terminate as _____ nerve endings.

4. Define the three classes of local anesthetics.

    a. Refrigerants:

    b. Protoplasmic Poisons:

    c. Specific Anesthetics:

5. Local anesthetics have a mechanism of action that prevents passage of impulses
through sensory nerve endings (Bare nerve endings) or prevents passage of impulses
through the nerve _____ (Bundle of nerve fibers).

6. Match the following Methods of Administration:

    ____ Applied to the skin and mucous   a. Saddle Block
         membrane surface
                                  b. Topical

    ____ Injection directly into the area
         that is painful or to be subjected   c. Spinal
         to surgical trauma
                                    d. Infiltration

    ____ Injection into a nerve trunk   e. Epidural and Caudal Block

    ____ Injection into the spine between
         the 3rd and 4th or 4th and 5th   f. Block
         lumbar vertebrae. Mixes with
         spinal fluid.

    ____ A form of low spinal that affects
         the perineal area.

    ____ Spinal fluid is not affected.

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7. Cocaine HCl is a potent anesthetic that is highly effective on mucous membranes and is never to be _____ because of its high toxicity.

8. In addition to its anesthetic properties, Cocaine is also a powerful _____

9. Procaine (Novacaine) is ineffective when applied _____

10. Ethyl Aminobenzoate (Benzocaine) is insoluble. Therefore, it is not to be _____ but should be used topically only.

11. _____(Ophthaine)(Ophthetic) is an ophthalmic anesthetic that should be kept in the refrigerator upon opening.

12. Dibucaine (Nupercaine) is _____ more toxic and potent than procaine if injected and is used mainly on the mucous membranes in a 1 percent ointment.

13. Ethyl Chloride USP is skin _____.

14. Phenol USP (Carbolic Acid) is a local anesthetic that is applied topically and is classed as a _____ poison because it kills the cell by the precipitation of protein.

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ANTI-INFECTIVE DRUGS

QUESTIONS

1. Those parasites or pathogenic organisms that invade or infest the body causing a reaction of the tissues by the toxins generated by them is the definition of _____ organisms.

2. The smallest of all infectious organisms are the _____ which are characterized by a lack of metabolism and proliferate only in the presence of living tissue.

3. Diseases caused by viruses are .

    a.

    b.

    c.

    d.

4. Minute rod-shaped parasites that cause disease in man by arthropod vectors are called

_____.

5. Rocky Mountain Spotted Fever, Typhus, and Mite Fever are diseases caused by

_____.

6. Bacteria are one-celled microorganisms that belong to the _____ kingdom.

7. Bacteria are classified by a procedure called "_____ Stain."

8. Bacteria that stains blue with Gram Stain is classified as Gram _____.

9. List six diseases caused by Gram Positive organisms:

    a.

    b.

    c.

    d.

    e.

    f.

10. Bacteria that stains red or pink is classified as Gram _____.

11. List five diseases caused by Gram Negative organisms:

    a.

    b.

    c.

    d.

    e.

12. The fungi are small _____ that have no roots, stems, or chlorophyll.

13. Diseases caused by fungi are:

    a.

    b.

    c.

    d.

    e.

14. A protozoa is a true member of the _____ kingdom and does not have a cell wall.

15. Four classes of protozoa are the Amoeba, Flagellates, Ciliates, and _____.

16. Diseases caused by protozoa are:

    a.

    b.

    c.

    d.

17. An intestinal worm or worm-like parasite is the definition of _____.

18. There are three classifications of Helminths: the Nematodes, Cestodes and _____

19. List the following Nematodes:

    a. Roundworm

    b.

    c. Whipworm

    d.

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20. List the following Cestodes:

    a. Beef tapeworm.

    b. Pork tapeworm

    c.

21. List the following Trematodes:

    a.

    b.

22. Lice (crabs) are also referred to as _____.

23. Diseases caused by lice are Typhus, Lapsing Fever, and _____.

24. Minute animals related to the spiders and are parasitic on man and domestic animals producing various irritations on the skin are called _____.

25. Scabies, inflammation, and secondary infections are caused by _____.

26. The treatment of disease by administering chemicals which affect the causative organism unfavorably but do not injure the patient is the definition of _____.

27. Antibiotics include a large class of drugs chemically produced by _____ able to inhibit growths of or destroy bacteria and other disease-causing pathogens.

28. Penicillin is the most widely used of all the antibiotics and is effective against most Gram _____ organisms and against some Gram Negative organisms such as gonococci and spirochetes.

29. Penicillin G is a _____ penicillin.

30. Penicillin V has the same properties as Penicillin G, but unlike Penicillin G, it is more stable in an acid medium causing it to be better _____ in the gastrointestinal tract.

31. Methicillin (Staphcillin) is a semi-synthetic penicillin intended to combat _____-producing staphylococci resistant to other penicillins.

32. Methicillin cannot be taken _____.

33. Oxacillin (Prostaphlin) is intended to combat penicillinase producing staphylococci but, unlike Methicillin, it is resistant to gastric acids so it can be taken _____.

34. Nafcillin (Unipen) is a semi-synthetic penicillin primarily used in treatment of, Penicillin _____-resistant staphylococcal infections.

35. Ampicillin has a wider range of activity than Penicillin G, but is destroyed by _____.

36. The use of the drugs in the tetracycline class during tooth development (last half of pregnancy, infancy, and up to 8 years of age) may cause permanent discoloration of the _____.

37. Monilia _____ sometimes occurs with oral use, therefore, the tetracyclines are often combined with an antimycotic (antifungal) agent.

38. Demeclocycline HCl has the slowest rate of excretion of all the tetracyclines and also has been known to cause photodynamic and _____ reactions.

39. Streptomycin Sulfate is given by injection only and is used primarily to treat tuberculosis. However, this drug may produce toxic effects in the liver or kidneys and cause damage to the 8th cranial nerve which results in tinnitus, vertigo, and an eventual loss of _____.

40. Chloramphenicol (Chloromycetin) is highly effective against certain rickettsial infections such as Typhus and Rocky Mountain Spotted Fever but serious and sometimes fatal blood _____ may occur with its use.

41. Erythromycin (Ilotycin, Erythrocin, Ilosone) is mainly used in the treatment of _____ sensitive organisms where the patient has a penicillin sensitivity.

42. Neomycin is not _____ when taken orally.

43. Neomycin is taken orally to treat infections of the _____ tract.

44. If injected, Neomycin may cause severe kidney damage and _____ loss.

45. The trade name for Lincomycin HCl Monohydrate is _____.

46. Cephalothin (Keflin) is a broad spectrum antibiotic somewhat similar to the _____ group.

47. Keflin is only given by _____.

48. Kanamycin Sulfate (Kantrex) is chemically related to Neomycin and Streptomycin and can also cause _____ loss.

49. Polymixin B Sulfate is used to treat Gram _____ bacteria.

50. Nitrofurantion USP (Furadantin) and Nalidixic Acid NF (Neg Gram) are used to treat infections of the _____ tract.

51. Nalidixic Acid NF (Neg Gram) has an outstanding cure rate against Proteus infections but bacterial _____ develops rapidly.

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52. Sulfonamides are classified as either _____ or non_____

53. The systemic Sulfonamides are either rapidly or slowly _____.

54. Match the following:

_____ Sulfadiazine	a. Systemic
_____ Sulfamerazine	b. Nonsystemic
_____ Sulfamethzaine	c. Topical
_____ Sulfisoxizole (Gantrisin)	
_____ Succinylsulfathiazole (Sulfasuxidine)	
_____ Phthalysulfathiazole (Sulfathalidine)	
_____ Sulfacetamide Sodium (Sylamyd)	
_____ Mafenide. (Sulfamylon)	
_____ Salicylazosulfapyridine (Azulfadine)	
_____ Sulfameter .(Sulla)	
_____ Sulfadimethoxine (Madribon)	

55. Trisulfapyrimidines Suspension (Sulfose, Triple Sulfa) is a combination of Sulfamerazine, Sulfamethazine, and _____.

56. Because Gantrisin is very soluble, the incidence of _____ is very slight.

57. Sulfacetamide Sodium (Sulamyd) Ophthalmic Solution must be stored in the _____.

58. A topical sulfonamide used in the treatment of burns is _____.

59. Azulfadine is nonsystemic and used in the treatment of _____.

60. Those agents which kill or inhibit fungi are called _____.

61. Amphotericin B USP is used both systemically and topically and has the widest _____ of antifungal activity of all the systemic antifungal drugs.

62. Griseofulvin (Fulvicin, Grifulvin, Grisactin) is an _____ antifungal agent that is used in the treatment of superficial fungus infections.

63. Griseofulvin is very effective in the treatment of a skin disease called _____ worm.

64. Nystatin USP (Mycostatin) is used both systemically and topically. It is used orally to treat intestinal _____.

65. Tolnaftate USP (Tinactin) is applied locally and affects those diseases of the skin that are susceptible to _____ therapy.

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66. Undecylenic Acid NF has the trade name of _____.

67. The three categories of Antiprotozoals are the Antimalarials, _____,
_____, and miscellaneous Antiprotozoals.

68. Match the following:

_____ Chloroquine

_____ Carbarsone

_____ Diiodohydroxyquin

_____ Emetine HCl

_____ Iodochlorhydroxyquin

_____ Paromomycin Sulfate NF

a. No trade name given

b. Diodoquin, Floraquin

c. Humatin

d. Vioform

e. Aralen

69. Because Emetine HCl is concentrated and stored in the liver, it is highly effective in
the treatment of amebic _____.

70. Idochlorhydroxyquin USP (Vioform) and Diiodohydroxyquin USP (Diodoquin, Floraquin) are
nonsystemic and are effective in the treatment of _____ amebiasis.

71. A patient should be cautioned about drinking _____ beverages
when taking Metronidazole USP (Flagyl).

72. Tryparsamide USP XVII is an antiprotozoal agent that can cause _____.

73. Those drugs used to combat any type of helminthiasis are called _____.

74. Antimony Potassium Tartrate USP is used in the treatment of _____
flukes and the patient may exhibit the effects of heavy metal poisoning during treatment.

75. Bephenium Hydroxynaphthoate (Alcopara) is the drug of choice in the treatment of
_____.

76. Diethyl Carbamazine Citrate USP has the trade name of _____
and is used to treat roundworms.

77. Hexylresorcinol NF (Crystoids) can cause a painful ulceration of the oral mucous
membrane and caustic burns if the pills are not swallowed _____.

78. Lucanthone HCl USP is used to treat blood and liver _____.

79. Piperazine Citrate USP (Antepar Citrate) and Pyrivinium Pamoate USP (Povan) are the
drugs of choice in the treatment of _____.

80. In addition to treating _____, Antepar is also effective in
the treatment of roundworms.

81. A _____ is highly
acceptable to the patient when taking Povan, but the drug colors the stools and teeth
bright red.

82. Tetrachloroethylene USP is used in the treatment of hookworms, _____,
pinworms, and flukes.

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83. An agent that destroys the itch mite and eggs on the skin of man is called a
_____.

84. Gamma Benzene Hexachloride (Kwell, Lindane) is a pediculocide and a _____.

85. Benzyl Benzoate USP (Zylate) Crotamiton BP (Eurax) and Precipitated Sulfur USP are
classed as _____.

86. Pediculocides are agents that destroy body _____ and their eggs.

87. Gamma Benzene Hexachloride (Kwell, Lindane) and Chlorophenothane (DDT) are effective
_____.

88. Agents that kill microbes on contact are called _____ and are
classified into two categories called Antiseptics and Disinfectants.

89. Antiseptics are applied to _____ _____ to kill or
prevent the growth of pathogens.

90. Disinfectants are used on _____ _____ to kill or
prevent the growth of pathogens.

91. Which germacide has a residual effect that is destroyed only by organic solvents?
_____

92. Methenamine Mandelate USP (Mandelamine) is a urinary tract antiseptic that depends upon
the liberation of _____ for its action.

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DRUGS ACTING ON THE CENTRAL NERVOUS SYSTEM

QUESTIONS

Divisions of the Central Nervous System (CNS) and their Functions

1. The CNS is composed of the _____ and the _____
_____

2. Sites of consciousness, memory, and sensation are located in the _____
_____

3. The part of the CNS which relays sensory impulses from the body to sensory areas of the brain is known as the _____.

4. The part of the CNS which regulates body temperature is known as the _____.

5. The _____, _____, and _____ control centers are located in the medulla oblongata.

6. The _____ controls posture and coordinates motor responses concerned with maintenance of equilibrium.

7. What are the two functions of the spinal cord?

   a. _____

   b. _____

Central Nervous System Stimulants

8. List the two categories of CNS stimulants.

   a. _____

   b. _____

9. List the three types of general stimulants according to the site of action.

   a. _____

   b. _____

   c. _____

10. In therapeutic doses, medullary stimulants are used to stimulate the _____ center. Overdose may produce _____.

11. Aromatic Spirit of Ammonia is a _____ stimulant. It indirectly stimulates the respiratory center by _____ of the nose and throat.

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12. Strychnine is a _____ _____ stimulant. In large doses it causes _____.

13. Cerebral stimulants such as Amphetamine are used primarily to _____ the mood and _____ mental alertness.

14. In large doses, cerebral stimulants also stimulate the _____.

15. Match the generic names in column A with the classifications in column B.

Column A

_____ Nikethamide

_____ Aromatic Spirit of Ammonia

_____ Pentylenetetrazol

_____ Strychnine

_____ Doxapram

_____ Caffeine

_____ Amphetamine

Column B

a. Reflex stimulant

b. Medullary stimulant

c. Cerebral stimulant

d. Spinal cord stimulant

16. Therapeutic doses of the medullary stimulants act specifically on the _____ _____ center within the medulla.

17. Hypnotics are agents which induce _____.

18. Agents which produce a calming or quieting effect without sleep are called _____.

19. Barbiturates are classified according to their _____ and _____ of action.

20. List the four classes of barbiturates.

a. _____

b. _____

c. _____

d. _____

21. In barbiturate poisoning, death is due to _____.

22. List two barbiturates which are of particular value in controlling epileptic seizures.

a. _____

b. _____

23. Long action barbiturates are used mainly as _____ while short acting barbiturates are used mainly for their _____ effects.

24. Ultra short acting barbiturates are used primarily for _____.

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25. Short acting barbiturates are used to produce sedation when given prior to
_____.

26. Match the barbiturates in column A with the durations of action in column B.

Column A

_____ Pentobarbital

_____ Phenobarbital

_____ Amobarbital

_____ Thiopental

_____ Mephobarbital

_____ Secobarbital

Column B

a. Long acting

b. Ultra short acting

c. Intermediate acting

d. Short acting

27. List the generic name of three nonbarbiturate sedative-hypnotic drugs.

a. _____

b. _____

c. _____

28. _____ are the most widely used sedative-hypnotic drugs.

Antiepileptic Drugs

29. Epilepsy is characterized by muscular _____, or by transient episodes of sensory or psychic _____, and loss of _____.

30. List the two types of epilepsy which are described in this lesson.

a. _____

b. _____

31. List the characteristics of Grand Mal and Petit Mal epilepsy.

Grand Mal

a. _____   d. _____

b. _____   e. _____

c. _____   f. _____

Petit Mal

a. _____

b. _____

c. _____

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32. Match the drugs in column A with the type of epilepsy they control in column B.

Column A

_____ Diphenylhydantoin

_____ Phenobarbital

_____ Trimethadione

_____ Mephobarbital

_____ Ethosuximide

Column B

a. Grand Mal

b. Petit Mal

33. State the mode of action for drugs used in the treatment of Grand Mal epilepsy.

a. _____

b. _____

General Anesthetics

34. List the three primary actions produced by general anesthetics.

a. _____

b. _____

c. _____

35. List the four stages of general anesthesia.

a. _____ c. _____

b. _____ d. _____

36. List the two major classes of general anesthetics and their routes of Administration.

a. _____

b. _____

37. _____ anesthetics are not metabolized and are readily removed from the body.

38. _____ anesthetics are metabolized and are not readily removed from the body.

39. Intravenous anesthetics have a _____ analgesic effect. They are used only for _____ procedures.

40. Basal anesthetics are used to produce _____ prior to administration of general anesthetics.

41. Preanesthetic medication prepares the patient for surgery in the following ways.

   a. _____

   b. _____

   c. _____

   d. _____

42. A major drawback of Ether and several other inhalation anesthetics. is the danger of

_____

43. Cyclopropane and Chloroform sensitize the heart to _____.

44. Match the general anesthetics in column A with the classes in column B.

   Column A

   _____ Thiopental

   _____ Chloroform

   _____ Halothane

   _____ Cyclopropane

   _____ Ether

   Column B

   a. Inhalation

   b. Intravenous

45. When using nitrous oxide there is a danger of _____ due to its weak anesthetic potency.

Analgesics

46. Analgesics are drugs used to relieve _____ without causing the patient to lose _____.

47. Nonnarcotic analgesics _____ elevate body temperature. This is. called an _____ effect.

48. Nonnarcotic analgesics are effective in pain arising from skeletal _____. They are ineffective in relieving _____ pain.

49. Analgesics such as Aspirin are also used to relieve symptoms of _____ fever.

50. Salicylates such as Aspirin and Sodium Salicylate have _____ and _____ effects.

51. Aniline derivatives such as Phenacetin produce a condition of the blood known as _____ after long periods of high dosage.

52. Pyrazolon derivatives such as Phenylbutazone and Oxyphenbutazone produce a condition of the blood known as _____ after long periods of high dosage.

53. Colchicine is used to relieve pain in acute _____.

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54. Match the generic names in column A with the drug groupings in column B.

Colunm A

_____ Acetominophen

_____ Phenylbutazone

_____ Acetylsalicylic acid

_____ Phenacetin

_____ Indomethacin

_____ Ethoheptazine

_____ Oxyphenbutazone

_____ Propoxyphene

Column B

a. Salicylate

b. Aniline derivation

c. Pyrazole derivative

d. Miscellaneous

Analgesics - Narcotic

55. Narcotic analgesics differ from nonnarcotic analgesics in that they produce
_____, _____, and _____.

56. Morphine is effective in almost all types of pain, but is used primarily for
_____ pain.

57. Match the sites of action in column A with the effects of Morphine in column B.

Column A

_____ Respiratory center

_____ Vomiting center

_____ Cough center

_____ Pupils

_____ Gastrointestinal tract

_____ Spinal cord

_____ Pain center

Column B

a. Stimulation

b. Depression

c. Constriction

d. Constipation

58. Death in narcotic overdose is usually due to _____.

59. Codeine is most widely used in _____ preparations.

60. Naloxone and Levallorphan are narcotic _____.

61. Apomorphine is used for its _____ effects.

62. Meperidine and Methadone are _____ opiates.

63. _____ is used in the treatment of Heroin addiction.

64. Match the generic names in column A with the drug groupings in column B.

Column A

_____ Camphorated opium tincture

_____ Hydromorphone

_____ Naloxone

_____ Meperidine

_____ Codeine

_____ Levallorphan

_____ Methadone

_____ Apomorphine

Column B

a. Opiate alkaloid

b. Semi-synthetic opiate

c. Synthetic or nonopiate narcotic

Psychotherapeutic Drugs

65. List the two types of mental illness.

a. _____

b. _____

66. _____ constitutes the lesser degree of mental illness, and are those for which commitment to a mental institution is usually not necessary.

67. List the two types of neuroses.

a. _____

b. _____

68. _____ constitutes a more severe degree of mental illness, and are those for which commitment to a mental institution is usually necessary.

69. An example of organic psychosis would be _____

70. Two examples of functional psychosis are _____ and _____

71. The two major types of drugs used to treat mental illness are _____ and _____.

72. Tranquilizers have a _____ effect without dulling the senses.

73. Major tranquilizers are used to treat _____; whereas, minor tranquilizers are used to treat _____.

74. Phenothiazine derivatives are used in the treatment of _____ and for relief of _____ and _____.

75. _____ is an example of a phenothiazine.

76. Chlordiazepoxide and Diazepam are _____ tranquilizers and are used to treat _____.

77. Antidepressants are used in mental illness when the predominant emotional symptom is _____.

78. List the two major classes of antidepressant drugs.

a. _____

b. _____

79. List the generic name of drugs used in the treatment of depression.

a. _____

b. _____

c. _____

d. _____

e. _____

80. List the major and minor tranquilizers.

Minor Tranquilizers

a. _____

b. _____

c. _____

d. _____

Major Tranquilizers

Nonphenothiazine derivatives

a. _____

b. _____

Phenothiazine derivatives

a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

DRUGS ACTING ON THE AUTONOMIC NERVOUS SYSTEM

QUESTIONS

1. The autonomic nervous system is a _____ system innervating visceral organs.

2. The sympathetic and parasympathetic divisions of the ANS innervate the following structures.

    a. _____

    b. _____

    c. _____

3. Preparing the body for fight, flight and fright is the general function of the _____ division.

4. Acting to protect, conserve and store body energy is the general function of the _____ division.

5. The sympathetic division of the ANS has (long/short) preganglionic fibers.

6. The parasympathetic division of the ANS has (long/short) postganlionic fibers.

7. The neurohormone between the postganglionic fiber and effector organ in the sympathetic division of the ANS is _____

8. The neurohormone between the postganlionic fiber and effector organ in the parasympathetic division of the ANS is _____

9. State the effects of the sympathetic and parasympathetic system on the following body structures.

	SYMPATHETIC	PARASYMPATHETIC
a. Cardiac Muscle		
(1) Rate	_____	_____
(2) Force of Contraction	_____	_____
b. Smooth Muscle		
(1) Gastrointestinal System		
(a) Peristalsis	_____	_____
(b) Sphincters	_____	_____
(2) Blood Vessels		
(a) Gastrointestinal	_____	_____
(b) Skeletal Muscle	_____	_____
(c) Skin	_____	_____
(d) Coronary Vessel	_____	_____

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c. Gland Secretion

    (1) Sweat   _____ _____

    (2) Gastrointestinal, Nasal
            and Lacrimal   _____ _____

d. Blood Pressure   _____ _____

e. Mental Activity   _____ _____

f. Metabolism   _____ _____

g. Pupils   _____ _____

10. Match the following.

    _____ Sympathomimetic   a. Cholinergic blocking agent

    _____ Sympatholytic   b. Adrenergic agent

    _____ Parasympathomimetic   c. Adrenergic blocking agent

    _____ Parasympatholytic   d. Cholinergic agent

11. List in the blanks below whether the following class of ANS drugs have a
sympathetic effect or parasympathetic effect.

    a. Sympathomimetic _____

    b. Sympatholytic _____

    c. Parasympathomimetic _____

    d. Parasympatholytic _____

12. Sympathomimetic drugs produce _____ of sympathetic receptor sites.

13. Supply the uses for the following sympathomimetic drugs.

    a. Epinephrine   (1) _____

                           (2) _____

                           (3) _____

                           (4) _____

    b. Levarterenol   _____

    c. Metaraminol   _____

    d. Isoproterenol   (1) _____

                           (2) _____

e. Ephedrine   (1) _____

                            (2) _____

                            (3) _____

                            (4) _____

f. Phenylephrine   (1) _____

                            (2) _____

                            (3) _____

                            (4) _____

g. Phyenylpropanalamine   (1) _____

                            (2) _____

h. Dextroamphetamine   (1) _____

                            (2) _____

                            (3) _____

i. Diethylpropion   _____

j. Tetrahydrozoline   (1) _____

                            (2) _____

k. Pseudoephedrine   _____

l. Oxymetazoline   _____

m. Xylometazoline   _____

14. The mechanism of action of sympatholytic drugs is _____ of
sympathetic receptor sites.

15. Depression of one division of the ANS produces effects similar to
_____ of the other.

16. Supply the uses of the following sympatholytic drugs.

    a. Tolazoline   _____

    b. Phentolamine   _____

    c. Propanolol   (1) _____

                            (2) _____

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17. List the two mechanisms of action for parasympathomimetic drugs.

    a. _____

    b. _____

18. Supply the uses for the following parasympathomimetic drugs.

    a. Bethanochol   _____

    b. Pilocarpine   _____

    c. Neostigmine   _____

    d. Echothiophate   _____

    e. Edrophonium'   (1) _____

                        (2) _____

19. The mechanism of action for the parasympatholytic drugs is _____
    of parasympathetic receptor sites.

20. Supply the uses for the following parasympatholytic drugs.

    a. Atropine   (1) _____

                        (2) _____

                        (3) _____

    b. Propantheline   _____

    c. Benztropine   _____

    d. Dicyclomine   (1) _____

                        (2) _____

                        (3) _____

    e. Trihexyphenidyl _____

    f. Scopalamine   (1) _____

                        (2) _____

    g. Clindinium   (1) _____

                        (2) _____

                        (3) _____

                        (4) _____

    h. Glycopyrrolate   _____

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21. Three toxic symptoms of atropine poisoning are

    a. _____

    b. _____

    c. _____

22. Muscle relaxants are defined as drugs which _____

_____

23. Centrally acting muscle relaxants block nerve impulses in the _____
and _____.

24. _____ blocking agent exert their action between the nerve and
the muscle where acetylcholine is released.

25. The sequence of muscles to be affected by the neuromuscular blocking agents are
as follows:

    a. _____

    b. _____

    c. _____

26. The drug used as an antidote for an overdose of tubocurarine is _____.

27. The two chief uses of muscle relaxants are

    a. _____

    b. _____

28. Match drugs in column A with modes of action in column B.

Column A

_____ Meprobamate

_____ Mephenesin

_____ Tubocurarine

_____ Carisoprodol

_____ Succinylcholine

_____ Chlorzoxazone

_____ Orphenadrine

_____ Methocarbamol

Column B

a. Centrally acting muscle relaxants

b. Neuromuscular blocking agents

DRUGS ACTING ON THE CIRCULATORY SYSTEM

QUESTIONS

1. The section of the heart wall which serves as a protective covering is the _____ _____.

2. The _____ is the heart muscle itself.

3. The _____ is the interior of the myocardial walls, and forms the chambers of the heart.

4. Deoxygenated blood is received into the heart in the _____ and passes to the _____ which pumps deoxygenated blood to the lungs for oxygenation. The oxygenated blood is received in the _____ and passes to the _____ where the blood is pumped throughout the body.

5. Define heart failure.

_____

_____

6. An _____ is any disturbance in the normal rhythm of the heart.

7. A heart rate of approximately 50 beats per minute would be described by the term

_____

8. A heart rate of approximately 90 beats per minute would be described by the term

_____

9. Match the following.

_____ Auricular flutter

_____ Congestive heart failure

_____ Embolism

_____ Coronary Thrombosis

_____ Symptom of Digitalis overdose

_____ Symptom of Quinidine overdose

_____ Arteriosclerosis

_____ Procainamide (Pronestyl)

_____ Nitroglycerin

_____ Pentaerythritol Tetranitrate (Peritrate)

a. 180-400 uniform beats per minute

b. Prophylactic coronary dilator

c. Transfer of an intravascular mass from point of origin

d. Cinchonism

e. Formation of a clot in coronary artery, resulting in obstruction of that vessel.

f. Administered sublingually for angina pectoris

g. Greenish-yellow vision

h. Loss of elasticity of arteries

i. Heart can't pump all blood out that is supplied to it.

j. Treatment of ventricular arrhythmias

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10. Hypertension can be divided into two classes called _____

and _____.

11. Match the following to their class of hypertension.

_____ About 90 percent of the cases   a. Primary

_____ Cause unknown   b. Secondary

_____ About 10 percent of all cases

_____ Cause well defined

12. Guanethidine Sulfate is a _____ agent.

13. Name four functions of the blood.

a. _____

b. _____

c. _____

d. _____

14. Anemia is a lack of _____ or red blood cells in the blood.

15. Match the following anemias with causes.

_____ Aplastic anemia   a. Inadequate quantities of iron for the formation of hemoglobin

_____ Pernicious anemia   b. Bone marrow ceases to function as producer of blood cells

_____ Hemolytic anemia

_____ Iron deficiency.   c. Results from excessive loss of blood

    d. Young red blood cells do not mature due to vitamin B12 deficiency

16. _____ increase the hemoglobin content of the blood.

17. List two coagulant drugs and their route of administration.

Drug	Route of Administration
a.	
b.	

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ENDOCRINE SYSTEM

QUESTIONS

1. Adrenocorticoids are secreted by the _____ of the adrenal glands.

2. The two classes of adrenal hormones are the _____ and _____.

3. Glucocorticoids have a pronounced effect on metabolism of _____, _____, and _____.

4. The output of glucocorticoids is greatly _____ during periods of physical stress.

5. Mineralocorticoids primarily affect the _____ and _____ balance of the body.

6. Mineralocorticoids cause sodium retention and _____ loss.

7. When the adrenal cortex has an abnormally low secretion, characteristic symptoms known as _____ disease develop.

8. General steroid therapy (a term to indicate glucocorticoids) is used to treat

   a. _____

   b. _____

   c. _____

   d. _____

   e. _____

9. Insulin is secreted by the beta cells of the _____.

10. Insulin regulates _____ metabolism

11. Diabetes mellitus is a condition marked by the _____ of insulin.

12. Unlike NPH and PZI Insulin, Lente Insulin contains no foreign _____.

13. Match the following insulins with their onset and durations of actions.

   _____ Onset 4 to 6 hours, duration 24-48 hours   a. Regular Insulin

   _____ Onset 2 hours, duration 16-24 hours   b. Lente Insulin

   _____ Onset 1 hour, duration 6-8 hours   c. NPH Insulin

   _____ Onset and duration same as NPH Insulin   d. PZI Insulin

14. Thyroid deficiency from birth produces dwarfism, called _____.

15. Myxedema results from severe _____ in adults.

16. _____ parathyroidism results in hypocalcemia, while _____ parathyroidism cause decalcification, a condition marked by soft and fragile bones.

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17. The antithyroid agents inhibit the synthesis of the _____ hormone.

18. The parathyroid hormone regulates the exchange of _____ between the bones and body fluids.

19. The primary female sex hormone is _____

20. Progesterone suppresses _____

21. The male sex hormones are called _____

22. (Testosterone/Methyltestosterone) is the drug of choice for oral administration.

23. Match the following.

_____ Testosterone   a. Androgen

_____ Dimethisterone with Ethinyl Estradiol   b. Estrogen

_____ Norethandrolone   c. Progesterone

_____ Norethindrone   d. Sequential oral contraceptive

_____ Estrogenic substances conjugated   e. Nonsequential oral contraceptive

_____ Norethindrone with Mestranol

_____ Ethynodiol Diacetate with Mestranol

_____ Estradiol

_____ Norethynodrel with Mestranol

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MISCELLANEOUS DRUGS

QUESTIONS

1. _____ are organic dietary substances necessary for the maintenance of normal body function.

2. Since most vitamins are not synthesized in the body, they must be supplied from

_____

3. Match the following vitamins with the appropriate classification.

_____ Vitamin B_{12} a. Water soluble

_____ Vitamin B_6 .b. Fat soluble

_____ Vitamin B_1

_____ Vitamin E

_____ Vitamin K

_____ Vitamin C

_____ Niacin

_____ Vitamin B_2

_____ Vitamin A

_____ Vitamin D

4. Nonavitamin tablets, Heptavitamin tablets, and Octavitamin drops are all used to treat.

_____

5. Match the following vitamins with the appropriate deficiency disease.

_____ Vitamin B_1 a. Megaloblastic anemia .

_____ Vitamin B_2 b. Blood coagulation

_____ Vitamin B_6 c. Pellagra and vasodilation

_____ Vitamin B_{12} d. Beri Beri

_____ Vitamin K   e. Pernicious anemia

_____ Niacin   f. Rickets

_____ Folic acid   g. Nightblindness

_____ Vitamin A   h. Nausea

_____ Vitamin D   i. Pellagra

6. A condition that exempts the body from contracting a contagious disease or which enables it to resist infection is known as _____.

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7. That immunity which normally exists in a human (species-race) is _____ immunity.

8. A specific immunity that does not occur naturally, but is induced actively or passively into the body is known as _____ immunity.

9. Two types of acquired immunity are _____ and _____.

10. _____ acquired immunity is when the body itself produces the antibodies.

11. _____ acquired immunity is a temporary immunity provided by antibodies not produced by the organism's own body cells.

12. An antibody that neutralizes a toxin is called an _____.

13. A substance that causes the formation and appearance of specific antibodies in the bloodstream is an _____.

14. Antigens produce _____ immunity.

15. Toxoids are usually modified with _____ to reduce its toxicity but not its antigenicity.

16. Match the type of drug with its definition

_____ Vaccine

_____ Toxin

_____ Toxoid

_____ Antitoxin

_____ Antisera (serum)

a. A specific antibody capable of neutralizing a specific toxin

b. Poisonous substances liberated by micro-organisms

c. Sterile solutions or suspensions of killed, or attenuated live microorganisms

d. A detoxified toxin, chemically modified to be low in toxicity but high in antigenicity

e. Blood serum of an animal or human that contains antibodies against an infectious disease

17. Match the class of drug with the type of immunity it provides.

_____ Vaccine

_____ Toxin

_____ Toxoid

_____ Antitoxin

_____ Antisera

a. Diagnostic agent

b. Passive immunity

c. Active immunity

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18. Match the tests with the appropriate disease.

_____ Schick test   a. Scarlet fever

_____ Dick test   b. Diphtheria

_____ Tuberculin, Purified   c. Tuberculosis
Protein Derivative

_____ Tine test

19. A sensitizing protein or antigen when introduced into the body gives rise to the formation of _____.

20. A _____ in blood pressure is an effect of histamine poisoning.

21. Histamine poisoning causes _____ _____ of the stomach, intestine, and uterus, therefore _____ may occur.

22. Because of its marked stimulation of gastric juice secretion, histamine is used to differentiate between true or false _____.

23. Direct antagonism of histamine is the mode of action of the _____ drugs.

24. _____ is the most common side effect of the antihistamines.

25. Two antihistamines widely used in the prevention and treatment of motion sickness are

_____ and _____.

26. Drugs that increase the rate of flow of urine are called _____.

27. Diuretics are used to _____,

_____, and, _____.

28. The four classes of diuretic drugs are

a. _____

b. _____

c. _____

d. _____

29. Hydrochlorothiazide is approximately _____ times more potent than Chlorothiazide.

30. Match the following drugs with their appropriate classification.

_____ Meralluride   a. Osmotic

_____ Mannitol   b. Acid forming salt

_____ Spironolactone   c. Mercurial

_____ Ammonium chloride   d. Carbonic anhydrase inhibitor

_____ Acetazolamide   e. Aldosterone antagonist

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31. A drug given to increase bronchial secretions and to facilitate the expulsion of sputum is classified as an _____.

32. Drugs that act to soothe acute inflammation by aiding the secretion of protective mucous are classified as _____ expectorants.

33. Drugs that act to stimulate repair in chronic inflammatory processes of the mucous membranes of the respiratory tract are called _____ expectorants.

34. Drugs that act through central depression of the cough center are classified as

_____.

35. Agents used to contract the uterus and speed delivery are referred to as _____.

36. Prolonged therapy with Ergonovine Maleate may lead to _____.

37. Methylergonovine Maleate has the same action as Ergonovine Maleate but its

_____ and _____ are greater.

38. Oxytocin acts directly on the smooth muscle to produce rhythmic contractions. Its action is more _____ and of _____ duration than that of Ergonovine.

39. _____ can be employed in the control of postpartum bleeding.

40. Organic catalysts produced by living organisms are called _____.

41. Enzymes are named using three methods.

   a.. By adding _____ to the root of the substance being acted upon.

   b. By adding _____ to the root of the reaction taking place.

   c. _____ _____; that is calling it a name without regard to anything else.

42. The enzyme that acts against Hyaluronic acid to increase the area of distribution of liquids in tissue spaces and facilitates absorption is _____.

43. An enzyme preparation used as an emergency drug to inactivate penicillin is

_____.

44. Two nitrogen mustard preparations used as antineoplastics are _____

and _____.

45.) The antineoplastic agents are sometimes referred to as _____ agents.

46. Prostate cancer is sometimes treated with _____ and

breast cancer with _____.

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GLOSSARY

PREFIXES AND SUFFIXES USED IN MEDICAL TERMINOLOGY

The following prefixes and suffixes should be studied carefully. They will be used throughout your career in the pharmacy in addition to being used in this workbook.

Prefix or Suffix	Definition	Example
a -	negative prefix (before consonants)	asepsis, asexual
an-	negative prefix (before vowels)	anaerobic
ad-	near or to	adrenal
alb-	white	albino
andro-	man	androgen
ante-	before	ante mortem, ante cibos
anti-	against (antacid - i dropped before vowels)	anticoagulant
brady-	slow	bradycardia
carcinoma	malignant tumor	
cardio	heart	electrocardiogram
cephal	head	encephalitis
cer, cera	wax	
-cid, cide	kill	bacteriacide
-cise	cut	incise, excise
contra-	against, counter	contraindication
corti-, cortex	bark, rind	cerebral cortex
cost	rib	intercostal
cuti	skin	subcutaneous
cyst	bladder, fluid filled sac	cystitis
cyt	cell	erythrocyte
dermo-, dermato	skin	dermis, dermatology
dextr	on the right	oculus dexter
dys-	bad, pain, improper	dysentery
ect-, ecto-	outside	ectoplasm, ectoparasite
ede-	swelling	edema

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Prefix or Suffix	Definition	Example
enter-	intestine	dysentery
erythro-	red	erythrocyte
extra-	outside	extracellular
-facient	make	rubifacient
febr-	fever	febrile
flav-	yellow	riboflavin
gastr-	stomach	gastritis
gloss	tongue	
glyc-, gluco-	sweet	hyperglycemia
gyn-	woman	gynecology
hemo-	blood	hemoglobin, hematology
hepat	liver	hepatitis
hist-	tissue	histology
hyper-	over, too much	hyperirritable, hypertension
hypo-	under, too little	hypotension, hypodermic
hystero-	uterus, womb	hysterectomy
-iasis	condition of	helminthiasis
inter-	between	intercostal
intra-	within	intravenous
-itis	inflammation	appendicitis
kerat	horn	keratolytic
lep-	seizing	epilepsy, narcolepsy
leuco-, leuko-	white	leukocyte
lingu	tongue	sublingual
lipo-	fat	lipid
-lysis	loosen, dissolve	hemolysis
mega-, macro	large	
micro-	small	microbe
mast	breast	mastitis

Prefix or Suffix	Definition	Example
men-	month	menstrual
myco-	fungus	mycosis
-myelo	marrow, spinal cord	osteomyelitis
myo-	muscle	myocardium
narco-	sleep	narcolepsy, narcotic
necro-	death	
neo-	new	neophyte, neonatal
nephro-	kidney	nephritis
neuro-	nerve	neuralgia, neurology
oculo-	eye	oculist, oculus dexter
-oma	tumor or swelling	hematoma
-osis	condition of	mycosis
-osteo	bone	osteology
oto	ear	otologist, otoscope, otic
path	sickness, disease	psychopathic
ped (Greek)	child	pediatrics
-penia	too few	leukopenia
-phagia	eat, swallow, speak	dysphagia
phleb-	vein	phlebitis
plasty	operative revision	rhinoplasty
post	after	post mortem postoperative
pyr-	heat	pyrogen
pseud-	false	pseudoreaction
renal	kidney	adrenal
-rrhea	flow	diarrhea
rhino	nose	rhinitis
-sclera	hard	arteriosclerosis
sep	rot, decay	sepsis
-sinister, sinistra	on the left side	oculus sinister
-stasis	stoppage	bacteriostasis
stoma	mouth	stomatitis
tach	fast	tachycardia
thromb-	lump, clot	thrombosis

Technical Training

Pharmacy Specialist

PHARMACOLOGY

(ANATOMICAL DRAWINGS)

April 1976

SCHOOL OF HEALTH CARE SCIENCES, USAF
Department of Biomedical Sciences
Sheppard Air Force Base, Texas 76311

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Department of Biomedical Sciences
School of Health Care Sciences, USAF
Sheppard Air Force Base, Texas 76311

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April 1976

PHARMACOLOGY

(ANATOMICAL DRAWINGS)
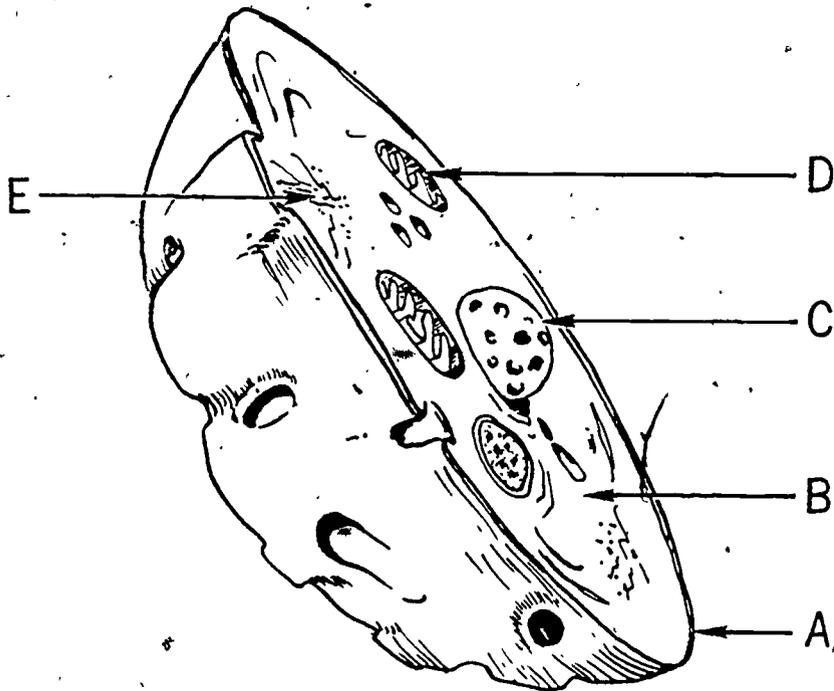
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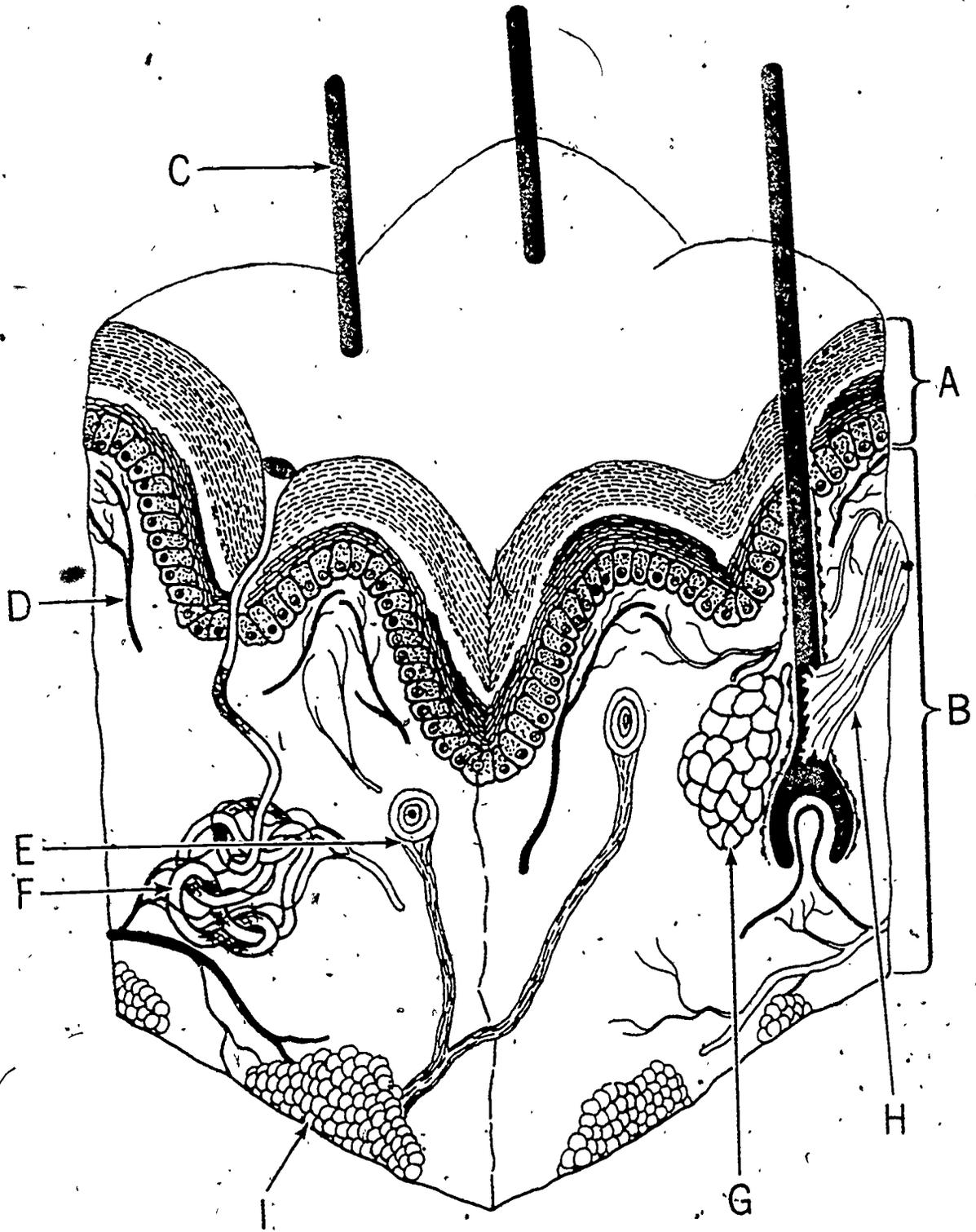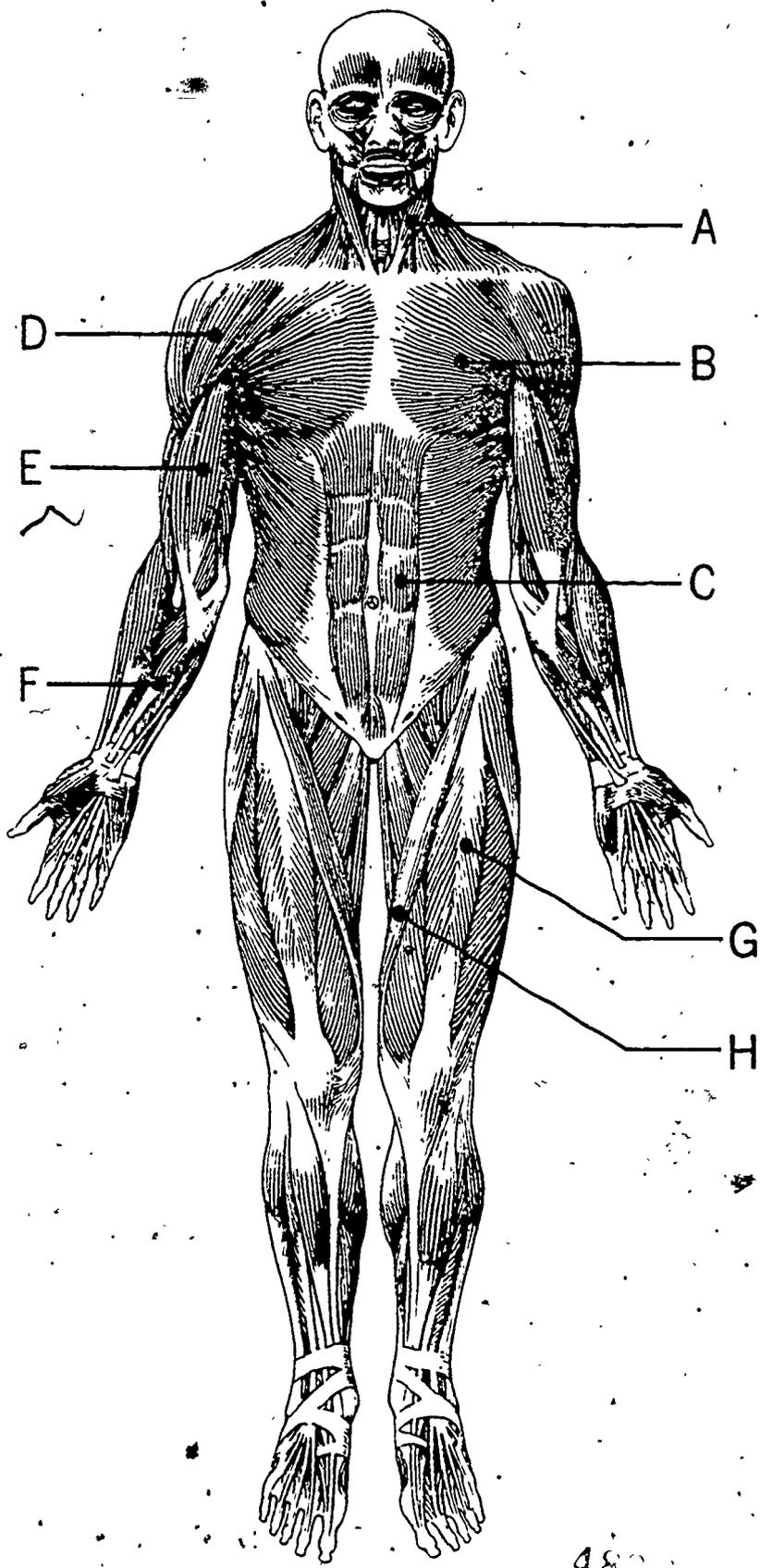
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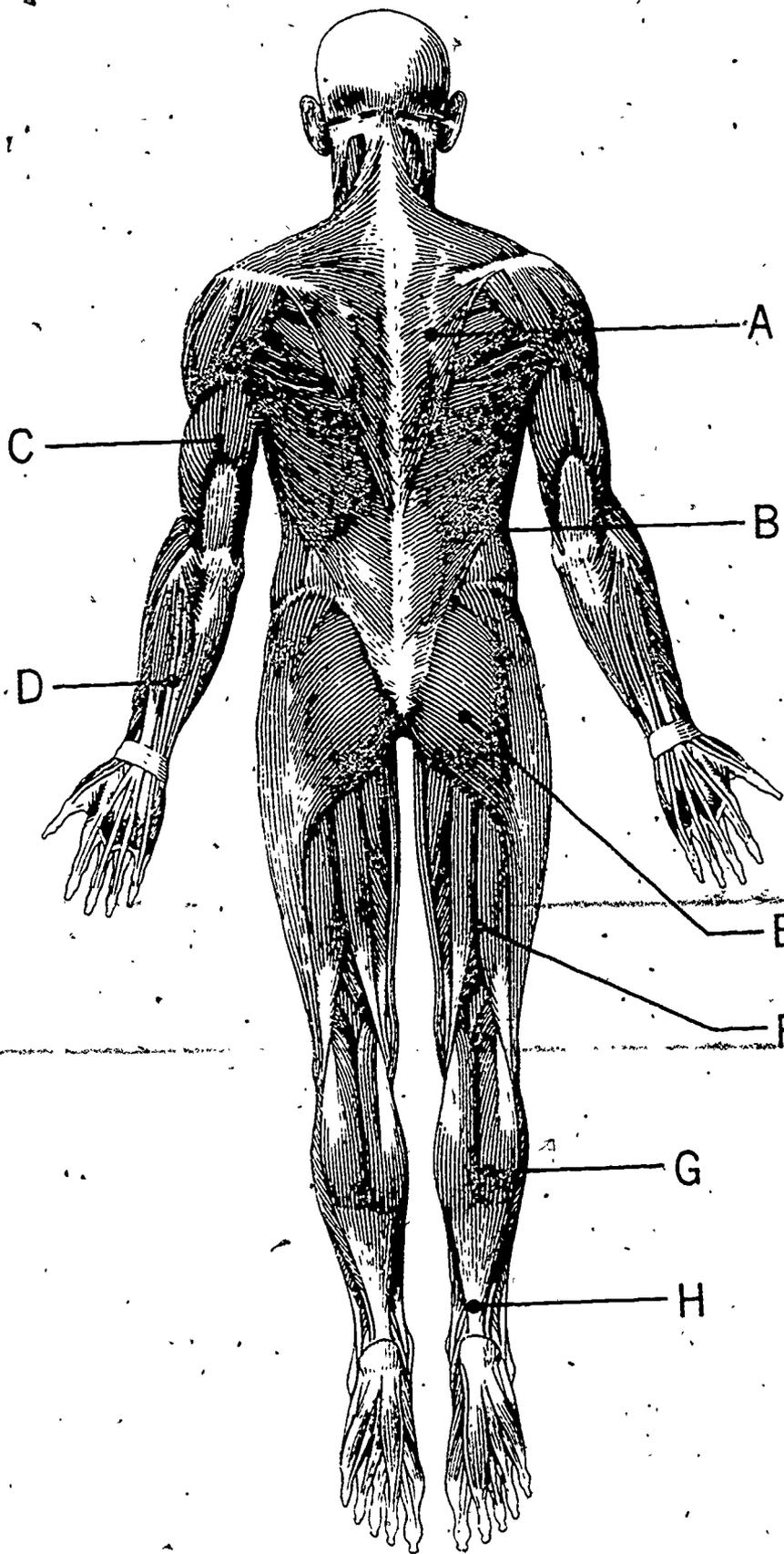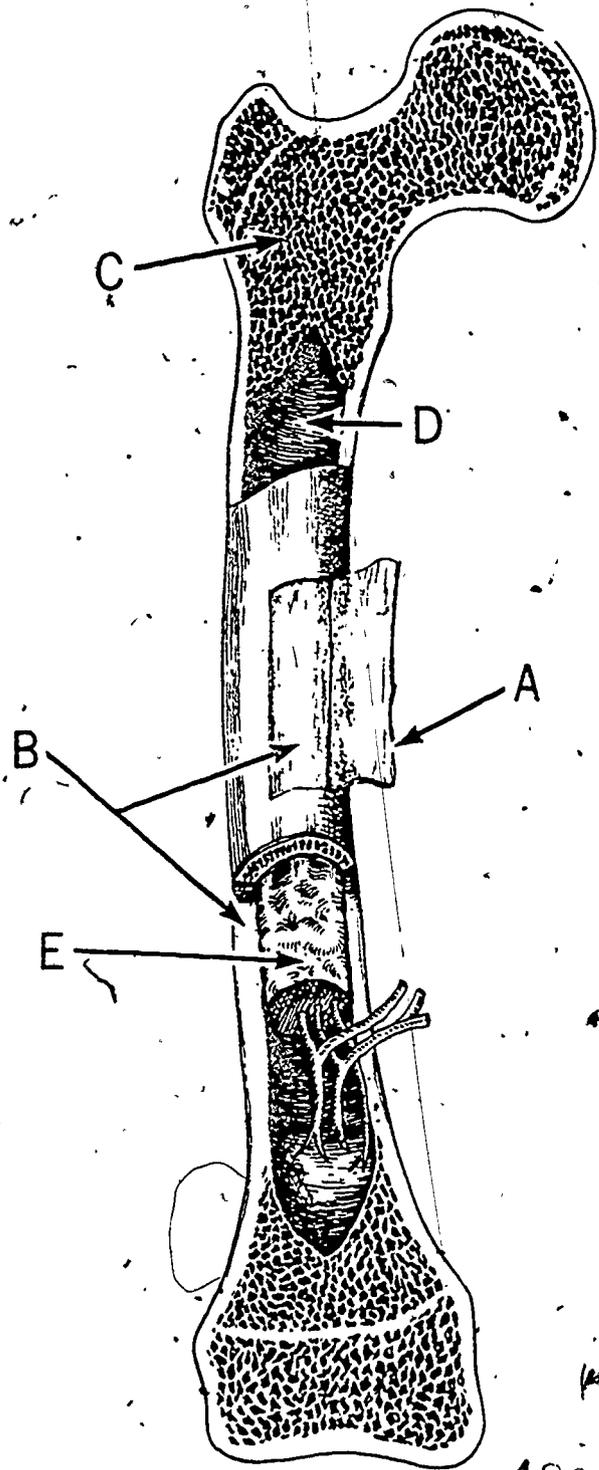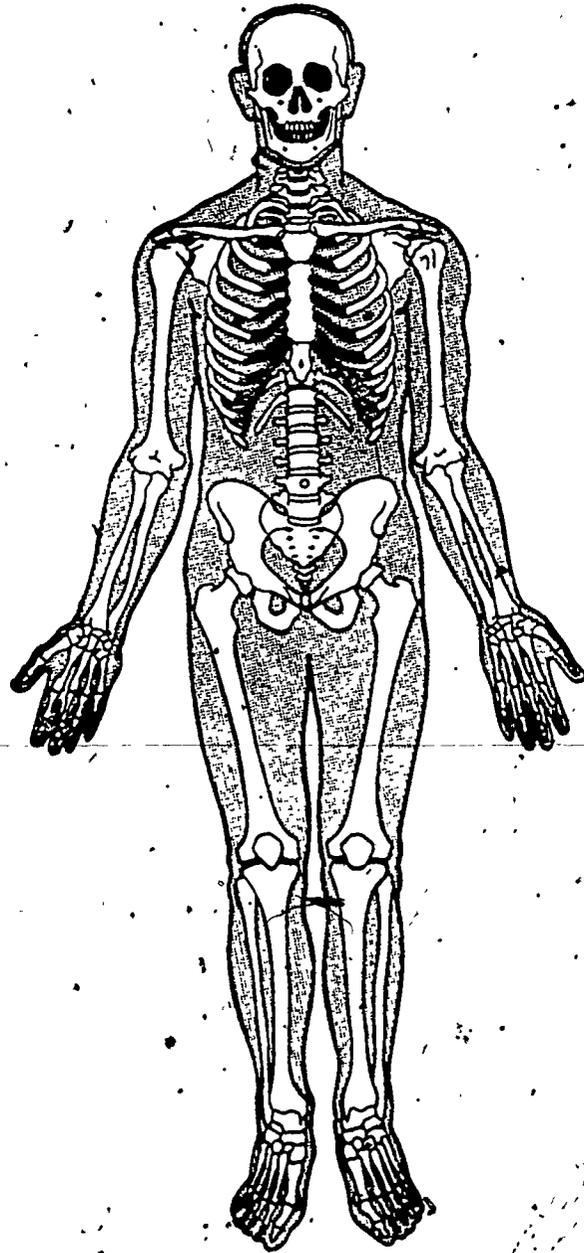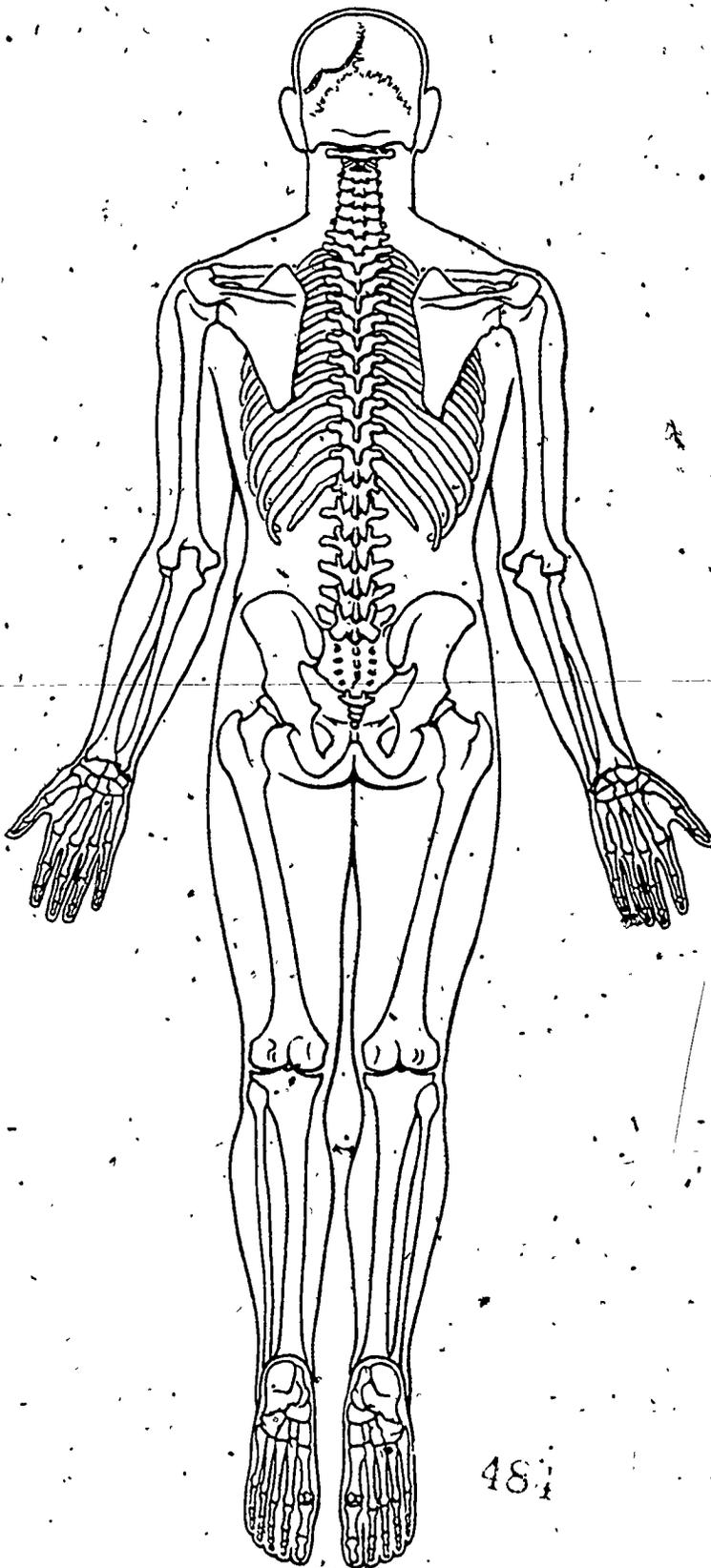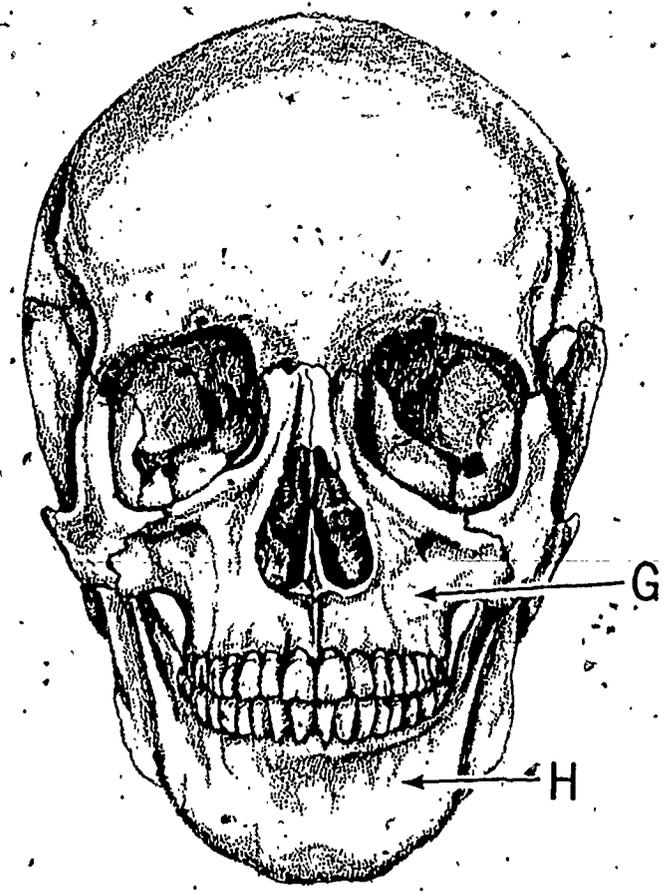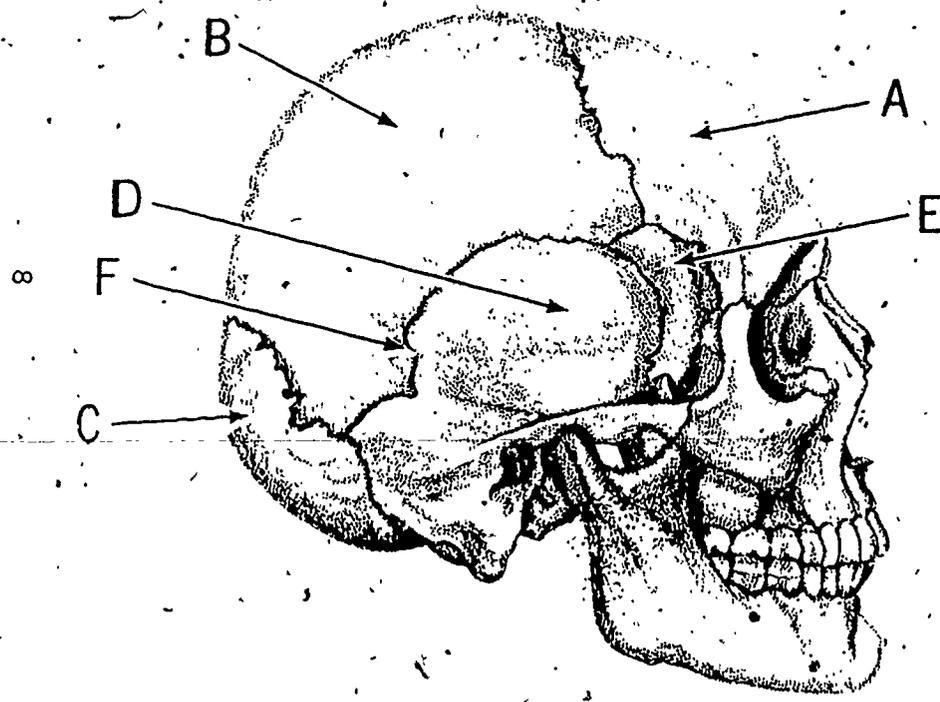
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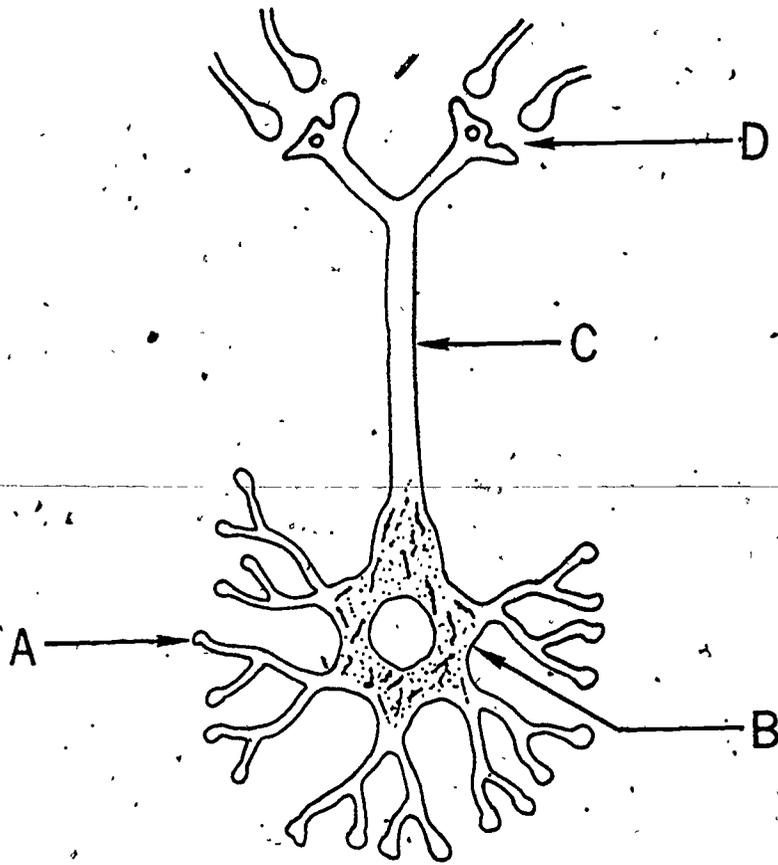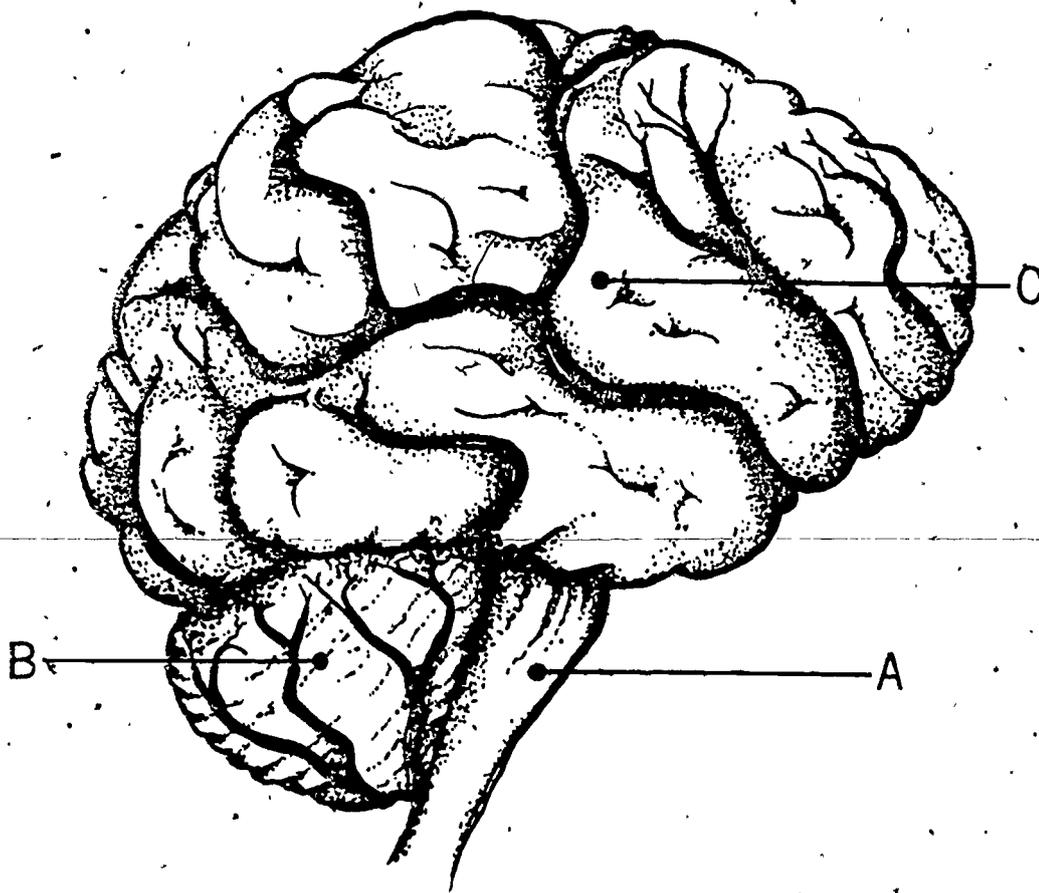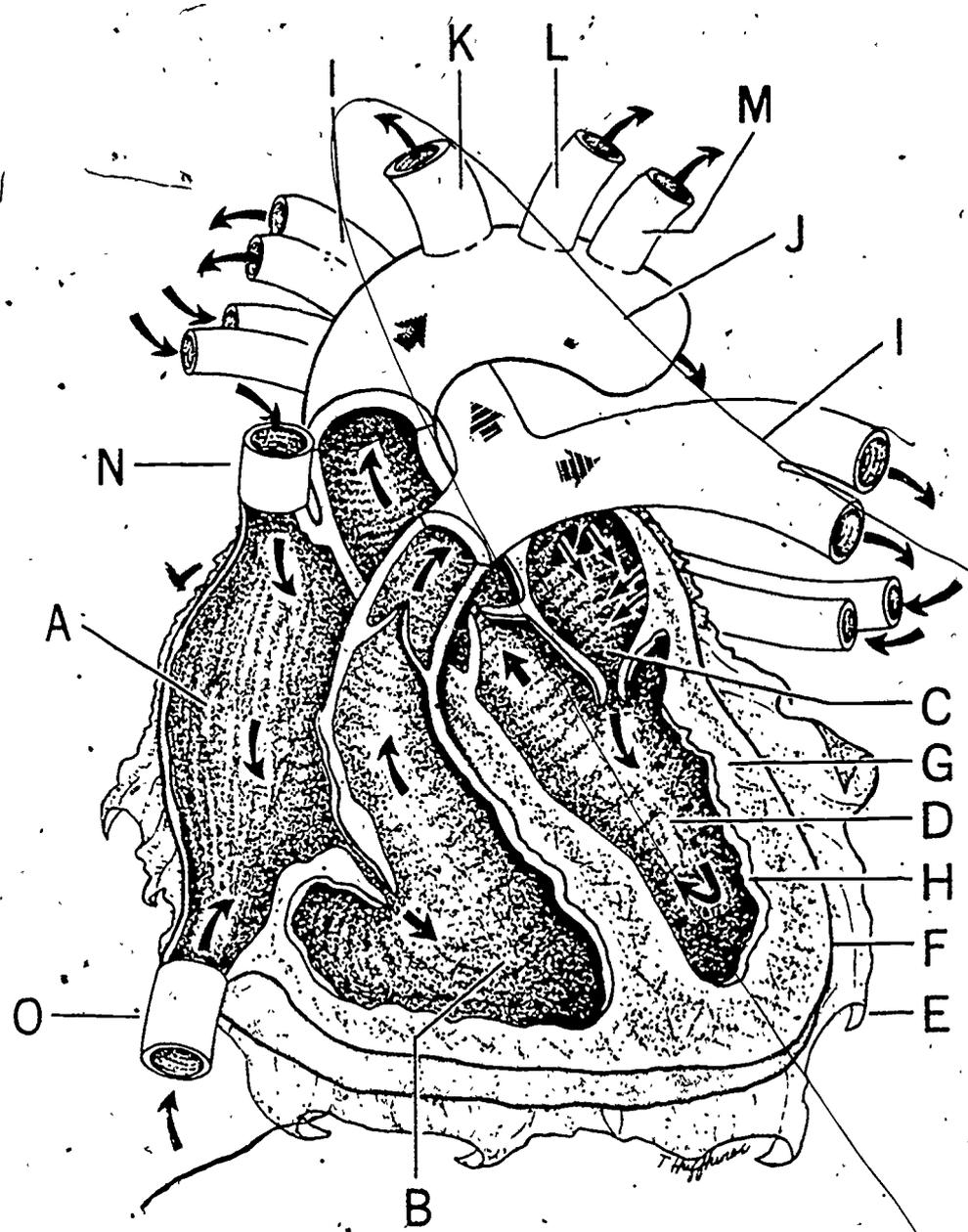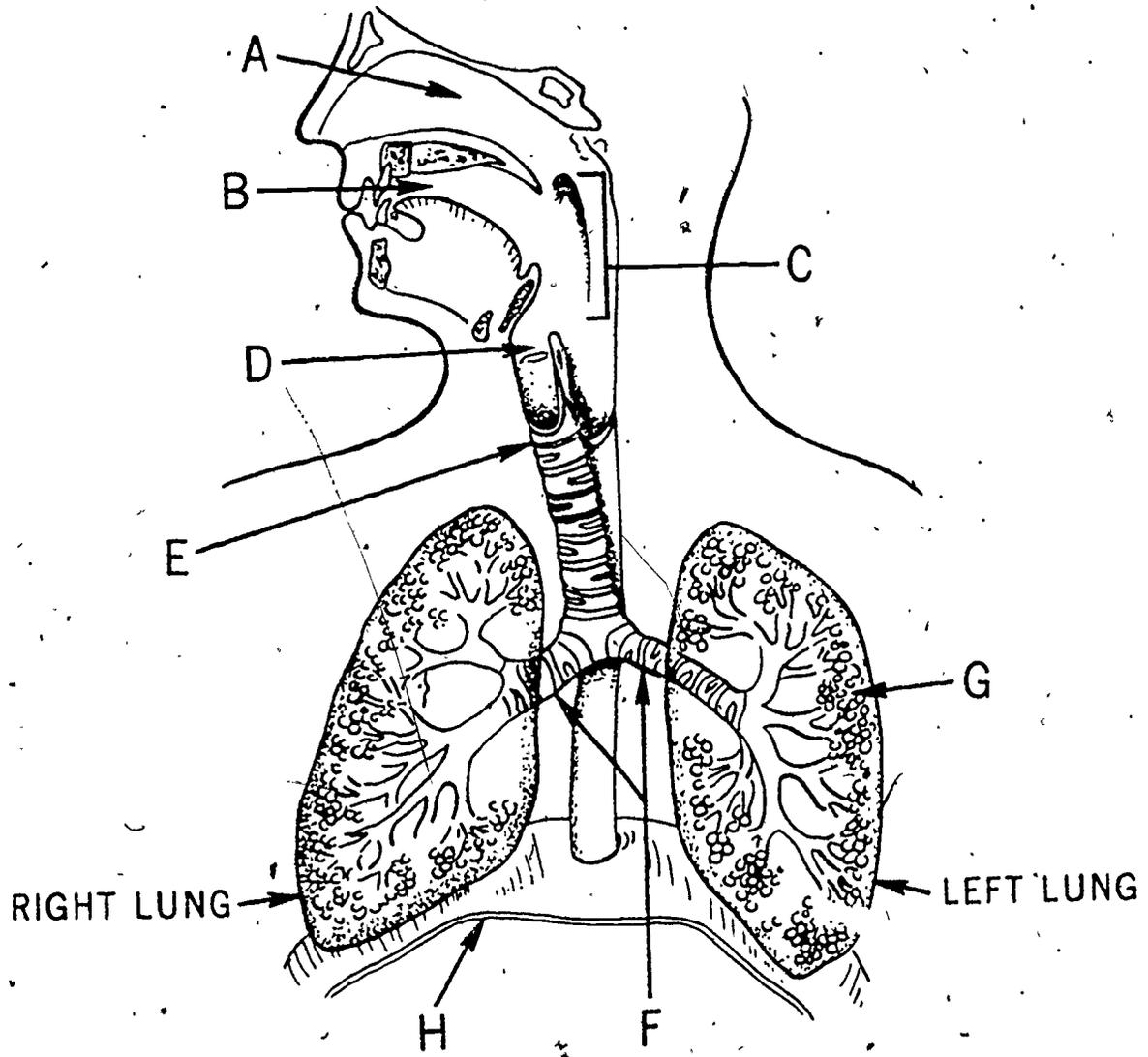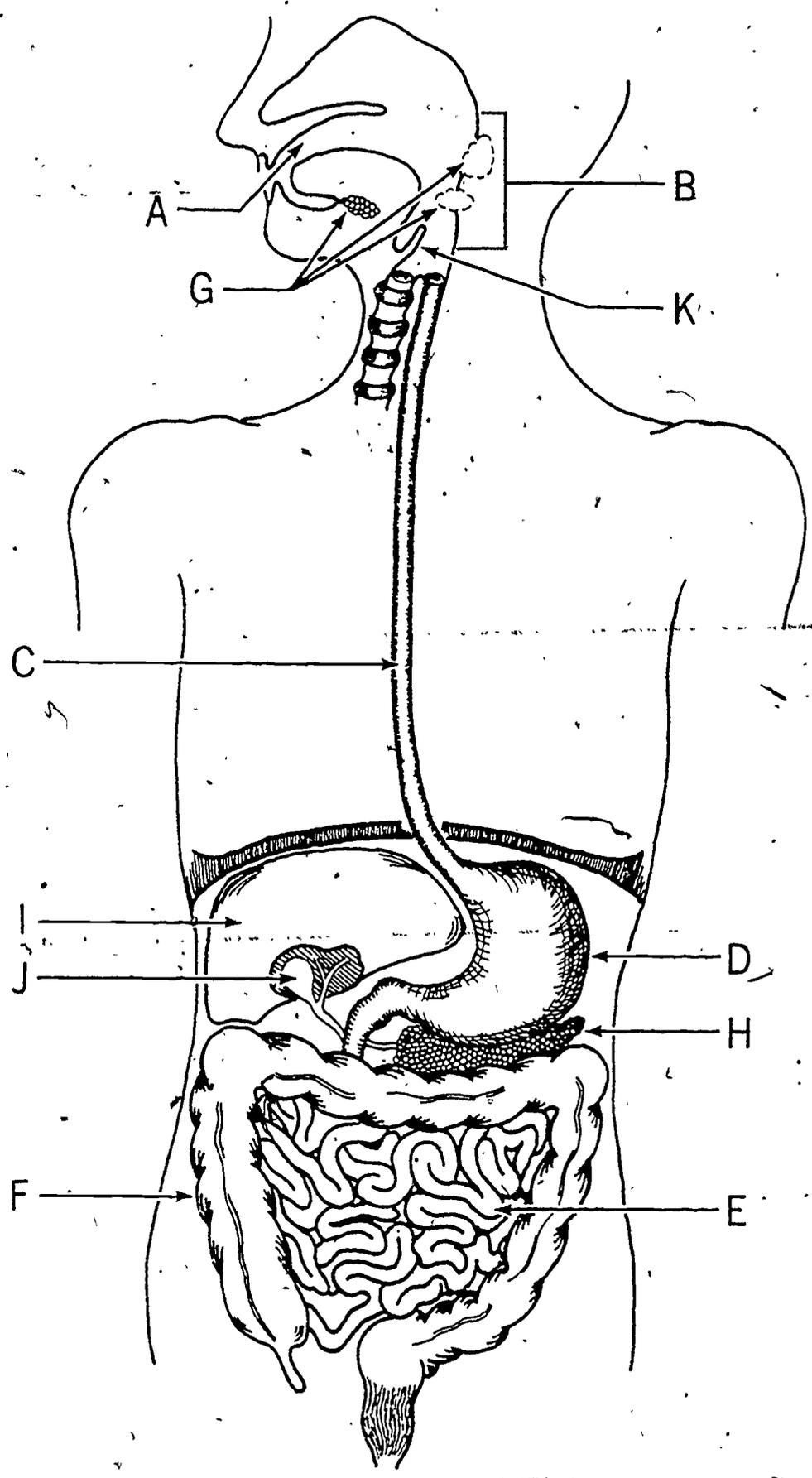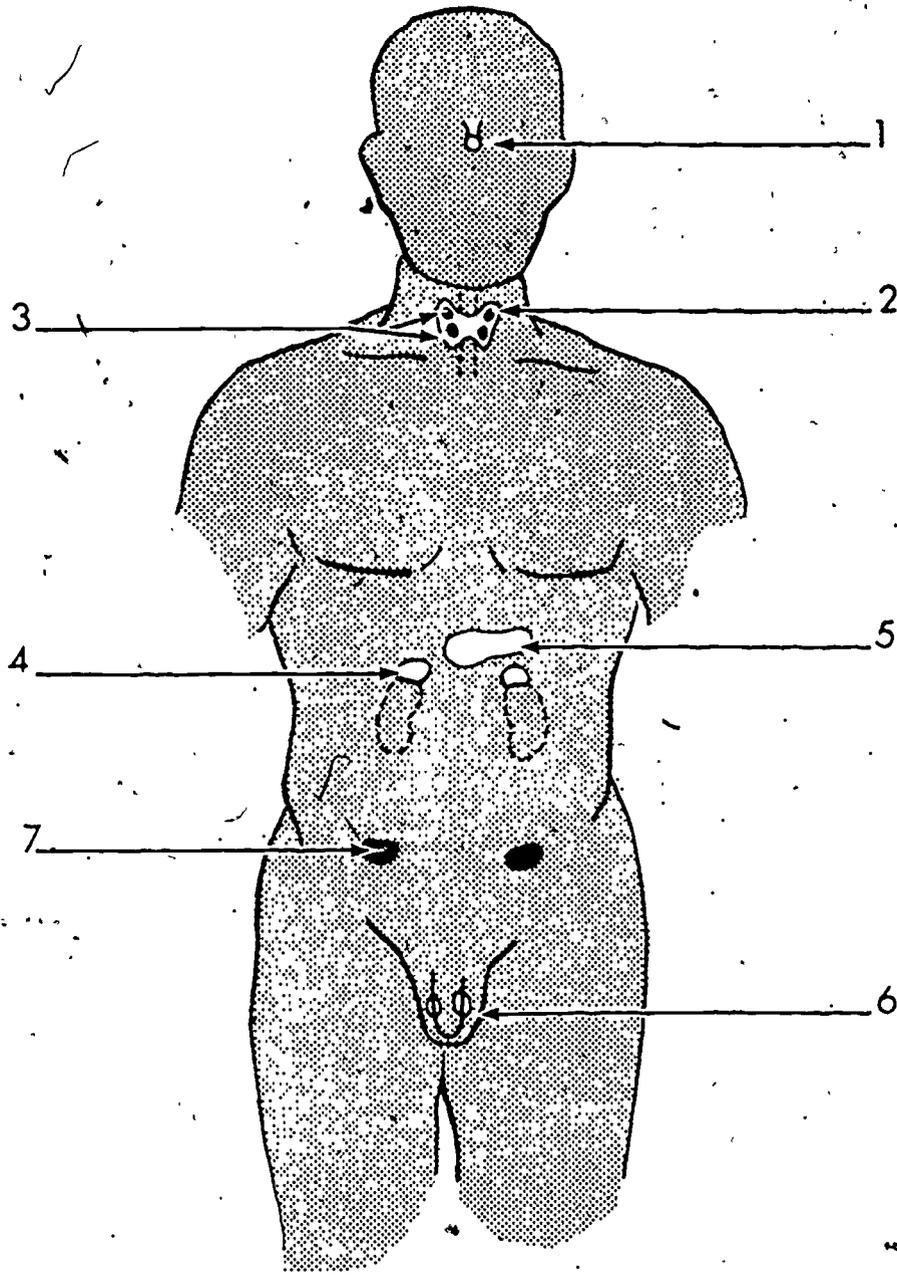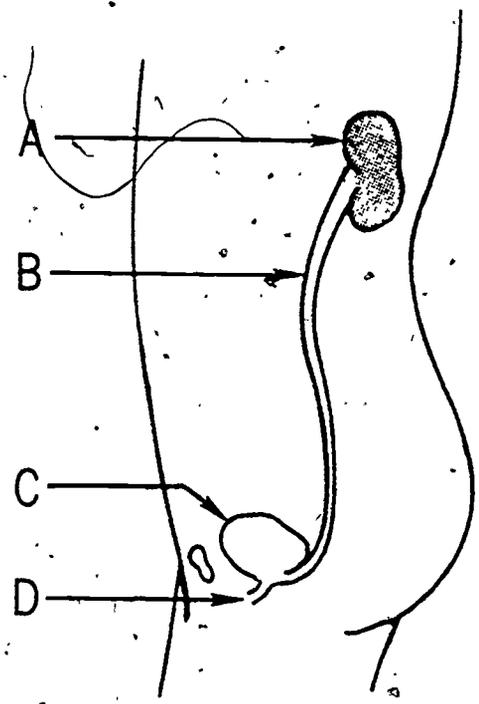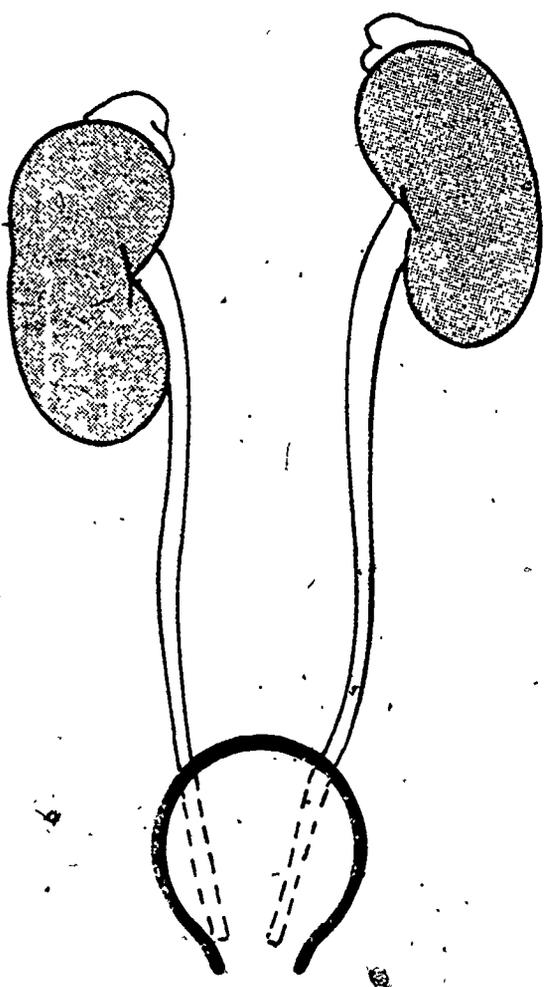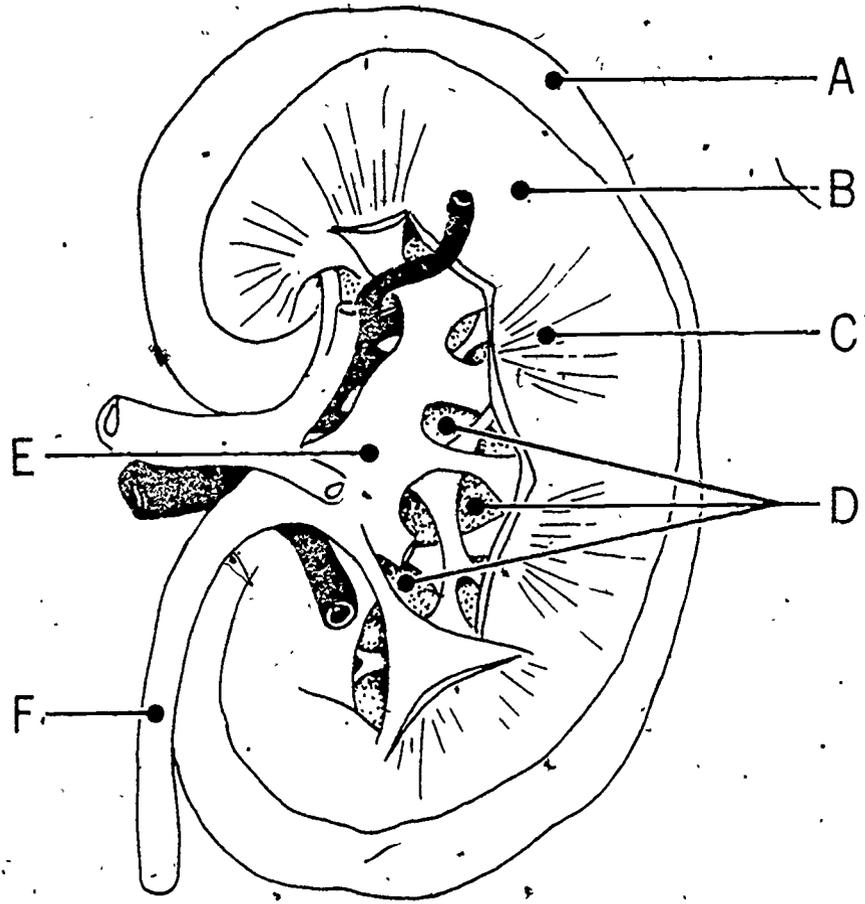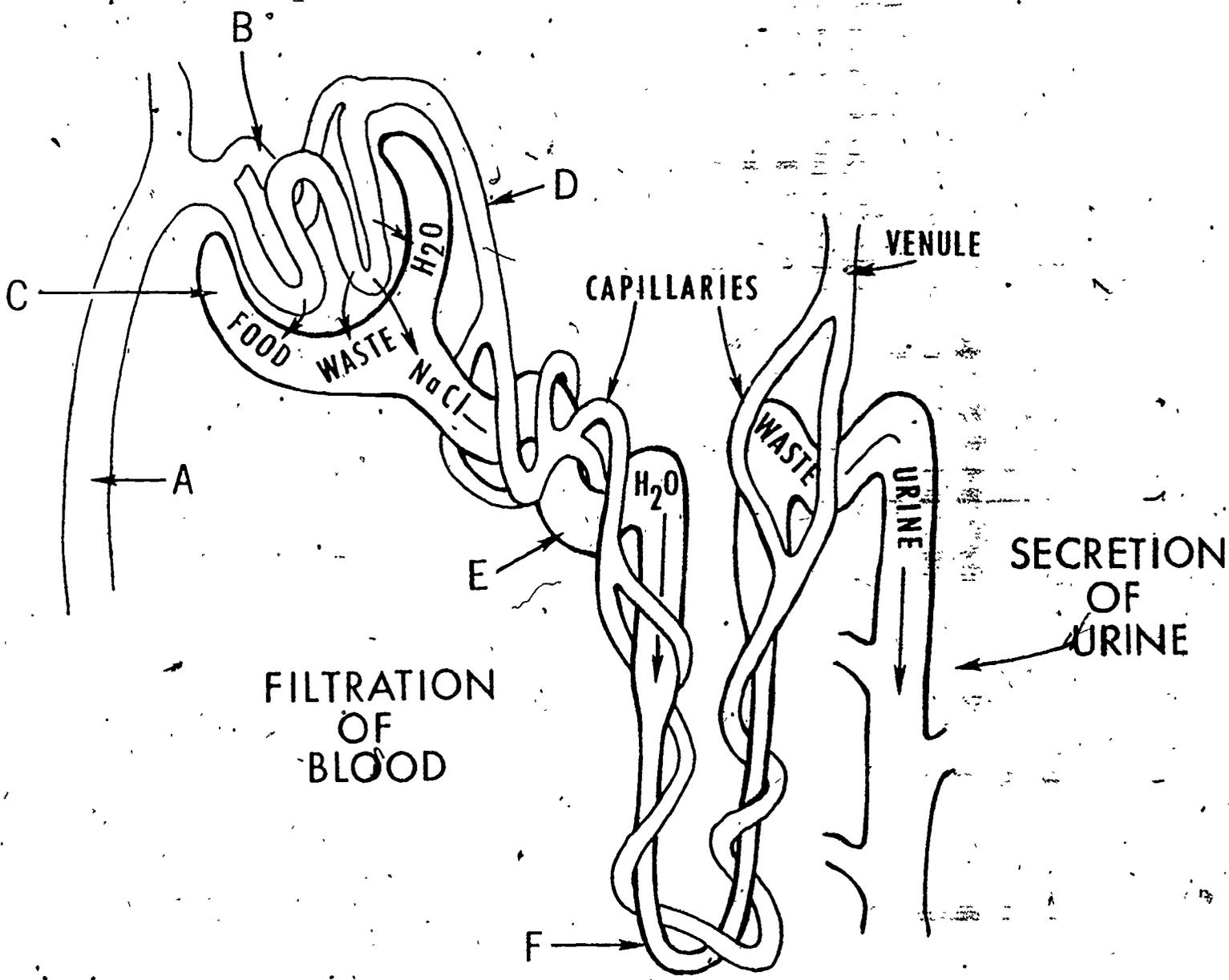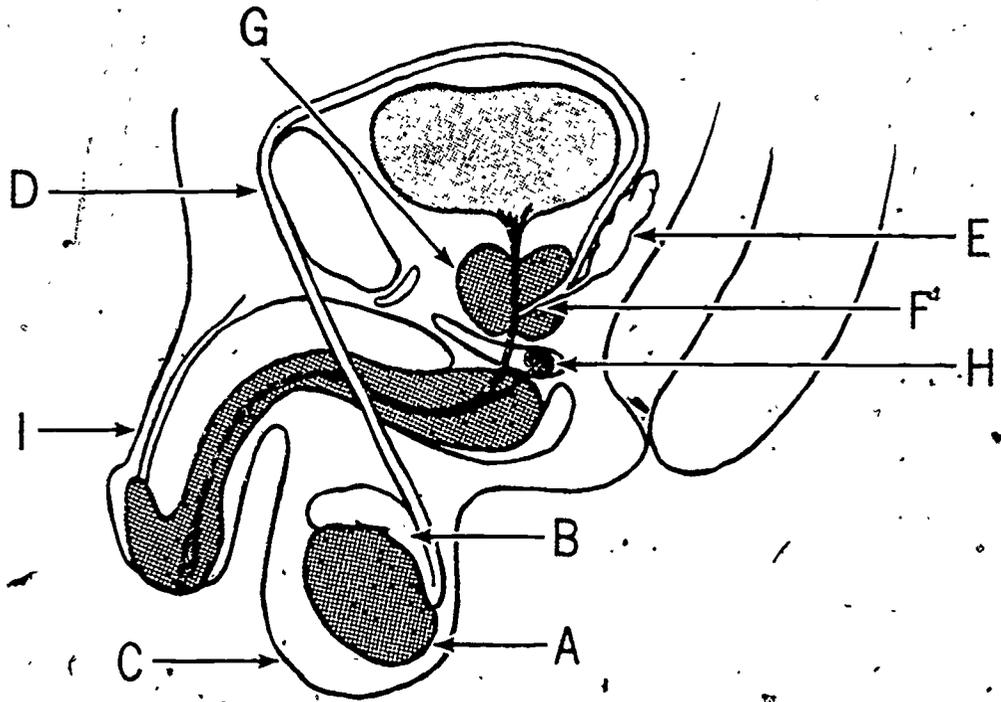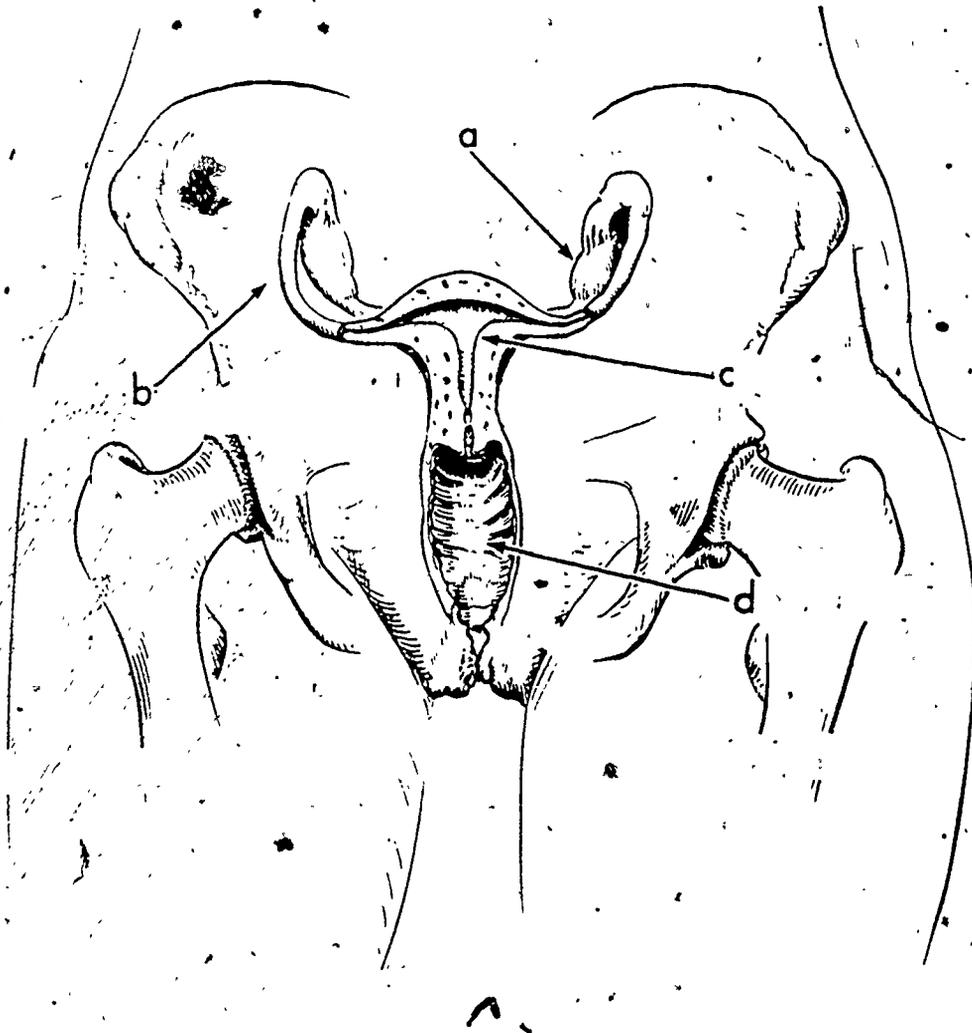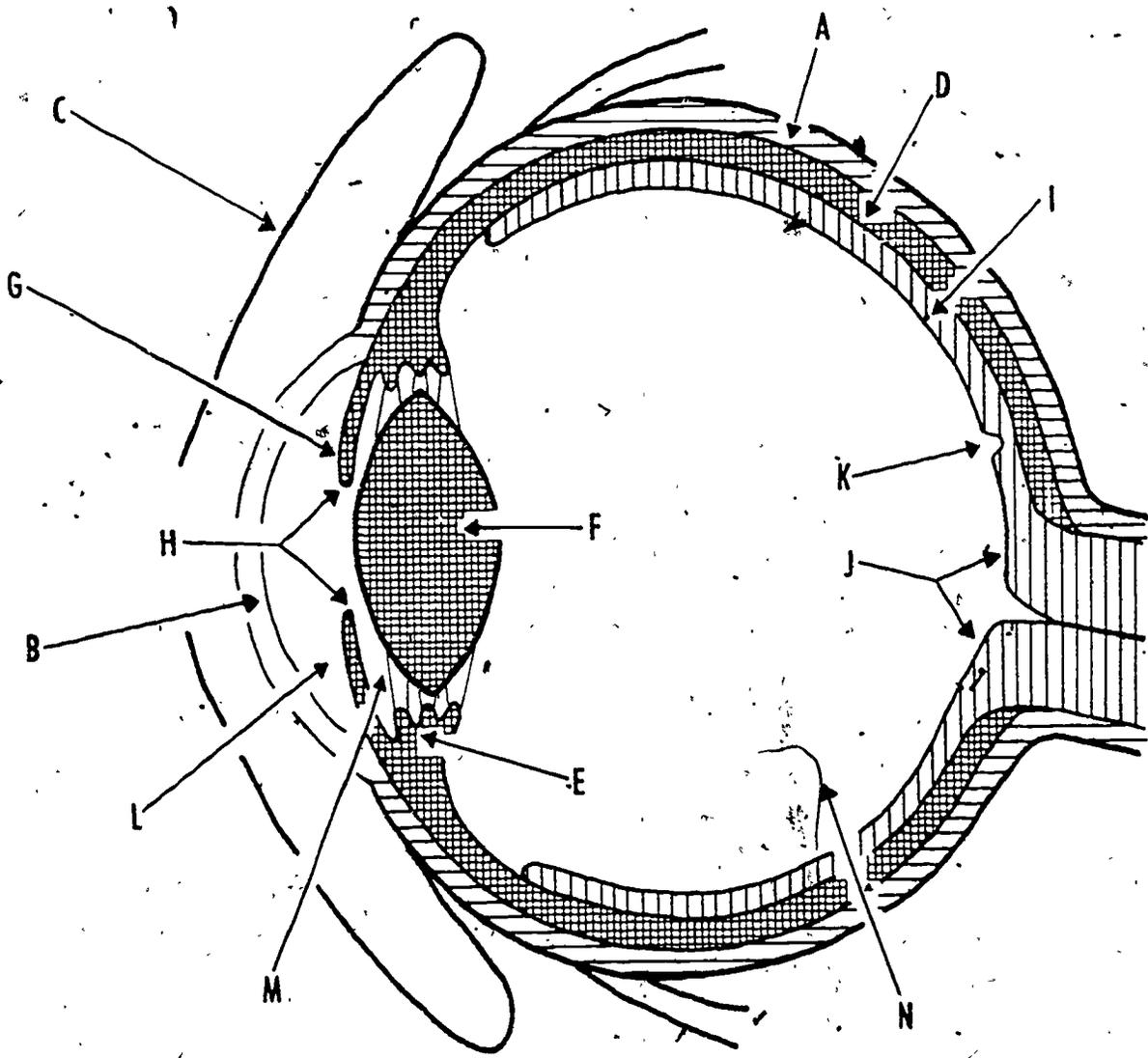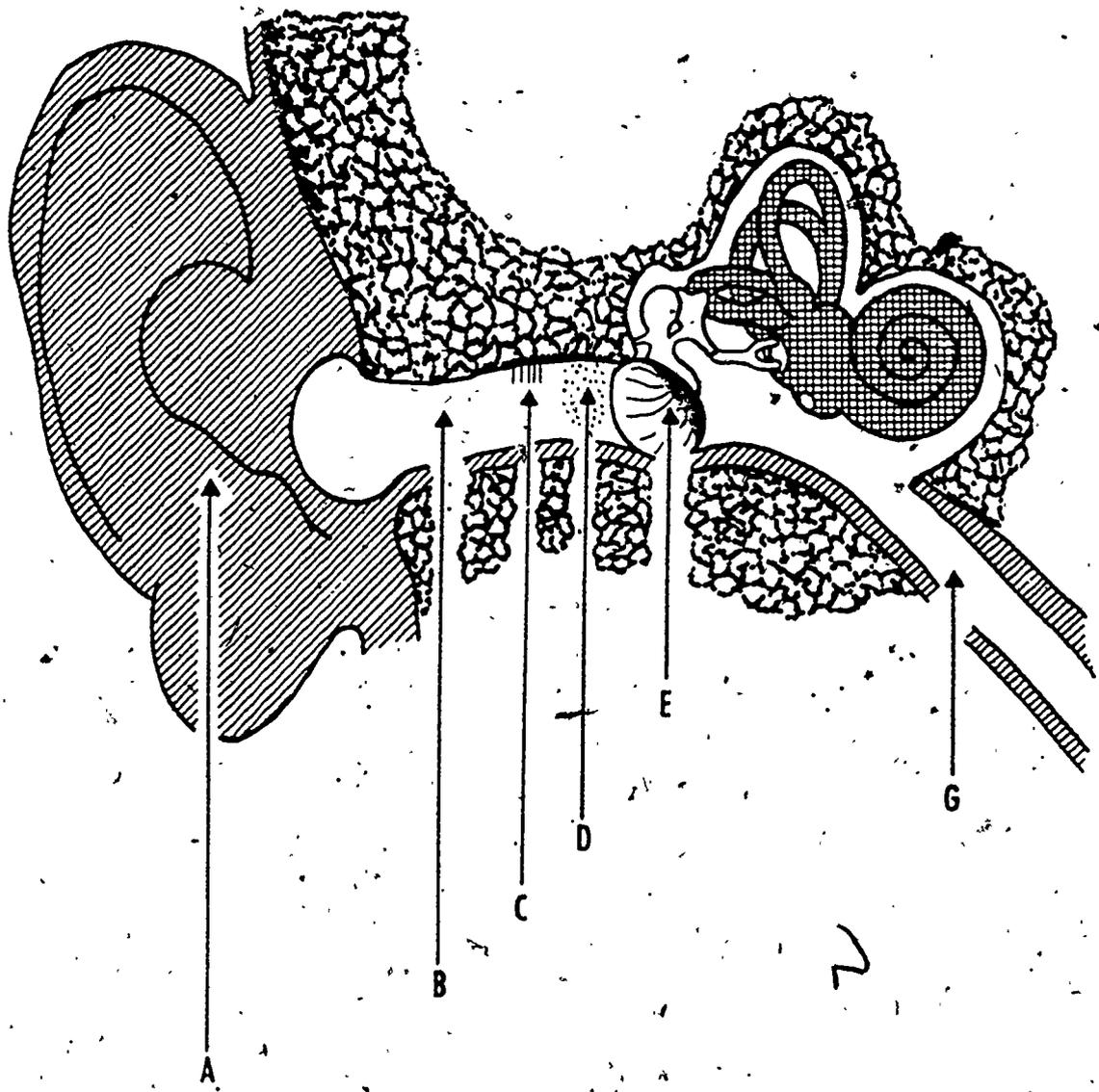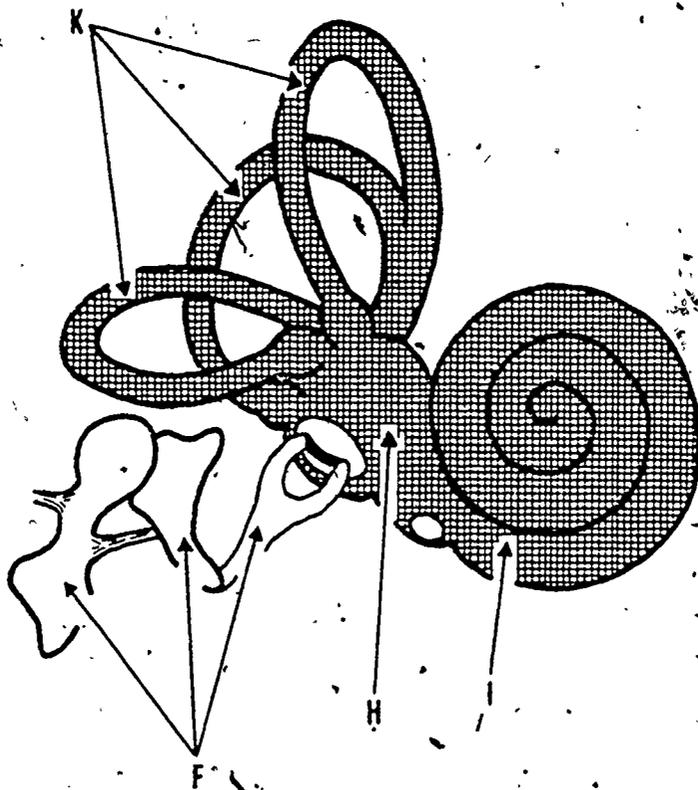
Technical Training

Pharmacy Specialist

ANATOMY AND PHYSIOLOGY

January 1976

SCHOOL OF HEALTH CARE SCIENCES, USAF
Department of Biomedical Sciences
SHEPPARD AIR FORCE BASE, TEXAS   76311

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ANATOMY AND PHYSIOLOGY

OBJECTIVES

When you have completed this Programmed Text, you will be able to list and define the functions of the major parts and systems of the human body.

INTRODUCTION

This text is designed so that you will go through it step by step. Each frame or step of instruction is designed to teach you a small bit of information. Confirmation for each step is given immediately below the slashes (/////////). You should slide a mask (piece of paper) down the page until the slashes are barely exposed. Read the information and respond as you are directed. Then slide the mask downward and confirm your response. Do not proceed until you have responded correctly. If you require assistance, see your instructor.

INFORMATION

This PT has been designed to teach you the anatomy and physiology required for you to satisfactorily perform as a Pharmacy Specialist, AFSC 90530.

Chapter One

MAIN UNITS OF BODY STRUCTURE

1. The human body is a very complex form of life. This chapter will explain a simple means of describing the body--we will discuss cells, tissues, organs, and systems. Once you have this organization in mind, later chapters in this book will be easier to study since you know how each part fits together.

   The human body is made up of millions of cells. Each cell is independent but works together with similar cells to form tissue. Tissue in the body is comparable to a group of eleven individual football players that make up a team. In the illustrations below select the one that best shows cell "teamwork" or tissue.

//
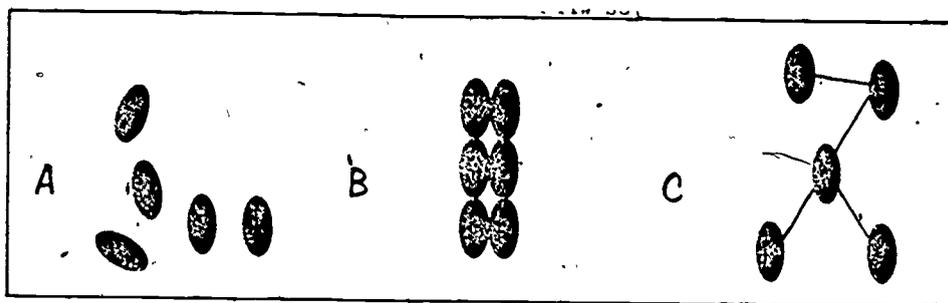
Correct response: __b__

---

2. Tissue is formed of cells that are:

   a. independent but joined together in a group.

   b. independently operating.

//

Correct response: __a__

---

3. When we find different types of tissues working together to do a certain job, it is called an organ.

   From the illustrations on the next page, select the one that best represents an organ.

///
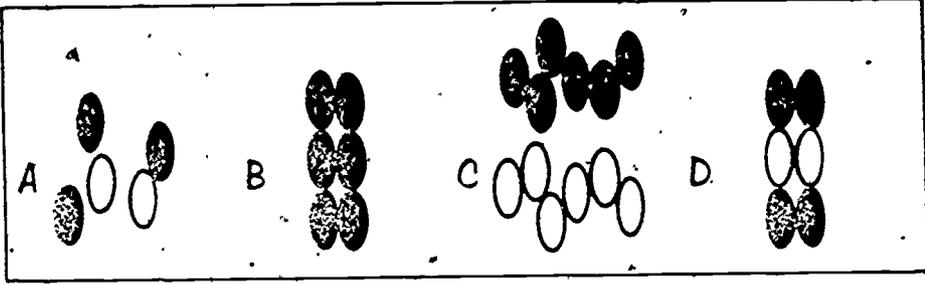
Correct response: __d__

4. Select the true statement(s) below:

　a. An organ is a group of similar cells working together.

　b. Tissues are different components of an organ.

　c. Cells can never be found in organs.

///

Correct response: __b__

5. Perhaps you have heard someone speak of the circulatory system in the body. They are referring to all the organs that work together to circulate blood.

From the list below, match the organ with its system.

____1. B-52 bomber　　　　　　　a. ink

____2. briefcase　　　　　　　　b. wings

____3. ball point pen　　　　　c. handle

____4. TV　　　　　　　　　　　d. picture tube

///

Correct response: 1. __b__ , 2. __c__ , 3. __a__ , 4. __d__

6. Which statement below best describes a system?

　a. Composed of organs working together.

　b. Smallest part of the body.

　c. A group of tissues with a special function.

///

1-2

Correct response: <u>a</u>

---

7. Arrange the list below from the most complex to the simplest. The most complicated should be first.

tissue, system, cell, organ

a.   b.   c.   d.

///

Correct response: a. <u>system</u>   b. <u>organ</u>   c. <u>tissue</u>   d. <u>cell</u>

---

8. Match the definition with its correct body structure.

____1. cell   a. combination of tissues having a
                                      common function.

____2. tissue   b. combination of cells having a
                                      common function.

____3. organ   c. smallest unit of organization in
                                      the body.

____4. system   d. combination of organs having a
                                      common function.

///

Correct response: 1. <u>c</u>,   2. <u>b</u>,   3. <u>a</u>,   4. <u>d</u>

---

9. Before going on to study the nine systems found in the body, let us talk about cell structure.

Each cell is covered by a cell membrane which gives shape to the cell. Pores within this wall allow for the exchange of materials inside and outside the cell.

Identify each statement below. If it applies to the membrane, mark an M. If it applies to the pores, mark a P.

____a. Allows food to enter the cell.

____b. Surrounds the cell.

____c. Waste products leave the cell.

____d. Oxygen enters the cell.

____e. Protects the cell.

///
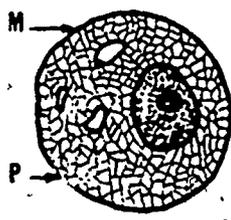
Correct response: a. <u>P-M</u>,   b. <u>M</u>,   c. <u>P-M</u>,   d. <u>P-M</u>,   e. <u>M</u>.

1-3

10. Within a cell is a nucleus, mitochondria, and ribosomes.

The central structure that controls cell activities is which of the following?

a. Nucleus

b. Mitochondrion

c. Ribosome

///

Correct response: a

11. The mitochondria are structures within a cell that combine oxygen with sugars and fats to produce energy.

A mitochondrion can be best represented by comparing it to a

a. factory.

b. powerhouse.

c. retail store.

///

Correct response: b

12. The ribosomes combine amino acids to build proteins.

A ribosome can be best represented by comparing it to a

a. factory.

b. powerhouse.

c. retail store.

///

Correct response: a

1-4

13. In the lists below, match the cell structure with its function.

_____1. Nucleus   a. produces energy

_____2. Mitochondrion   b. builds proteins

_____3. Ribosome   c. control center

//

Correct response: 1. c   2. a   3. b

503

1. Muscles are the organs of the muscular system. During this chapter we will study the function of all muscles and then learn the three types of muscles.

First let us study some pictures to get a simple idea of how muscles work.

Consider the castle with its drawbridge over the moat. How was the drawbridge raised to keep the enemies out?

_____

_____

_____

_____

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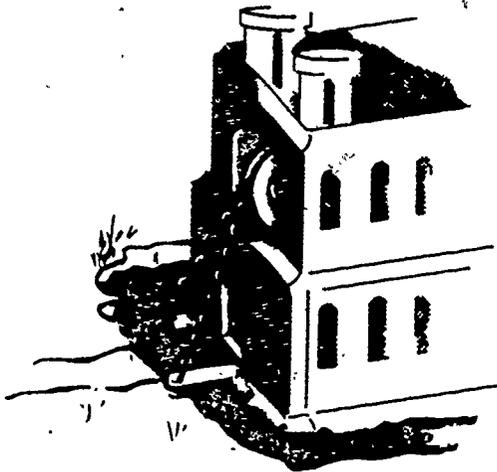
Correct response: Men inside the castle would wind the chain up and pull the drawbridge up.

2. Here is another view of that same drawbridge. Compare it to the picture of the bones of the arm and the biceps muscle. What happens when the muscle contracts?

    a. Fingers move.

    b. Forearm pulled up.

    c. Shoulder girdle pulled down.

    d. Humerus bends.

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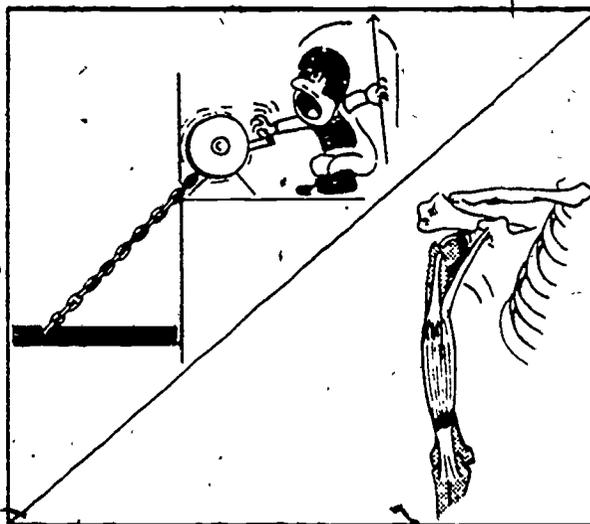
Correct response: __b__

3. Muscles do work when they contract because, usually, something moves.
However, muscles cannot do work when they relax (go back to their original
shape.)

Here is a picture of that arm
after the forearm has been raised.
Suppose you wanted to lower the
forearm slowly but steadily (which
is work or movement.)
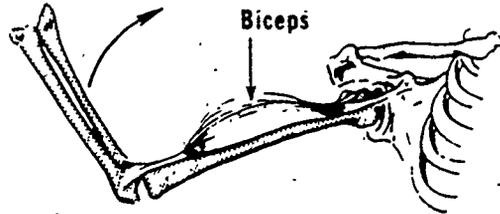
Draw in another muscle on the
arm which could lower the forearm
by contracting.

Biceps

//

Correct response: When this triceps
muscle contracts,
it would pull the
forearm down.

Triceps

---
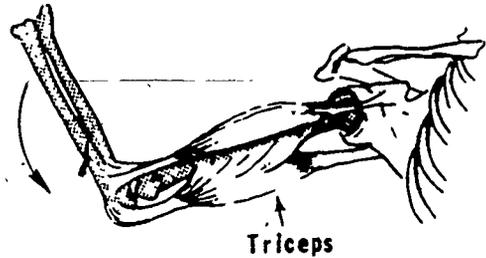
4. What happens to the biceps muscle when the triceps is contracted?

a. contracts

b. relaxes

//

Correct response: __b__

---

5. What happens to the triceps muscle when the biceps is contracted?

a. contracts

b. relaxes

//

Correct response: __b__

51i

6. Perhaps you have seen Mr. Universe flex his arm to show off his muscles. In your own words, describe what is happening.

///

Correct response: Biceps contract and bulge while the triceps relax.

---

7. Muscle flexion means the same as

   a. muscle contraction

   b. muscle relaxation

///

Correct response: _a_

---

8. Choose the correct statement(s) below:

   When you smile

   a. muscles which lift the corners of the mouth contract.

   b. muscles which pull down the corners of the mouth relax.

   c. all muscles of the face contract.

   d. all muscles of the face relax.

///

Correct response: _a_ and _b_

---

9. Although muscles can contract or relax, they have only one useful function--to do work (or make something move).

   To make something move, a muscle must

   a. contract

   b. relax

///

Correct response: _a_

---

10. The sole function of muscle is

   a. contraction

   b. relaxation

///

Correct response: _a_

2-3

11. The three types of muscles we will study are skeletal, smooth, and cardiac.

You already know a lot about skeletal muscle from studying how muscles work. Skeletal muscles were used as examples. From past study, skeletal muscles:

    a. hold the bones together.

    b. work when they relax.

    c. protect the lungs.

    d. move the body.

///

Correct response: __d__

---

12. Let us take a closer look at the skeletal muscle we studied before. The part of the muscle which actually contracts is called the body of the muscle. The narrow portions leading to the bones are called the ends.
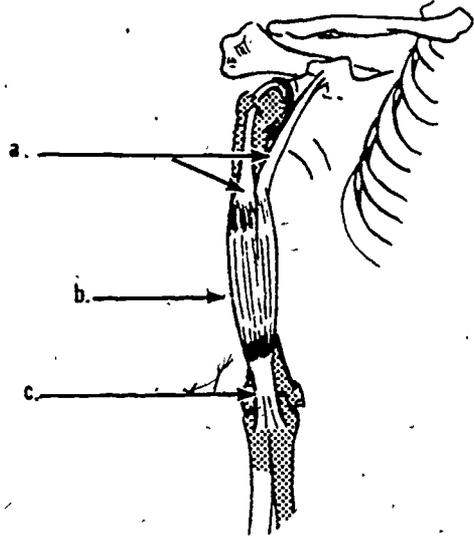
Locate and label the body and ends of the muscle shown.

    a.

    b.

    c.

///

Correct response: a. __end__, b. __body__, c. __end__

---

13. Why do the bones move when the muscle body contracts? (If you have difficulty answering this question, refer back to page 2-12 of Chapter Two.

    a. Muscle body contracts and pulls on the muscle ends which are attached to the bone.

    b. Muscle body is attached to the bone and causes the bone to bend.

///

Correct response: __a__

2-4

14. Muscle ends attached to the bone are called tendons. When a baseball player complains of a "pulled muscle", he means he has injured the tendon of a muscle.

Would an injured tendon in the arm of a baseball pitcher be painful when he throws the ball?

    a. Yes, the tendon could not contract as well when it was injured.

    b. No, if only the tendon is injured the muscle would not hurt when its body is contracted.

    c. Yes, everytime the muscle contracts it would aggravate the injured tendon by pulling on it.

//

Correct response: __c__

---

15. Choose the correct statement(s) below.

Skeletal muscle

    a. has a body and two ends

    b. protects the heart.

    c. holds bones together.

    d. has one function--relaxation.

    e. moves the body.

//

Correct response: __a__ and __e__

---

16. Smooth muscle is quite different from skeletal muscle. Smooth muscle occurs in layers of flat sheets, such as those which line the walls of the internal organs.

Which illustration below best illustrates smooth muscle layers?

    a   b   c

//

Correct response: __a__

2-5
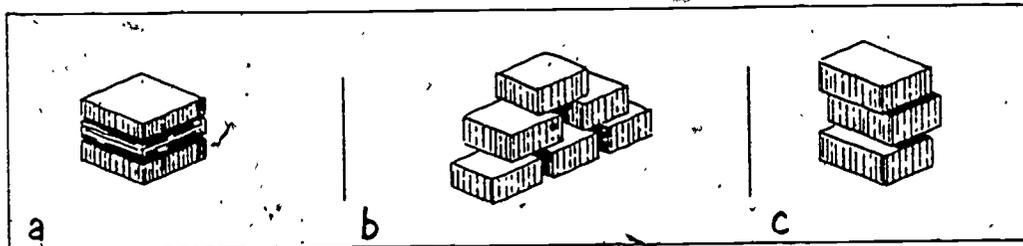
17. Which statement below is NOT true?

Smooth muscle is easily distinguished from skeletal muscle since:

a. smooth muscle is not attached to bones.

b. smooth muscle does not have a body and two ends.

c. smooth muscles cannot contract.

///

Correct response: __c__

---

18. When each layer of smooth muscle contracts, the muscle appears to move in waves. The rippling of smooth muscle in the internal organs (such as the stomach or the intestines) is called peristalsis.

What is meant by "the stomach churns food?"

a. Smooth muscle contractions cause the stomach to rotate like a cement mixer.

b. Smooth muscle contractions cause ripples in stomach lining and help mix food for digestion.

c. Smooth muscle contractions cause the stomach to move up and down.

///
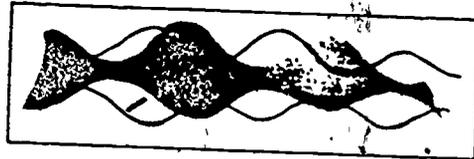
Correct response: __b__

---

19. Another word for smooth muscle contractions is

a. rotation.

b. extension.

c. peristalsis.

///

Correct response: __c__

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2-6

20. In addition to the walls of internal organs, smooth muscle is found
in blood vessels and in circular bands around the entrances and exits to
some organs.

Consider the diagram at the right.

What will happen to the passage
of fluid if the doughnut shaped
band of muscle contracts?
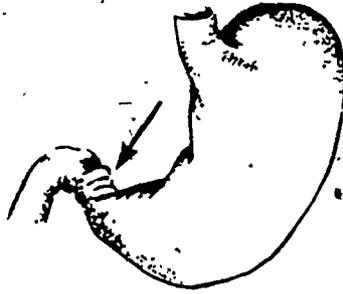
a. nothing

b. fluid flow will stop

c. fluid flow will increase

///

Correct response: __b__ .

_____

21. The doughnut shaped bands of muscle are called sphincters. Why are
sphincters used at both ends of the stomach?

a. Enable the stomach to hold contents until properly mixed.

b. Allows stomach to squeeze food before it enters.

c. Permits stomach to choose those foods that enter and leave.

///

Correct response: __a__ .

_____

22. Actually, sphincters may be composed of circular bands of skeletal or
smooth muscle--in many cases they work together, like in the anus.

Choose the statement(s) below that is/are true.

Smooth muscle →

a. is attached to the bone.

b. occurs in layers of flat sheets.

c. lines walls of some internal organs and blood vessels.

d. has a body and two ends.

e. is the only type of muscle that forms a sphincter.

///

Correct response: __b__ and __c__

2-7

23. Cardiac muscle is the third type of muscle to be studied and can only be found in the heart.

What happens each time the Heart "beats"?

a. Cardiac muscle contracts and pumps blood.

b. Cardiac muscle relaxes and pumps blood.

c. Cardiac muscle in the veins and arteries contracts.

///

Correct response: a

---

24. The work of cardiac muscle will be much more fully explained in a later chapter. Remember only for now that it is found only in the heart and is the working muscle of the heart.

Identify each example below by its muscle type.

a. skeletal   _____1. found only in heart

b. smooth   _____2. lines walls of internal organs and
                                blood vessels

c. cardiac   _____3. contraction causes blood flow

                       _____4. has body and two ends

                       _____5. occurs in flat sheets

                       _____6. provides body movement

///

Correct response: 1. c , 2. b , 3. c , 4. a , 5. b , 6. a

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Chapter Three

THE SKELETAL SYSTEM

1. Bones are the organs of the skeletal system. There are many different shapes and sizes of bones but they all support the body.

Which example(s) below correspond to the bones in the body?

a. leaves of a tree

b. frame of a car

c. windows in a house

d. buttons on a shirt

e. rafters of a roof

///

Correct response: __b__ , __e__

_____

2. In your own words, describe what the body would look like if it had no bones.

///

Correct response: If there were no bones, the body would be a flat, shape-less mass.

_____

3. When two or more bones meet to form a joint, ligaments hold the bones together. They allow for movement of the bones.

Choose the best statement(s) below.

a. Ligaments are strong, rigid tissue, much like heavy steel cables.

b. Ligaments are strong, flexible tissue, much like a strong elastic band.

c. Ligaments are strong flexible muscle.

///

Correct response: __b__

3-1

4. In the sketch identify:

___a. bone

___b. ligament

___c. joint

//
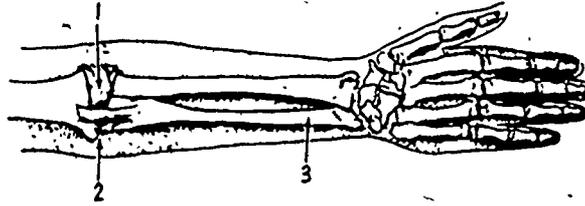
Correct response: a. __3__, b. __1__, c. __2__

_____

5. Identify each statement applying to bones (B), joints (J), or ligament (L)

___a. hold two or more bones together.

___b. gives shape to the body.

___c. composed of strong, flexible connective tissue.

___d. place where bones meet.

//

Correct response: a. __L__, b. __B__, c. __L__, d. __J__.

_____

6. Since there are over 200 bones in the human body, it would be quite difficult for you to learn all their names. We are going to name and locate just fourteen bones that are very important to our future study.

The axial skeleton consists of all the bones, joints, and ligaments of the head and torso.

Using the example below, shade in the axial skeleton.

//

Correct response:

2B- 76-898

a _____→

b _____→

c _____→

d _____→
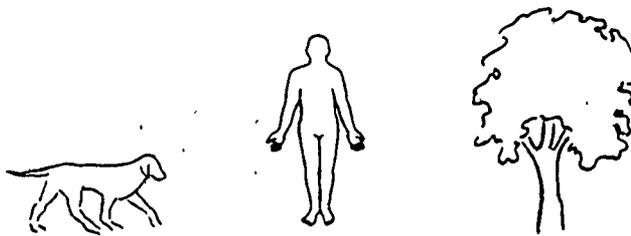
e _____→
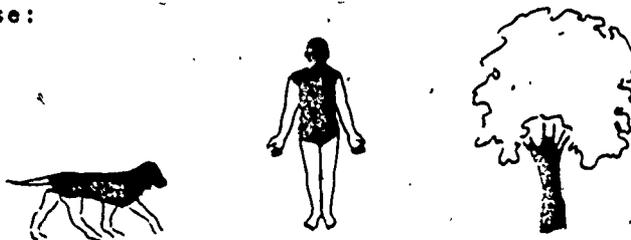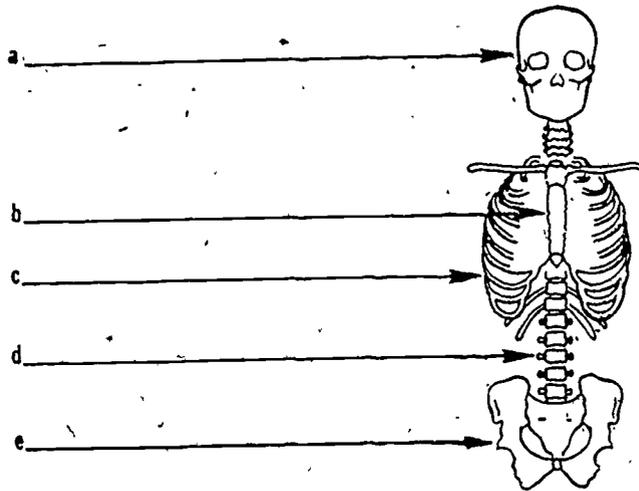
7. Locate each bone in the axial skeleton on the diagram as each is
described. Write its name on the appropriate arrow.

Skull--all the bones of the head.

Vertebral column--the bones of the back.

Rib cage--bones which protect the lungs.

Sternum--breastbone.

Pelvis--forms the hips.

///

Correct response: a. <u>skull</u>, b. <u>sternum</u>,   c. <u>rib cage</u>,   d. <u>vetebral column</u>

e. <u>pelvis</u>

3-3
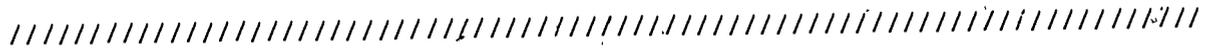
8. Draw your own diagram of the axial skeleton--label each of the five main bones . Refer back to the previous question only if necessary. Be sure to include: skull, vertebral column, rib cage, sternum, and pelvis.

Refer back to page 3-3 to check your work.

9. The remaining portions of a body are called the appendicular skeleton. Describe what parts of the body comprise the appendicular skeleton.

//

Correct response: The appendicular skeleton consists of all the bones, joints and ligaments of the shoulder girdle and upper and lower extremities (the arms and legs).

3-4

10. The shoulder girdle connects the arms
to the torso of the body. We call the
collar bone the clavicle and the shoulder
blades the scapula.
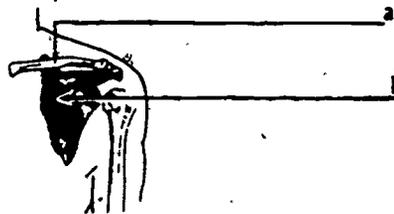
   Locate the clavicle and scapula and
write their names on the appropriate arrows.

///

Correct response: a. clavicle, b. scapula

---

11. Draw your own diagram of the shoulder
girdle. Be sure to locate and label both
the clavicle and scapula. Refer back to
the previous question only if necessary.

///

Correct response: Refer to question 10 to check your work.

---
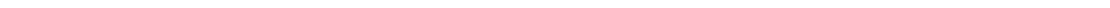
12. Using the diagram, label the
five bones of the axial skeleton
and the two bones that compose the
shoulder girdle: skull, sternum,
rib cage, vertebral column, pelvis,
clavicle and scapula.
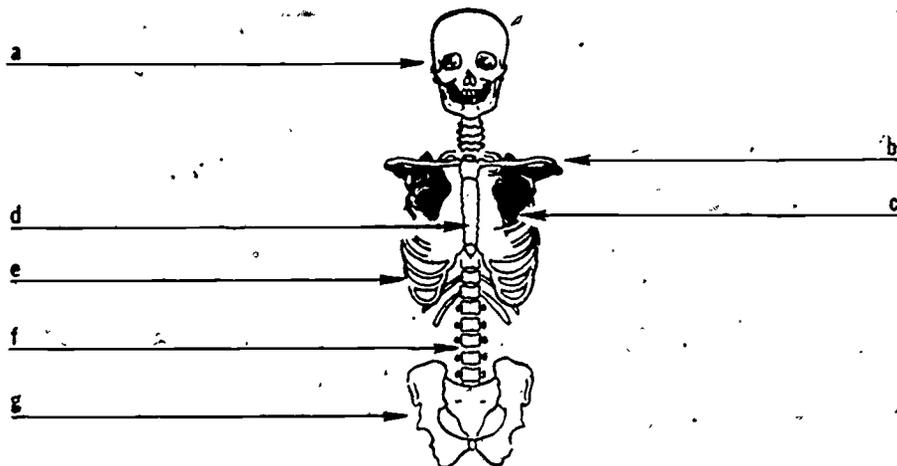
You should not need to refer back to complete the diagram. If you do, study
this completed diagram carefully before proceeding.
///

Correct response: a. skull, b. clavicle, c. scapula, d. sternum, e. rib cage,
               f. vertebral column, g. pelvis

3-5

13. The arm consists of three main
bones. The largest bone of the arm
connected to the Shoulder girdle is
the humerus. Locate this bone on the
diagram and write its name on the
appropriate arrow.
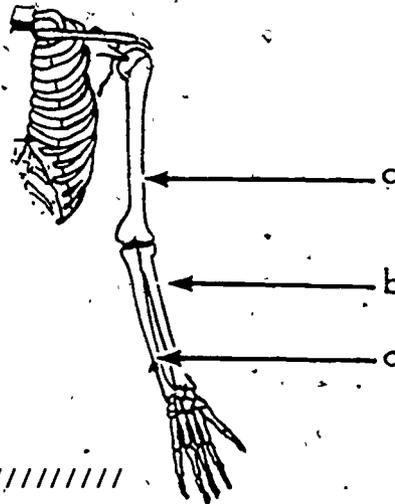
The forearm consists of two bones.
In the normal anatomical position,
the radius is along the same side as
the thumb. Locate the radius on the
diagram and label it.

Label the other bone of the fore-
arm, the ulna.

///

Correct response: a. humerus, b. radius, c. ulna

---

14. Although there are many bones in the wrist and hand (the carpals and
metacarpals), you need not learn them by name, but might remember they con-
sist of many small bones.

Draw your own diagram of
the bones in the arm. Be sure
to locate and label the humerus,
radius, and ulna.

Refer back to the previous
question only if necessary.

//

Correct response: Refer back to previous diagram to check your work.

---

15. Using the diagram, label the
following bones:

Skull, vertebral column,
rib cage, sternum, pelvis,
clavicle, scapula, humerus,
radius, and ulna.

You should not need to refer
back to complete this diagram.
If you do, study the completed
diagram thoroughly before
proceeding.

//
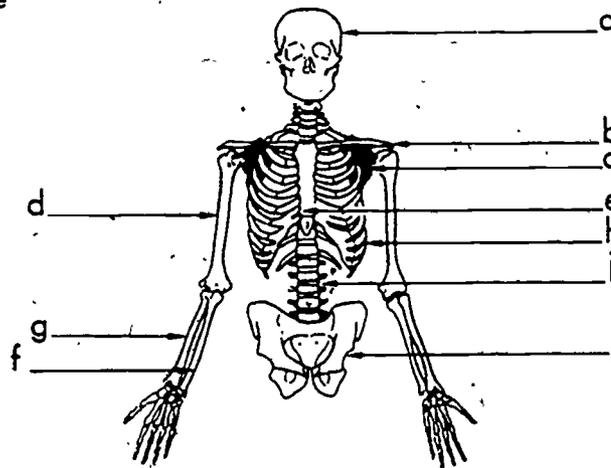
Correct response: a. skull, b. clavicle, c. scapula, d. humerus, e. sternum,
                   f. ulna, g. radius, h. rib cage, i. vertebral column j. pelvis

3-6

16. The bones of the leg are similar to those of the arm in many respects. One similarity exists with the small bones in the ankle and foot (the tarsals and metatarsals). Remember that there are many small bones, but you need not know their names.

The long bone connected to the pelvis is called the femur. In the lower leg, the large anterior bone is the tibia, the smaller bone is the fibula.

Label the femur, tibia, and fibula in the diagram.

One other bone of the leg is the patella, commonly called the kneecap. Locate and label the patella.

///
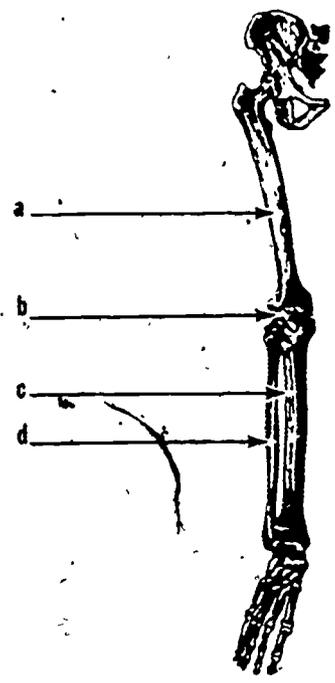
Correct response: a. _femur_, b. _patella_, c. _tibia_, d. _fibula_

17. Now draw your own diagram of the leg. Be sure to locate and label the femur, patella, tibia, and fibula. Refer back to the previous question if necessary.

///

Correct response: Same as previous question.

3-7

18. Using the diagram, label the following bones of the appendicular skeleton:

clavicle

scapula
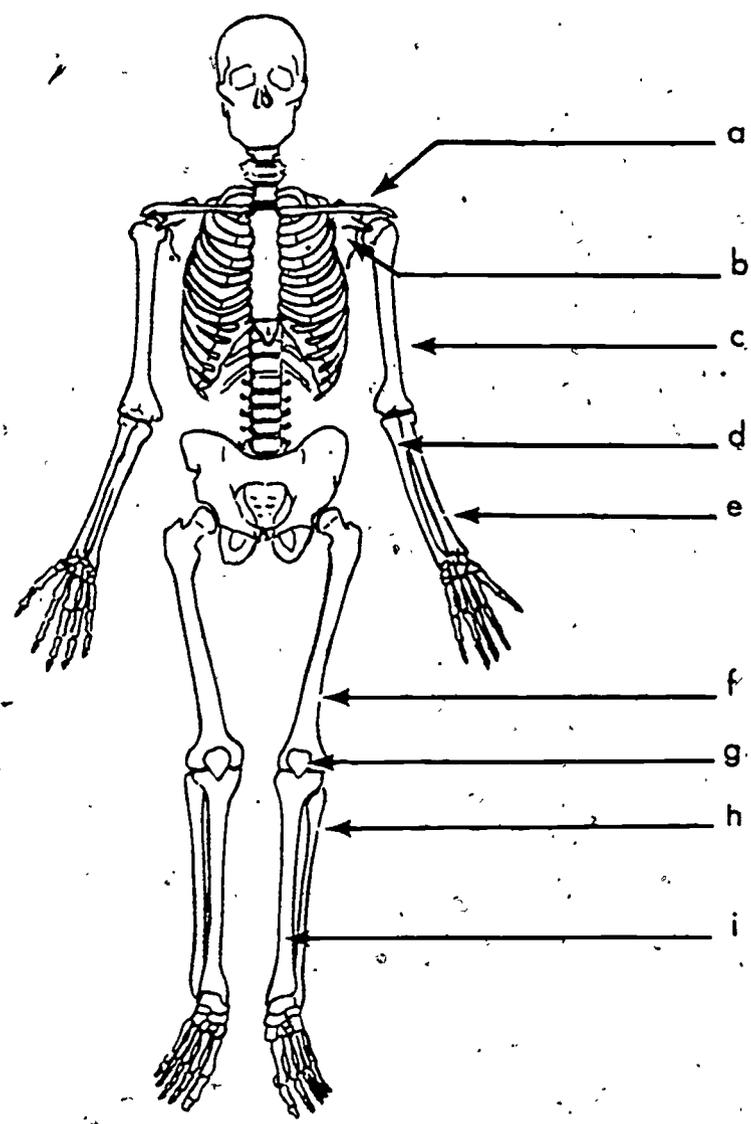
humerus

ulna

radius

femur

tibia

fibula

patella

You should not need to refer back to complete this diagram. If you do, study the completed diagram thoroughly before proceeding.

///

Correct response: a. <u>clavicle</u>, b. <u>scapula</u>, c. <u>humerus</u>, d. <u>ulna</u>,
                   e. <u>radius</u>, f. <u>femur</u>, g. <u>patella</u>, h. <u>fibula</u>, i. <u>tibia</u>

19. Using the diagram, label the following bones of the axial skeleton:

 skull

 vertebral column

 rib cage
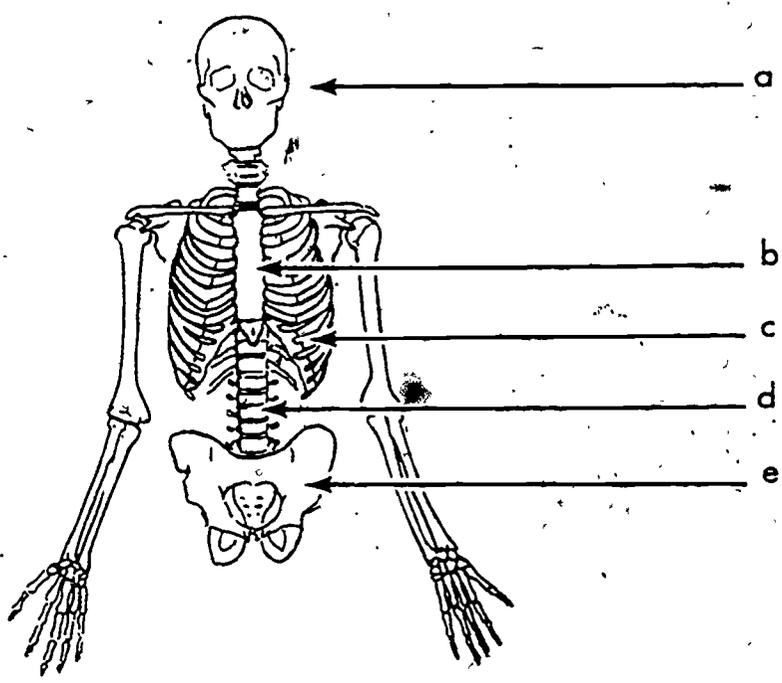
 pelvis

 sternum

  Again, if you need to refer to past material to complete this diagram, study the completed diagram before proceeding.

//

Correct response: a. <u>skull</u>, b. <u>sternum</u>, c. <u>rib cage</u>, d. <u>vetebral column</u>, e. <u>pelvis</u>

3-9

ERIC
Full Text Provided by ERIC

20. Using the diagram, label the following bones of the axial and appendicular skeleton:

skull

vertebral column

rib cage

pelvis

sternum

clavicle

scapula

humerus

ulna

radius

femur

tibia

fibula

patella

a
b
c
d
e
f
g
h
i
j
k
l
m
n
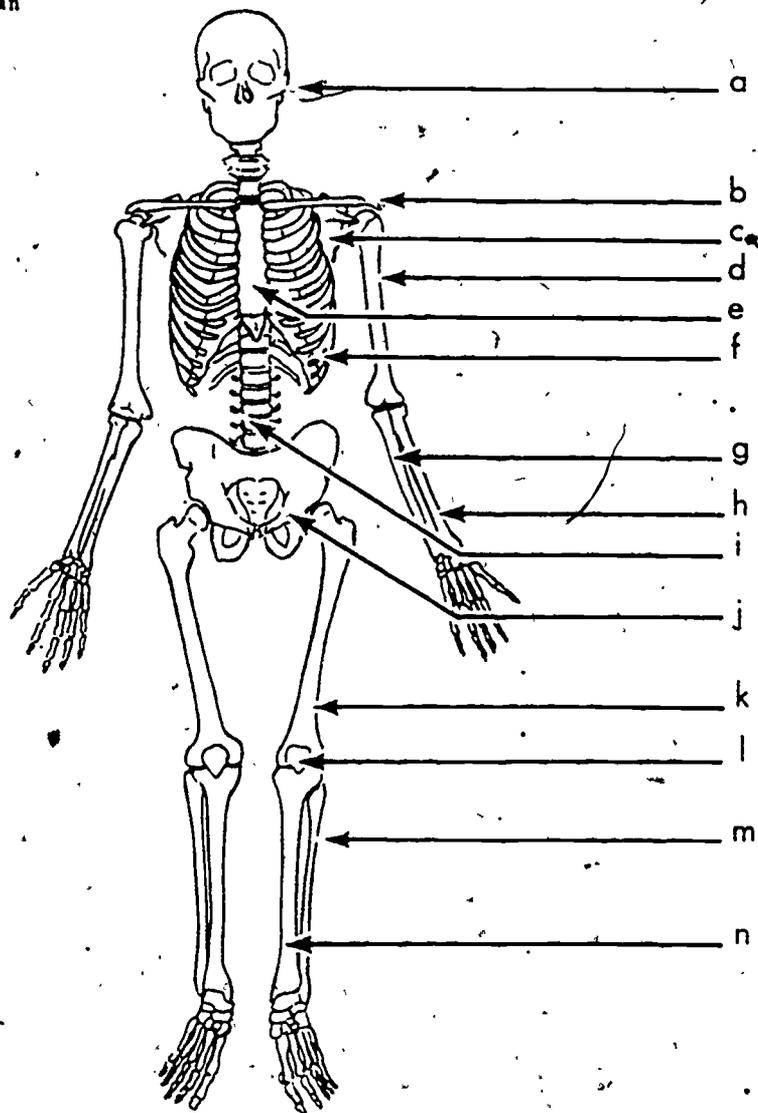
If you cannot complete this diagram without refering to past material, begin to restudy (from page 3-3) and notify your instructor .

///

Correct response: a. skull, b. clavicle, c. scapula, d. humerus, e. sternum, f. rib cage, g. ulna, h. radius, i. vertebral column, j. pelvis, k. femur, l. patella, m. fibula, n. tibia

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21. The skeleton serves many functions in the body. Remember the exercise before when you described what the body would look like if there were no bones? It would have no shape. The skeleton provides support for the body.

Since your internal organs are composed of soft tissue:

a. Why isn't your heart injured when someone pokes you in the chest?

b. Why isn't your brain injured when you bump your head?

///

Correct response: a. The heart is protected by the rib cage.

b. The brain is protected by the skull.

22. As you have just learned, the two most obvious functions of the skeletal system are: (fill in the functions)

a.

b.

///

Correct response: a. support the body.   b. protection of internal organs.

23. We will now study two other functions of the skeletal system, although they will be discussed in more detail in succeeding chapters.

Study the drawings below and then answer the questions.
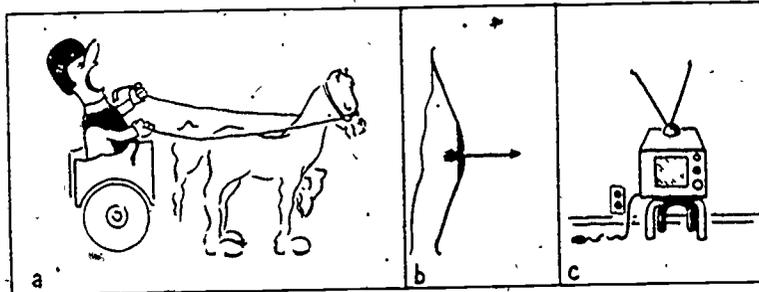
a. Why can't the horse move the cart?

b. Why won't the arrow fly?

c. Why won't the TV work?

3-11

///

Correct response: a. The horse is not harnessed to the cart--only the man
would be pulled since he holds the reins.

b. The bow string cannot be pulled tight since it is not
connected to the bow.

c. The TV won't work until it is connected to its power
source.

---

24. In your own words, why must muscles be attached to the bones before
our body can move?

///

Correct response: Any of the following three answers would be correct.

Muscles must be harnessed to what they are supposed to move.

Muscles wouldn't be able to pull tight if they were not connected to
something.

The bones would not be connected to their power source, the muscles.

---

25. A third function of the skeletal system is to provide for

_____ attachment.

///

Correct response: muscle

52)

26. The last function of the skeletal system is blood cell production. Blood cells are produced in many areas of the skeletal system, three of these areas are the ribs, sternum and pelvis. The sternum and pelvis are the most common sites for bone marrow tests. It is in the bone marrow that the cell formation occurs.

3-13

27. Match each example with a function of the skeletal system.

    a. Support   ____1. Lungs behind the rib cage

    b. Protection   ____2. Ribs, sternum and vertebrae

    c. Muscle attachment   ____3. Permits body movement

    d. RBC production   ____4. Gives shape to your face

///

Correct response: __b__ 1., __d__ 2., __c__ 3., __a__ 4.
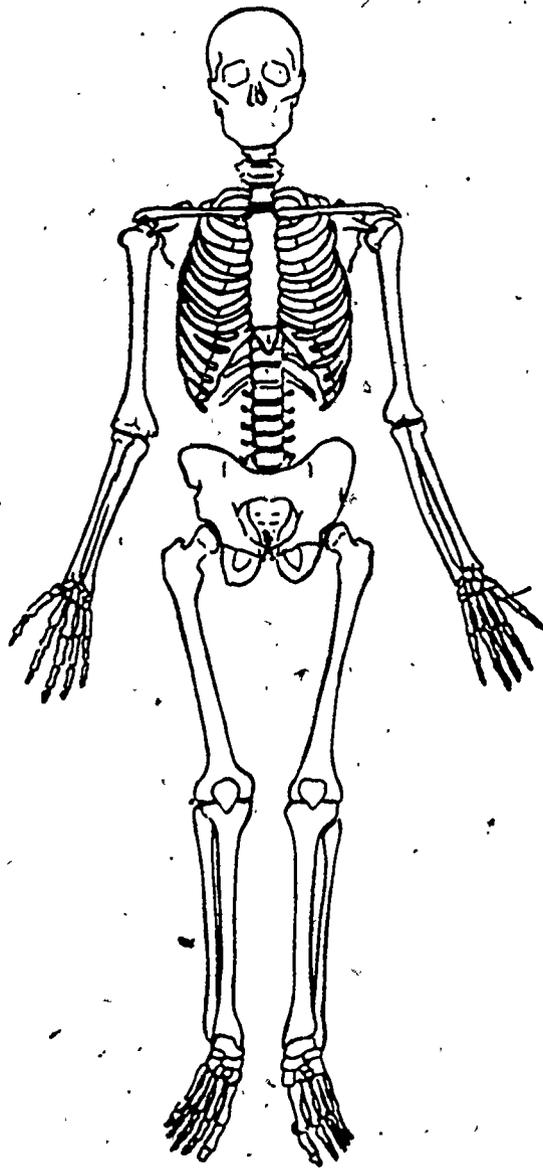
Chapter Four

THE NERVOUS SYSTEM

1. The nervous system is the communications network of human body. It is divided into two main parts, known as the central nervous system (C.N.S.) and peripheral nervous system (P.N.S.). The C.N.S. consists of the brain and spinal cord and controls thinking, memory, and behavior. It is the control center through which all body activities are controlled except chemical functions.

The P.N.S. lies outside the brain and spinal cord and serves as a connection or message system between various organs and muscles of the body and the C.N.S. It consists of voluntary and involuntary branches. The voluntary branch, as its name implies, permits you to move parts of your body voluntarily such as your arms, hands, legs, mouth, etc. The involuntary branch maintains those automatic body activities that are normally outside your conscious control. It includes activities such as the functioning of your heart, liver, kidneys, digestion, constriction of pupils, etc.

Match the specific branch of the nervous system in Column A with its function in Column B.

Column A

a. C.N.S.

B. P.N.S.

Column B

___1. Is made up of the brain and spinal cord.

___2. Carries messages throughout the body.

___3. Helps to maintain digestion.

___4. Is the thought center of the body.

___5. Controls all learning activity.

___6. Causes the urge to urinate.

///

Correct response: <u>a</u> 1. <u>b</u> 2. <u>b</u> 3. <u>a</u> 4. <u>a</u> 5. <u>b</u> 6.

2. If you were to put your hand down on a hot stove, which system transmits the impulse to the brain telling you to move?

a. Central Nervous System

b. Peripheral Nervous System

///

Correct response: <u>b</u>

3. While you are sitting here working on this lesson, you are mainly under the control of one of the two systems. Which system is now controlling you?

a. Central Nervous System

b. Peripheral Nervous System

///

Correct response: <u>a</u>

4-1

4. Now that you have learned about the two branches of the nervous system, write in your own words a definition of:

a. Central Nervous System

b. Peripheral Nervous System

///

Correct response: Your answer should have said something like:.

a. C.N.S. consists of brain and spinal cord which deals with behavior, thinking, and memory.

b. P.N.S. lies outside the brain and spinal cord and serves as a connection or message system between various organs and muscles of the body and the C.N.S.

_____

5. You have learned that there are two main branches of the nervous system--central nervous system and peripheral nervous system. Also, that the peripheral nervous system is divided into a voluntary branch and an involuntary branch.

The involuntary branch of the P.N.S. is also subdivided. One of these subdivisions is known as the autonomic nervous system (A.N.S.). The A.N.S. is divided into the sympathetic and parasympathetic branches. The sympathetic branch controls the body in times of stress, worry, fear, and emergency. You have often felt this branch take over when you were scared or startled. It is sometimes called the flight or fight branch. The parasympathetic branch brings the body back to a normal state and allows for rest and relaxation to occur. So hopefully, at the present time, you are under partial parasympathetic dominance.

Mark each picture as to which system it is.

a   b

///
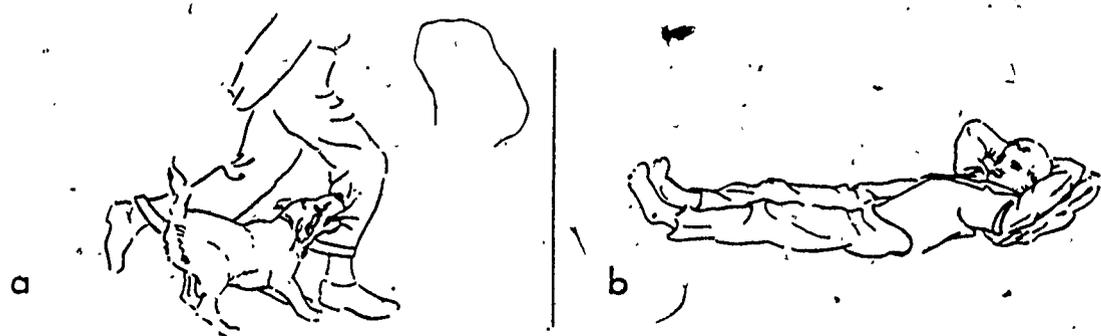
Correct response: a. Sympathetic, b. Parasympathetic

4-2

6. Match the branch of the Autonomic Nervous System in Column A that is being used with the proper response in Column B

Column A   Column B

a. Sympathetic   ___1. Playing football.

b. Parasympathetic   ___2. Dreaming of a vacation in Hawaii.

                   ___3. Running from a dog.

                   ___4. Watching a Frankenstein film.

                   ___5. Sitting quietly listening to soft music.

///

Correct response: _a_ 1.   _b_ 2.   _a_ 3.   _a_ 4.   _b_ 5.

---

7. Now in your own words write a definition for:

a. Sympathetic.

b. Parasympathetic.

///

Correct response: a. Sympathetic prepares the body during times of stress, worry, fear, and emergency.

           b. Parasympathetic brings the body back to a normal state. Allows for rest and relaxation.

---

8. A sensory neuron transmits nerve impulses to the C.N.S. When you dash your foot against a stone, a message is sent to your brain to tell you it hurts. The portion of the nervous system on which this message is sent is called

a. sensory neuron.

b. motor neuron.

c. interneuron.

d. synapse.

///

Correct response: _a_

---

9. Once the impulse leaves the sensory neuron, it enters the spinal cord where it travels to and from the brain on a special neuron called an inter-neuron. Impulses may travel in both directions on the same interneuron. The type of neurons on which impulses can travel in both directions is called:

a. motor neuron.

b. sensory neuron.

c. interneuron.

d. synapse.

///

Correct response: c.

10. Just as the sensory neuron transmits impulses toward the C.N.S. and interneurons carry impulses within the C.N.S., the motor neuron carries impulses away from the C.N.S. and toward the muscle. So when you jerked your foot away quickly, that reflex was directed by a message sent from the C.N.S. toward a

a. sensory neuron.

b. motor neuron.

c. interneuron.

d. synapse.

///

Correct response: b.

11. The motor neuron controls the action of the

a. brain cells.

b. muscles.

c. sensative organs.

///

Correct response: b.

53ʒ

4-4

12. Match the part in Column A with its proper response in Column B.

Column A

a. sensory neuron

b. motor neuron

c. interneuron

Column B

_____1. Jim placed his hand on a hot stove and the impulse traveled along a neuron toward the spinal cord. What was the name of that neuron?

_____2. The impulse leaves the first neuron and now is traveling toward the brain. It can also travel in both directions on this neuron.

_____3. Jim now jerks his hand away from the hot stove. The neuron that carried the impulse to the muscle causing this action was what?

///

Correct response: a 1., c 2., b 3.

---

13. Between every neuron, both sensory and motor, there appears an event called a synapse, which is the place where the neural impulse jumps from one neuron to another on its pathway toward the C.N.S. It is here that the impulse is boosted so that it can make the trip in the fastest possible time. If you were to sketch out a series of sensory or motor neurons with its synapses it would look like this.

SYNAPSE

MOTOR NEURON   MOTOR NEURON
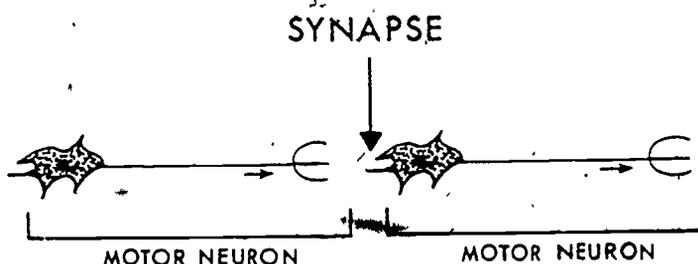
Select the proper location of a synapse.

a. Located only at the spinal cord.

b. Located between every 5th neuron.

c. Located only between the first and the second neuron.

d. Located between every neuron.

///

Correct response: d

4-5

14. Label this diagram properly; locate the motor neurons and synapses.

//

Correct response:

SYNAPSE

MOTOR NEURON   MOTOR NEURON

---
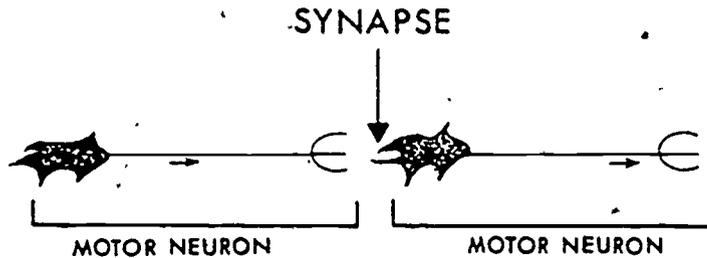
15. The function of a synapse is to:

a. divide the neural impulse.

b. transfer the impulse from one neuron to another.

c. decrease the neural impulse.

d. change the direction of the impulse.

//

Correct response: b

---

16. From the following list, select the proper definition for a synapse.

a. Transmits impulses to muscles.

b. Place where impulses transfer from one nerve cell to another.

c. Transmits impulses within the C.N.S. only.

d. Transmits impulses to the A.N.S.

//

Correct response: b.

17. Later on we will discuss what a voluntary response is. For now though, we need only to know that there is another type of response, called an involuntary response. You may have referred to this as a reflex, for they are the same. An involuntary response or reflex is by definition an unlearned response. In other words it is an automatic action that comes naturally and you did not have to learn it.

From the following list, select the responses that normally define an involuntary act.

a. A hiccup.

b. Throwing a football.

c. Removing your hand from a hot stove.

d. Your heart beat.

e. Writing a letter.

f. Blinking your eyes.

g. Being able to speak English.

h. To shiver when you are cold.

///

Correct response: __a__ , __c__ , __d__ , __f__ , __h__

---

18. So far we have told you what the parts of the nervous system are and what they do. Now we will take those parts and put them together to explain what happens in a voluntary or learned response. To start with, when you reach out and touch a piece of sandpaper with your hand some nerve endings in your fingers called receptors pick up the message and pass it along to the sensory neurons. As you know by now, the sensory neurons carry the message toward the C.N.S.

Complete the following statement. A receptor passes a stimulus directly to

a. an interneuron.

b. a motor neuron.

c. a muscle.

d. a sensory neuron.

///
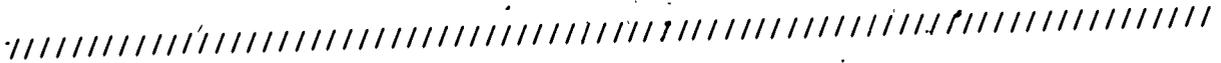
Correct response: __d__

19. In the diagram below, write in the name for the part that is missing.

///
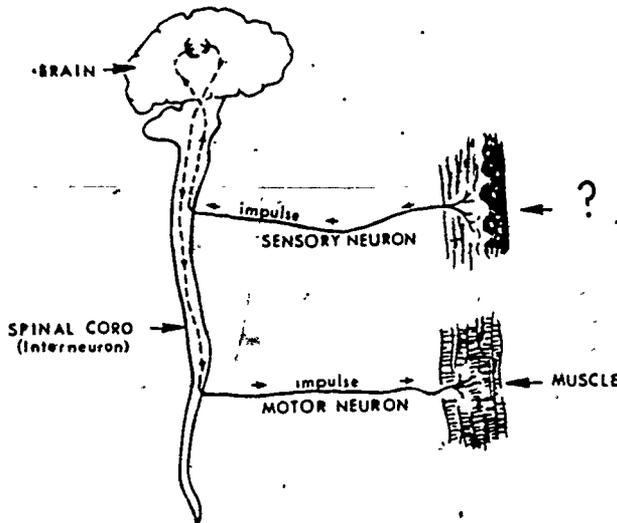
Correct response: <u>receptor</u>

_____

20. After the stimulus is picked up by the receptor and travels along a sensory neuron, it travels toward the C.N.S. We have already told you that the C.N.S. is made up of the spinal cord and brain. All decisions and thinking, as we know it, take place in the brain. So a response comes from a sensory neuron and passes into the spinal cord and travels to the brain on an interneuron. In the brain a decision is made and the response leaves and travels back down the spinal cord on an interneuron. The purpose of the interneuron is to

    a. speed the message from the receptor to the spinal cord.

    b. slow the receptor message going to the brain.

    c. allow the brain to make a decision.

    d. carry the impulse within the C.N.S.

///

Correct response: <u>d</u>

_____

21. Interneurons are found in which of the following areas.

    a. A.N.S.

    b. C.N.S.

    c. Peripheral nervous system

///

Correct response: <u>b</u>

4-8

515

22. Label the interneurons in the diagram below

//

Correct response:

Interneurons

Interneurons

4-9

540
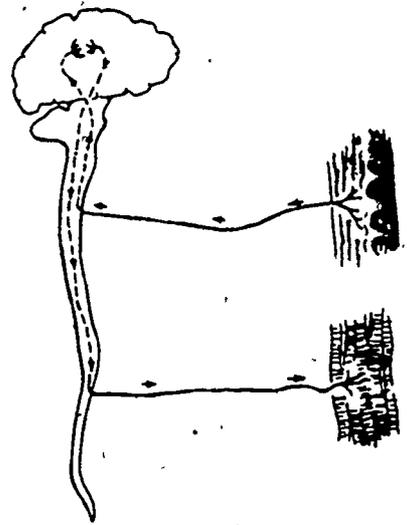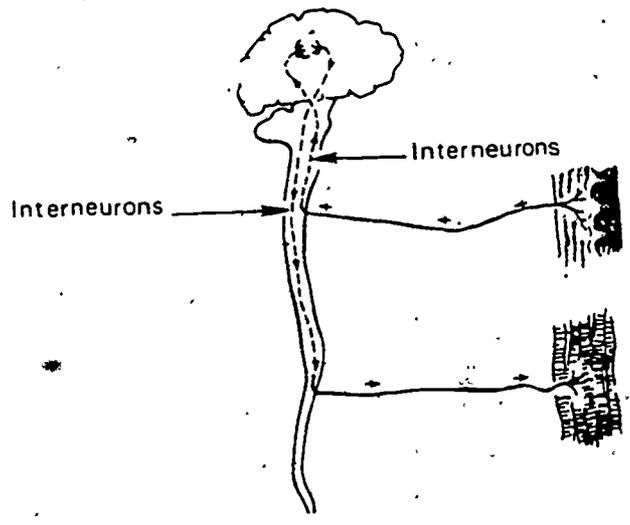
23. After the impulse leaves the spinal cord, it travels along the motor
neuron. The motor neuron connects directly with the muscle. When the
impulse stimulates the muscle, it causes action to take place. The muscle
contracts, as you learned before in the chapter on muscles. When the muscle
contracts motion takes place and the part moves.

On the diagram below, label the motor neuron and the muscle.

///
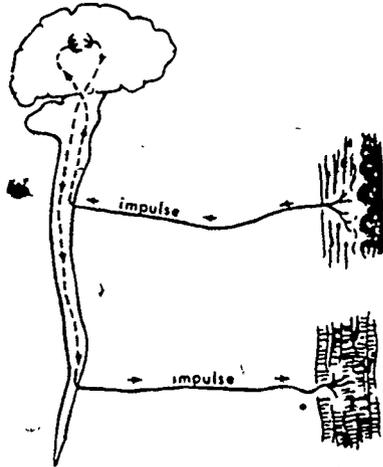
Correct response:

_____
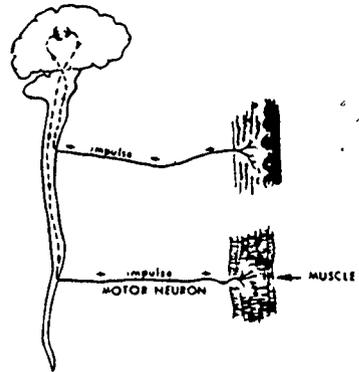
24. When a muscle is stimulated by an impulse coming from the C.N.S. what
happens?

    a. No action takes place.

    b. Motion takes place.

    c. Neither a nor b are correct.

///

Correct response: <u>b.</u>

_____

25. Write in your own words what happens when an impulse leaves the spinal
cord.

///

Correct response: The impulse travels along a motor neuron to the muscle
                    causing action to take place.

26. You have now received all the information starting with the receptor all the way through to the response. In the diagram below, label the parts of the diagram that are indicated.

//

Correct response: Brain

Interneuron

Receptor
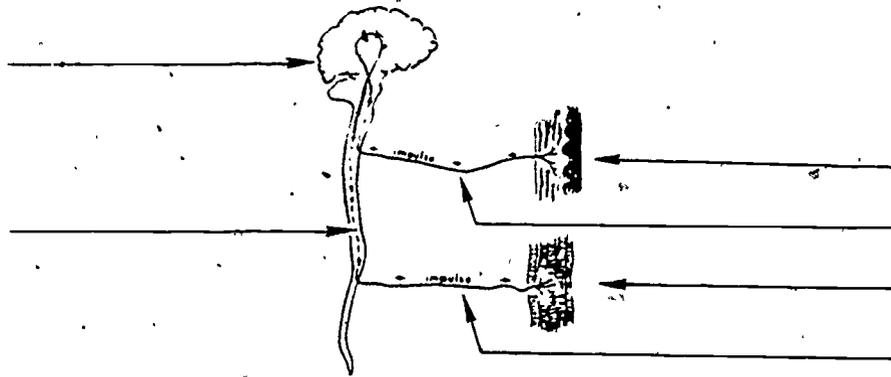
Sensory Neuron

Muscle

Motor Neuron

//
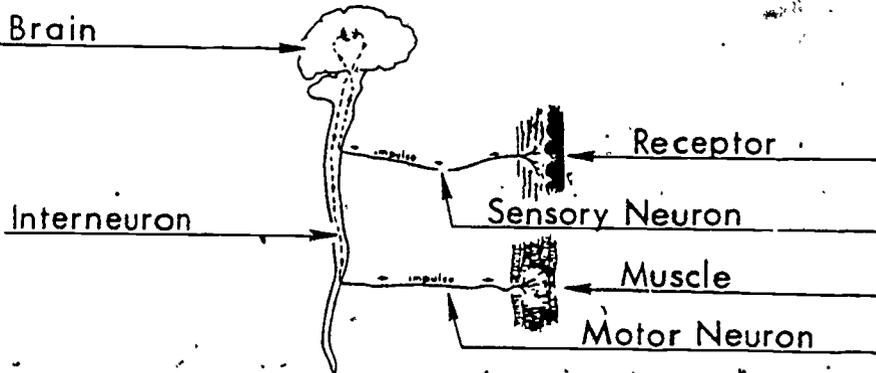
27. Located below are a list of important parts to the voluntary response. Write the function of each.

a. Receptor

b. Sensory Neuron

c. Interneuron

d. Brain

e. Motor Neuron

f. Muscle

//

Correct response: a. Receptor receives the stimulus.

b. Sensory Neuron transmits impulses to the C.N.S.

c. Interneurons transmit impulses in both directions within the C.N.S.

d. Brain is the thought center.

e. Motor Neuron transmits impulses to the muscle.

f. Muscle causes motion to take place.

4-11

Chapter Five

CIRCULATORY SYSTEM

1. The following sections will be about the circulatory system. Read the material, then respond to the questions. If you have trouble with any part, review that part before going to the next section of material.

STRUCTURES of the HEART and BLOOD FLOW

The heart is constructed much like four cubes placed together to make a big square.

: Example of the heart.
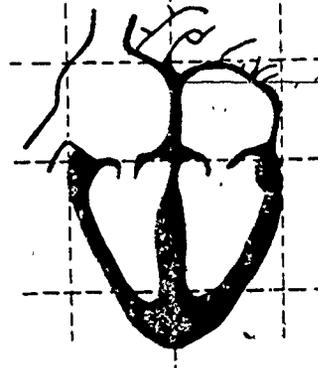
The two bottom cubes, or chambers to describe them better, are known as the ventricles. Indicate the ventricles in the heart to the right by placing a "V" in the correct place(s).

//

Correct response:

_____

2. Describe the ventricles in your own words.

//

Correct response: The ventricles are the two lower chambers of the heart.

5-1

3. A major portion of the heart is made
up of myocardium (muscle). The ventricles
have more myocardium around them than
other parts of the heart and are refer-
red to as the pumping chambers of the
heart. Draw a heart and place the
myocardium where it does the pumping.

///

Correct response: You should have
                    something like this:

4.   In your own words describe the ventricles.

///

Correct response: The ventricles are the two lower chambers of the heart,
                    also known as the pumping chambers of the heart.

5.   The two upper chambers of the heart
are the atria.   Indicate the atria in
the heart below by placing an "A" in
the correct place(s).

///
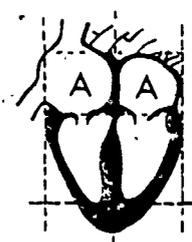
Correct response:

6.   The atria of the heart are the

     a.   two right chambers.
     b.   two lower chambers.
     c.   two left chambers.
     d.   two upper chambers.

///

Correct response: d

5-2

7. The atria receive the blood as it comes back into the heart. Draw a heart and indicate the receiving chambers with an "A".

///

Correct response:

8. In your own words describe the atria.

///

Correct response: The atria are the two upper chambers of the heart and are called the receiving chambers.

9. Match the following chambers of the heart with the statement(s) that pertain to them by placing the letter in front.

a. Atria   _____ 1. Lower chambers of the heart

                            _____ 2. Receive blood into the heart
b. Ventricles
                            _____ 3. Chambers without pumping action

                            _____ 4. Upper chambers of heart

                            _____ 5. More myocardium than other places

                            _____ 6. Pumps blood to body

///

Correct response: 1. _b_ , 2. _a_ , 3. _a_ , 4. _a_ , 5. _b_ , 6. _b_

5-3

10. The ventricles and atria are divided into left and right chambers. As you look at a diagram of a heart, the left chambers would be on your right and the right chambers would be on your left, as your arms are reversed when looking into a mirror. Study the example at right.
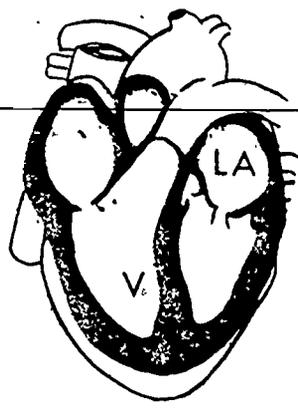
On the diagram at right, complete the missing chambers by labeling them.

//

Correct response:

_____
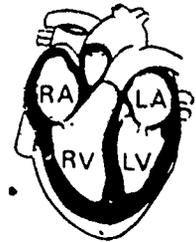
11. Label the diagram below completely.

//

Correct response:
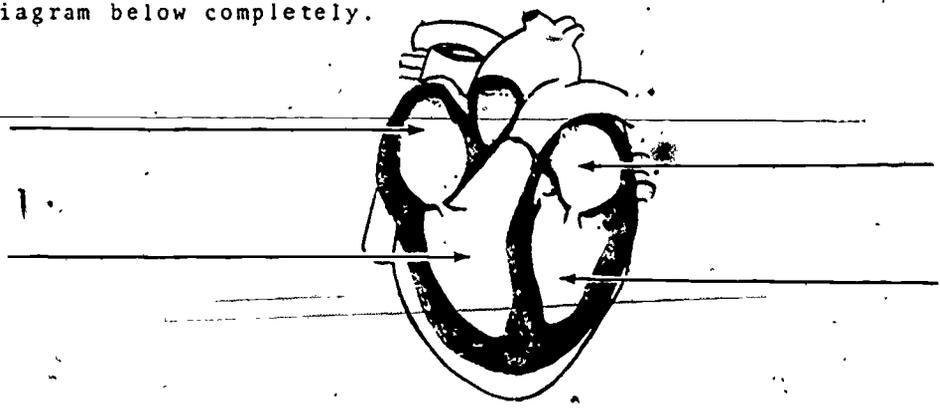
Right Atrium
Left Atrium
Right Ventricle
Left Ventricle
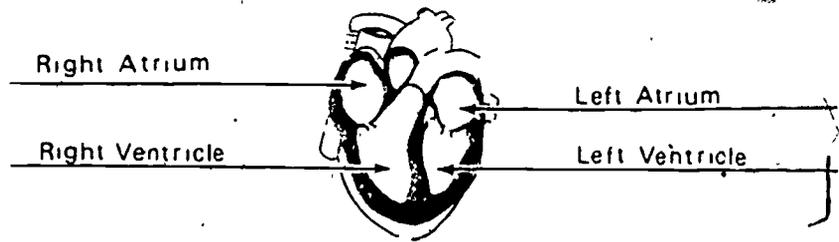
12. Study the diagram below carefully. The following questions will pertain to this diagram. Refer back to the diagram only if necessary. It shows the different chambers of the heart and the flow of the blood. Start at the left ventricle.
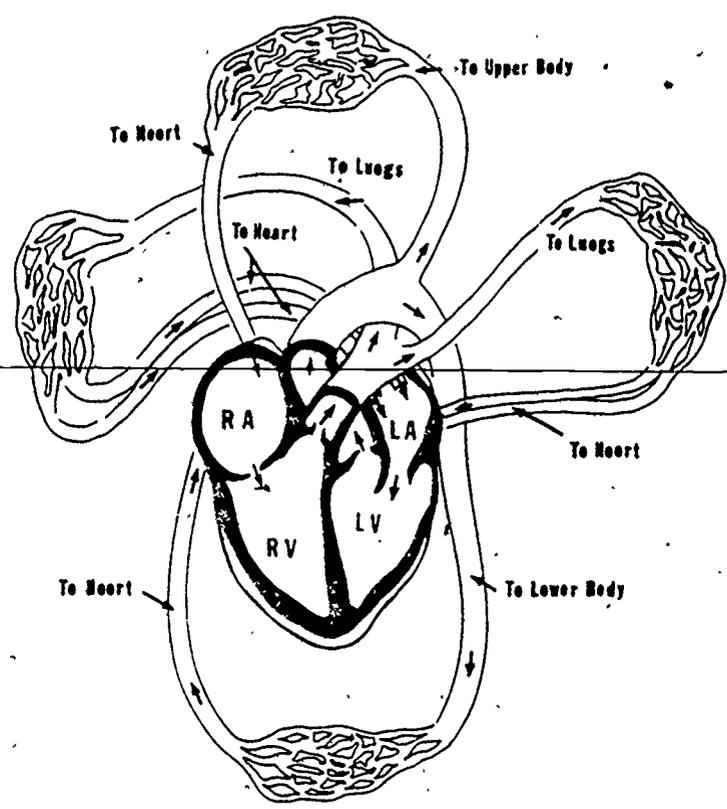
13. Which chamber pumps blood to the body?

   a. right ventricle   c. left ventricle

   b. left atrium   d. right atrium

//

Correct response: c

14. The left ventricle pumps blood to the

   a. left atrium.   c. right atrium.

   b. lungs.   d. body.

//

Correct response: d

S-5

15. Which chamber receives blood from the body?

    a.   right atrium   c.   right ventricle

    b.   left atrium   d.   left ventricle

//

Correct response: a

---

16. On the diagram at right, label the chamber, with its name, that receives the blood from the body.

//

Correct response:

---
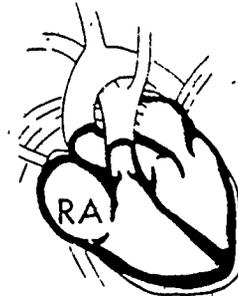
17. After the blood coming from the body is received by the right atrium, it goes into the right ventricle. From here it is pumped to the lungs. In the diagram at right, indicate the name of the chamber where the blood is prior to being pumped to the lungs.

//

Correct response:

540
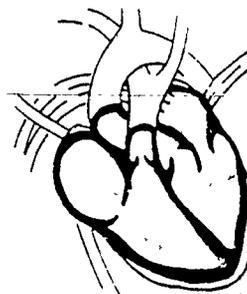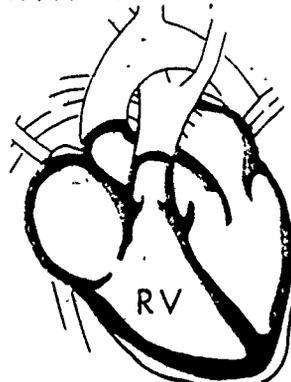
18. The right ventricle will send the blood to the

    a. body.   c. lungs.

    b. right atrium.   d. left atrium.

//

Correct response: _c_

---

19. The left atrium receives the blood from the

    a. right ventricle.   c. left ventricle.

    b. body.   d. lungs.

//

Correct response: _d_

---

20. On the diagram to the right label
the chamber with its name that receives
the blood from the lungs.

//

Correct response:

LA

5-7
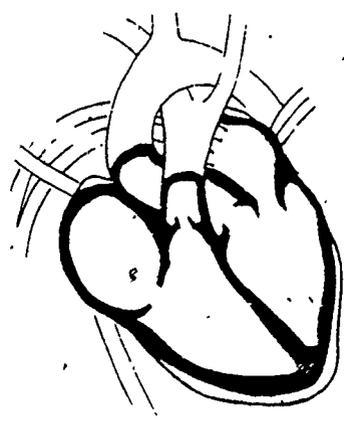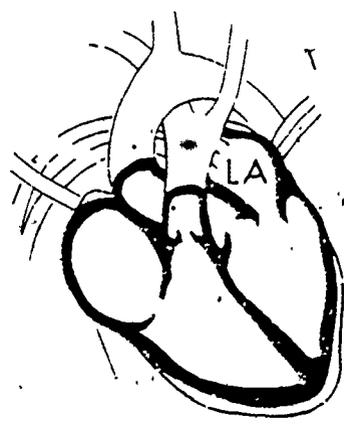
21. Match the chamber with the statement(s) that pertain to it.

a. left ventricle

b. left atrium

c. right ventricle

d. right atrium

_____ 1. Receives blood

_____ 2. Pumps blood to body

_____ 3. Receives blood from lungs

_____ 4. Receives blood from body

_____ 5. Pumps blood

_____ 6. Pumps blood to lungs

//
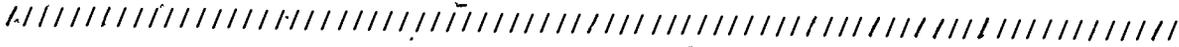
Correct response: 1. b,d , 2. a , 3. b , 4. d , 5. a,c , 6. c

22. On the diagram below label the chambers and indicate with arrows where the blood is going to or coming from.

//
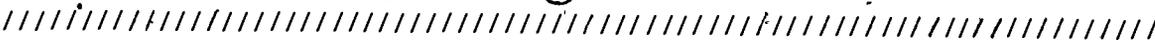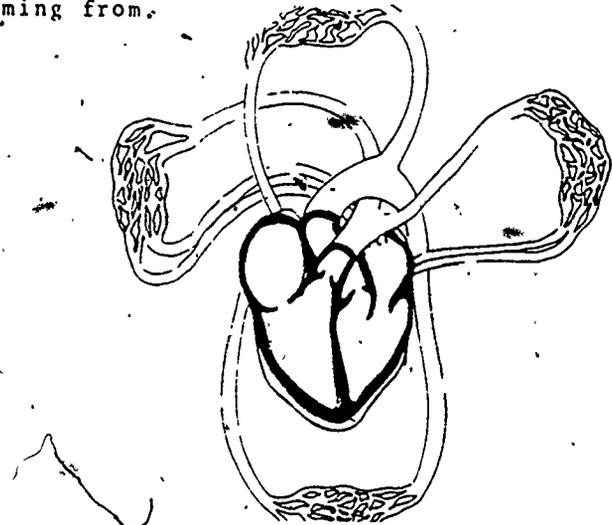
Correct response:
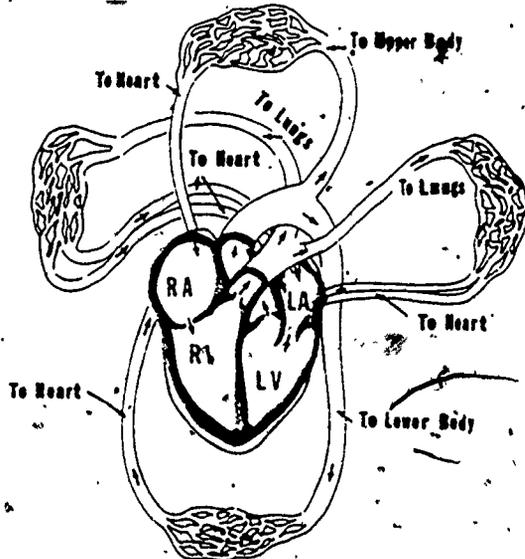
23. The last structures of concern in the heart are the valves. If not for the valves the blood would be pumped back into the atria and not to the body or lungs. So it is easy to see why the valves are needed to control the direction of blood flow in the heart.

Which of the following examples would be like a valve?

a   b   c

///
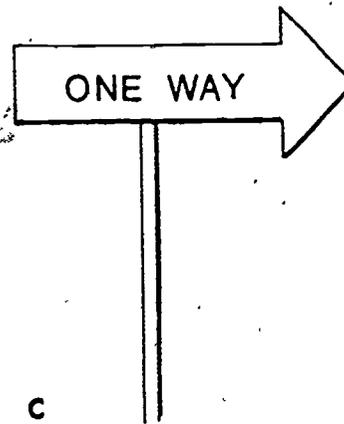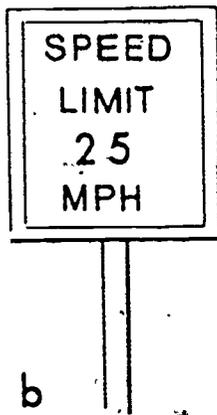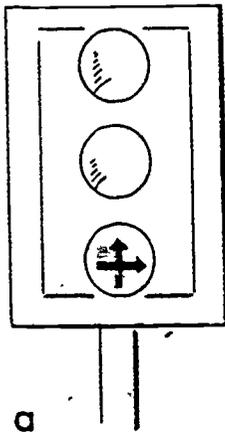
Correct response: a, c

_____

24. Check the following statement(s) that are true about a heart valve.

    a. Controls the pressure of blood.

    b. Controls amount of blood in chambers.

    c. Controls the direction of blood flow.

///

Correct response: c

_____

25. In your own words describe the function of a heart valve.

///

Correct response: A heart valve controls the direction of blood flow.

5-9

BLOOD VESSELS AND THEIR FUNCTIONS

26. Study the diagram below carefully. Then continue with the questions.
Refer back to this diagram only if necessary.

Veins

Pulmonary Artery

Artery

RA

A

LA

Pulmonary Veins

Veins

R.V

V

Arteries

Venules

Arteriole

Body Capillaries

S-10

27. Arteries are blood vessels that carry blood away from the heart. On the diagram below label the arteries.

//

Correct response:

S-11
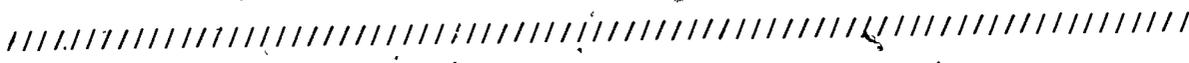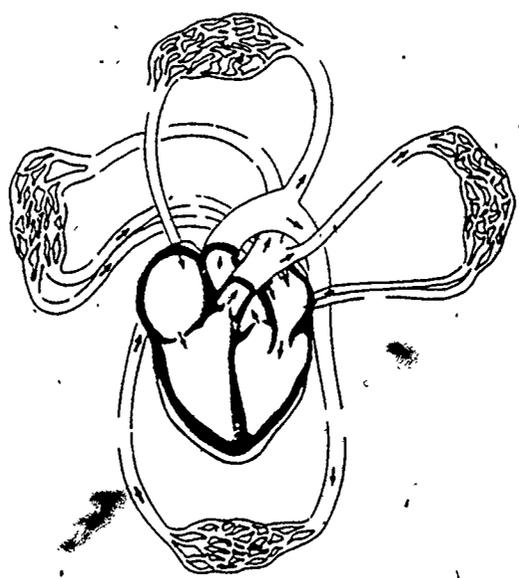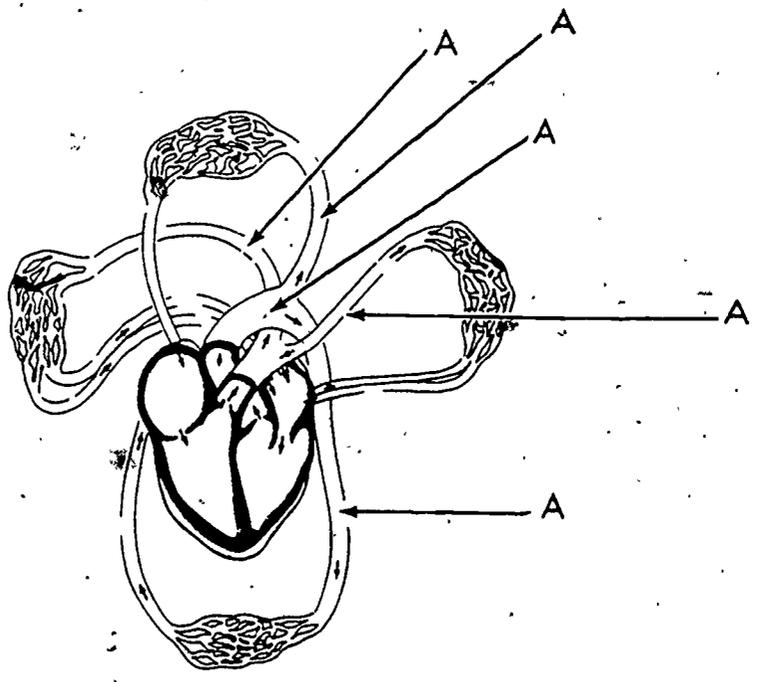
28. An artery carries the blood to the (check the right statement(s)).

    a. lungs

    b. heart

    c. body

    d. ventricles

///

Correct response: __a, c__

---

29. Arterioles are smaller branches of the arteries. They also carry blood away from the heart. On the diagrams below darken the parts that represent arterioles.

///

Correct response:

55.1
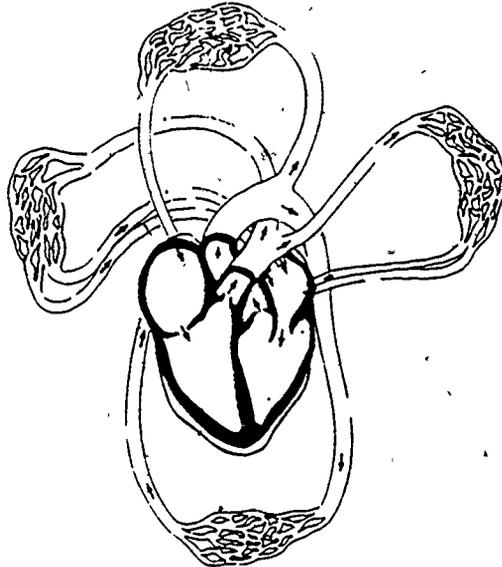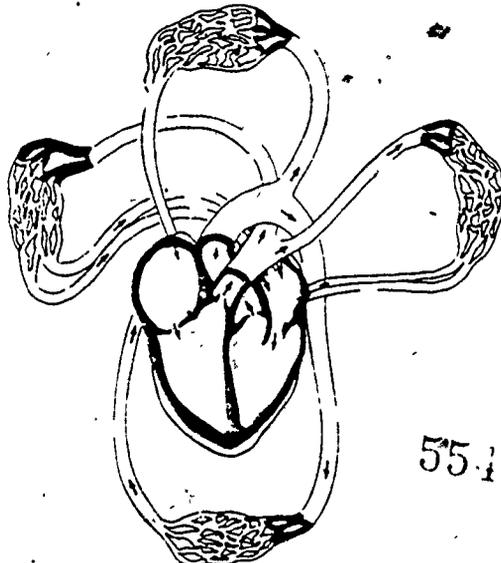
30. On the diagram below label the arteriole(s).

//

Correct response:

Arterioles
Arterioles
Arterioles
Arterioles

_____
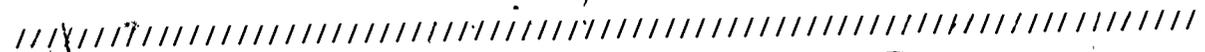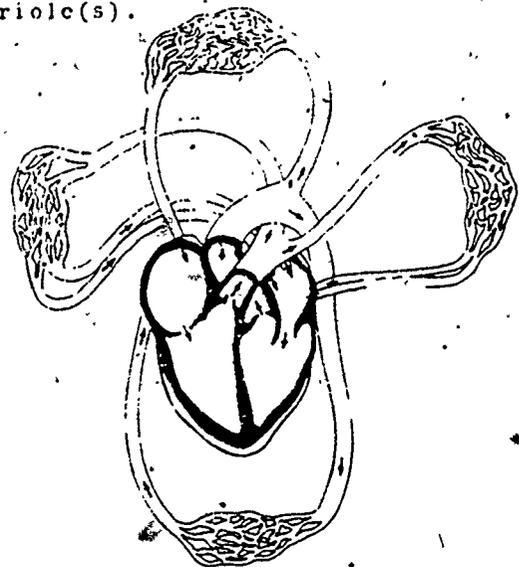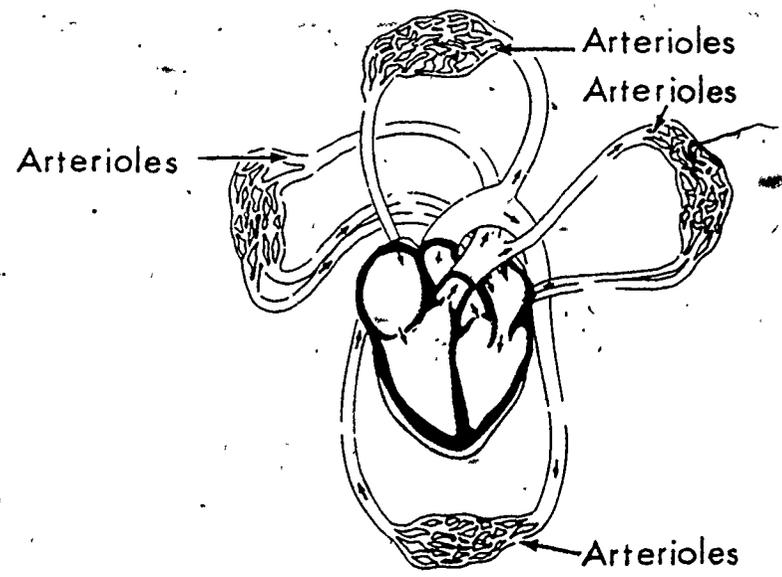
31. Match the following vessels with the statement(s) that pertain to them.

a. arteries

b. arterioles

_____ 1. Smaller branches carry blood away from the heart

_____ 2. Carry blood away from the heart.

_____ 3. First blood vessel to carry blood away from the heart.

_____ 4. Branching vessels to lungs

_____ 5. Connect smaller branches to heart

//

Correct response: 1. __b__, 2. __a,b__, 3. __a__, 4. __b__, 5. __a__

S-13

531

32. The capillaries are the smallest vessels in the body. On the diagram
below label the capillaries.
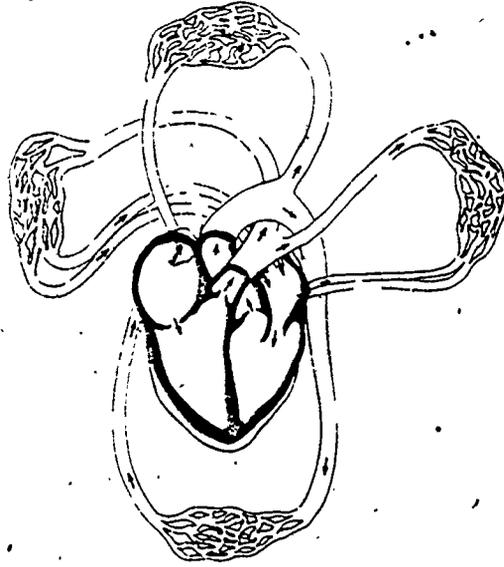
//
Correct response:

_____
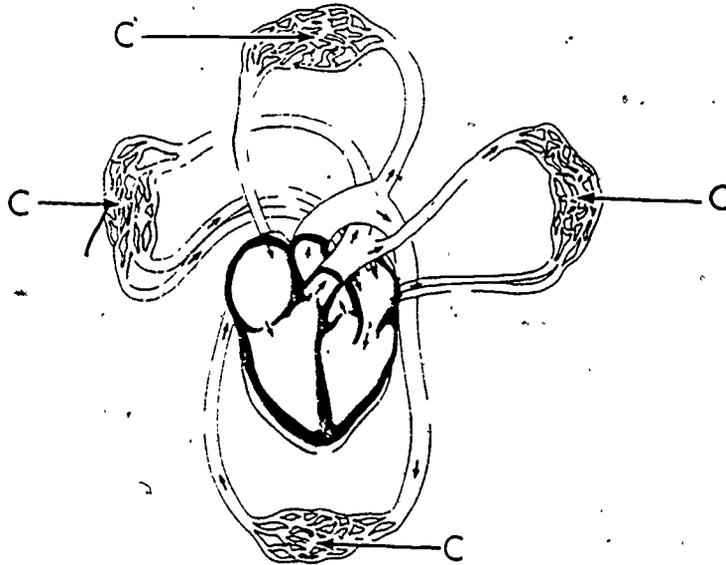
33. Capillaries are found in the body tissue and circulate the blood to
each cell, providing a connecting network of vessels between arterioles
and venules.

Check the following statement(s) that are true about capillaries.

a. Are large vessels leaving the heart.

b. Vessels that bring blood to the cells.

c. Vessels that bring blood to the lungs.

d. Found near the skin surface.

e. Next to the smallest vessels in the body.
//
Correct response: b, d

34. Venules start when the capillaries come together. Venules are larger in size and are not spread out as much as the capillaries. On the diagram below label the venules.

/ /

Correct response:
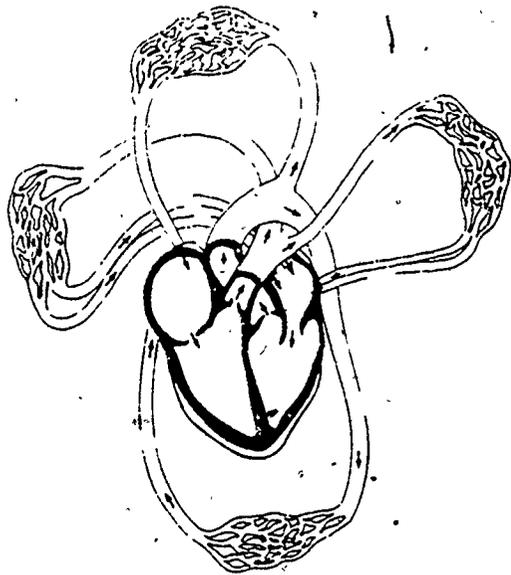
Venules

Venules
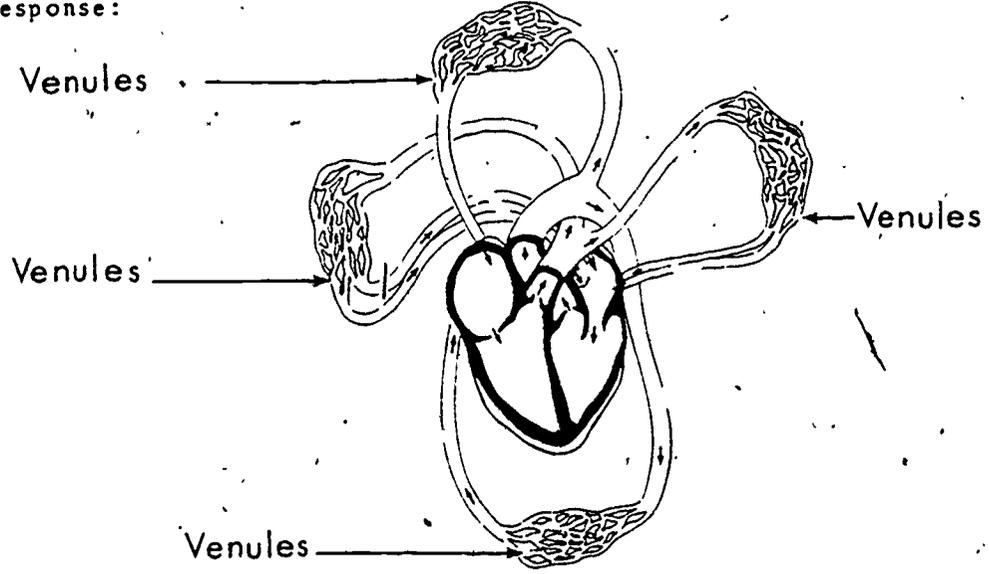
Venules

Venules

35. In your own words describe venules.

/ /

Correct response: Venules are larger than capillaries and are not spread out like the capillaries.

5-15

36. Veins are the large vessels that carry the blood back to the heart. On the diagram below label the vein(s).

///
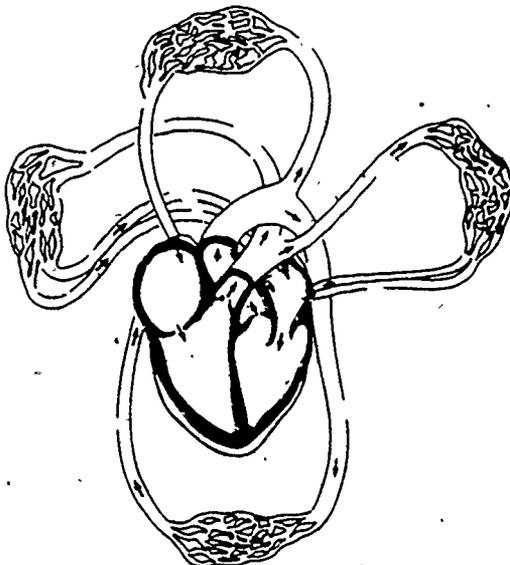
Correct response:

_____
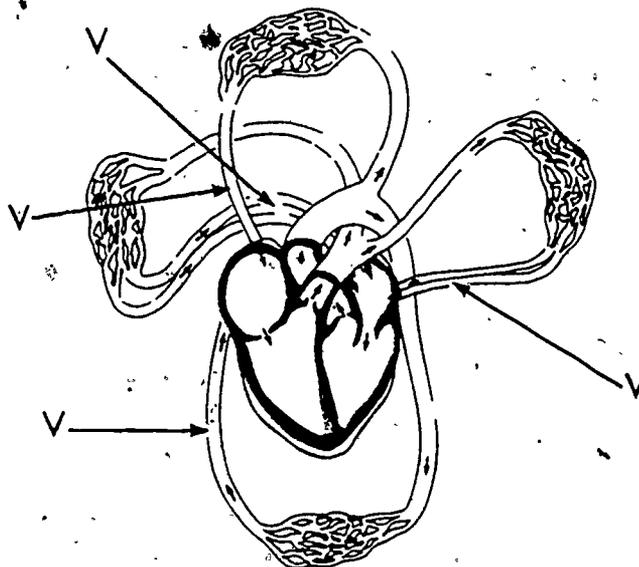
37. A vein carries blood (check the right answer(s)).

   a. to the body cells.

   b. from the lungs.

   c. to the capillaries.

   d. from the capillaries.

   e. to the heart.

///

Correct response: <u>b, d, e</u>

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38. Match the following vessel(s) with the statement(s) that pertain to them

a. capillaries

b. venules

c. veins

_____1. Largest vessel for returning blood to the heart

_____2. Vessels found in body tissue

_____3. Return blood to heart

_____4. Connect capillaries and veins

_____5. Circulate blood next to cells

//

Correct response: _c_ 1, _a_ 2. _b,c_ 3. _b_ 4. _a_ 5.

---

39. Using the diagram below, label the numbered vessels. State the characteristics of each vessel.

6. _____
7.
5. _____
4. _____
3. _____
1.
8.
2.

//

Correct response:

6. Veins (Blood to Heart)

5. Veins (Blood to Heart)

4. Venules(Vessels Getting Larger. Blood back to Heart)

3. Capillaries (Found in Body Tissue. Take Blood to Cells)

7. Arteries (Blood to Lungs)

1. Artery (Blood away from heart)

8. Veins (Blood to Heart)

2. Arterioles. (Smaller Branches of Artery)

5-17

55J
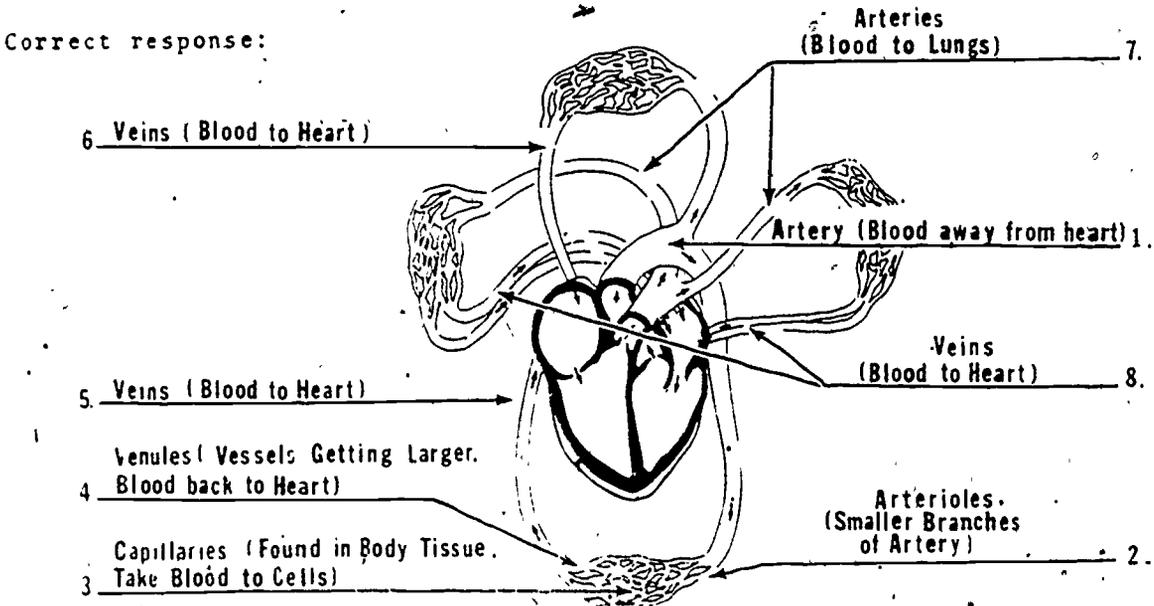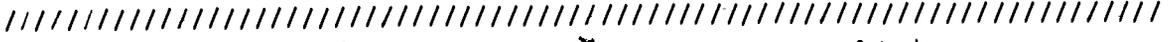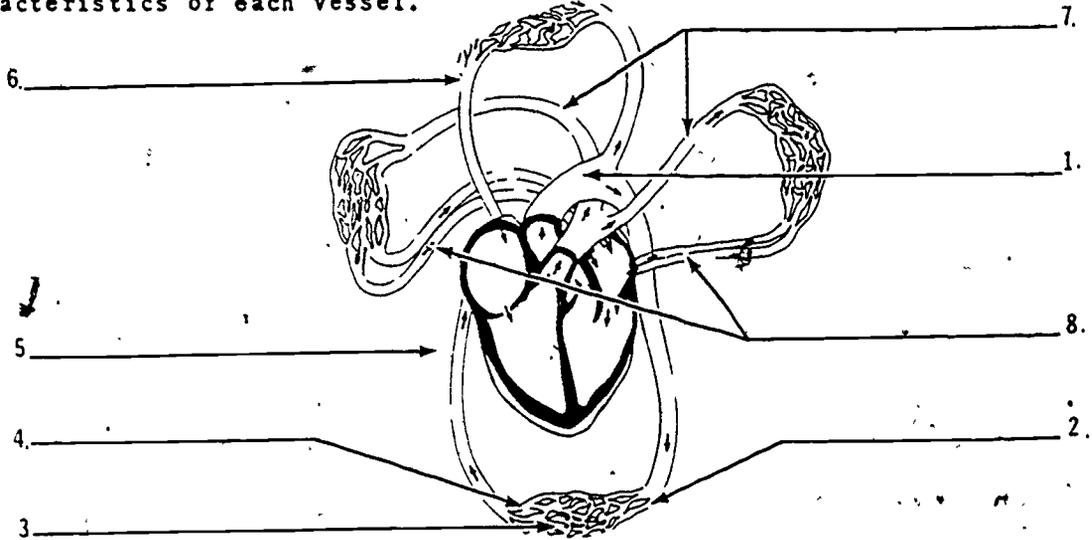
TYPES of CIRCULATION:

40. There are two types of circulation within the circulatory system. The first one is called the SYSTEMIC CIRCULATION. In the systemic circulation the blood is transported to and from all parts of the body by starting at the left ventricle and ending at the right atrium. Study the diagram below of the systemic circulation with the heart and vessels labeled.

7. R. Atrium

6. Vein

5. Venules

4. Capillaries

L. Ventricle   1.

Artery   2.

Arteriole   3.

///
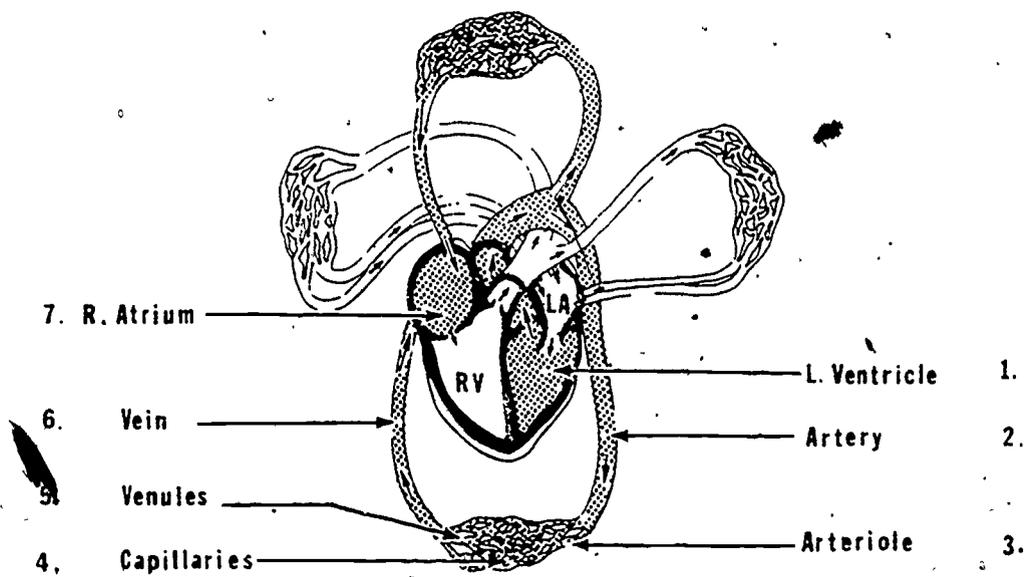
On the diagram below label the missing parts.

7.

6. Vein

5.

4. Capillaries

L. Ventricle   1.

2.

Arterioles   3.

//
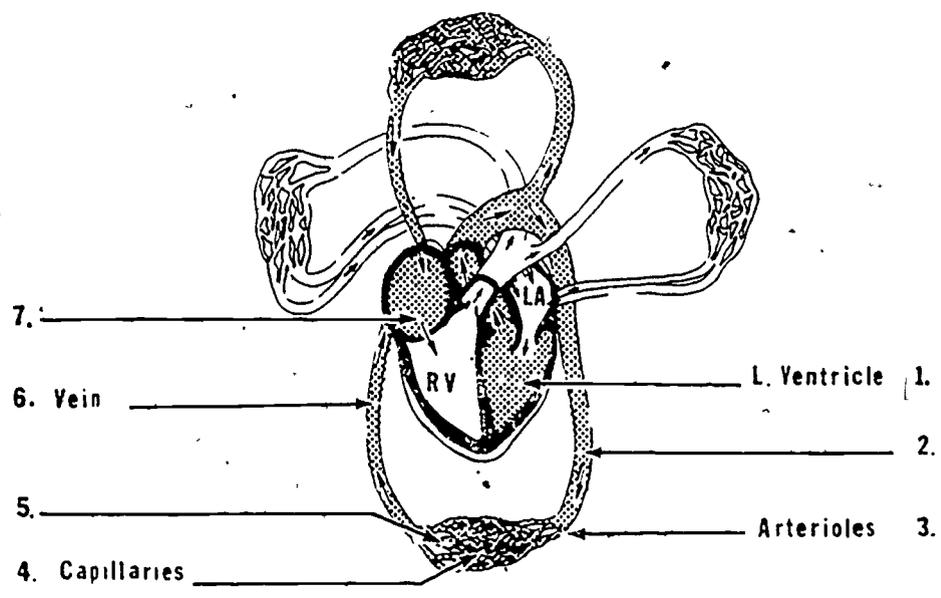
Correct response: 2. <u>artery</u>   5. <u>venules</u>   7. <u>right atrium</u>

_____

41. Label the missing parts of the systemic circulatory system.

7. —R.Atrium
6.
5. ___Venules___
4.

1.
Artery   2.
3.

//
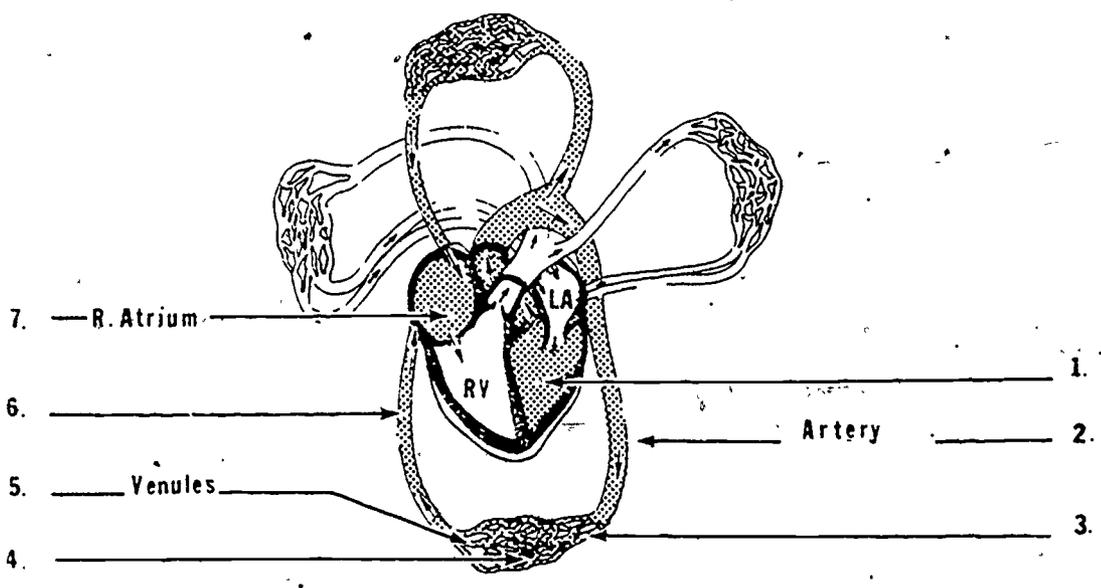
Correct response: Missing parts 1. <u>left ventricle</u>, 3. <u>arterioles</u>,
                    4. <u>capillaries</u>, 6. <u>vein</u>

_____

42. Where does the systemic circulatory system carry blood?

//

Correct response: The blood is transported to and from the body.

43. The systemic circulation begins at one chamber of the heart and ends
at another. From the list below check the correct set of chambers.

    a. Left atrium to right ventricle.

    b. Left ventricle to left atrium.

    c. Left ventricle to right atrium.

    d. Right atrium to right ventricle.

///

Correct response: c

---

44. From the sets below, check the correct sequence of vessels the blood
will flow in the systemic circulation.

    a. arterioles-capillaries-venules-veins-arteries

    b. veins-venules-capillaries-arterioles-arteries

    c. arteries-arterioles-capillaries-venules-veins

///

Correct response: c

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45. Check the statement(s) below that is/are true.

Systemic circulation transports blood

    a. to the body only.

    b. to the lungs.

    c. from the body only.

    d. to and from the body and lungs.

    e. to and from the lungs.

    f. to and from the body.

///

Correct response: f

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46. The second type of circulation is known as the PULMONARY CIRCULATION. This circulation transports the blood from the heart to the lungs and back to the heart, starting at the right ventricle and ending at the left atrium. Study the diagram below of the pulmonary circulation with the heart and vessels labeled.

3. Pulmonary Arteriole
4. Capillaries
5. Pulmonary Venules
6. Pulmonary Veins
7. L. Atrium
Pulmonary Artery 2.
R. Ventricle 1.

//
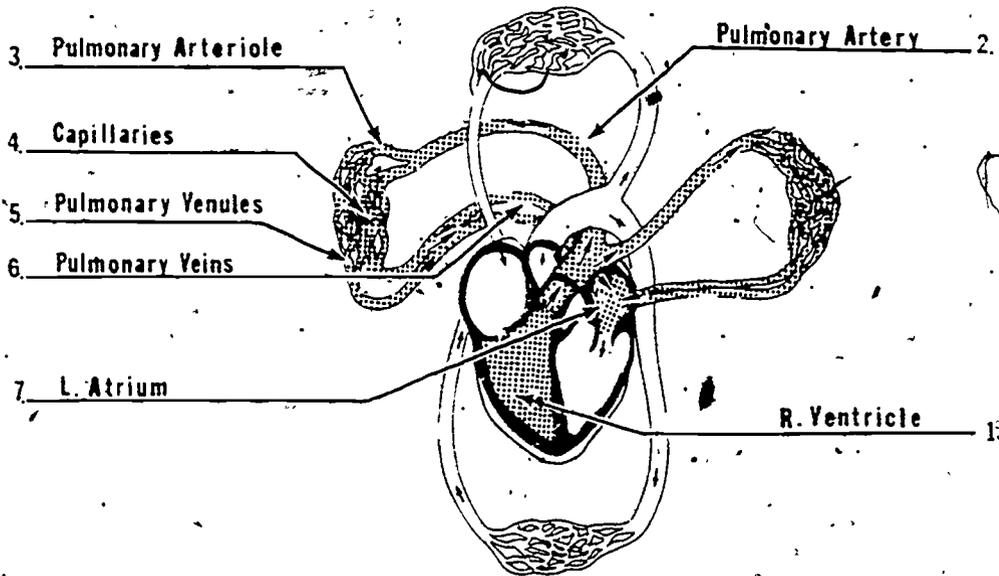
Label the missing parts on the diagram below.

3. Pulmonary Arteriole
4. Capillaries
5. Pulmonary Venules
6.
7.
2.
R. Ventricle 1.

5-21

//
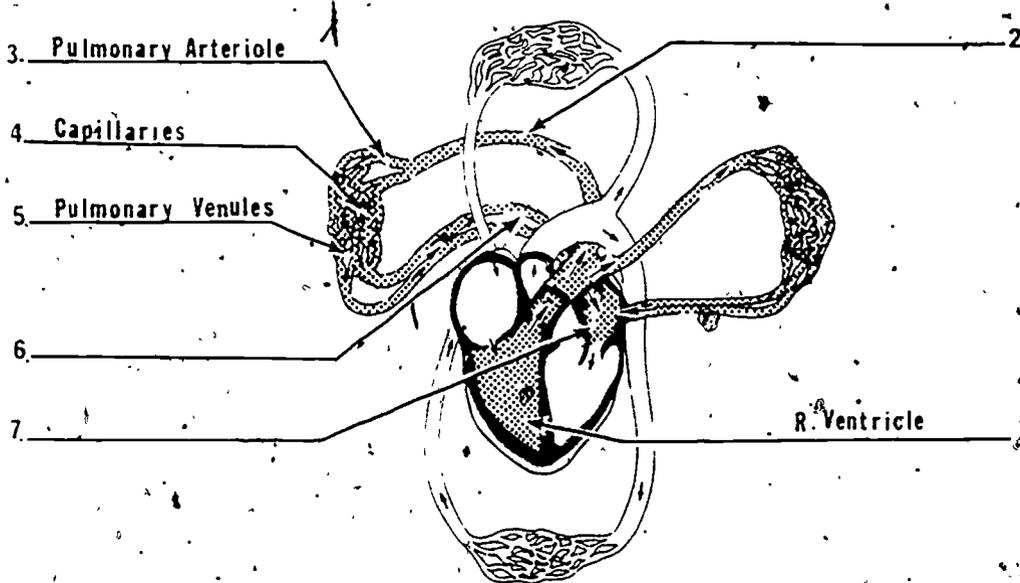
Correct response: 6. <u>pulmonary vein</u>, 7. <u>left atrium</u>, 2. <u>pulmonary artery</u>

_____

47. Label the missing parts on this diagram.

3 _____

4 _____

5 _____

6 Pulmonary Veins

7 L. Atrium

Pulmonary Artery ___ 2

1

//
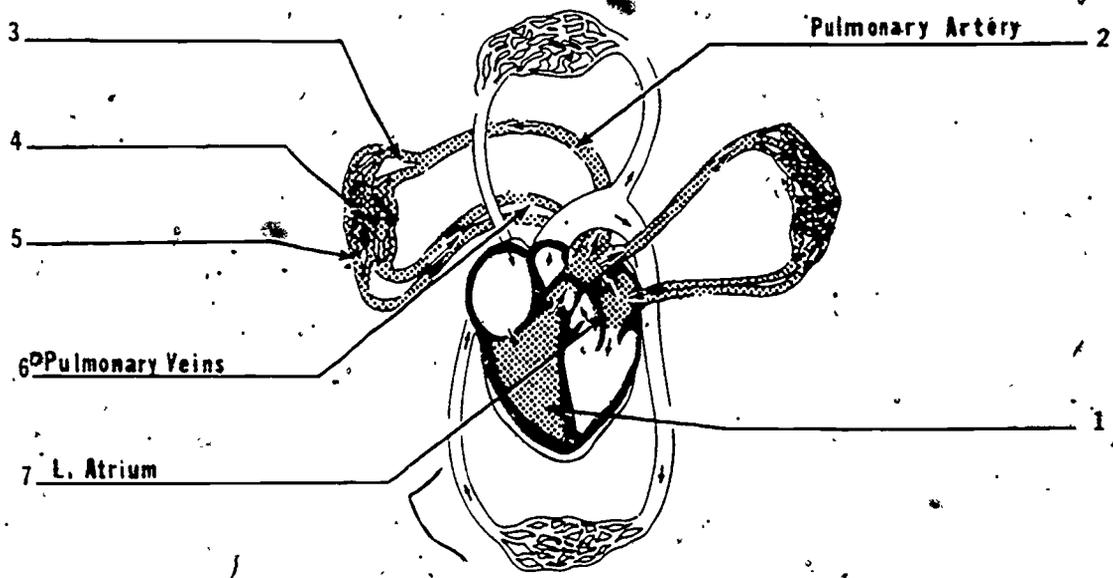
Correct response: 1. <u>right ventricle</u>, 3. <u>pulmonary arteriole</u>, 4. <u>capillaries</u>,
                    5. <u>pulmonary venules</u>

_____

48. In your own words, where does the pulmonary circulatory system transport
blood?

//

Correct response: The blood is transported from the heart to the lungs and
                    back to the heart.

49. From the choices below, check the correct sequence of vessels the blood
will flow in the pulmonary circulation.

    a.   artery-arterioles-capillaries-venules-vein

    b.   pulmonary vein-venules-capillaries-arterioles-pulmonary artery

    c.   pulmonary artery-pulmonary arteriole-capillary-pulmonary venules-
       pulmonary vein

    d.   pulmonary arterioles-capillary-pulmonary venule-pulmonary vein-
       pulmonary artery.

///

Correct response: c

_____

50. The pulmonary circulation begins at one chamber of the heart and ends
at another. From the list below check the correct set of chambers.

    a.   Left atrium to left ventricle.

    b.   Right ventricle to left atrium.

    c.   Left ventricle to right atrium.

    d.   Right ventricle to right atrium.

///

Correct response: b

_____

51. On the diagram below, start with the systemic circulation and label its
parts and then label the parts of the pulmonary circulation.

//

Correct response:

Pulmonary Artery

Arteries

Pulmonary Veins

Pulmonary Arterioles

Capillaries

Pulmonary Venules

R. Atrium

R. Ventricle

L. Atrium

L. Ventricle

Vein

Arterioles

Venules

Capillaries
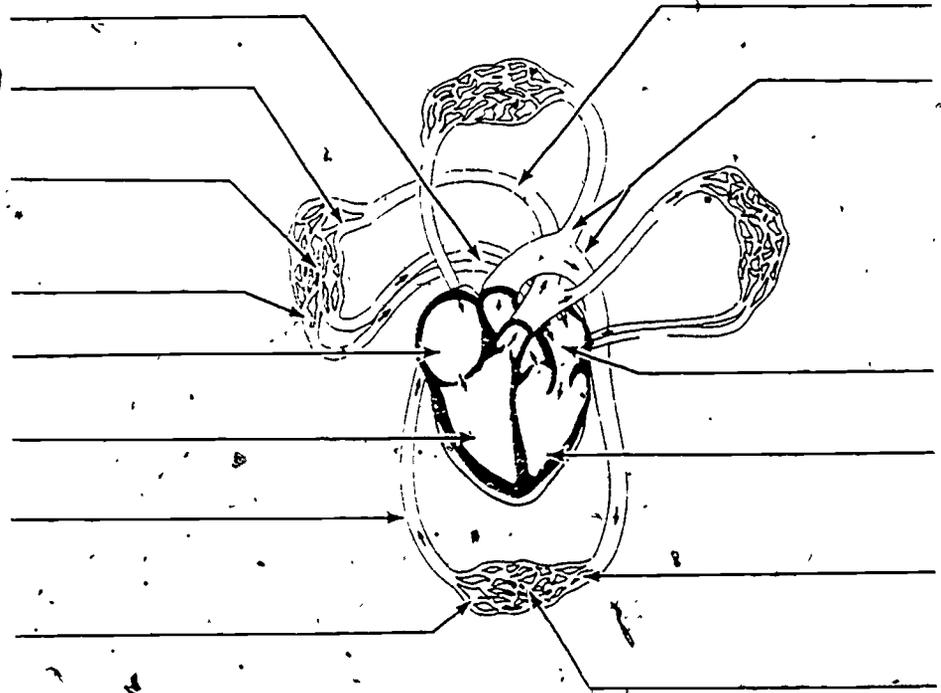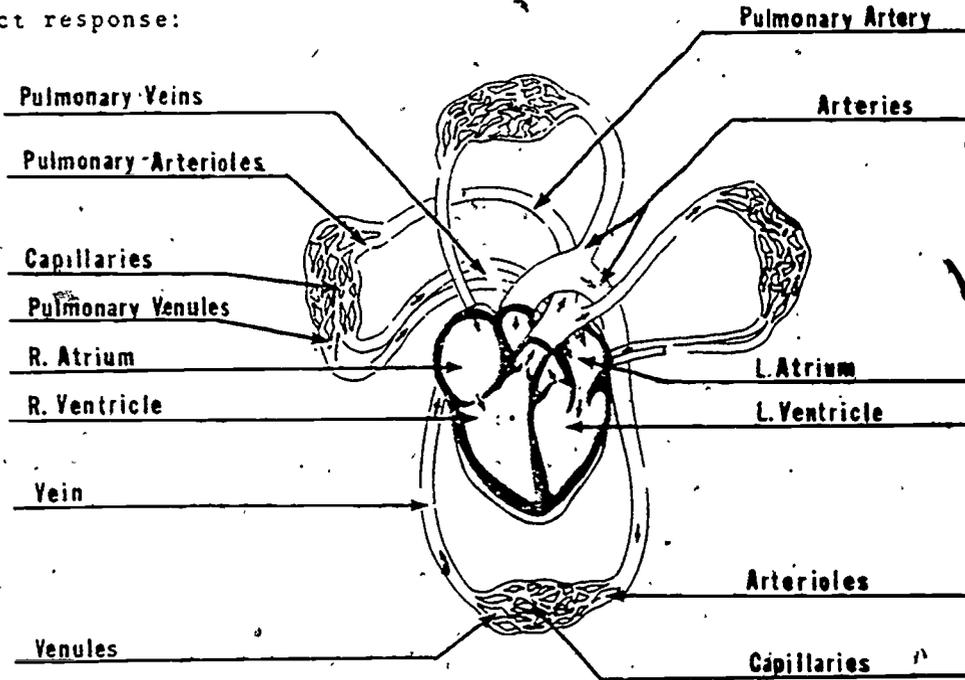
52. Now that you have studied the chambers of the heart, the different blood vessels and the two systems of circulation, let's now examine parts of the blood. Blood is composed of four different parts; each having its own function.

The first part of blood is the erythrocytes or Red Blood Cells (RBC's). The RBC's are produced in the marrow of some bones. From there they enter the circulatory system to start their work. The RBC's carry oxygen to the body cells and carbon dioxide from the body cells.

The second part of our blood is leukocytes or White Blood Cells (WBC's). These too are produced in the marrow of a few bones as well as in other tissue of the body. Their function is to aid in fighting infection in the body.

If a person is suffering from a lack of oxygen in his blood, it is due to a lack of

   a. RBC's

   b. WBC's

//

Correct response; <u>a</u>

___

53. When a person falls and cuts himself on a blunt object, which blood cell starts to work to fight infection?

   a. RBC's

   b. WBC's

///

Correct response: b

_____

54. Match the type of blood cell with the statement(s) that pertain to them.

a. RBC's

b. WBC's

____1. Produced in bone marrow and carry oxygen

____2. Produced in marrow and other tissue and aid in fighting infection

____3. Work when there is an injury to the body

____4. Produced in marrow and carry carbon dioxide

///

Correct response: 1. a , 2. b , 3. b , 4. a

_____

55. Platelets are the third part of the blood. Just like the RBC's and WBC's, the platelets are formed in the bone marrow, too. Their function is to aid in the coagulation or clotting of the blood.

Plasma is the last part of the blood. It is the liquid part of the blood that carries the RBC's, WBC's, and platelets. This is why we say that plasma supports all blood functions.

When you are shaving and nick yourself, the bleeding stops because of the

a. platelets.

b. plasma.

///

Correct response: a

_____

56. If there were three different colored buttons in a glass of water, the water would be like

a. platelets.

b. plasma.

///

Correct response: b

5-25

57. Match the blood components with the statement(s) that pertain to them.

a. platelets

b. plasma

_____ 1. Produced in bone marrow

_____ 2. Supports blood functions

_____ 3. Liquid part of blood

_____ 4. Join together to stop bleeding

_____ 5. Work as part of a system

///////'///

Correct response: 1. _a_ , 2. _b_ , 3. _b_ , 4. _a_ , 5. _a, b_

FUNCTIONS of the BLOOD

58. This section of the circulatory system has to do with the five functions
of the blood. Each function is in support of the body and its functioning.

One function of the blood is respiration. Oxygen is transported from
the lungs to the cells and carbon dioxide from the cells to the lungs.

Another function of the blood is nutrition. Nutrients are transported
from the digestive system to the body cells.

When a person breathes in and out, which blood function is utilized?

a. nutrition

b. respiration

//

Correct response: _b_

---

59. When you are hungry, you eat. When a cell is hungry, what blood
function takes care of it?

a. nutrition

b. respiration

//

Correct response: _a_

56

60. Excretion is a third blood function. Waste products are carried away from the cell by the blood.

Another function is protection. The blood defends against infection and heals injuries.

Regulation is the last blood function. Regulatory hormones are distributed throughout the body.

When a person cuts himself, which function helps to prevent blood poisoning?

a. excretion   b. protection   c. regulation

//

Correct response: b

___

61. Distribution of a sex hormone to body cells illustrates which blood function?

a. excretion   b. protection   c. regulation

//

Correct response: c

___

62. Removal of carbon dioxide from a cell is an example of which blood function?

a. excretion
b. protection
c. regulation

//

Correct response: a

___

63. Match the blood function with the statement(s) that pertain to it.

a. protection   ___ 1. Removes waste

b. regulation   ___ 2. Acts when you cut yourself shaving

c. excretion   ___ 3. A function of the blood

                     ___ 4. Takes hormones from gland to working spot

                     ___ 5. Fights germs from rusty nail in foot

                     ___ 6. Carries used substances away from cell

//

Correct response: 1. c , 2. a , 3. a,b,c , 4. b , 5. a , 6. c

5-17

Chapter Six

RESPIRATORY SYSTEM

1. This chapter deals with the respiratory system. The respiratory organs
work together to give our body oxygen, a needed gas. Also, carbon dioxide,
a waste product, is removed from our body by the respiratory system. The
intake of oxygen and removal of carbon dioxide by the respiratory system
is known as the "act of breathing".

The first structures that the oxygen will come into contact with are
the nose and mouth. These are the entrance ways into the respiratory
system. As the air passes through the mouth and nose, it is warmed and
moistened. These are two of the functions of the mouth and nose. The other
functions have to do with other body systems and will not be discussed in
this chapter.

In your own words, define respiration.

///

Correct response: You should have said something like: "Respiration is
                   the act of breathing."

---

2. On the diagram on page 6-2, label the first two structures of the
respiratory system.

///

Correct response: 1. nose, 2. mouth

---

3. From the list below, check the correct functions of the mouth and nose.

    a. dry the air.

    b. track the air.

    c. warm the air.

    d. smoke the air.

    e. shape the air.

    f. moisten the air.

///

Correct response: c, f

6-1

1

2

3

4

5

6

7

8

9

6-2
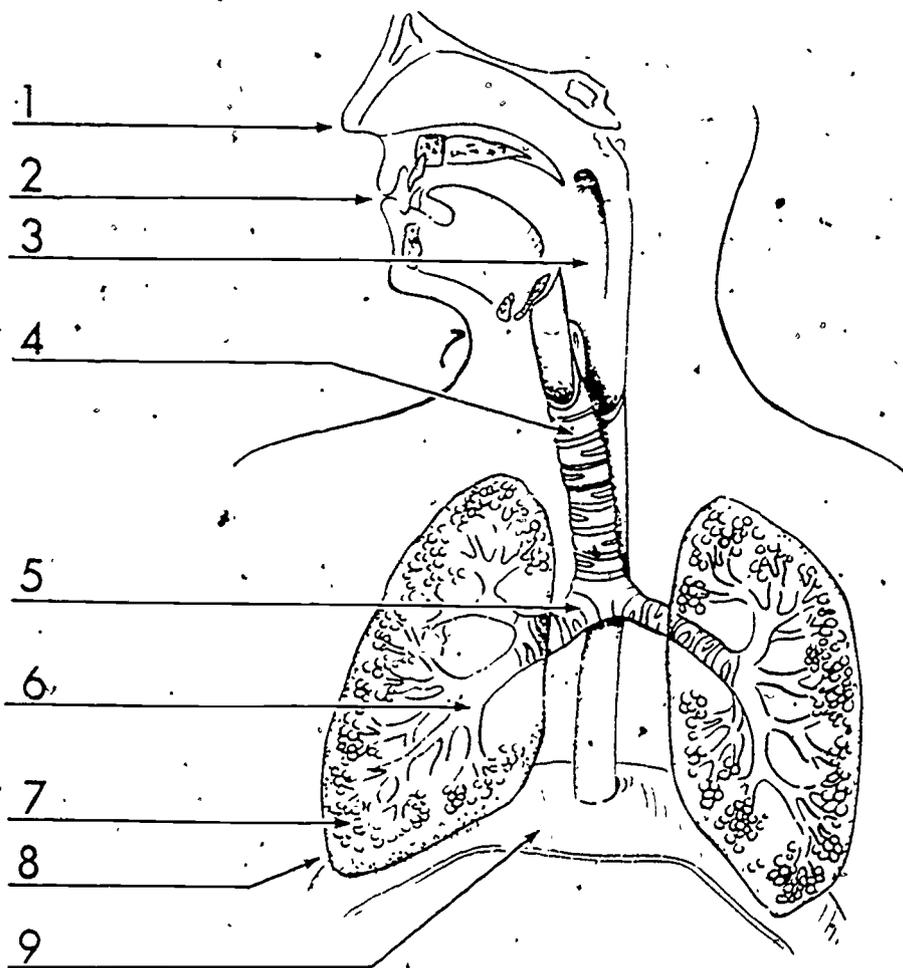
4. The next structures the air passes through are the pharynx and the trachea. The pharynx follows directly after the mouth and nose. It is a passageway for the air to follow. The trachea is one of two branches at the distal end of the pharynx. The other branch is the esophagus, which is to be covered in the digestive system. The trachea is located anterior to the esophagus and is another passageway for air like the pharynx.

- On the diagram on page 6-2, label the pharynx and trachea.

//

Correct response: 3. pharynx, 4. trachea

---

5. The pharynx follows which structure(s) of the respiratory system?

   a. tongue

   b. nose

   c. pharynx

   d. mouth

//

Correct response: b & d

---

6. What is the name of the respiratory structure that is in front of the esophagus?

//

Correct response: trachea

---

7. In your own words, describe the function of the pharynx and trachea.

//

Correct response: The pharynx and trachea are air passageways.

---

8. The next structures are the bronchi and the bronchioles. The bronchi is a continuation of the trachea. It also has the same function, an air passageway. At the distal end of the bronchi there is a division. This is where the bronchioles start and bring the oxygen into each of the lungs. The bronchioles are air passageways, too, because they do not stop at the lungs, but continue on into each lung where they branch out inside the lungs.

On the diagram on page 6-2, label the bronchi and bronchioles.

//

Correct response: 5. bronchi, 6. bronchioles

6-3.

9. What structure carries the air directly into the lungs?

//

Correct response: __Bronchioles__

_____

10. Which of the following is a function of the bronchi and bronchioles? ▾

    a. warms the air.

    b. serves as a food passageway.

    c. serves as an air passageway.

    d. moistens the air.

//

Correct response: __c__

_____

11. From the list below, match the functions in Column B with its structure
in Column A.

Column A	Column B
a. bronchi	____1. Moistens air
b. pharynx	____2. Passageway for air
c. nose	____3. Warms air
d. bronchioles	
e. mouth	
f. trachea	

//

Correct response: a. __2__ , b. __2__ , c. __1,3__ , d. __2__ , e. __1,3__, f. __2__

_____

12. At the ends of the bronchioles are the alveoli or air sacs. These air
sacs cover the entire interior lining of the lungs. They look like a bunch
of grapes still on their branches. The alveoli are covered by the capil-
laries and this is where the exchange of oxygen for carbon dioxide takes
place.

    On the diagram on page 6-2, label the alveoli.

//

Correct response: alveoli __7__

13. From the list below, check the other name for the air sacs.

    a. lungs

    b. bronchioles

    c. trachea

    d. alveoli

///

Correct response: __d__

___

14. The exchange of gases is the function of the _____.

    a. bronchi.

    b. alveoli.

    c. trachea.

    d. nose.

///

Correct response __b__

___

15. Check the gas(es) that is/are exchanged in the alveoli.

    a. hydrogen

    b. nitrogen

    c. carbon dioxide

    d. carbon monoxide

    e. oxygen

///

Correct response: __c, e__

___

16. The pleural sacs are another structure of the respiratory system. They are attached to the chest wall, but do not touch the lungs. The pleural sacs form the outer lining of the lungs.

    The muscle of respiration is the diaphragm. The diaphragm is also attached to the sides of the chest wall and the bottom of the pleural sacs. The action of the muscle is what enables us to breathe.

    On the diagram on page 6-2 label the pleural sacs and diaphragm.

///

Correct response: pleural sacs __8__ , diaphragm __9__

6-5

17. In your own words explain the location of the pleural sacs.

///

Correct response: The pleural sacs surround the lungs but do not touch
them and are attached to the chest wall and diaphragm.

_____

18. The diaphragm is the muscle of

    a.   circulation.   c.   digestion.

    b.   respiration.   d.   nerves.

///

Correct response: b

_____

19. The diaphragm is attached to the _____ and _____.

///

Correct response: chest wall and pleural sacs

_____

20. As you read the following paragraph, refer to the diagram on page 6-2
to better understand the functions of the pleural sacs and the lungs.

The air pressure in the lungs is the same as that outside of the body.
When the diaphragm contracts, it pulls the pleural sacs along with it
causing the confined air between the sacs and lungs to thin out. The
pressure inside the lungs now decreases causing air to be pulled into the
lungs to equalize pressure. This process is called inhaling.

What is the difference between the air pressure outside the body and
inside the lungs before inhaling?

    a.   greater.

    b.   less.

    c.   same.

///

Correct response;   c

_____

21. What muscle contracts to thin out the confined air between the lungs
and pleural sacs?

    a.   femur   c.   humerous

    b.   diaphragm   d.   cardiac

///

Correct response: b

22. In your own words explain what will happen when the pressure outside the body is greater than inside the lungs.

///

Correct response: Air is pulled into the lungs to equalize the pressure.

---

23. The questions you have been answering have all been talking about the process of _____.

///

Correct response: inhaling

---

24. The process of removing carbon dioxide from the lungs, or exhaling, is the opposite of inhaling.

The diaphragm will relax which reduces the size of the pleural sacs. This compresses the air between the sacs and lungs so it becomes greater than that inside the lungs. The air inside the lungs is then forced out of the mouth or nose and we exhale.

Once again the process of inhaling and exhaling will start over to give our bodies the needed oxygen and remove the waste, carbon dioxide.

What is the condition of the diaphragm when we exhale?

///

Correct response: relaxed

---

25. When exhaling, the air pressure is greater in the

    a.   bronchi.

    b.   pleural sacs.

    c.   air sacs.

    d.   lungs.

///

Correct response: b

26. Air is pushed out of the lungs by the compression of the

    a.   sac.

    b.   alveoli.

    c.   lungs.

    d.   bronchi.

//

Correct response __c__

---

27. Match the function in Column B with its structure in Column A

Column A		Column B
a. lungs	____1.	Relaxes
b. pleural sac	____2.	Air pressure equal to outside of body
c. diaphragm	____3.	Is pulled on to thin out confined air
	____4.	Contracts
	____5.	Compresses the lungs
	____6.	Carbon dioxide starts out of the respiratory system

//

Correct response: 1. __c__, 2. __a__, 3. __b__, 4. __c__, 5. __b__; 6. __a__

    This concludes the chapter on the respiratory system. Now we know how we breathe, how oxygen is taken on by the body and carbon dioxide is given off. If you have any questions, feel free to ask your instructor.

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Chapter Seven

DIGESTIVE SYSTEM

The digestive system is one of the most important systems of the human body. It is this system that supplies the body with the food and energy to maintain life. Just like the other systems of the body, the digestive system is made up of many parts. It is these parts and their functions with which we are concerned.

In the following diagram the main organs of digestion are listed. Remember them and their order in the system.

a. Mouth

b. Pharynx

c. Esophagus

i. Liver

j. Gall Bladder

e. Duodenum

g. Large Intestine

h. Anus

Stomach   d.

Pancreas   k.

Small
Intestine   f.

7-1
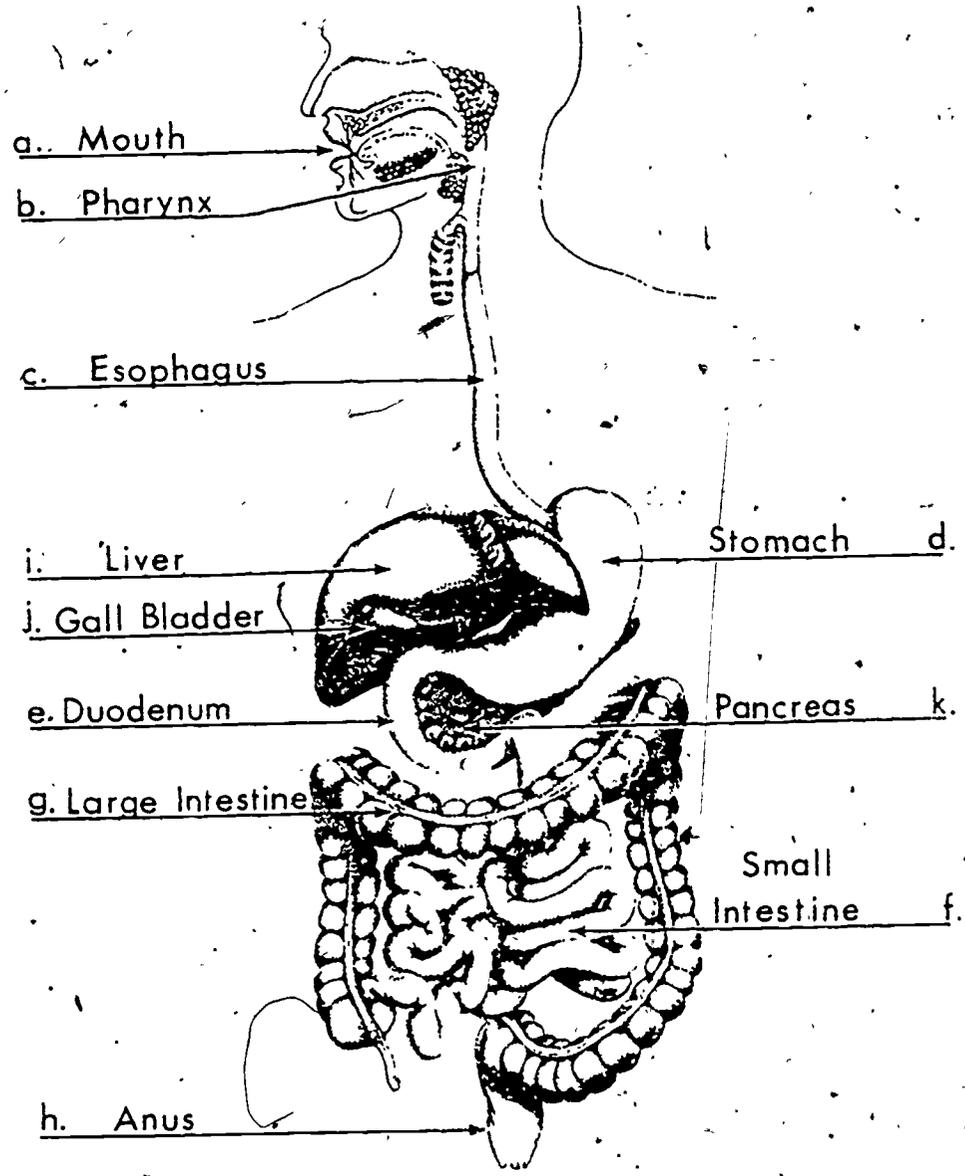
1. We will now look at the main organs of the digestive system.
The mouth is the first structure of the alimentary canal (digestive tract).
Mechanical digestion (or chewing) occurs here. A chemical action takes
place in the mouth also, but that will be discussed later.

Complete the following statement. Food is received in the mouth and
chewed. This is called _____ _____.

///

Correct response: <u>mechanical</u> <u>digestion</u>

---

2. The mechanical digestion that occurs in the mouth is sometimes referred
to as _____.

///

Correct response: <u>chewing</u>

---

3. The next two organs are passageways, the pharynx and the esophagus.
Their function is to allow food to pass from the mouth to the stomach.
When food enters the esophagus it produces a dilatation that stimulates
contraction. This contraction of smooth muscle is referred to as peristal-
sis, a ripple like motion. Peristalsis starts at the esophagus and con-
tinues down through the entire alimentary canal.

The organs of the digestive system that are passageways are the

_____ and _____.

///

Correct response: <u>pharynx</u> and <u>esophagus</u>

---

4. From the diagram on page 7-1, select the letters that indicate the
pharynx and the esophagus.

///

Correct response: <u>b, c</u>

---

5. The next organ in the digestive system is the stomach. This is the
widest portion of the alimentary canal and is also the most muscular organ.
A churning action in the stomach mixes the food with gastric juice. Only
partial chemical digestion of proteins occurs in the stomach.

From the diagram on page 7-1, locate and write the letter that indicates
the stomach. _____

///

Correct response: <u>d</u>

7-2

6. Write in your own words the function and actions that occur in the stomach.

///

Correct response: The function of the stomach is to receive food from the esophagus and start a churning action. Gastric juices are mixed with the food and begin chemical digestion of proteins.

7. Let us go back and review the organs that we have discussed up to now. The first structure is the mouth in which food is chewed. This is called mechanical digestion. The next two organs are the pharynx and the esophagus. They serve as passageways through which food may travel on its way to the stomach. When the food arrives at the stomach, a churning action occurs and gastric juices are added to the food mixture.

After food leaves the stomach it enters the small intestine. The small intestine is similar to a long tube, approximately 20 feet in length. The main function of the small intestine is the absorption of digested food. As we have said before, the digestion process starts in the mouth and continues to break down the food so that the body can use it.

Some digestion occurs in the first part of the small intestine. This part is referred to as the duodenum and represents the first ten inches of the small intestine. Two organs empty their digestive juices into the duodenum of the small intestine.

Refer to the diagram on page 7-1 and identify the small intestine. Write the letter in the space provided._____

///

Correct response: f

8. Write in your own words why food is digested.

///

Correct response: Food is broken down because in its solid state it cannot be used by the body.

9. After the food leaves the small intestine, it enters the large intestine. This organ is five feet in length and is larger in diameter than the small intestine. When food enters the large intestine, it is in a semi-liquid form; as it travels through the large intestine the liquid is absorbed through the intestinal walls and is utilized to maintain proper body fluid balance. By the time the food reaches the distal end of the large intestine, all of the necessary materials have been removed. That which remains is of no use to the body. This portion of the large intestine is called the anus, and the material that leaves the body is called fecal matter.

7-3

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In the diagram on page 7-1, select the letter that indicates the large intestine. ____

//

Correct response: __g__

---

10. The main function of the large intestine is

    a. absorption of waste material.

    b. absorption of liquid,

    c. absorption of digested food.

    d. reabsorption of digestive juices.

//

Correct response: __b__

---

11. The name of the part at the distal end of the large intestine is the _____.

//

Correct response: __anus__

---

12. We now have finished with the main organs of digestion. Up until now, we have only discussed the alimentary canal. There are other organs which aid digestion but they lie outside of the alimentary canal. The function of these organs is to break down the food either by chemical or mechanical, digestion. These organs are called accessory organs of digestion.

The first of these accessory organs is the teeth, tongue, and salivary glands, all located in the mouth. When food is taken in, the teeth and tongue chew and grind up the food. This is mechanical digestion. Mechanical digestion continues on through the alimentary canal due to the squeezing action of peristalsis.

The salivary glands secrete an enzyme, which is a substance necessary for chemical digestion of food. The name of this enzyme is saliva and its function is to start the digestion of carbohydrates. Carbohydrates, such as bread and potatoes, are used by the body to supply heat and energy.

The accessory organs to digestion are mainly located _____

//

Correct response: outside of the alimentary canal.

---

13. The two types of digestion are _____ and _____.

//

Correct response: __mechanical__ and __chemical__

14. Does mechanical digestion stop in the mouth? _____

//

Correct response: no

_____

15. The teeth and tongue are used in _____ digestion.

//

Correct response: mechanical

_____

16. The salivary glands produce an enzyme called _____.

//

Correct response: saliva

_____

17. Saliva works on which of the following types of food?

    a. fats

    b. proteins

    c. minerals

    d. carbohydrates

//

Correct response: d

_____

18. Carbohydrates are used by the body for

    a. supplying heat and energy.

    b. growth and repair of body tissue.

    c. regulating fluid balance.

    d. regulating solid balance.

//

Correct response: a.

_____

19. The next accessory organ is the liver. The liver is one of
the largest and most important organs of the human body. It has many
functions, but its most important function is the production of an
emulsifier called bile. Up to now, we have talked about enzymes. What is
an emulsifier? An emulsifier is a chemical substance which breaks large
particles into many smaller particles but does not chemically change them.
Bile breaks up fat to enable further digestion and storage. Bile is being

produced by the liver constantly, and must be stored until needed by
the body. Bile is stored in the gall bladder, a small gland located just
below the liver. Fats are used by the body the same way as carbohydrates
as a supply of heat and energy.

19. The liver secretes a substance called _____

//

Correct response: bile

_____

20. Bile is not an enzyme, it is an _____.

//

Correct response: emulsifier

_____

21. Bile is secreted by the _____ and is stored in the _____

//

Correct response: liver , gall bladder

_____

22. Fats are used by the body for

   a. growth and repair of body tissue.

   b. regulating fluid balance.

   c. regulating solid balance.

   d. supply of heat and energy.

//

Correct response: d

_____

23. The pancreas is the last accessory organ and is located just below the
stomach. It secretes an enzyme called pancreatic juice. The function of
this enzyme is to digest fats, proteins and carbohydrates. Proteins are
needed by the body for the repair and growth of body tissues. Both
pancreatic juice and bile are emptied into the duodenum. The pancreas is
known as a dual function gland and will be discussed more fully later when
we talk about the endocrine system.

   The pancreas empties its enzymes into what portion of the alimentary
canal? _____

//

Correct response: duodenum

583

7-6

24. Pancreatic juice works on fats, carbohydrates and _____.

///

Correct response: <u>proteins</u>

---

25. Proteins are used by the body for .

a. growth and repair of body tissues.

b. regulating fluid balance.

c. regulating solid balance.

d. supply of heat and energy.

///

Correct response: <u>a</u>

---

26. You now have been given all of the information on the digestive system, both main organs and accessory organs. As a means of review, we now will trace a bit of food from start to finish.

Mouth	chews food, mechanical digestion.
	saliva, works on carbohydrates, chemical digestion.
Pharynx & Esophagus	passageway for food to the stomach.
Stomach	churning action.
	partial digestion of proteins.
	production of gastric juices.
Duodenum	the first ten inches of the small intestine.
	receives pancreatic juice and bile.
Liver	secretes an emulsifier to break down fats.
Gall bladder	stores bile for the liver.
Pancreas	secretes an enzyme to digest fats, carbohydrates and proteins.
Small intestine	absorption of digested food.
Large intestine	absorption of liquids.
	elimination of waste through the anus.

The diagram on this page is the same as the one on page 7-1. As a test to see if you know the main units of the digestive system, you should label all of the listed parts without referring to your notes. Also, on page 7-9 you will find a list of terms we have used in this chapter. Beside each organ, write its function. Try to do this without referring to your notes.

a.

b.

c.

i.

j.

e.

g.

d.

k.

f.

h.

585
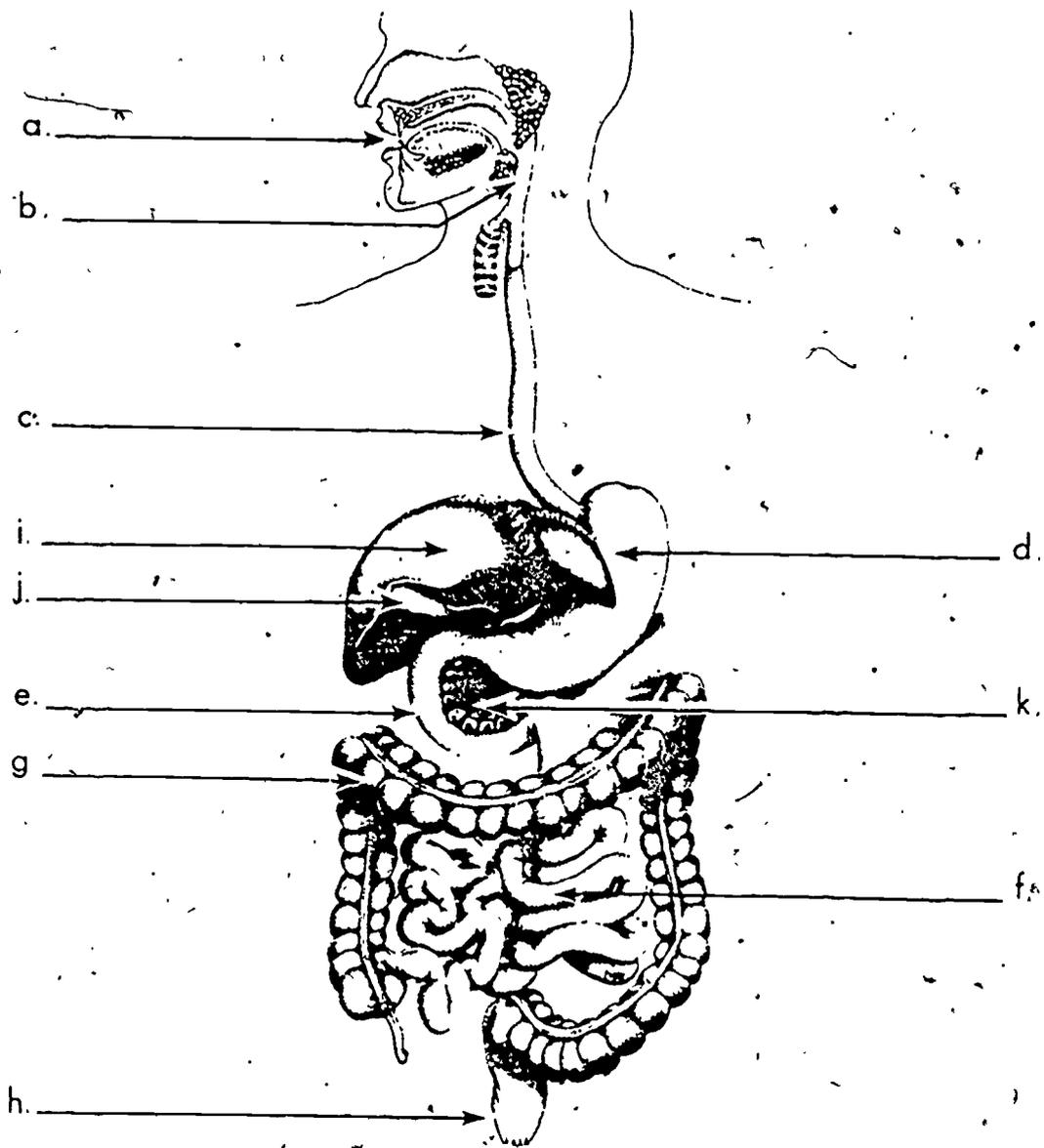
LIST OF TERMS

Mouth

Saliva

Pharynx

Esophagus

Stomach

Duodenum

Liver

Gall bladder

Pancreas

Small Intestine

Large Intestine

Anus

Chapter Eight

ENDOCRINE SYSTEM

The endocrine system is important because of the secretions produced by its glands. These secretions are responsible for the proper functioning of the body and many of its organs. An excess or deficiency of any one of these secretions can have serious effects on the body.

1. Let's take a look at the glands of the endocrine system, their location and function.

GLAND	LOCATION	FUNCTION
Pituitary	Base of the brain just behind the eyes.	Produces hormones which regulate function of thyroid, adrenals, and gonads; influences growth.
Thyroid	Anterolateral neck on both sides located just below the larynx.	Regulates rate of body metabolism (rate at which the body uses oxygen to burn food taken in).
Parathyroids	Imbedded in posterior surface of thyroid.	Regulates calcium level of blood.
Adrenals Cortex Medulla	On top of each kidney. Outermost part. Innermost part.	Cortical hormone regulates salt and water balance for the body. Adrenalin stimulates cardiac rate and influences blood pressure. Prepares the body for flight or fight.
Pancreas	Posterior to stomach.	Produces insulin which regulates sugar metabolism.
Gonads:		
Testes (Male)	Suspended from the body in the scrotum.	Hormone influences secondary sexual characteristics of the male; i.e., beard, deep voice, coarse skin, hair, etc.
Ovaries (Female)	In the pelvis.	One hormone influences secondary sexual characteristics of the female; i.e., lack of beard, high pitched voice, development of breasts, fat distribution. One hormone prepares and maintains the uterus for pregnancy.

8-1

563

2. Write in the name of each gland described on page 8-1.

///
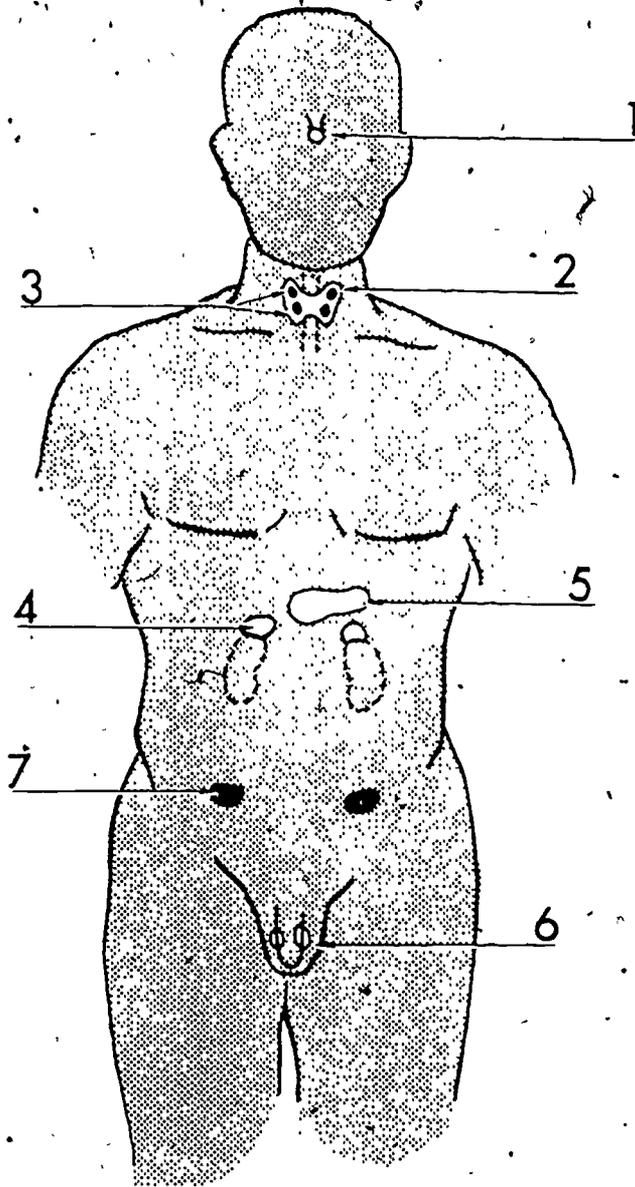
Correct response: 1. <u>Pituitary</u>, 2. <u>Thyroid</u>, 3. <u>Parathyroid</u>, 4. <u>Adrenal</u>, 5. <u>Pancreas</u>, 6. <u>Testes</u>, 7. <u>Ovaries</u>

Chapter Nine

URINARY SYSTEM

1. The body is constantly metabolizing food, when this occurs there is always some waste produced. The body is unable to use this material so it has to rid itself of it. We have already mentioned that solid waste is removed through the anus, but there is more waste than just the solid waste. The body also filters the blood and removes liquid waste products. This waste is filtered from the blood by the urinary system for elimination from the body.

The first organs to be discussed are the kidneys; they are the main organs of the urinary system. The kidneys are two bean shaped organs located superior to the waistline and posterior to the digestive organs. Blood is filtered by these organs and the liquid removed is called urine. Urine is considered a waste product.

Urine (contains/does not contain) waste products.

///

Correct response: <u>contains</u>

___

2. The kidneys are located (superior/inferior) to the waistline.

///

Correct response: <u>superior</u>

___

3. The human body contains how many kidneys? Answer:_____

///

Correct response: <u>2</u>

___

4. Using the diagram on page 9-2, identify the kidneys by letter._____

///

Correct response: <u>a</u>

___

5. After urine is secreted by the kidneys, it is transported to the bladder by two small tubes called ureters, one ureter leading from each kidney. Urine moves through these tubes by way of peristalsis, just as food moves through the digestive system.

Urine is moved through the ureters by a wave like motion called

_____.

///

Correct response: <u>peristalsis</u>

9-1

a

b

c

d

9-2
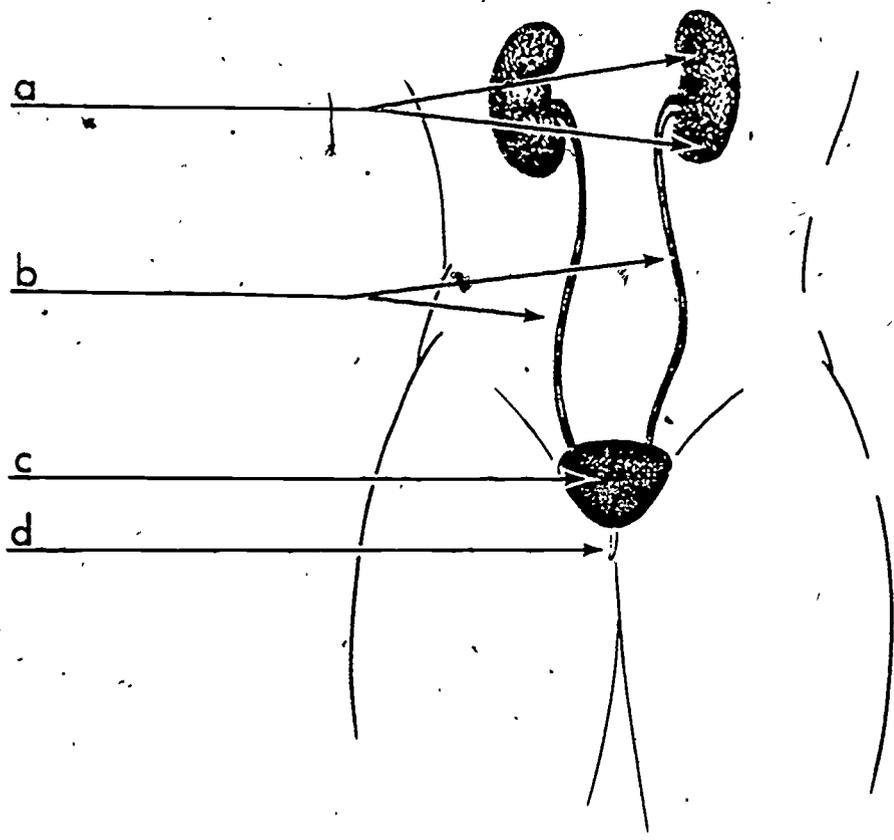
6. The human body has how many kidneys?

///

Correct response: 2

_____

7. The next two organs to be considered are the bladder and the urethra.
The bladder is a hollow muscular organ. Its function is to store the
urine which has been filtered by the kidneys until it is time to be released
from the body. This organ is capable of expanding to hold the urine. When
the bladder is full a signal is sent to the brain telling the person that
the bladder needs to be emptied. The urine then flows through a small tube
called the urethra. The male urethra is approximately 6-8 inches long,
whereas the female urethra is approximately 1-1/2 to two inches in length.
It is through this tube that urine leaves the body.

   The tubes that lead from the kidneys to the bladder are called, _____.

///

Correct response: ureters

_____

7. The function of the ureters is to

///

Correct response: Transport the urine from the kidneys to the bladder.

_____

8. Using the diagram on page 9-2, locate by letter the ureters.

///

Correct response: b

_____

9. What is the shape of the bladder?

///

Correct response: hollow and muscular

_____

10. Using the diagram on page 9-2, locate by letter the bladder.

///

Correct response: c

11. The tube leading outwardly from the bladder is called _____

//

Correct response: <u>urethra</u>

---

12. The function of the urethra is to

//

Correct response: transport urine from the bladder to the outside of body.

---

13. The size of the urethra in the male is _____ inches long,

and in the female it is _____ inches long.

//

Correct response: <u>6-8 inches in male.</u> <u>1-1/2 to 2 inches in female.</u>

---

14. Using the diagram on page 9-2, locate by letter the urethra.

//

Correct response: <u>d</u>

---

15. On page 9-5, you will find a diagram of the urinary system identical to
the one on page 9-2. Identify the parts in order and write their names
below.

   a.

   b.

   c.

   d.

592

a.

b.

c.

d.

///
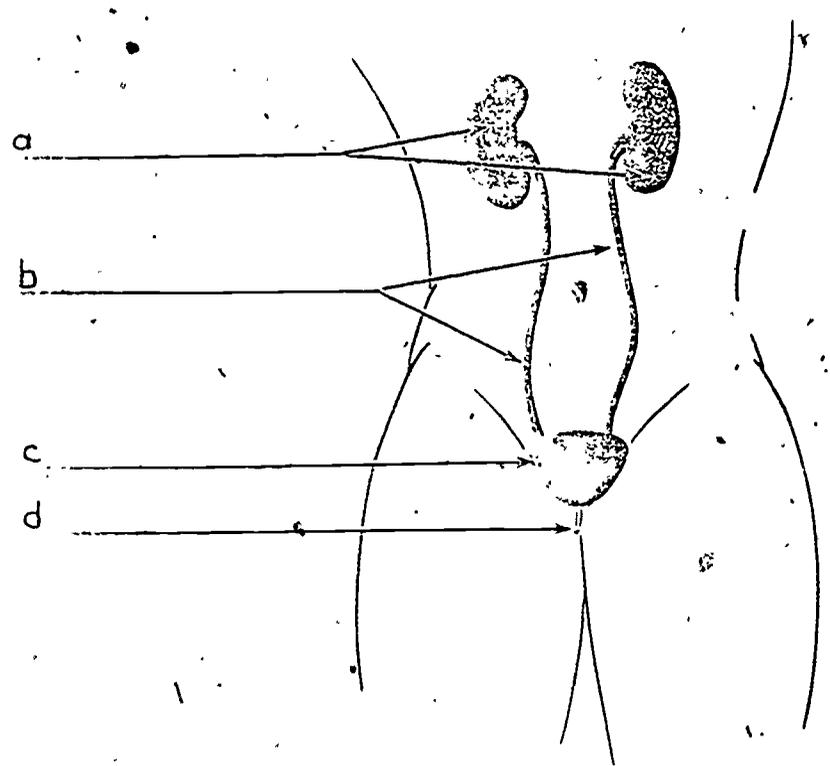
.: response: a. <u>kidneys</u>,   b. <u>ureters</u>,   c. <u>bladder</u>,   d. <u>urethra</u>

9-5

Chapter Ten

REPRODUCTIVE SYSTEM

This chapter is divided into two sections. The first is on the male and the second is on the female system.

REPRODUCTIVE SYSTEM

The testes are the sperm producing organs of the male reproductive system. These organs are located in a pouch called the scrotum. The sperm they produce fertilize the egg in the female.

Label the testes and scrotum on the diagram on page 10-2.

///

Your response: testes __a__ , scrotum __b__

_____

What do the testes produce?

///

Response: __sperm__

_____

Where are the testes located?

///

Response: __scrotum__

_____

The egg is fertilized by the

scrotum.

testes.

sperm.

offspring.

//

Your response: __c__

10-1

10-2
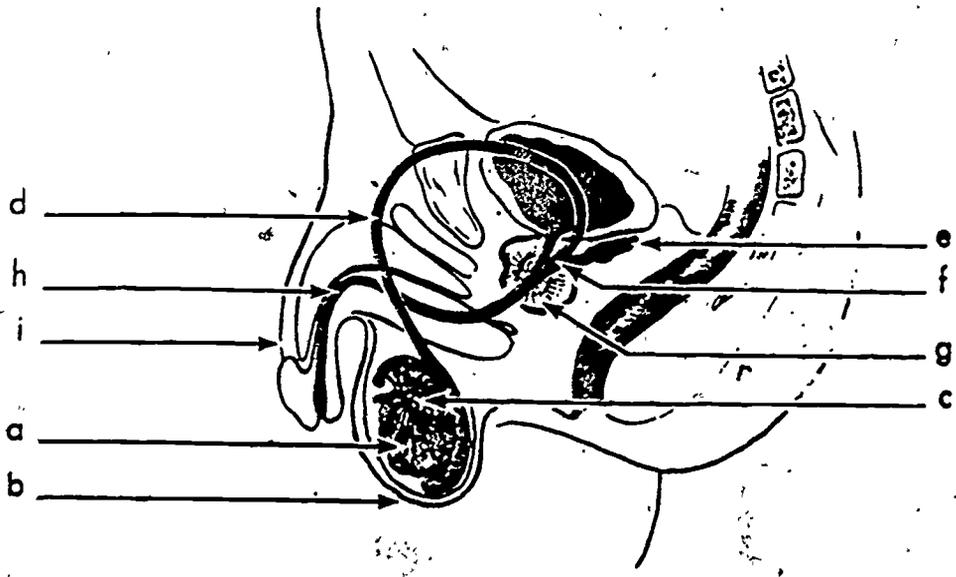
595

5. Sperm leaves the testes and enters the epididymis, a multicoiled tube that lies on top of the testes. They are stored in this tube until they mature.

Label the epididymis on the diagram on page 10-2.

//

Correct response: __c__

_____

6. Name the structure on top of the testes.

//

Correct response: __epididymis__

_____

7. The function of the epididymis is to

   a. produce sperm.

   b. fertilize the egg.

   c. store sperm.

   d. support the testes.

//

Correct response: __c__

_____

8. The mature sperm leaves the epididymis and enters a passageway known as the vas deferens. The sperm is moved through this passageway by muscular action until it reaches the urethra and is ejected.

On the diagram on page 10-2, label the vas deferens.

//

Correct response: __d__

_____

9. What is the name of the structure that moves the sperm from the epididymis?

//

Correct response: __vas deferens__

_____

10. The vas deferens is a passageway to the

   a. bladder.

   b. urethra.

   c. scrotum.

   d. testes.

//

10-3

correct response: b

11. How is the sperm moved through the vas deferens?

///

Correct response: by muscular action

12. Enroute to the urethra, the sperm is mixed with seminal fluid, a fluid
secreted by the seminal vesicles. This fluid provides nutrients and
protection for the sperm. At this point the sperm and fluid enters the
ejaculatory duct which connects with the urethra. The prostate gland also
aids in the protection of the sperm. It is located immediately below the
bladder and surrounds the urethra. It secretes an alkaline fluid that
neutralizes the acid content in the female vagina, thus protecting the
sperm. It also aids in neurtalizing the acid in the male urethra.

    Label the seminal vesicles and ejaculatory duct on the diagram on
page 10-2.

///

Correct response: e, f

13. The seminal vesicles add what type of fluid to the sperm?

///

Correct response: seminal fluid

14. Check the correct function(s) below that pertain(s) to the seminal
fluid.

    a. Protects the sperm.

    b. Provides nutrients for the testes.

    c. Protects the vas deferens.

    d. Provides nutrients for the sperm.

///

Correct response: a, d

15. Label the prostate gland on the diagram on page 10-2.

///

Correct response: g

10-4

16. The main function of the prostate gland is to

//

Correct response: neutralize the acid in the female vagina.

---

17. The alkaline fluid also neutralizes

//

Correct response: the urine in the male urethra.

---

18. The urethra, as studied in the urinary system, is the duct through which urine passes to reach the external surface of the body. In the male, the urethra serves an additional purpose, the passage of sperm. The urethra is located within the male organ of copulation, the penis.

Label the urethra and penis on the diagram on page 10-2.

//

Correct response: urethra __h__, penis __i__

---

19. In the male reproductive system the urethra is used to carry

   a. acid.

   b. sperm.

   c. urine.

   d. neutralizing fluids.

//

Correct response: __b, c, d__.

10-6
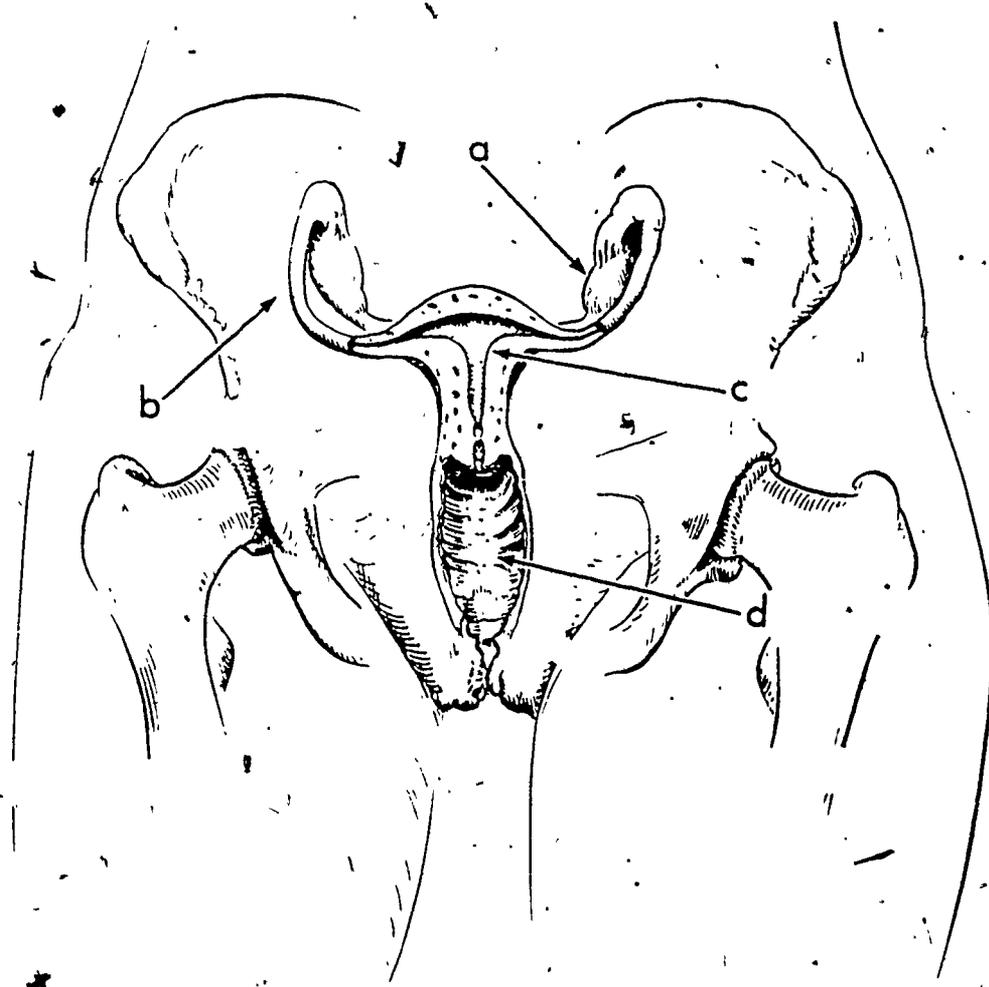
20. The ovaries in the female reproductive system are responsible for producing ova or ovum. Ova are eggs which must be fertilized by the male sperm in order to produce offspring. The ovaries are located in the lower pelvic cavity of the female. Near, but not attached to the ovaries, are the fallopian tubes which convey the ova to the uterus of the female. All fertilization takes place in the fallopian tubes.

Label the ovaries and fallopian tubes on the diagram on page 10-6.

//

Correct response: ovaries _a_ , fallopian tubes _b_

---

21. The ovary produces the

//

Correct response: _ovum or egg._

---

22. Where will the ovum be fertilized?

//

Correct response: The ovum will be fertilized in the fallopian tube.

---

23. The ovum is transported away from the ovary by the

//

Correct response: _fallopian tube._

---

24. When a fertilized ovum reaches the uterus, a pear shaped organ, it; attaches itself to the wall of the uterus to receive nourishment. The uterus also protects the fertilized ovum during its development. The vagina is the female organ of copulation and also serves as the birth canal.

Label the uterus and vagina on the diagram on page 10-6.

//

Correct response: uterus _c_ , vagina _d_

25. From the list below, check the function(s) of the uterus.

    a. protects the ovum.

    b. neutralizes the ovum.

    c. nourishment of the ovum.

    d. passageway of the ovum.

//

Correct response: _a,   c_

---

26. The vagina also serves as the

//

Correct response: _birth canal._

This concludes the chapter on the reproductive system. If you should have any questions about the structures or functions of the male or female system, feel free to ask your instructor.

60

Chapter Eleven

THE EYE AND EAR

11-1

11-2

APPROVAL OFFICE AND DATE	INSTRUCTOR
MSDB *Wilson* 1 OCT 1974	

COURSE NUMBER	COURSE TITLE
3ABR90530	Pharmacy Specialist

BLOCK NUMBER	BLOCK TITLE
III	Pharmaceutical Preparations and Their Manufacture

LESSON TITLE

Pharmaceutical Calculations II

LESSON DURATION

CLASSROOM/Laboratory	LABORATORY Complementary	TOTAL
16 hrs/0 hrs	6 hrs	22 hrs

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
12 13	18 July 75	1a

STS/CTS REFERENCE

NUMBER	28 Feb 75
STS 905X0	

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE
E. Vejeur	1 OCT 7	*R.E. Vejeur*	6 OCT 1975
E. Vejeur	31 Mar 5		
E. Vejeur	12 Sept 5		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
NA	NA	NA	SW 3ABR90530-III-1 Pharmaceutical Preparations Transparency Set #1 Pharmaceutical Calculations II

CRITERION OBJECTIVES AND TEACHING STEPS

1a. Solve problems in reducing and enlarging formulas, specific gravity, percentage preparations, concentration and dilution, alligation, and temperature conversion.

(Teaching steps listed in Part II)

APPROVAL OFFICE AND DATE	INSTRUCTOR
MSDB *Wilson* 17 Oct 74	

COURSE NUMBER	COURSE TITLE
3ABR90530	Pharmacy Specialist

BLOCK NUMBER	BLOCK TITLE
III	Pharmaceutical Preparations and Their Manufacture

LESSON TITLE

Pharmaceutical Calculations II Laboratory

LESSON DURATION

CLASSROOM/Laboratory	Complementary	TOTAL
0/3	2 hrs	5 hrs

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
13 14	18 July 75	2a

STS/CTS REFERENCE

NUMBER	
STS 905X0	28 Feb 75

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE
Wegener	22 Oct 74		
Wegener	1 Apr 5		
Wegener	6 Oct 1975		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
N/A	N/A	N/A	WB 3ABR90530-III-1 Pharmaceutical Preparations Transparency Set #1, Pharmaceutical Calculations II

CRITERION OBJECTIVES AND TEACHING STEPS

2a. Given information pertaining to reducing and enlarging formulas, specific gravity, percentage preparations, concentration and dilution, alligation, and temperature conversion, solve problems in each area in WB 3ABR90530-III-1 with 60% accuracy.

(Teaching steps listed in Part II)

LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE	INSTRUCTOR
Wilson 31 Oct 74	

COURSE NUMBER	COURSE TITLE
3 ABR 90530	Pharmacy Specialist

BLOCK NUMBER	BLOCK TITLE
III	Pharmaceutical Preparations and Their Manufacture

LESSON TITLE

Techniques of Pharmaceutical Compounding

LESSON DURATION

CLASSROOM /Laboratory	XXXXXXXX Complimentary	TOTAL
8/0	2	10

POI REFERENCE

PAGE NUMBER	18 July 75	PARAGRAPH
14		4a

STS/CTS REFERENCE

NUMBER	28 Feb 75
STS 905X0	

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE
	8 1 OCT 1974		
	25 APR 75		
	6 OCT 1975		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
Laboratory Equipment	N/A	N/A	Transparency Set #1 Pharmaceutical Preparations

WB 3ABR90530-III-2 Pharmaceutical Preparations |

CRITERION OBJECTIVES AND TEACHING STEPS

4a. Identify laboratory equipment, equipment user maintenance procedures, metrology procedures, incompatibilities, and methods of comminution.

(Teaching steps listed in Part II)

APPROVAL OFFICE AND DATE	INSTRUCTOR
MSDB *Wilson* 31 Oct 74	

COURSE NUMBER	COURSE TITLE
3ABR90530	Pharmacy Specialist

BLOCK NUMBER	BLOCK TITLE
III	PHARMACEUTICAL PREPARATIONS AND THEIR MANUFACTURE

LESSON TITLE
Pharmaceutical Dosage Forms

LESSON DURATION

CLASSROOM/Laboratory	Complimentary	TOTAL
4/0	2	6

POI REFERENCE

PAGE NUMBER	P/	PARAGRAPH
15	18 July 75	5a

STS/CTS REFERENCE

NUMBER	28 Feb 75
STS905X0	

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE
[signature]	8 1 OCT 1974		
[signature]	25 AUG 5		
[signature]	6 OCT 1975		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
N/A	N/A	N/A	WB3ABR90530-III-2 Pharmaceutical Preparations

CRITERION OBJECTIVES AND TEACHING STEPS

5a. Identify the properties, preparation techniques and incompatabilities of waters, spirits, solutions and syrups.

(Teaching steps listed in Part II)

LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE	INSTRUCTOR
MSTR _Wilson 31 Oct 74_	

COURSE NUMBER	COURSE TITLE
3ABR90530	Pharmacy Specialist

BLOCK NUMBER	BLOCK TITLE
III	Pharmaceutical Preparations and Their Manufacture

LESSON TITLE:
Pharmaceutical Dosage Forms

LESSON DURATION

CLASSROOM Laboratory	XXXXXXXXX Complimentary	TOTAL
8/C	2	10

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
15	18 July 75	5b

STS/CTS REFERENCE

NUMBER	
STS 905X0	28 Feb 75

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE
	1 Oct ...		
	25 April 5		
	6 OCT 1975		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
N/A	N/A	N/A	WB3ABR90530-III-2 Pharmaceutical Preparations

CRITERION OBJECTIVES AND TEACHING STEPS

5b. Identify the properties, preparation techniques and incompatabilities of eye, ear, and nose preparations, elixirs, tinctures, mixtures, magmas, suspensions, gels, lotions and liniments.

(Teaching steps listed in Part II)

60.

APPROVAL OFFICE AND DATE	INSTRUCTOR
MSDB *Wilson 3 Oct 74*	

COURSE NUMBER	COURSE TITLE
3ABR90530	Pharmacy Specialist

BLOCK NUMBER	BLOCK TITLE
III	Pharmaceutical Preparations and Their Manufacture

LESSON TITLE

Pharmaceutical Dosage Forms

	LESSON DURATION	
CLASSROOM/Laboratory	LABORATORY Complimentary	TOTAL
10/0	3 /	13

	POI REFERENCE	
PAGE NUMBER	PAGE DATE	PARAGRAPH
15	18 July 75	5c

	STS/CTS REFERENCE	
NUMBER	DATE	
STS905X0	28 Feb 75	

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE
	1 OCT 1974		
	25 April 5		
	6 OCT 1975		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
N/A	N/A	N/A	WB3ABR90530 III-2 Pharmaceutical Preparations

CRITERION OBJECTIVES AND TEACHING STEPS

5c. Identify the properties, preparation techniques and incompatabilities of powders, capsules, emulsions, oitments, pastes, creams and suppositories.

(Teaching steps list as in Part II)

ATC FORM 770
AUG 72

☆ GPO: 1972 779-396/23

610

LESSON PLAN (Part I, General).

APPROVAL OFFICE AND DATE	INSTRUCTOR
MSDB *Wilson* 31 Oct 74	

COURSE NUMBER	COURSE TITLE
3ABR90530	Pharmacy Specialist

BLOCK NUMBER	BLOCK TITLE
III	Pharmaceutical Preparations and Their Manufacture

LESSON TITLE

Pharmaceutical Dosage Forms

LESSON DURATION

CLASSROOM/Laboratory	~~LABORATORY~~ Complimentary	TOTAL
12/0	4	16

POI REFERENCE

PAGE NUMBER	PAGE DA	PARAGRAPH
15	18 July 75	5d

STS/CTS REFERENCE

NUMBER	
STS905XO	28 Feb 75

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE
(signature)	2 OCT 1974		
(signature)	25 APRIL 75		
(signature)	6 OCT 1975		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
N/A	N/A	N/A	WB3ABR90530-III-2 Pharmaceutical Preparations Slides, Ohio State Admixture Slides and cassette Tape

CRITERION OBJECTIVES AND TEACHING STEPS

5d. Identify the properties, preparation techniques and incompatabilities of parenterals, bulk compounding, prepackaged items and intravenous admixtures.

   (Teaching steps listed in Part II)

611

APPROVAL OFFICE AND DATE	INSTRUCTOR
MSDH *Wilson 6 Oct 75*	

COURSE NUMBER	COURSE TITLE
3ABR90530	PHARMACY SPECIALIST

BLOCK NUMBER	BLOCK TITLE
III	Pharmaceutical Preparations and Their Manufacture

LESSON TITLE
PHARMACEUTICAL DOSAGE FORMS

LESSON DURATION

CLASSROOM / laboratory	LABORATORY CTT	TOTAL
0 0	5	.5

POI REFERENCE

PAGE NUMBER	PAGE DATE	PARAGRAPH
15	18 July 75	5e

STS/CTS REFERENCE

NUMBER	DATE
STS 905x0	28 Feb 75

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE
(signature)	6 OCT 1975		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
N/A	N/A	N/A	WB/SG 3ABR9XXXX/ MOBM0104-1

CRITERION OBJECTIVES AND TEACHING STEPS

5e. Identify information as classified, unclassified, or possible intelligence value, Top Secret, Secret, Confidential, or for Official Use Only.

(Teaching Steps Listed In Part II).

ATC FORM 770
AUG 72

612

LESSON PLAN (Part I, General)

APPROVAL OFFICE AND DATE	**INSTRUCTOR**
Wilson 21 Oct 74	
COURSE NUMBER	**COURSE TITLE**
3ABR9050	Pharmacy Specialist
BLOCK NUMBER	**BLOCK TITLE**
III	Pharmaceutical Preparations

LESSON TITLE

Compounding Laboratory

LESSON DURATION

CLASSROOM/Laboratory	~~LABORATORY~~ Complementary	TOTAL
0/42	16	58

POI REFERENCE

PAGE NUMBER	PAGE	PARAGRAPH
16/17	18 July 75	6a,b,c,d,E

STS/CTS REFERENCE

NUMBER		
STS 905X0	28 Feb 75	1974

SUPERVISOR APPROVAL

SIGNATURE	DATE	SIGNATURE	DATE
Eulqui	22 Oct 74		
Eulqui	18 April 75		
Megeui	6 Oct 1975		

PRECLASS PREPARATION

EQUIPMENT LOCATED IN LABORATORY	EQUIPMENT FROM SUPPLY	CLASSIFIED MATERIAL	GRAPHIC AIDS AND UNCLASSIFIED MATERIAL
Laboratory Equipment Laminar flow hood IV admixture materials Chemicals* Class A balances Typewriters Prescriptions Alsop filter-tank unit (over)	N/A	N/A	N/A

CRITERION OBJECTIVES AND TEACHING STEPS

6a. Given instructor assistance, necessary references and selected formulas; compound waters, spirits, solutions, and syrups IAW AF Form 2380 and AF Form 2381. Then package and label IAW AFM 168-4.

6b. Given instructor assistance, necessary references and selected formulas; compound ear and nose preparations, elixirs, tinctures, , suspensions, lotions and liniments IAW AF Form 2380 and AF Form 2381. Then package and label preparations IAW AFM 168-4.

6c. Given instructor assistance, necessary references and selected formulas; compound capsules, emulsions, ointments, creams IAW AF Form 2380 and AF Form 2381. Then package and label preparations IAW AFM 168-4.

(Teaching steps listed in part II)

613

589

Equipment Located
in Laboratory
(Cont'd)

Tablet counting machine
Bottle filling machine
Label imprinter

890

6d. Given instructor assistance, necessary references and selected prescriptions; compound intravenous admixtures, correcting any incompatabilities, using accepted methods and techniques as outlined in checklist 3ABR90530-III-6d.

6e. Given instructor assistance, rotate through the outpatient, inpatient, supply and administrative work steps of the USAF Regional Hospital Sheppard Pharmacy IAW local directives and policies.

HANDOUTS III - I through IV

Course 10 - 8

1. Pine Tar Ointment (unofficial)

Pine Tar.. 150.90 Gms
Zinc Oxide... 94.48 Gms
Petrolatum... 248.62 Gms
                        Makes about   454.00 Gms

Calculate the quantity of each ingredient needed to prepare
1 Kilogram of the above ointment.

2. How many mgsof each ingredient are needed to make one Kgm.
of the following ointment?

Benzoic Acid... 12 Gms
Sulfur... 20Gms
Coal Tar... 15Gms
Zinc Oxide... 45Gms
Petrolatum... 135Gms
                        To make   227Gms

3. Calculate the number of Grams of Magnesium Oxide and
Calcium Carbonate needed to make 4 ounces of the
following mixture.

Calcium Carbonate...................................... 370Gms
Magnesium Oxide.. 70Gms
Sodium Bicarbonate..................................... 280Gms
Bismuth Subcarbonate................................... 188Gms
M. ft. powder

4. From the following formula, calculate the number of grains
of Sodium Chloride needed to make one gallon of Normal
Saline Solution.

Sodium Chloride.. gr. xxxiiss
Aqua qs.. fl℥viii

1.

5. Hydrocortisone.................................... 1 part
   Sulfur...20 parts
   Zinc Oxide Paste..................................79 parts

   Mix and make 30 Gms
In the above formula calculate the number of Gms of each
ingredient needed to make the formula.

6. Calculate the number of Grams each of Camphor and of
Starch needed to make 60 Gms of the following:

   Camphor.. .8 parts
   Calamine powder................................ 8.0 parts
   Starch... 9.2 parts
   Talc... 30.0 parts

7. Calculate the number of mgs of Methylparaben contained
in 2.5 g of the following:

   Methylparaben.................................. 0.26Gms
   Propylparaben.................................. 0.14Gms
   Purified Water..... QSAD.......................1000.00mls

8. Calculate the number of grains of Thyriod contained in
one dose of the following:

   Thyriod.. 199.4mg
   Phenobarbital.................................. 100mg
   Ascorbic Acid..................................   50mg
            Makes 20 capsules
   Sig: Take 2 capsules TID

9. If 53 milliliters of a liquid weighs 61.48Gms, what is it's
specific gravity?

10. Calculate the specific gravity of a liquid if one pint
weighs one pound.

11. Sixteen fluid ounces of a liquid weighs 11/3 lbs.(apoth).
Calculate the specific gravity of the liquid.

2.

3ABR90530 Pharmacy Calculation II   Handout 3ABR90530 III-I

12. How many grams will 40 mls of Chloroform weigh, if the specific gravity is 1.46?

13. How many pounds(AV) does one gallon of glycerin, sp.gr. 1.25 weigh?

14. 45 Gms of Glycerin (sp.gr. 1.25) will have a volume of ____.

15. What volume will 1 Kgm of Lactic Acid measure if the sp.gr. is 1.264.

3.

1. Calculate the number of Grams of Sodium Citrate needed to prepare 1 Kg. of 40% (w/v) solution of Sodium Citrate in water.

2. How many grains of Phenol are there in 2 fl ℥ of a 4% (w/v) solution?

3. How many mgs of Sodium Chloride are required to prepare . ℥ of a 1:10% (w/w) preparation?

4. With 14,560 grs of Potassium Iodide, how many fl ℥ of a 2% solution can you prepare?

5. How many liters of a 8% solution can be prepared from 22 Grams of Gentian Violet?

6. If 8 liters of a solution of Iodine in water contains 14 Grams of Iodine, what is the percentage strength (w/v) of the solution?

7. If 3 ℥ of Boric Acid is dissolved in enough water to make .5 liters, what is the percentage of this solution?

8. How many ml of Peppermint Oil should be added to 1 quart of water to make a 4% solution?

9. How many grains of Sodium Chloride should be mixed with 2 ℥ of Potassium Iodide to make a .3% preparation?

10. If you need to prepare a 14% powder, how many grams of active ingredient should be mixed with 22 ℥ of your base?

11. A saturated solution of Sodium Chloride boils at 227.1°F. Express this temperature on the centigrade scale.

12. Theobroma Oil melts between 30° and 35°C. What is the range of it's melting point on the Fahrenheit scale?

13. Convert the following:

    a. -20°C.

    b. -14°F.

    c. 32°F.

    d. -40°C.

1.

1. Convert the following to %.
a. 1:500   b. 1:250   c. .001   d. 1:800

2. If 600 ml of a 25% solution is diluted to 3 Liters, what will be the percentage strength?

3. How many mls of a 1:25 stock solution of a chemical should be used to prepare 500 ml of a 1:4000 solution?

4. How many mls of a .5% Benzalkonium Chloride solution are needed to fill a prescription requiring 30 ml of 1:10,000 Benzalkonium Chloride?

5. How many mls of 1:1000 solution of a drug are needed to prepare 50 ml of a 1:20,000 solution?

6. How many mls of water should be added to a quart of 1:500 solution to make a 1:4000 solution?

7. How much water should be added to a Liter of 1:250 solution to make a .1% solution?

8. How many milliliters of 25%(w/v.) mild silver protein solution and how many milliliters of 5%(w/v) mild silver protein solution are required to make 500 ml of a 10%(w/v) solution?

9. How many mls of water must be mixed with 500 ml of 70%(w/v) alcohol in order to reduce the strength to 50%(w/v) alcohol

10. Calculate the number of Grams of 2% Boric Acid ointment needed to be added to 40Grams of 10% Boric Acid ointment in order to prepare some 5% Boric Acid ointment.

11. How many Grams of Petrolatum should be added to 180Grams of 45% Sulfathiazole ointment to make a 8% Sulfathiazole ointment?

12. What percentage of Boric Acid is contained in a mixture of 20Grams of 30% Boric Acid ointment, 35Grams of 40% Boric Acid ointment and 50Grams of 75% Boric Acid ointment?

13. What is the percentage of Alcohol in a mixture of 800ml of 95% Alcohol, 300 ml of 65% Alcohol, 75ml of 30% Alcohol and 250ml of pure Alcohol?

1

3ABR90530 Pharmacy Calculations II   Handout 3ABR90530 III-IV

1 Camphor and Soap Liniment, NF
   Hard Soap, powdered.. 60 Gm
   Camphor, small pieces... 45 Gm
   Rosemary oil.. 10ml
   Alcohol USP... 700 ml
   Purified water.... QSAD... 1,000 ml

   Calculate the quantity of each ingredient needed to make
   200 ml of the above formula.

2. Calculate the number of ml of each ingredient listed below
   that will be required to make one liter.

   Aromatic Cascara.. 1 part
   Liquid Petrolatum... 3 parts
   Milk of Magnesia.. 4 parts

3. 20 Grams of Acetic Acid solution is needed for a preparation
   and has a specific gravity of 1.05. Calculate the amount of
   Acetic Acid in ml that is needed for this preparation.

4. Calculate the specific gravity of a liquid if one-half
   liter weighs 730 Grams.

5. Calculate the number of Grams that should be used to make
   two ounces (Apoth) of an ointment if it contains 10% (w/w)
   of active ingredient.

6. Calculate the percent of Mercurochrome (w/v) in one gallon
   of solution containing 227 Grams of Mercurochrome.

7. Calculate the number of Grams of Potassium Iodide that should
   be added to 250ml of water, so that the finished solution will
   be 12%.

8. Convert the following degrees Centigrade to Fahrenheit:

   a. 82 C   b. -15 C

1.

9. Convert the following degrees Fahrenheit to Centigrade:
   a. 16 F   b. -31 F

10. Calculate the number of Grams of petrolatum ointment base
that should be added to 180 Gms. of 10% Ammoniated Mercury
Ointment to dilute its strength to 3%.

11. Calculate the number of Grams of Lactose that is needed to
dilute 25Gms of 1:10 trituration of Atropine Sulfate to
a 1:50 strength.

12. Calculate the number of mls of 95% Alcohol and of 50%
Alcohol needed to prepare 180mls of 70% Alcohol.

13. Calculate the precentage strength of the following mixture:

   24oz. containing 86% opium
    8oz. containing 73% opium
    3oz. containing 70% opium

2.

10-8

Technical Training

Pharmacy Specialist

PHARMACEUTICAL PREPARATIONS

November 1975

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Designed For ATC Course Use

PHARMACEUTICAL PREPARATIONS

OBJECTIVE

Solve problems in reducing and enlarging formulas, specific gravity, percentage preparations, concentration and dilution, and temperature conversion.

INTRODUCTION

Each type of problem you may encounter will be explained by the instructor. Fill in each blank in the example sections as the information is given to you. This will assist you in working the practice problems. These problems will be evaluated by the instructor to insure you are working them correctly. Complete all problems assigned. SHOW ALL WORK!

INFORMATION

REDUCE AND ENLARGE FORMULAS

EXAMPLE: Reduce this formula to make 120 ml.

Peppermint Oil......................... 2 ml
Talc.................................. 15 Gm
Purified Water.....QSAD..............1000 ml

Ratio and Proportion Method

Step 1. How much will the original (old) formula make? _____ How much Peppermint Oil does the "old" formula call for?

_____

Now write these values side by side.   2 ml   1000 ml

Step 2. How much do you wish to make of the original formula? _____ Place this value over the 1000 ml. (Total Amounts)

$$\frac{120 \text{ ml (New amount)}}{1000 \text{ ml (Old amount)}}$$

Use an "x" for the number of ml Peppermint Oil wanted. Place the "x" over the 2 ml. (Active Ingredients)

A.I.   T

$$\frac{x \text{ ml}}{2 \text{ ml}} = \frac{120 \text{ ml}}{1000 \text{ ml}}$$

Step 3. Since the problem is set up, now use the Ratio Proportion Method and solve for the unknown.

$$\frac{x\ ml}{2\ ml} = \frac{120\ ml}{1000\ ml}$$

Cross multiply:

$$1000\ x = 240$$

Divide both sides of the equation by 1000, maintaining an equation of equality.

$$\frac{1000\ x}{1000} = \frac{240}{1000}$$

Step 4. Your answer for the value of "x" is:

$$x = 0.24\ ml$$

Therefore, 0.24 ml of Peppermint Oil is needed in the formula to make 120 ml.

Step 5. Repeat this procedure for each ingredient, making sure that each value is placed over the proper value to be found.

$$\text{A.I.} \qquad \text{T.}$$

$$\frac{x\ Gm}{15\ Gm} = \frac{120\ ml}{1000\ ml}$$

$$1000\ x = 1800$$

$$x = 1.8\ Gm\ of\ Talc$$

Step 6. Your new formula is:
Peppermint Oil..................... 0.24 ml
Talc............................. 1.8 Gm
Purified Water....OSAD........... 120.0 ml

NOTE: To enlarge formulas, use exactly the same procedures. Remembering to place the new value over the old value.

Factor Method of Solving the Same Example That is On Page One

Step 1. How much will the original (old) formula make? _____.

Step 2. How much of the original formula do you wish to make (new)? _____.

Step 3. Place these values over each other as illustrated.

$$\frac{120\ ml\ (New\ Amount)}{1000\ ml\ (Old\ Amount)}$$

Step 4. Solve for your FACTOR.

FORMULA FOR FACTORING

$$\frac{NEW}{OLD}$$

Step 5. Divide the Old into the New.

$$120 \div 1000$$

Your FACTOR is:

$$0.12$$

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Step 6. Once this factor is found, to find
the amount of active ingredient to
be used in the new formula, multiply
each ingredient by this FACTOR.

Peppermint Oil
2 ml
x .12 (factor)
4
2
Answer: 0.24 ml Peppermint Oil.

Talc
15 Gm
x .12 (factor)
30
15
Answer: 1.80 Gm Talc

Step 7. Your new Formula is: Peppermint Oil................. 0.24 ml
Talc........................... 1.8 Gm
Purified Water.....QSAD.......120.0 ml

NOTE: To enlarge formulas, use exactly the same procedure. Remember to place the New over the Old to find your factor and multiply this number by your active ingredient to find your new amount.

In reducing formulas the value of your factor will be less than one, in enlarging formulas the value of your factor will be greater than one.

PROCEDURE

The object of this lesson is to solve problems in pharmaceutical calculations. Specifically, you will calculate the amount of medicinals in a preparation by:

1. Reducing and enlarging formulas.

2. Preparing formulas when given proportionate parts.

3. Calculating the amount of ingredient in a dose.

QUESTIONS

1. Reduce this formula to make 100 ml:

Liquid Coal Tar........................... 4 ml   Answer _____

Sulfur.................................... 10 ml   Answer _____

Lime Water................................ 50 ml   Answer _____

Bentonite Magma......QSAD................. 120 ml   Answer _____

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2. Reduce this formula to make 30 ml:

Fphedrine Sulfate......................... 30 Gm   Answer _____

Chlorobutanol............................. 5 Gm   Answer _____

Sodium Chloride........................... 3.6 Gm   Answer _____

Purified Water........OSAD................ 1000 ml   Answer _____

3. Enlarge this formula to make 1 gallon:

Talc...................................... 12 Gm   Answer _____

Bentonite................................. 3.5 Gm   Answer _____

Zinc Oxide................................ 25 Gm   Answer _____

Distilled Water........OSAD............... 100 ml   Answer _____

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4. Enlarge this formula to make 1 liter:

Orange Oil.............................. 12 ml   Answer _____

Lemon Oil.............................. 3 ml   Answer _____

Coriander Oil.......................... 1.2 ml   Answer _____

Anise Oil.............................. 0.3 ml   • Answer _____

Alcohol USP........QSAD................. 60 ml   Answer _____

/

INFORMATION

SOLVING PROBLEMS USING PROPORTIONATE PARTS

EXAMPLE: Prepare 130 Gm. of this ointment.

Starch................................ 5 parts

Zinc Oxide............................ 10 parts

Hydrophilic Ointment Base............ 50 parts

Step 1. Add up all the parts to find the _____
number of parts in the formula.

$$\begin{array}{r} 5 \\ 10 \\ \underline{50} \\ 65 \text{ Total Parts} \end{array}$$

Step 2. What is the _____ number of Gms. you wish to make? 130 Gms.

Step 3. Since 130 Gms. represents the total weight and 65 parts represents the _____ parts, therefore, 130 Gms. equals 65 parts.

To find the weight of one part, divide the number of parts into the total weight.   130 Gms. ÷ 65

Each part will weigh 2 Gms.

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Step 4. Multiply the weight of one part times
         the number of parts required for each
         ingredient.

Starch: 2 Gm (Weight of 1 part)
          x 5
          10 Gms

Zinc Oxide: 2 Gm
              x 10
              20 Gms

Hydrophilic Oint: 2 Gm
                    x 50
                    100 Gms

Step 5. Your new formula: Starch.............. 10 Gms
                             Zinc Oxide.......... 20 Gms
                             Hydrophilic Oint.... 100 Gms
                                   Total Weight 130 Gms

QUESTIONS

1. From the following formula, calculate the quantity of each ingredient required to
make 2 ounces (Apoth) of this ointment.

Zinc Oxide................................ 2 parts   Answer _____

Coal Tar.................................. 2 parts   Answer _____

Starch.................................... 15 parts   Answer _____

Petrolatum................................ 25 parts   Answer _____

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2. From the following formula, calculate the quantity of each ingredient required to prepare 120 ml of this solution.

Witch Hazel............................ 4 parts   Answer _____

Glycerin............................... 1 part   Answer _____

Boric Acid Solution.................... 15 parts   Answer _____

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INFORMATION

CALCULATING THE AMOUNT OF MEDICATION IN A DOSE

EXAMPLE. How many mg. of Codeine Phosphate will each dose contain?

Codeine Phosphate............................... 240 mg
Elixir of Terpin Hydrate........:QSAD............ 120 ml

SIG: 1 teaspoonful as needed.

Step 1. How much active ingredient is in the "old"
formula? _____ mg. How many ml will the
"old" formula make? _____ ml. Write these
values side by side.   240 mg   120 ml

Step 2. How much active ingredient will each dose
contain? _____. This is unknown so
use "x" and place it over the 240 mg. How   A.I.   T
many ml will be in each dose (new)? $\frac{x \text{ mg}}{240 \text{ mg}} = \frac{5 \text{ ml}}{120 \text{ ml}}$
_____ ml. Write this value over 120 ml.

Step 3. Solve by using the Ratio and Proportion
method.

Cross multiply: $120 x = 1200$

Divide both sides of the equation by 120. $x = 10$

Step 4. The value of "x" is your answer which is 10 mg.
Always write the prescription doses using the
amount of active ingredient per dose.   10 mg/5 ml

NOTE: When calculating for one active ingredient it is not necessary to use the Factor
Method. The Factor Method is a short cut in finding many active ingredients.

QUESTIONS

1. In the following prescription calculate the number of mg of Phenobarbital in each 2 teaspoonfuls dose.

                 Phenobarbital.......................... 4 Gm
                 Alcohol................................ 150 ml
                 Glycerin............................... 450 ml
                 Distilled Water..QSAD .... 1000 ml

                                                    Answer _____

2. In the following prescription calculate the number of Grams of Terpin Hydrate and the number of ml of Alcohol the patient will receive in each dose.

                 Terpin Hydrate......................... 17.00 Gm
                 Alcohol................................ 430.00 ml
                 Syrup USP.............................. 100.00 ml
                 Glycerin............................... 400.00 ml
                 Benzaldehyde........................... 0.05 ml
                 Distilled Water.......QSAD............. 1000.00 ml

        SIG: ℥ss QID prn.

                                                    Answer _____

                                                    Answer _____

INFORMATION

SPECIFIC GRAVITY

Specific Gravity is the ratio of the weight of a liquid to the weight of an equal volume of water. Water has the Specific Gravity of 1.000.

The general formulas used in calculating Specific Gravity problems are:

$$\text{Specific Gravity} = \frac{\text{Weight (in Grams)}}{\text{Volume (in milliliters)}}$$

$$\text{Weight} = \text{Specific Gravity} \times \text{Volume (in mls)}$$

$$\text{Volume} = \frac{\text{Weight (in Grams)}}{\text{Specific Gravity}}$$

Instead of learning three separate formulas, use the triangle below with the proper labeling:

W = Grams
─ = division
V = milliliters

multiplication
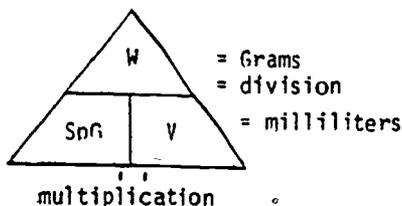
This triangle can be used to solve any specific gravity problem.

CALCULATING THE SPECIFIC GRAVITY OF A LIQUID

EXAMPLE: What is the Specific Gravity of Glycerin if 100 ml weighs 125 Gm?

Step 1. Draw the triangle and label.

Step 2. Assign values to the appropriate terms:

W = 125 Gms
V = 100 mls

Step 3. Substitute the assigned values for the terms.

SpG = W (Gm) divided by V (ml)

Step 4. Solve by the process indicated:

SpG = 125 Gm divided by 100 ml

Step 5. Your answer:

SpG = 1.250

QUESTIONS

1. If 125 ml of a liquid weighs 160 Gm, what is its Specific Gravity?

    Answer _____

2. If 134 Grams of a liquid measures 142.6 ml, what is its Specific Gravity?

    Answer _____

3. What is the Specific Gravity of a liquid if 2 liters weighs 1.75 kilograms?

    Answer _____

4. Six pounds (Apoth) of a liquid measures 128 fluid ounces. What is its Specific Gravity?

    Answer _____

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INFORMATION

CALCULATING THE WEIGHT OF LIQUIDS

EXAMPLE: What is the weight of 200 ml of Castor
Oil (SpG 0.96)?

Step 1. Draw the triangle and label.

Step 2. Assign values to the approoriate terms: $SpG = 0.96$
$V = 200\ ml$

Step 3. Substitute the assigned values for the
terms, and place them in the triangle

Step 4. Always make sure that you have the
volume in MILLILITEPS before you
solve your problem. $W = SpG \times V$

Step 5. Solve by the process indicated. $W = 0.96 \times 200\ ml$

Step 6. Your answer: $W = 192$

Step 7. Since you are solving for weight and
you have the Specific Gravity given,
and the Volume is in ml, therefore,
your answer will be in Grams. $W = 192\ Gm$

NOTE: Always label your answer to what it is. This will tell you where you are at all
times. If the problem desires a different unit of measure, by labeling it will
assist you in what to do.

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QUESTIONS

1. How many grams does 225 ml of an acid weigh if the Specific Gravity of the acid is 1.83?

Answer _____

2. The Specific Gravity of a liquid is 0.75 and the liquid measures 3 quarts. What is its weight in grams?

Answer _____

3. A liquid has a Specific Gravity of 1.50. What is the weight of 1.5 Liters?

Answer _____

4. If an oil has a Specific Gravity of 1.55, what is the weight of 240 ml?

Answer _____

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INFORMATION

CALCULATING THE VOLUME OF LIQUIDS

EXAMPLE: What is the volume of 156 Gm of Isopropyl
Alcohol (SpG 0.78)?

Step 1. Draw the triangle and label.

Step 2. Assign values to the appropriate terms: $\cdot$ W = 156 Gm

SpG = 0.78

Step 3. Substitute the assigned values for
the terms, and place them in the
triangle.

Step 4. Always make sure that you have the
weight in GRAMS before you solve
your problem.   V = W divided by SpG

Step 5. Solve the process indicated.   V = 156 Gm divided by 0.78

Step 6. Your answer: V = 200

Step 7. Since you are solving for volume
and you have the Specific Gravity
given, and the Weight is in Gm,
therefore, your answer will be in
milliliters.   V = 200 ml

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QUESTIONS

1. What is the volume in ml of 227 grams of a liquid having the Specific Gravity of
1.230?

Answer _____

2. A formula for 1000 ml of a preparation calls for 800 grams of Cottonseed Oil with a
Specific Gravity of 0.920. How many ml of Cottonseed Oil should be used in preparing
5 liters of this formula?

Answer _____

3. What is the volume, in pints, of 40 lb. of a liquid with the Specific Gravity of
1.32?

Answer _____

4. How many ml will 3 kilograms of oil be if its Specific Gravity is 1.11?

Answer _____

INFORMATION

PERCENTAGE PREPARATIONS

Three types of percentage preparations:

Weight in Volume................................. W/V
Volume in Volume.............................. V/V
Weight in Weight............................... W/W

The General Formulas used in calculating percentage preparations are:

$$\text{Active Ingredient (AI)} = \text{Total Amount} \times \text{Percent (\%)}$$

$$\text{Percent (\%)} = \frac{\text{Active Ingredient (AI)}}{\text{Total Amount}}$$

$$\text{Total Amount} = \frac{\text{Active Ingredient (AI)}}{\text{Percent (\%)}}$$

In working these problems, the percent is converted to a decimal before solving. The general rule for changing percent to a decimal is to divide by 100. The general rule for changing a decimal to a percentage is to multiply by 100. Watch your decimal point!

Instead of learning the three general formulas above, use the triangle below with the proper labeling:

```
        /\
       /  \
      / AI \        = division
     /------\
    / TOTAL | % \   = convert % to a decimal before solving
   /_____|____\
    multiplication
```
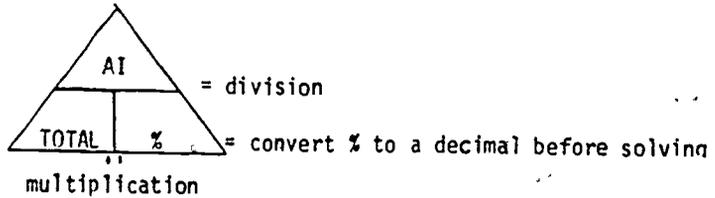
NOTE: Change your percentage (%) to a decimal before solving your problem in the triangle.

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CALCULATING THE AMOUNT OF ACTIVE INGREDIENT IN A PERCENTAGE PREPARATION WHEN GIVEN THE PERCENTAGE STRENGTH AND THE TOTAL AMOUNT

EXAMPLE: How many grams of Sodium Chloride will be required to prepare 100 ml of a 15% (W/V) solution?

Step 1. Write the complete formula or draw your triangle and label.
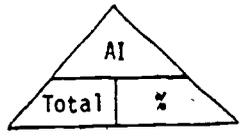
Step 2. Assign the values to the appropriate terms.

    a. What are you looking for? Therefore, the Active ingredient becomes: Active Ingredient

                                               X Grams

    b. What is your total amount?   100 milliliters

    c. What is your percentage? 15% Change the percentage to a decimal by dividing it by 100.   0.15

Step 3. Rewrite the values, substituting them for the terms in the triangle. $X = 100 \times 0.15$

Step 4. Solve by the process indicated: $X = 15$

Step 5. Since you have assigned the value of X as Grams, your answer is: 15 Grams

NOTE: Notice in your problem after 15% you see the symbol (W/V). Where have you seen this term before? Specific Gravity.
Therefore, if the volume is given to you as milliliters, your weight will be in Grams. In solving these problems, make sure you are working in the proper system - Metric, Apothecary, or Avoirdupois. This will depend on what is given to you and what you are to solve.

QUESTIONS

1. How many grams of Mercuric Chloride are required to prepare 250 ml. of a 5% (W/V) solution?

Answer _____

2. How many grams of Boric Acid are there in 30 ml. of a 2% (W/V) solution?

Answer _____

3. How many grams of Phenol are required to prepare 480 ml. of a 1/10% (W/V) solution?

Answer _____

4. How many grains of Silver Nitrate will be required to prepare 6 fluid ounces of a 0.25% (W/V) solution?

Answer _____

5. How many grains of Gentian Violet should be used in preparing 2 fluid ounces of a 1/2% solution?

Answer _____

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INFORMATION

CALCULATING THE PERCENTAGE STRENGTH OF A PREPARATION WHEN GIVEN THE TOTAL AMOUNT AND THE AMOUNT OF ACTIVE INGREDIENT

EXAMPLE: What is the percentage strength of 240 ml (V/V) of a solution containing 12 ml of Orange Oil?

Step 1. Write the complete formula or draw your triangle and label.
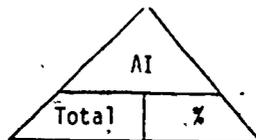
Step 2. Assign the values to appropriate terms.

    a. What is your total amount?   240 ml

    b. What is your active ingredient?   12 ml of Orange Oil

    c. What are you looking for?   percentage strength
    Therefore, let X represent the percentage strength.

Step 3. Rewrite the values, substituting them for the terms in the triangle.

$$X = \frac{12 \text{ ml}}{240 \text{ ml}}$$

Step 4. Solve by the process indicated: $X = 0.05$

Step 5. X = 0.05, is this your final answer?   <u>NO</u>, it is a decimal answer.

Step 6. Changing a decimal to a percentage (%), multiply by 100. Therefore, your answer is: 5%

NOTE: Always make sure you know what you are looking for. As in this case you were looking for percentage (%). Therefore an additional step is indicated. Changing a decimal to a percent (%) by multiplying your answer by 100.

QUESTIONS

1. If 425 Grams of Sucrose is dissolved in enough water to make 500 ml, what is the percentage strength of this solution?

Answer _____

2. If 2 liters of a solution of Iodine in Alcohol contains 7 Grams of Iodine, what is the percentage strength (W/V) of the solution?

Answer _____

3. If 1 gallon of a solution contains 474 Grams of solute, what is the percentage strength of the solution?

Answer _____

4. What are the percentages (W/V) of the ingredients in the following prescription?

Zinc Sulfate .... 2 grains   Answer _____
Boric Acid .... 20 grains
Distilled Water ...QSAD............. 1 fluid ounce   Answer _____

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INFORMATION

CALCULATING THE TOTAL AMOUNT OF A PREPARATION WHEN GIVEN THE PERCENTAGE STRENGTH AND THE AMOUNT OF ACTIVE INGREDIENT

EXAMPLE: How many Grams of a 15% (W/W) Sulfur Ointment can be made from 30 Grams of Sulfur powder?

Step 1. Write the complete formula or draw your triangle and label.

```
      /\
     /AI\
    /----\
   /Total|%\
  /_____\
```
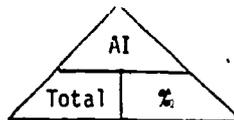
Step 2. Assign the values to the appropriate terms.

    a. What are you looking for? Therefore, the total amount becomes: Total Amount

                                           X Grams

    b. What is your active ingredient?   30 Grams

    c. What is your percentage? 15% Change the percentage to a decimal by dividing by 100.   0.15 (decimal form of 15%)

Step 3. Rewrite the values, substituting them for the terms in the triangle.

$$X = \frac{Active\ Ingredient}{\%}$$

$$X = \frac{30\ Grams}{0.15}$$

Step 4. Solve by the process indicated: X = 200

Step 5. Since you have assigned the value of X as Grams, your answer is: 200 Grams

NOTE: Notice in your problem after 15% you see the symbol (W/W). This means that there are solids involved in this problem. If one is given to you as Grams, than the other will be in Grams. Make sure that you stay in the proper system when solving and convert to any other system after solving for the unknown if necessary.

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QUESTIONS

1. How many ml of a 0.1% solution can be made from one gram of Atropine Sulfate?

Answer _____

2. How many Liters of a 2% (W/V) Iodine Tincture can be made from 123 grams of Iodine?

Answer _____

3. How many fluid ounces of a 0.55% solution can be prepared from 75 grains of Scopolamine Hydrobromide?

Answer _____

4. How many milliliters of a 6% solution can be prepared from 14 grams of Neomycin Sulfate?

Answer _____

5. With 43 grams of Hydrocortisone Powder, how many grams of 1.5% ointment could you make?

Answer _____

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INFORMATION

CALCULATING THE AMOUNT OF ACTIVE INGREDIENT WHEN GIVEN THE PERCENTAGE STRENGTH AND THE AMOUNT OF THE SOLVENT

EXAMPLE: How many grams of Potassium Iodide should be added to 180 ml of water, so that the finished solution will be 10%?

Step 1. What percent of the finished product will the number of Grams represent   10%

Step 2. What percent of the finished product does the 180 ml of water represent?   90%

Step 3. Since you are adding to the 180 ml, your total amount of the preparation will be increasing. Therefore, the triangle CANNOT BE USED. Set up a ratio and proportion, using 10% over 90% and X over 180 ml. (Water can be changed to Grams).

10%	X, Gm
90%	180 Gm

Step 4. Solve by the process indicated:

10	X
90	180

Cross·multiply: 90x = 1800

Divide both sides by 90:   x = 20

Step 5. Since you are solving for X, and X is in grams, your answer is: 20 Grams

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QUESTIONS

1. How many mg of Boric Acid whould be added to 240 ml of water to make a 2% solution?

Answer _____

2. How many grams of Vioform whould be added to 1 pound (Avoirdupois) ointment base to yield a 3% Vioform ointment?

Answer _____

3. How many ml of Orange Oil should be added to 1 pint of water to make a 0.02% Solution?

Answer _____

4. How many grains of Phenobarbital should be added to 16 fl℥ of Cherry Syrup to make a 0.3% Phenobarbital Syrup?

Answer _____

5. If you need to prepare a 15% powder, how many grams of active ingredient should be added to 8℥ of your powder base?

Answer _____

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INFORMATION

There is one, general formula used in conversion of temperatures.

.General Formula: 9C = 5F - 160

This formula can be used for converting either Centigrade or Fahrenheit. All that
is necessary is to place the value of your given temperature to the proper symbol (C or
F) and solve the mathematical equation.

CONVERTING FAHRENHEIT DEGREES TO CENTIGRADE DEGREES

EXAMPLE: Convert -40°F to Centigrade.

Step 1. Write the complete formula: 9C = 5F - 160

Step 2. Substitute the -40°F for the "F"
in the formula: 9C = 5(-40) - 160

Step 3. Multiply 5 times -40 and place
this product in the equation: 9C = -200 - 160

Step 4. Since you have like signs, bring
down your sign and proceed as in
addition: -200 -160 = -360   9C = -360

Step 5. Divide both sides of the equation
·by 9 to find the value of C: C = -40

Step 6. Since C stands for Centigrade,
your answer is: -40° Centigrade

NOTE: The following are some general mathematical rules:

1. When multiplying like signs, your product will be positive (+).

2. When multiplying unlike signs, your product will be negative (-).

3. When adding like signs, bring down the sign and proceed as in
addition.

4. When adding unlike signs, take the sign of the larger number
and proceed as in subtraction.

QUESTIONS

1. Convert 98.6°F to Centigrade.   Answer _____

2. Convert 32°F to Centigrade.   Answer _____

3. Convert 210°F to Centigrade.   Answer _____

4. Convert -60°F to Centigrade.   Answer _____

5. Convert 212°F to Centigrade.   Answer _____

6. Convert 55°F to Centigrade.   Answer _____

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INFORMATION

CONVERTING CENTRIGRADE TO FAHRENHEIT

Use the same General Formula: $9C = 5F - 160$

EXAMPLE: Convert 30°C to Fahrenheit.

Step 1. Write the complete formula: $9C = 5F - 160$

Step 2. Substitute the 30°C for the "C" in the formula: $9(30) = 5F - 160$

Step 3. Multiply 9 times 30 and place this product in the equation: $270 = 5F - 160$

Step 4. Solving for "F" you must add 160 to both sides of the equation to maintain its equality. What is done to one side of an equation MUST be done to the other side. $160 + 270 = 5F - 160 + 160$

Step 5. Do the mathmatical processes indicated: $430 = 5F$

Step 6. Divide both sides of the equation by 5 to find the value of "F": $86 = F$

Step 7. Since F stands for Fahrenheit, your answer is: 86° Fahrenheit

NOTE: Remember in calculating for Fahrenheit, one must add 160 to both sides of the equation before solving.

65₁

QUESTIONS

1. Convert 60°C to Fahrenheit.   Answer _____

2. Convert -47°C to Fahrenheit.   Answer _____

3. Convert 92°C to Fahrenheit.   Answer _____

4. Convert 13°C to Fahrenheit.   Answer _____

5. Convert 44°C to Fahrenheit.   Answer _____

6. Convert -15°C to Fahrenheit.   Answer _____

INFORMATION

CONCENTRATION AND DILUTION OF
STOCK SOLUTIONS AND STOCK TRITURATIONS

Stock solutions are solutions of known concentration that are frequently prepared by the pharmacist for convenience in dispensing.

Stock Triturations are dilutions of potent substances prepared by mixing finely powdered medicaments with finely powdered Lactose in a definite proportion by weight.

General Formula:

$$Amt_1 \times \%_1 = Amt_2 \times \%_2$$

EXAMPLE: If 500 ml of a 10% solution was diluted to make a 2% solution, how many ml. will the new solution measure?

Step 1. What information is given concerning the first solution?

500ml of 10%

Step 2. What information is given concerning the second solution? (use "X" for the unknown)

X ml of 2%

Step 3. Write the complete Formula:

$Amt_1 \times \%_1 = Amt_2 \times \%_2$

Step 4. Assign values to the appropriate terms:

$Amt_1 = 500$ ml

$\%_1 = 0.10$ (as a decimal)

$Amt_2 = $ "x" ml

$\%_2 = 0.02$ (as a decimal)

Step 5. Rewrite the formula substituting the assigned values for the terms:

500ml x 0.10 = xml x 0.02

Step 6. Solve by the processes indicated:

50.00 = 0.02x

Step 7. Divide both sides of the equation by 0.02:

2500 = x

Step 8. Since x is mls, your answer is:

2500 ml

QUESTIONS

1. How many ml of a 25% (W/V) solution can be made from 750 ml of a 65% (W/V) solution?

Answer _____

2. If 30 Grams of a 45% (W/W) powder was diluted to make a 30% (W/W) powder, how many grams will the new preparation weigh?

Answer _____

3. If you dilute two pints of a 65% (W/V) solution to 30% (W/V), how many fl will the new preparation measure?

Answer _____

4. How many grams of 10% (W/W) Phosphoric Acid can be made from one Kilogram of 85% (W/W) Phosphoric Acid?

Answer _____

5. How many gallons of 70% Alcohol can be made from 10 gallons of 95% (V/V) Alcohol.

Answer _____

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INFORMATION

CALCULATING THE AMOUNT OF DILUENT

EXAMPLE: How much water <u>should be added</u> to 1 liter of a 70% solution to make a 35% solution?

Step 1. Write the complete formula: $Amt_1 \times \%_1 = Amt_2 \times \%_2$

Step 2. Assign values to the appropriate terms:

$Amt_1 = 1000$ ml (1 liter)

$\%_1 = 0.70$ (as a decimal)

$Amt_2 = $ "x" ml

$\%_2 = 0.35$ (as a decimal)

Step 3. Rewrite the formula substituting the assigned values for the terms: 1000 ml $\times 0.70 = x$ ml $\times 0.35$

Step 4. Solve by the processes indicated:

$700.00 = 0.35x$

$2000 = x$

Step 5. Since x is in ml your answer for the new amount is: 2000 ml

Step 6. The total volume of the new solution is 2000 ml.

How many ml did you start with (the amount of the first solution)? 1000 ml

Step 7. Subtract the amount of the first solution from the amount of the new solution to find how much water was added.

$$2000 \text{ ml}$$
$$- 1000 \text{ ml}$$
$$\overline{1000 \text{ ml}}$$

Step 8. The difference between the volume of the first solution and that of the second solution is the amount of water added. 1000 ml of water added

QUESTIONS

1. If 55 ml of an 18% (W/V) solution are diluted to 330 ml, what will the percentage strength be?

Answer _____

2. If a pint of a 1:500 (W/V) solution is diluted to 24 fluid ounces, what will the percentage strength be?

Answer _____

3. How many ml of normal saline solution (0.9% W/V) can be prepared from 250 ml of 25 (W/V) Sodium Chloride solution?

Answer _____

4. How much water should be added to a pint of a 1:2000 (W/V) solution to make a 1:2500 (W/V) solution?

Answer _____

5. How much Lactose and how much Strychnine Sulfate should be used to make 4 drams of a 1:10 trituration of Strychnine Sulfate?

Answer _____

Answer _____

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ALLIGATION

Alligation Alternate is a method by which we may calculate the number of parts of two or more components of a given strength when they are to be mixed to prepare a mixture of desired strength.

Alligation Medial is the method by which the weighted average percentage strength of a mixture of two or more substances, whose quantities and concentrations are known, is calculated.

Calculating Problems Using Alligation Alternate

EXAMPLE: If you wished to make 1000 ml of a 40% solution, using a 10% solution and a 50% solution, how many milliliters of each would be required?

Step 1   What is the percentage strength of the solution you are going to make and its amount? This is called the WANTED %.

40%   1000 ml

Step 2.   What are the strengths of the solutions you are going to use? These are called the HAVES %s.

50% and 10%

Step 3.   Draw the following configuration to set up your problem. It is similar to the game of Tic-Tac-Toe.

Step 4.   Label each section of the Tic-Tac-Toe configuration as follows: Have, Want, Parts, Amounts. Then place the "WANTED" in the proper location. It always goes in the center box.

HAVE	WANT	PARTS	AMOUNTS
	40		1000 ml

Step 5.   Place the largest percentage of the HAVES in the upper LEFT corner; and the lower percentage in the lower LEFT corner.

HAVE	WANT	PARTS	AMOUNTS
50		30	
	40		1000 ml
10		10	

Step 6.   What is the difference between 50 and 40, ____; place this number in the bottom section of the PARTS. What is the difference between 40 and 10, ____, place this number in the top section of the PARTS.

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NOTE: Since the question asks for. the number of milliliters of the 50% and 10%, you must use the <u>parts</u> section of this Tic-Tac-Toe structure. However, in solving any ratio proportion problem you must have three knowns and solve for the fourth. Therefore:

Step 7. In this case we must find the total parts the solution will contain. To do this, all that you do is add the parts you already have and place it into the center.

HAVE	WANT	PART	AMOUNTS
50		30	x ml
	40	40	1000 ml
10		10	x ml

Step 8. Reduce the parts section if possible. In this case it can be reduced by 10.

HAVE	WANT	PART	AMOUNTS
50		3	x ml
	40	4	1000 ml
10		1	x ml

Step 9. Since 4 parts equal 1000 ml (the total), how many ml will each part contain? This can be calculated by setting up a ratio and proportion since you have three sections to the problem.

$$\frac{3 \text{ parts}}{4 \text{ parts}} = \frac{x \text{ ml}}{1000 \text{ ml}}$$

Step 10. Solve by the processes indicated:

$$4 x = 3000$$

$$x = 750$$

Step 11. Since x equals the number of ml of the 50% solution, your answer is:

<u>750 ml of 50% solution</u>

Step 12. Solve for the 10% solution the same way:

$$\frac{4 \text{ parts}}{1 \text{ part}} = \frac{1000 \text{ ml}}{x \text{ ml}}$$

$$4 x = 1000$$

$$x = 250$$

Step 13. Since x equals the number of ml of the 10% solution your answer:

<u>250 ml of 10% solution</u>

34

650

QUESTIONS

1. How many grams of Sulfathiazole should be added to 3400 grams of a 10% Sulfathiazole cream to prepare a cream containing 15% Sulfathiazole?

Answer _____

2. How many grams of Coal Tar should be added to 925 grams of Zinc Oxide Paste to prepare a 6% Coal Tar Ointment?

Answer _____

3. In what proportions should 95% Alcohol be mixed with 30% Alcohol to make 70% Alcohol?

Answer _____

4. In what proportions should solutions of 1.2% (W/V) and 0.38% (W/V) be mixed to make a 0.5% (W/V) solution?

Answer _____

5. How many grams of Petrolatum should be added to 250 grams of 20% Sulfathiazole Ointment to make a 5% Sulfathiazole Ointment?

Answer _____

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6. How many grams of Coal Tar should be added to 2700 grams of an Ointment Base to prepare a 10% Ointment of Coal Tar?

Answer _____

7. How many grams of Iodochlorhydroxyquin Powder should be added to 2000 grams of a Water Soluble Ointment, to prepare an ointment containing 3% Iodochlorhydroxyquin?

Answer _____

8. How many mls of 70% Alcohol and 30% Alcohol should be used to make 5 gallons of 55% Alcohol?

Answer _____

Answer _____

9. How many grams of Precipitated Sulfur Ointment 20% and Precipitated Sulfur Ointment 5% should be used to make 908 Gms of 8% Sulfur Ointment?

Answer _____

Answer _____

10. How much 95% Alcohol should be mixed with Purified Distilled Water to obtain 7568 mls of 70% Alcohol?

Answer _____

INFORMATION

CALCULATING PROBLEMS USING ALLIGATION MEDIAL

EXAMPLE: If you mixed the following solutions together, what would the percentage strength of the total be?

100 ml of a 50% (W/V)
200 ml of a 10% (W/V)
50 ml of water 0%

Step 1. List all the amounts and their percentages (converted to a decimal).

100 ml 0.50
200 ml 0.10
50 ml 0.00

Step 2. Multiply each of the volumes times its respective percentage strength and place the answer to the right, on the same line.

100 ml x 0.50 = 50.00
200 ml x 0.10 = 20.00
50 ml x 0.00 = 00.00

Step 3. Add the first column up and write the answer under it.

Now add the third column up and write its answer under it.

$$\begin{array}{r} 100 \text{ ml} \times 0.50 = 50.00 \\ 200 \text{ ml} \times 0.10 = 20.00 \\ \underline{50 \text{ ml}} \times 0.00 = \underline{00.00} \\ 350 \text{ ml} \qquad 70.00 \text{ Gm} \end{array}$$

Step 4. The 350 ml is the total volume of the mixture and the 70 Grams will be the total amount of Active Ingredient in that total.

Step 5. Remember in percentage preparations you had a triangle, if you had the total amount and the amount of Active Ingredient (AI) you could find the percentage strength.

Step 6. Assign the values to the appropriate terms:

$$X = \frac{70 \text{ Gms}}{350 \text{ Gms}} \text{ (ml to Gm)}$$

Step 7. Solving for the process indicated

$X = 0.2$

Step 9. The answer of 0.2 is a decimal and you are asked for a percentage. To change a decimal to a percent multiply by 100. Therefore, your answer is:

20%

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66I

QUESTIONS

1. What is the percentage strength of Alcohol in a mixture of 900 ml of a 40% Alcohol, 500 ml of a 60% Alcohol, 300 ml of a 75% Alcohol and 600 ml of a 35% Alcohol?

Answer _____

2. What would be the percentage strength if you mixed 700 ml of a 55% Alcohol, 330 ml of a 33% Alcohol, 40 ml of a 60% Alcohol and 3000 ml of a 90% Alcohol?

Answer _____

3. What would be the percentage strength if the following Coal Tar Ointments were mixed together?

3% Coal Tar . . . . 45 Grams
15% Coal Tar . . . . 15 Grams
10% Coal Tar . . . . 120 Grams

Answer _____

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ADDITIONAL QUESTIONS

REDUCING AND ENLARGING FORMULAS

1. From the following formula calculate the quantities required to make 5 gallons of Ferrous Sulfate Syrup.

Ferrous Sulfate	40 Gm	Answer _____
Citric Acid	2.1 Gm	Answer _____
Peppermint Spirits	2 ml	Answer _____
Sucrose	825 Gm	Answer _____
Purified Water. . QSAD	1000 ml	Answer _____

2. In the above original formula, how many Grams of Ferrous Sulfate will the patient receive in a 2 teaspoonfuls dose?

Answer _____

From the below formula for 100 capsules, calculate the quantity of each ingredient required to prepare 35 capsules.

Codeine Phosphate . . . . 1.6 Gm   Answer _____

Phenacetin 4   Gm   Answer _____

Aspirin 16   Gm   Answer _____

Atropine Sulfate . . . . 0.025 Gm Answer _____

4. In the above original formula, how many mg of Codeine and how many mg of Atropine Sulfate will be contained in each capsule?

Answer _____

Answer _____

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6. Reduce the following formula to make 120 ml.

Terpin Hydrate	. . . .	17	Gm	Answer _____
Codeine Sulfate	. . . .	2	Gm	Answer _____
Orange Peel Tincture	. . . .	20	ml	Answer _____
Benzaldehyde	. . . .	0.05	ml	Answer _____
Glycerin	. . . .	400	ml	Answer _____
Alcohol	. . . .	430	ml	Answer _____
Syrup	. . . .	100	ml	Answer _____
Distilled water . . QSAD	. . . . .	1000	ml	Answer _____

SIG. Dram one QID

5. In the above prescription, calculate the prescription dose the patient will receive for the Terpin Hydrate and Codeine.

Answer _____

Answer _____

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669

ADDITIONAL QUESTIONS

SPECIFIC GRAVITY

1. If 250 ml of Alcohol weighs 203 Gm, what is its Specific Gravity?

    Answer _____

2. If 125 ml of a liquid weighs 165 Gm, what is its Specific Gravity?

    Answer _____

3. If 500 ml of Ferric Chloride solution weighs 650 Gm, what is its Specific Gravity?

    Answer _____

4. If a liter of syrup weighs 1313 Gm, what is its Specific Gravity?

    Answer _____

5. If Olive Oil has a Specific Gravity of 0.912 and weighs 225 Gm, what is its volume?

    Answer _____

6. A oroduct weighs 3.ounces and has a Specific Gravity of 1.25, what is its volume?

Answer _____

7. If a gallon of oil has a Specific Gravity of 0.888, what is its weight?

Answer _____

8. A liquid has a Specific Gravity of 0.91 and a volume of 16 fluid ounces, what is its weight?

Answer _____

9. A liquid has a Specific Gravity of 1.33 and weighs 455 Gm, what is its volume?

Answer _____

10. If 30 ml of a certain liquid weighs 570 grains, what is its Specific Gravity?

Answer _____

ADDITIONAL QUESTIONS

PERCENTAGE PREPARATIONS

1. How many mg of Cocaine Hydrochloride will be required to prepare 60 ml of a 4% aqueous solution?

Answer _____

2. How many grains of Mercuric Chloride will be required to make 1 gallon of a 1:10,000 solution?

Answer _____

3. How many Gm of Silver Nitrate will be required to make 8 fluid ounces of a 0.5% solution?

Answer _____

4. Calculate the percentage strength (W/V) of a solution, 1 pint of which contains 1 ounce of solute.

Answer _____

5. How would you prepare 8 fluid ounces of a 12% solution of Wintergreen Oil in alcohol?

Answer _____

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6. How many gr of Potassium Iodide must be added to 8 fluid ounces of water to make a 15% (W/W) solution?

Answer _____

7. How many ml of Wintergreen Oil must be used to prepare 180 ml of a 6% solution in Alcohol?

Answer _____

8. How many mg of Potassium Permanganate are required to make 1 pint of a 1:400 solution?

Answer _____

9. Two pounds of a mixture of Zinc Chloride contain 75 Gm of Zinc Chloride. What is the percentage strength (W/W) of this preparation?

Answer _____

10. How many Gm of a chemical should be added to 200 ml of water to make a 15% (W/W) solution?

Answer _____

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ADDITIONAL QUESTIONS

TEMPERATURE CONVERSION

1. Convert -162° F. to Centigrade.   Answer _____

2. Convert 425° F. to Centigrade.   Answer _____

3. Convert 70° F. to Centigrade.   Answer _____

4. Convert 37" C. to Fahrenheit.   Answer _____

5. Convert 200° C. to Fahrenheit.   Answer _____

6. Convert -6° C. to Fahrenheit.   Answer _____

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ADDITIONAL QUESTIONS.

CONCENTRATION AND DILUTION

1. If 250 ml of a 1:800 (V/V) solution are diluted to 1000 ml, what will be the ratio strength (V/V)?

Answer _____

2. If 400 ml of a 20% (W/V) solution is diluted to 2 liters, what will be the percentage strength?

Answer _____

3. How many ml of 0.45% (W/V) Sodium Hypochlorite solution can be prepared from 800 ml of an 11.25% (W/V) solution?

Answer _____

4. How many ml of 10% (W/V) solution can be made from 50 ml of an 85% (W/V) solution?

Answer _____

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5. How many pounds of 10% (W/W) Sulfuric Acid can be made from 9 pounds of 94% (W/W) Sulfuric Acid?

Answer _____

6. How many ml of Normal Saline solution 0.9% (W/V) can be prepared from 250 ml of 25% (W/V) salt solution?

Answer _____

7. How many ml of a 1:8000 Potassium Permanganate Solution can be prepared from 20 ml of a 1 solution?

Answer _____

8. How many fluid ounces of 6% (W/V) solution can be made from 2 fluid ounces of a 36% (W/V) solution?

Answer _____

9. How many ml of 2.5% (W/V) stock solution of Iodine should be used to prepare 5 liters of a 1:5000 (W/V) solution?

Answer _____

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ADDITIONAL QUESTIONS

ALLIGATION

How man, grams of Sulfathiazole should be added to 4300 grams of a 10% Sulfathiazole
Cream to prepare a cream containing 15% Sulfathiazole?

Answer _____

2. How many grams of Coal Tar should be added to 908 Grams of Zinc-Oxide Paste to
prepare a 9% Coal Tar Ointment?

Answer _____

3. In what proportions should 95% Alcohol be mixed with 50% Alcohol to make 70% Alcohol?

Answer _____

4. In what proportions should solutions of 3.8% (W/V) and 0.12% (W/V) be mixed to
make a 0.5% (W/V) solution?

Answer _____

5. How many Grams of Petrolatum should be added to 340 Grams of 35° Sulfathiazole Ointment to make a 10% Sulfathiazole Ointment?.

Answer _____

6. How many Grams of Coal Tar should be added to 2270 Grams of an ointment base to prepare a 4% Coal Tar Ointment?

Answer _____

7. What percentage of Sulfur is contained in a mixture of 10 Grams of 20% Sulfur Ointment, 20 Grams of 10% Sulfur Ointment, and 60 Grams of 5% Sulfur Ointment?

Answer _____

8. What is the percentage of Alcohol in a mixture of 700 ml of 95% Alcohol, 250 ml of 70% Alcohol, 150 ml of 60% Alcohol and 200 ml of 25% Alcohol?

Answer _____

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DEPARTMENT OF BIOMEDICAL SCIENCES

PHARMACY SPECIALIST

PHARMACEUTICAL PREPARATIONS

August 1975

SCHOOL OF HEALTH CARE SCIENCES, USAF
SHEPPARD AIR FORCE BASE, TEXAS

Department of Biomedical Sciences   SW 3ABR90530-III-2
School of Health Care Sciences, USAF   August 1975
Sheppard Air Force Base, Texas 76311

PHARMACEUTICAL PREPARATIONS

OBJECTIVES

Upon the completion of the lessons in this workbook, you will have a working knowledge of pharmaceutical compounding and dispensing.

Given information pertaining to pharmaceutical heating, measuring and filtering techniques, complete questions in SW 3ABR90530-III-2.

Given information pertaining to the properties and techniques of preparing pharmaceutical dosage forms, complete questions in SW 3ABR90530-III-2.

EQUIPMENT

SW 3ABR90530-III-2
General Laboratory Equipment
Pen or Pencil
Martin's Dispensing of Medication.
Remington's Pharmaceutical Sciences
United States Pharmacopeia
National Formulary

INTRODUCTION

The following list of rules have been compiled to insure that you will be able to perform your assigned projects in the laboratory correctly and safely. It is essential that you understand these rules and follow them completely. Your success and safety is our prime concern. When in doubt as to any procedure, ask an instructor.

INFORMATION

1. Before Coming to Class

    a. Each student will complete the section of the workbook that applies to the lecture and laboratory work to be done that day.

    b. Each student will observe proper wear of the uniform, proper haircuts, and maintain a high standard of hygiene.

2. During Classroom Lecture

    a. Each student will wear low quarter shoes only! It has been observed that any other type of military shoes scuff and mar the floors in the classroom.

    b. Each student will take his seat quietly and be prepared for the lecture.

    c. Each student will be responsible for all information presented during the lecture, research, and compounding hours.

    d. After the lecture, each student will complete the laboratory sheets with the aid of the issued reference books. The preparation sheet will be used for this purpose. The instructor staff will be available to answer questions.

This supersedes WB 3ABR90530-III-2, May 1974

e. Upon completion of the laboratory worksheets, the student must have them pre-checked by an instructor. The worksheets must be rated satisfactory before starting laboratory work. Failure to comply with this responsibility will result in an unsatisfactory on the final preparation.

f. After receiving a precheck, the student will correct any mistakes annotated by the instructor and then start working in the laboratory on the preparation. Any mistakes pointed out on the precheck will be corrected before turning in the prep sheet. Failure to do this will result in an unsatisfactory on the final preparation.

3. During the Pharmacy Laboratory

a. All work must be done individually unless otherwise specified. Make only the quantities requested. When you have completed a preparation, turn it in to your lab instructor. DO NOT, under any circumstances, touch any preparation once it has been placed on the table by an instructor. No student is authorized to touch anything on the preparation table.

b. No talking among students while lab is in session; consult the instructor instead of another student.

c. There will be no horseplay, radios, eating, or drinking in the laboratory at any time. Breaks will be provided every hour and the breaks will be mandatory.

d. All drugs and reagents used in the laboratory are potentially hazardous and extreme caution will be observed in their use. Improper handling and carelessness can result in serious injury and a poor preparation. Make sure that you read the label of all drugs and reagents before using and be familiar with proper techniques for handling them. Use only clean equipment to avoid contamination of the preparation and to prevent any adverse effects. After using the chemical, secure the stopper or lid, clean the bottle, and return it to the proper storage place as soon as possible. Whenever ALCOHOL U.S.P. is used in a preparation, the amount used is to be recorded on an AF Form 582 which will be provided. Accurate records in this area are mandatory.

e. All drugs and chemicals will be labeled at all times. Any material not labeled will be destroyed immediately by the instructor. Under no circumstances will a student take any drug, reagent, chemical, or preparation out of the laboratory unless specifically authorized by the officer in charge of the pharmacy training school or his representative.

f. Each student's work area will be neat at all times. Any material or liquids that are spilled will be cleaned up immediately. All preparation sheets will be in a document protector and will remain in the personnel area at all times. Each student will be assigned to a group, and each group will have specific tasks and general housekeeping duties that must be accomplished on a daily basis. Because the laboratory is subject to both formal and informal inspections, visits, and tours, it is essential that the laboratory classroom be kept clean and neat at all times.

g. Students will be held responsible for excessive breakage of equipment. If any equipment is broken, you will inform an instructor and then will be required to enter your name, date, and type of equipment broken in a special book provided. Any broken, chipped, or cracked equipment will be replaced by the student as soon as possible. Remember, safety depends on reliable equipment, and it is your responsibility to maintain your equipment properly.

h.   Read the compounding instructions CAREFULLY!!! Observe all time provisions, temperature indications, order of mixing, and other specifications. Remember that there is a reason behind every step taken in compounding!!! Students will budget their time and strive to develop a technique that promotes efficiency and meets the strict require- ments of laboratory safety and pharmaceutical accuracy. Remember, accuracy and neatness will never be sacrificed for speed.

i.   When a container of a drug/chemical is completely used, the student will order another container on an AF Form 1517 (supply card) and turn it in to an instructor. The empty container will then be disposed of properly.

j.   Each student will turn in the completed preparation sheet along with the com- pleted preparation so that both can be evaluated as satisfactory or unsatisfactory by the laboratory instructor.

k.   After a preparation has been evaluated, it will be placed on the display table and you will not handle it again until you are directed by the instructor to dispose of it.

LABELING PROCEDURE

1.   AFM 168-4 specifies the labeling requirements of a prescription. Each student will be required to meet these requirements when typing any label in the pharmacy labora- tory. The following format will be used:

```
        SCHOOL OF
     HEALTH CARE SCIENCES
        SHEPPARD A.F.B., TEXAS

  No.  Code #(J-3)Date/Initials
  For: PHARMACY STOCK

     GENERIC NAME
     STRENGTH        QUANTITY
  Lot# (Julian date + code #)
     KEEP OUT OF THE REACH OF CHILDREN
```

2.   Labels will be typed accurately and with a minimum of typing errors. The label will be affixed to the container neatly, and auxiliary labels (if any) will be attached directly under the main label. The auxiliary labels will be attached according to order of importance. An example of this would be a POISON label being placed above a SHAKE WELL label.

3.   Remember, the finished appearance of any preparation handed to a patient indicates the attitude, proficiency, and integrity of the pharmacy personnel. Just like an artist signs his name to a picture or work of art, the prescription is initialed by the pharmacy specialist, and the label is initialed by the typist. The last line in the hospital chain, from physician to the pharmacy, is YOU, the pharmacy specialist.

EVALUATION PROCEDURES

Each preparation made in the laboratory will be evaluated by the instructor staff. The evaluation procedure is not difficult, but to preclude any misunderstanding, the following is a copy of the checklist used by the instructor staff to evaluate your preparations.

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GENERAL PURPOSE CHECKLIST	Page 1 of 6 Pages

TITLE/SUBJECT/ACTIVITY Dispensing Pharmacy Checklist, SHCS, MSDB, Pharmacy	DATE		
ITEM (Assign a paragraph number to each item. Draw a horizontal line between each major paragraph.)	Yes	No	

Code No. _____   Date _____

Class No. _____   Evaluator _____

Instructions

* Check mark ( ) the complied (yes or no) blocks.

* A "No" response requires a brief explanation.

---

1. AF Form 2380-Pharmacy Manufacture Control Data

    a. Properly filled out at home and presented at work showing:

        (1) Ingredients, amounts, stock solutions, all math calculations and initialed by instructor <u>prior</u> to starting compounding.

    b. Annotated while compounding to show:

        (1) Product lot number (julian date and code number), manufacturer, manufacturer's lot number, compounder's initials and use of schedule drugs.

    c. Reviewed for accuracy, signed and dated by compounder.

GENERAL PURPOSE CHECKLIST	Page 2 of 6 Pages		
TITLE/SUBJECT/ACTIVITY Dispensing Pharmacy Checklist, SHCS, MSDB, Pharmacy	DATE		
ITEM (Assign a paragraph number to each item. Draw a horizontal line between each major paragraph.)	Yes	No	

2. AF Form 2381-Pharmacy Master Formula

  a. Factor amounts in directions

  b. Read directions thoroughly

  c. Follow directions EXACTLY

---

3. AF Form 2382-Pharmacy Bulk Compounding Chronological Control Log

  a. List preparation lot number

  b. Include name of the preparation

  c. Include amount of the preparation

    NOTE: THIS IS TO BE DONE WHEN PREPARATION IS TURNED IN.

ATC FORM 88F   PREVIOUS EDITION MAY BE USED
MAR 74

GENERAL PURPOSE CHECKLIST	Page 3 of 6 Pages

TITLE/SUBJECT/ACTIVITY

Dispensing Pharmacy Checklist, SHCS, MSDB, Pharmacy

ITEM (Assign a paragraph number to each item. Draw a horizontal line between each major paragraph.)	Yes	No	
4. Label			
a. Follow format as outlined by display poster and workbook. The following will be included:			
(1) Facility and location			
(2) Date/initials			
(3) Code number			
(4) Pharmacy stock			
(5) Generic name, strength and amount			
(6) Include N.F., U.S.P., or local formula			
(7) Preparation lot number			
(8) Keep out of the reach of children			
(9) Auxiliary labels			
(10) Insure that typing area is left neat			
(11) Insure that label does not contain strikovers, is is straight and is proportionately placed on container			

ATC FORM 88F
MAR 74

PREVIOUS EDITION MAY BE USED

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GENERAL PURPOSE CHECKLIST		Page 4 of 6 Pages	
TITLE/SUBJECT/ACTIVITY		DATE	
Dispensing Pharmacy Checklist, SHCS, MSDB, Pharmacy			
ITEM (Assign a paragraph number to each item. Draw a horizontal line between each major paragraph.)	Yes	No	

5. Preparing prescription for controlled drugs

   a. The prescription must include the following:

      (1) Date

      (2) Prescription number

      (3) Pharmacy stock

      (4) Item and amount

      (5) Name and amount of preparation being compounded

      (6) Used by

      (7) Time and initials

      (8) Instructor's signature

      NOTE: THIS MUST BE DONE PRIOR TO WITHDRAWING ALCOHOL

TITLE/SUBJECT/ACTIVITY	DATE
Dispensing Pharmacy Checklist, SHCS, MSDB, Pharmacy	

ITEM (Assign a paragraph number to each item. Draw a horizontal line between each major paragraph.)	Yes	No	

6. AF Form 582-Pharmacy Stock Record Card

    a. The Pharmacy Stock Record Card should include:

        (1) Date

        (2) Prescription number

        (3) Physician's name

        (4) Amount dispensed

        (5) Balance

        (6) Student's initials

        NOTE: PRESCRIPTION MUST BE POSTED AS SOON AS THE ALCOHOL IS DRAWN

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GENERAL PURPOSE CHECKLIST		Page 6 of 6 Pages		
TITLE/SUBJECT/ACTIVITY Dispensing Pharmacy Checklist, SHCS, MSDB, Pharmacy		DATE		
ITEM (Assign a paragraph number to each item. Draw a horizontal line between each major paragraph.)		Yes	No	
7. Techniques				
a. Balance				
(1) Put into equilibrium				
(2) Weights on right-hand pan				
(3) Balance locked when adding or subtracting weights				
(4) Rider-arm and weights returned when not in use				
(5) Cleaned with Isopropyl alcohol				
(6) May be "zero-ed in" at beginning of day and left. However, if balance moved it must be recalibrated.				
b. Uses correct pouring technique				
c. Returns clean stock containers to side shelves				
d. Properly maintain glassware and area while compounding				
e. Labels all drugs and chemicals not in stock container				
f. Completed in allotted time				

ATC FORM 88F MAR 74   PREVIOUS EDITION MAY BE USED

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INTRODUCTION TO PHARMACEUTICAL DISPENSING

1. EVAPORATING DISH - Used for sand baths, fusion, and incineration.

2. CASSEROLE DISH - Used for sand baths, fusion, and incineration.

3. MEDICINE DROPPER - Used to measure phenols, acids, and other caustics or when measurement of liquids is too difficult to use other glassware.

4. PILL TILE (OINTMENT SLAB) - Used to make ointments, pastes, and creams. Provides a smooth surface for levigating or spatulating and can be cleaned easily.

5. STAINLESS STEEL SPATULA - Used for levigation and spatulation of ointments, pastes, and creams.

6. RUBBER OR PLASTIC SPATULA - Used for levigation and spatulation of ointments, pastes, and creams when one or more of the ingredients are mercury, iodine, tannic acid, or heavy metals and their salts.

7. LABORATORY BEAKER - Used to mix and heat liquids. Graduations on this glassware are only approximate, and it will never be used for measuring.

8. ERLENMEYER FLASK - Used to mix, heat, and macerate. Graduations on this glassware are only approximate, and it will never be used for measuring.

9. CYLINDRICAL GRADUATE - Used for measuring liquids. The most accurate of all the graduates due to the "flat" miniscus obtained.

10. MORTAR - Used to mix, triturate, levigate, and comminute in many cases.

11. PESTLE - Used with the mortar to mix, triturate, levigate, and comminute in many cases.

12. STIRRING ROD - Used to stir or mix liquids.

13. CONICAL GRADUATE - Used for measuring liquids. This glassware is calibrated in both apothecaries and metric systems.

14. RING STAND AND BASE - Used for heating and filtering procedures.

15. ASBESTOS PAD (WIRE GAUZE) - Used to provide an even distribution of heat when heating various types of glassware.

16. FISHER BURNER - A gas operated burner used for heating procedures.

17. GLASS FUNNEL - Used for filtering. Do not use for pouring.

18. SUPPOSITORY MOLD - Used to make suppositories by fusion-molding method.

19. PIPETTE - Used for measuring small amounts of liquids. Never to be used when measuring phenol, caustic agents or poisons.

1. Metric System
   Unit of Length: Meter (M)
   Unit of Volume: Liter (L)
   Unit of Weight: Gram (Gm. or g.)

   These units may be preceded by these prefixes

Kilo – 1000	deci – 0.1	micro – 0.000001
Hecto – 100	centi – 0.01	
Deka – 10	milli – 0.001	

2. Avoirdupois Weight

437.5 grains (gr.)	1 ounce (oz.) (oz. ay.)
16 ounces (oz.) (av. oz.)	1 pound (lb.) (#)
2000 pounds	1 hundred weight (C.W.T.)
	1 ton (T)

3. Apothecary Weight

20 grains (gr.)	1 scruple ( )
3 scruples ( )	1 dram ( )
60 grains (gr.)	1 dram ( )
8 drams ( )	1 apothecary ounce ( ) (oz. apoth)
12 apoth. ounces ( )	1 apoth. pound ( )

4. U. S. Fluid ("Wine") and Apothecary Fluid Measure

60 minims (min.) ( )	1 fluidram (f.)
8 fluidrams (fl.)	1 fluidounce (f.)
16 fluidounces (fl.)	1 pint (pt.) (O.)
2 pints (pt.)	1 quart (qt.)
4 quarts (qt.)	1 gallon (gal.) (C)

   f. or fl. frequently omitted and "understood"

Conversion Equivalents

1 ml.	1 cc.
1 inch	2.54 cm.
1 M.	39.37 in.
1 gal.	231 cu. in.
1 gal.	3785 ml.
1 qt.	946 ml.
1 pt.	473 ml.
1 gr. av.	1 gr. apoth.
1 fluidounce	29.57 ml.
1 Kg.	2.2 lbs (av.)
1 Gm.	15.432 grains
1 grain 64.8 mg.	64.8 mg.
1 ml.	16.23 minims.
1 min. of water	0.95 grains

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Conversion Equivalents (cont.)

1 apoth. ounce	480 grains
1 apoth. fluidounce of water	454.6 gr.
1 apoth. ounce	31.1 Gm.
1 av. ounce	28.35 Gm.
1 pound (av.)	7000 grains
1 pound (av.)	453.6 Gm.
1 pound (apoth.)	5760 grains
1 gal. water	8.32 lbs.
1 gr. of water	1.05 minims
1 gallon (C., Cong., gal.)	128 fluidounces
1 L.	2.113 pints
1 gamma	1 microgram
1 micron ( )	0.001 mm.
1 ml. of water at 4°C	1 Gm.
1 cu. ft. water	62.5 lbs. av.
1 drop (gtt) has no definite weight or size.	

5. Household Measure*

1 teaspoonful (tspf.) (℥)	5 ml.	1/6 f.
1 dessertspoonful (ii)	10 ml.	1/3 f.
1 tablespoonful (tbsp.) (ss)	15 ml.	1/2 F
1 wineglassful	60 ml.	F. ii
1 teacupful	120 ml.	f. iv
1 tumblerful	240 ml.	f. viii

*Highly inaccurate. The (dram) sign is normally read Teaspoonful when it appears in the "sig."

INTRODUCTION TO PHARMACEUTICAL DISPENSING

QUESTIONS

1. A beaker is used for mixing, heating or stirring. Never used for

   _____ liquids.

2. An _____ _____ is used for mixing,

   macerating or heating of liquids.

3. Conical and Cylindrical _____ are used to measure

   liquids.

4. The mortar and pestle is used for mixing, grinding, and various forms

   of _____.

5. The _____ is used for measuring small amounts of

   liquids. It is never to be used when measuring phenol, caustic agents,

   or poisons.

6. Wire gauze (asbestos pad) is used for providing an even distribution of

   _____ on the bottom of containers.

7. The process of strongly heating solid or semi-solid substances to a

   definite and limited degree (the residue of this is the product sought)

   is called _____.

8. The process of the removal of water of crystallization, or moisture,

   from a solid crystalline substance by heating strongly is called

   _____.

9. The process of roasting certain organic substances in order to modify

   some of their constituents is called _____.

10. The process of liquifying solid substances by the application of heat without the use of a solvent is called _____.

11. Converting a liquid or solid into a vapor is called _____.

12. Driving off as a vapor, volatile portion of a liquid by the application of heat is called _____.

13. Separation of the constituents of a liquid mixture by vaporization and subsequent condensation of the vapors is called _____.

14. Separation of volatile solids from non-volatile solids is called _____ and the product obtained is the sublimate.

15. A Cool Place is _____ C or _____ F.

16. A Cold Place does not exceed _____ C or _____ F.

17. Refrigerated means the temperature is _____ C or _____ F.

18. Excessive heat is any temperature that exceeds _____ C or _____ F.

19. The primary concern when using pharmaceutical heating devices is _____.

20. _____, _____ are used to check excessive heat and not to injure certain medicinal products.

21. match the following:

For temperatures not to exceed 100°C (212°F) ____   a. Oil Bath

Maximum temperature is 250°C ____   b. Water Bath

Used to maintain a CONSTANT temperature of   c. Steam Bath
100°C (212°F) ____
                                                           d. Sand Bath
Used for moderate to extremely high
temperatures ____

Same as heat source ____

Decomposes under high temperatures ____

METROLOGY

QUESTIONS

1. The Troemner and Torsion Balances are Class _____ Prescription
   Balances.

2. The balance that works on the knife-edge principle is a _____
   Balance.

3. The maximum amount weighable on a Class A Prescription Balance is
   _____ Gm.

4. The minimum amount weighable on a Class A Prescription Balance is
   _____ mg.

5. Rider Scale on the Torsion and Troemner Balances is divided into
   _____ mg increments and the maximum amount weighable using the rider
   weight is _____ Gm.

6. The Harvard Trip (Laboratory Balance) is a Class _____ Prescription
   Balance.

7. The maximum amount weighable on a Class B Prescription Balance is
   _____ Gm. (_____ lb.)

8. The minimum amount weighable on a Class B Prescription Balance is
   _____ mg. (_____ gr.)

9. The Rider Scale on the Harvard Trip (Laboratory Balance) is divided
   into _____ mg increments and the maximum amount weighable using the
   rider (poise) weight is _____ Gm.

10. Because of rapid evaporation, the solvent of choice for cleaning
    balances is _____.

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11. Weights are put on the _____ pan of the balance and the drug to be

    weighed is put on the _____ pan.

12. Match the following:

    Used to measure small amounts of liquids ____   a. 30 ml Conical
                                                             Graduate

    Phenol not measured in this _____
                                                         b. 10 ml Cylindrical
    Never used to measure amounts less than   Graduate
    5 ml _____
                                                         c. Pipette
    Never used to measure amounts less than
    2 ml _____   d. Medicine Dropper

    Most accurate device to measure large   e. Beaker
    amounts of liquids _____
                                                         f. Graduate
    Never used for measuring liquids _____

13. Cylindrical Graduates are more accurate than Conical Graduates.

    (TRUE or FALSE)

14. Liquids that cannot be used in a pipette because of their toxic or

    caustic properties or too small to be measured in a pipette will be

    measured in a _____.

15. "TD" means "To _____".

16. "TC" means "To _____".

17. A Cylindrical Graduate has a "flatter" meniscus than a Conical Graduate

    and as a result, the chances of an ERROR of _____ is

    reduced.

COMMINUTION

QUESTIONS

1. The process of physically reducing solid substances into smaller fragments or particles is called _____.

2. The purpose of Comminution is to _____ the rate of solution of solids, obtain a uniform powder or mixtures of powders, and to increase ease and thoroughness of _____.

3. Water sifting is called _____.

4. Hand picking or sorting is called _____.

5. Sieves or screens are used when _____.

6. The process of placing a substance in a heavy mortar and crushing it by pounding with a heavy pestle is called _____.

7. Rasping, grating, cutting, slicing, and chopping are methods of preparing _____ drugs.

8. The process of reducing substances to a powder by rubbing them in a mortar with a pestle is called _____.

9. Reducing the particle size of a solid by first forming a mass of the solid with a liquid and then grinding in a Mortar and Pestle or by spatulation is called _____.

10. The process of reducing a solid to a powder through the use of a foreign substance from which the powder is freed by some simple method is called _____.

11. Comminution can never increase solubility but can increase the _____ of _____.

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INCOMPATIBILITIES

1. When drugs or chemicals are not capable of acting in harmony or concert with another, they are said to be _____.

2. 3 types or classifications of incompatibilities are:

   a. _____

   b. _____

   c. _____

3. _____ incompatibilities are evidenced by:

   a. Clouding

   b. Precipitation

   c. Liquefaction

   d. Change in consistency

   e. Immiscibility

   f. Insolubility

4. A change in the physical state of a preparation resulting from mixing two or more drugs together is called a _____ incompatibility.

5. The result of a reaction taking place when two or more ingredients of a prescription are mixed and forming a new compound or compounds is called a _____ incompatibility.

6. A condition in a prescription that results in a dosage different from that intended by the prescriber is called a _____ incompatibility.

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7. _____ incompatibilities are evidenced by:

   a. Explosion or Implosion

   b. Liberation of a gas

   c. Change of color

   d. Formation of a precipitate

8. "SA" is translated as "_____ to the "_____".

9. _____ incompatibilities are evidenced by:

   a. An overdose or improper dose of a single drug

   b. An undesirable combination of two or more drugs

   c. A contraindicated drug

   d. The wrong drug

10. The 2 methods of correcting incompatibilities are:

    a. According to the Art

    b. _____ the prescriber

11. The prescriber is always contacted in the case of _____ incompatibilities.

12. When correcting physical incompatibilities, care should be taken to insure that the _____ effect is not altered.

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GENERAL METHODS OF CORRECTING INCOMPATIBILITIES

1. On any question of therapeutics, consult the prescriber.
2. Modify order of mixing.
3. Alter solvents.
4. Change form of one or more ingredients.
5. Alter volume.
6. Emulsify or suspend.
7. Add or omit therapeutically inactive substances.
8. Change dosage form.
9. Replace one of reacting ingredients.
10. Control reaction during mixing.
11. Add color inhibiting or masking agent.

Type of incompatibility	Possible methods of correction
Therapeutic:	
Overdose	1
Additive combinations	1
Antagonistic combinations	1
Wrong drug	1
Contraindicated medication	1
Physical:	
Immiscibility	2,3,4,5,6,7,8
Insolubility	2,3,4,5,6,8
Precipitation	3,5,6,8,9
Liquefaction of solids	7,8,9
Solidification of solids	5,7,8,9
Chemical:	
Precipitation	3,4,6,7,8,9
Effervescence	8,9,10
Decomposition	3,4,7,8,9
Color formation	7,8,9,11
Explosion	2,8,9

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Identify the incompatibility(ies) in the following prescriptions. Using the general methods of correcting incompatibilities, correct the incompatibility(ies).

1.   Compound Tincture of Benzoin   2 ml.
       Phenergan Expectorant   q.s.   2 fl oz

       Sig: i dr q.i.d.

    Incompatibility(ies):

       Directions for correcting:

2.   Peru Balsam   2 Gm
       Petrolatum q.s.   30 Gm

       M. Ft. oint.

    Incompatibility(ies):

       Directions for correcting:

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3. Aminophylline   gr iss
    Sugar of Milk   gr iii

    Per capsule Make 24

    Incompatibility(ies):

    Directions for correcting:

4. Ferric Chloride   40
    Water   qs ad   120

    M. Ft. sol.

    Incompatibility(ies):

    Directions for compounding:

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WATERS AND SPIRITS

QUESTIONS

1. _____ USP is not suitable for pharmaceutical work because

of the considerable amount of dissolved solids present.

2. _____ water USP does not contain the dissolved mineral.

matter that Water USP contains and is the water used for pharmaceutical

compounding unless otherwise specified.

3. Water for _____ USP is pyrogen free, used in making

parenterals and is not sterile.

4. _____ Water for Injection USP is used for preparing

parenterals and is sterile, but does not have an antimicrobial agent in

it.

5. _____ Water for Injection USP is Sterile Water

for Injection USP with 1 or more antimicrobial agents added to it.

6. Solutions of volatile oils or other aromatic or volatile substances in

purified water are called _____ Waters.

7. Unless otherwise specified, Aromatic Waters are saturated and their

percentage strength is _____ %.

8. The 3 methods of preparing Aromatic Waters are:

a. _____

b. Simple _____

c. _____ Solution

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9. When preparing Aromatic Waters by the Simple Solution method, the volatile substance and water must set for _____ hours.

10. The Alternate Solution method requires only 10 minutes of agitation because of the addition of _____ that acts as a dispersing agent.

11. The use of Talc in preparing Aromatic Waters speeds up the saturation by dispersing the aromatic substance and also acts as a _____ bed.

12. Alcoholic or hydroalcoholic solutions of volatile substances are called _____.

13. The 4 methods of preparing Spirits are:

    a. _____ Solution

    b. Solution with _____

    c. _____ Reaction

    d. _____

14. When water is added to a Spirit, _____ occurs.

15. Match the Following:

    Carminative, anesthetic, and antiseptic in eye preparations. Pharmaceutical Solvent. _____   a. Aromatic Ammonia Spirit

    Flavored Vehicle _____   b. Cinnamon Water

    Carminative and Flavored Vehicle _____   c. Camphor Water

    Reflex Stimulant _____   d. Compound Orange Spirit

    Local irritant _____   e. Peppermint Water

    Flavoring Agent _____   f. Camphor Spirit

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SOLUTIONS AND SYRUPS

QUESTIONS

1. Aqueous solutions of nonvolatile substances are called _____
   _____.

2. Because solutions are used for whatever the therapeutic effect of the
   substances dissolved, no general use can be stated. (TRUE/FALSE)

3. When preparing solutions, the solute is dissolved into the solvent
   without the aid of any catalyst and this method is called _____
   _____ Solution.

4. Solution by _____ _____ is a method of
   preparing solutions in which the solutes react to form the solution.

5. The method of sterilizing a simple solution is called Simple Solution
   with _____.

6. The method of macerating the solute to obtain the active ingredient or
   constituent in solution is called Solution by _____.

7. 4 factors affecting the _____ are:

   a. Particle size

   b. Agitation

   c. Heat

   d. Degree of Saturation

8. List the degrees of saturation:

   1 Gm of solute in:

   Less than 1 ml _____

   1-10 ml _____

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10-30 ml _____

30-100 ml _____

100-1000 ml _____

1000-10,000 ml _____

10,000 ml or more _____

9. Supersaturation _____ the rate of solution.

10. Hyposaturation _____ the rate of solution

because the percentage strength is lowered.

11. When Supersaturation occurs by evaporation, the percentage strength

is _____.

12. In addition to evaporation, supersaturation may occur by _____.

13. Match the Following:

Anti-Infective _____   a. Amaranth Solution USP

No Dose _____   b. Saturated Solution of Potassium
                                 Iodide NF
Source of Iodine _____
                             c. Gentian Violet Solution
Expectorant _____
                             d. Potassium Permanganate Solution
5% _____
                             e. Strong Iodine Solution USP
Topical _____

1% _____

0.3 ml 3 times daily _____

100% (w/v) _____

Local Formula _____

0.3 ml _____.

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Coloring Agent _____

Antifungal _____

SSKI _____

Lugol's Solution _____

FD&C Red No. 2 _____

14. A nearly saturated aqueous solution of sugar with or without a medicinal or flavoring agent is called a _____.

15. _____ Syrups contain a medicinal ingredient or ingredients designed for a therapeutic effect on the body or system.

16. Non-Medicated Syrups are used just as a sweetner or _____.

17. The 2 methods of preparing syrups are as follows:

a. Solution _____ Heat

b. Solution _____ Heat.

18. Overheating of Syrup USP will result in _____

_____.

19. Syrups should be stored in a cool place or _____ if possible.

20. Syrups USP will not need a preservative if the concentration of Sucrose is _____%.

21. Match the Following:

Vehicle, Sweetening Agent _____   a. Simple Syrup USP

Sympathomimetic, Antiasthmatic _____   b. Epnedrine Sulfate Syrup

20 mg/5ml _____

85% _____

No Dose _____

5 ml 4 times daily _____

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EYE, EAR, AND NOSE PREPARATIONS

QUESTIONS

1. When a concentrated solution is separated from a less concentrated
solution by a semipermeable membrane, the solvent passes through the
membrane to the more concentrated solution and the force which brings
this about is called _____ pressure.

2. A substance is said to be _____ if it has the same
osmotic pressure as body fluids (the same number of particles in
solution as body fluids).

3. A substance is said to be _____ if it has a lower osmotic
pressure than body fluids (a lesser concentration of particles than the
body fluids).

4. A substance is said to be _____ if it has a higher
osmotic pressure than body fluids (a greater concentration of particles
than body fluids).

5. _____ is the negative common logarithm of the hydrogen ion concen-
tration.

6. A pH of 7-14 is _____.

7. _____ are substances that resist a change in pH of
a preparation.

8. Group I (Boric Acid) is used to buffer anesthetics and _____
_____.

9. Group II (Modified Sorenson's Solution) is used to buffer
_____ and similar drugs.

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10. Ophthalmic preparations must be _____, have the correct
pH, tonicity, viscosity, free from foreign particles, and sterile.

11. The vehicles for ophthalmic preparations are either _____
aqueous solutions or _____ ointment bases.

12. To prolong a drug's contact with the eye you would increase the
_____.

13. No single preservative is sufficiently free from incompatibilities to
be used in all cases but they should be _____.

14. Benzalkonium Cl, Chlorobutanol, Methyl and Propyl Paraben, and Thimersol
are used as ophthalmic _____.

15. The 5 methods of applying ophthalmic preparations are:

a. _____

b. _____

c. _____

d. _____

e. _____

16. Match the following:

astringent _____   a. Zinc Sulfate

mydriatic _____   b. Tetracaine

anesthetic _____   c. Fluorescein Sodium

miotic _____   d. Atropine Sulfate

diagnostic agent _____   e. Pilocarpine

17. Otic preparations should be _____, non-allergenic and
nonsensitizing, have the correct pH, and be sterile.

18. Vehicles used for otic preparations are:

    a. Glycerin

    b. Propylene Glycol

    c. Ethyl Alcohol

    d. Vegetable Oils

    e. Acidic _____ Solutions

19. To prevent bacterial growth, aqueous preparations in the ear should

    be _____.

20. The 2 methods of applying or instilling ear preparations are:

    a. _____

    b. _____

21. Benzocaine, Antipyrine, Glycerin, and Menthol ear drops is classified

    as an Anesthetic, _____.

22. Acetic Acid 2% in Ethyl Alcohol ear drops is classified as a

    _____.

23. Nose preparations should be stable, non-allergenic and nonsensitizing,

    have the correct _____, and correct pH.

24. The pH range of nose preparations is _____ to _____.

25. The most commonly used vehicle in nasal preparations is _____

    _____.

26. Mineral oil and other petroleum distillates were used as vehicles in

    the past but it was found to cause oil-aspiration _____.

27. The 2 methods of applying or instilling nose preparations are:

    a. _____

    b. _____

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.   Ephedrine Sulfate Solution is used as a nasal _____.

9. Phenylephrine HCL Solution (Neosynephrine) is used as a nasal

_____.

30. Commonly used preservatives in nasal preparations are:

a. _____

b. _____

ELIXIRS AND TINCTURES

QUESTIONS

1. A clear, sweetened, hydro-alcoholic liquid, medicated or non-medicated, intended for oral use is the definition of an _____.

2. Elixirs are colored to match taste, pleasant tasting, sweet, used therapeutically or as a vehicle and have an alcohol range of ____ to ____%.

3. There is no set procedure for preparing Elixirs but the _____ soluble ingredients are dissolved in the water portion and the _____ soluble ingredients are dissolved in the alcohol.

4. Raising the _____ content will cause the water soluble ingredients to precipitate or come out of solution.

5. Lowering the _____ content will cause the alcohol soluble ingredients to precipitate or come out of solution.

6. Match the Following:

    Expectorant _____

    Antihistamine, Pediatric Sedative _____

    Anticonvulsant, Sedative, Hypnotic _____

    Flavored Vehicle _____

    20 mg/5 ml _____

    85 mg/5 _____

    21-23% Ethyl Alcohol _____

    12.5 mg/5 ml _____

    a. Terpin Hydrate Elixir NF

    b. Aromatic Elixir USP (Simple Elixir)

    c. Phenobarbital Elixir (Luminal Elixir)

    d. Diphenhydramine HCl Elixir USP (Benadryl Elixir)

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30 mg 4 times daily ____

No dose ____

10 ml 4 times daily ____

5 ml as needed ____

7. Alcoholic or hydroalcoholic solutions prepared from vegetable drugs or chemical sources are called _____.

8. _____Tinctures do not exceed 10% of the active drug.

9. _____ Tinctures do not exceed 20% of the active drug.

10. _____ _____ Tinctures do not exceed 50% of the active drug.

11. Tinctures are prepared by _____ (Process M).

12. Match the Following:

2% _____   a. Iodine Tincture USP

Pharmaceutical Necessity _____   b. Sweet Orange Peel Tincture

Flavoring Agent _____

No Usual Dose _____

Topical Use

50% _____

Germacide _____

710

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SUSPENSIONS

QUESTIONS

1. Two-phase liquid preparations containing solid insoluble material for oral, injection, or ophthalmic use are called _____.

2. The dispersed phase in suspensions should settle slowly and should be easily _____.

3. Suspensions should not cake upon _____.

4. Suspensions should pour easily and be _____.

5. Suspensions should have good patient _____ in taste and color qualities.

6. List the 3 types of suspensions:

   a. _____

   b. _____

   c. _____

7. Nonviscous aqueous preparation containing insoluble material intended for internal use are called _____.

8. Viscous aqueous preparations, containing insoluble material intended for internal use are called _____.

9. Aqueous liquid preparations containing insoluble material of nearly colloidal size intended for internal use are called _____.

10. Magmas are prepared by _____ _____ or chemical reaction.

11. There is no set method for preparing _____.

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12. The presence of a suspending agent is required to overcome agglomeration of the dispersed particles and to increase the _____
    of the medium so that particles settle slowly.

13. Many suspending agents are also _____ agents.

14. Acacia USP is a suspending agent used for insoluble substances in water and is susceptible to microbial attack and, therefore, needs a

    _____.

15. Bentonite USP is a protective _____ used for the stabilization of suspensions.

16. _____ is used as a dispersing, thickening, emulsifying, and coating agent. It is not susceptible to microbial growth like the natural gums such as Acacia and Tragacanth but should still have a preservative added.

17. Tragacanth USP hydrates very slowly and is only partially soluble in water. It is susceptible to microbial attack and must have a

    _____ added.

18. List the preservatives used in suspensions:

    a. _____ 7%

    b. _____ 0.2%

    c. _____ 0.2%

    d. _____

19. The auxiliary label required for Mixtures, Magmas, Suspensions, and Gels is " _____ ".

20. Magmas and Gels must be kept from _____ .

21. Match the Following:

Antibacterial _____   a. Brown Mixture NF

Antacid _____   b. Bentonite Magma

Suspending Agent _____   c. Aluminum Hydroxide Gel

Expectorant _____   d. Acetylsulisoxazole Suspension

3-4 Gm Stat then   e. Chalk Mixture NF

1-2 Gm q4-6 hours _____

No Dose _____

15 ml _____

5 ml _____

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LOTIONS AND LINIMENTS

QUESTIONS

1. Aqueous or hydroalcoholic preparations that contain insoluble solids held in suspension and that are intended for external use by application to the skin without friction are called _____.

2. Lotions are filtered before dispensing. (TRUE/FALSE)

3. The 2 methods of preparing lotions are Trituration, and _____.

4. No suspending agent is needed when preparing a lotion by the precipitation method since the precipitate is nearly _____ size.

5. Commonly used preservatives used in Lotions are:

   a. _____ 7%

   b. _____ 0.2%

   c. _____ 0.2%

   d. Methyl and _____ parabens

6. Oily or alcoholic preparations intended for external use to be applied with friction and are liquid or semi-solid in form are called.

   _____.

7. An external preparation having the poorest patient acceptance is a _____ because:

   a. Application must be repeated over a period of time.

   b. The patient is required to expend effort on application.

   c. The preparation may leave a film on skin or stain clothing.

   d. Removal may be difficult.

   e. The appearance and odor may not be pleasing.

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8. There is no set method of preparing a liniment. Therefore, the method of preparation depends on the _____.

9. Because of a slight effervescent action, _____ should be allowed to stand for a few minutes before capping.

10. Match the Following:

   a. Protectant _____   1. Medicinal Soft Soap Liniment NF

   b. Detergent _____   2. White Lotion USP

   c. Astringent- _____   3. Calamine Lotion USP

   d. Counterirritant _____ 4. Camphor Liniment NF

   e. Stand before capping _____

   f. Alcoholic base

   g. Oily base

   h. Made by precipitation _____

   i. Oily base _____

11. The purpose of levigating powders when making a lotion is to reduce _____ size.

12. Liniments with oily or alcoholic bases are usually prepared by the _____ Solution method.

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POWDERS AND CAPSULES

QUESTIONS

1. Mixtures of drugs or chemicals in a dry, pulverized form intended for internal or external use are called _____.

2. The 2 types of powders are Bulk powders and _____ powders.

3. Effervescent powders, dusting powders, dentifrices, and insufflations are _____ _____ powders.

4. Divided powders are measured and packaged by the _____ _____.

5. Bulk powders are measured by the _____.

6. Chartula is another name for _____ powders.

7. The _____ activity of a medication is affected by the degree of fineness of the powder.

8. In all prescriptions, the powders should be in a fine state of _____.

9. Trituration is the method of choice for _____ powders and also the most common method used for mixing powders.

10. Spatulation can be used for mixing _____ quantities of powders.

11. _____ is the method of choice for light powders.

12. Tumbling is the mixing method used to advantage where _____ _____ on the powder is undesirable.

13. Powders that are blown into body cavities are called _____.

14. Powder papers containing deliquescent, efflorescent, hygroscopic, or volatile substances should be _____ wrapped to protect them from the atmosphere.

15. _____ powders absorb enough moisture from the atmosphere to become a liquid.

16. Efflorescent powders lose their waters of _____ to the atmosphere.

17. _____ powders absorb enough moisture from the atmosphere to become moist.

18. Salts which contain a large amount of water of crystallization may need to be _____ before mixing to prevent reactions.

19. Phenols, phenolic compounds, aldehydes, and ketonic compounds form _____ mixtures.

20. Eutectic mixtures can be corrected by the addition of Magnesium Carbonate or Light _____ Oxide.

21. _____ are shells of gelatin used for containing individual doses of medication,

22. Hard Gelatin capsules are used primarily for _____ _____ compounding.

23. _____ Gelatin capsules usually have a liquid in them.

24. _____ Coated capsules are intended to dissolve in the intestine rather than the stomach.

25. The lactose or diluent is added to the active ingredient by _____ dilution.

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26. Capsules should be stored in a cool place of _____ humidity.

27. A warm dry place will cause capsules to lose water and become

    _____.

28. Match the Following:

    Antispasmodic _____   a. Phenobarbital and Belladonna
                                     Capsules
    Analgesic _____
                                 b. Aspirin and Codeine Capsules

29. After punching capsules, fingerprints may be removed by polishing them

    in _____.

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EMULSIONS

QUESTIONS

1. Preparations containing two _____ liquids, one
   of which is uniformly dispersed as globules within the other are
   called _____.

2. Emulsions are classified as either _____ in _____
   or oil in water.

3. If oil in the internal phase and water in the external phase, the
   emulsion is a _____ in water emulsion.

4. Acacia (Gum Arabic) is a natural gum and a true emulsifying agent. The
   emulsions produced by acacia are rather _____.

5. When preparing oil-in-water emulsions, _____
   is the most efficient emulsifying agent but it is the least stable and
   prone to rapid decomposition.

6. Special Gelatin Pharmagel A is used in an _____ pH.

7. Special Gelatin Pharmagel B is used in a _____ pH.

8. Tragacanth _____ is seldom used alone as an emulsifying agent but
   in combination with other emulsifying agents it increases the viscosity
   of the preparation to such an extent that it is _____ times
   more powerful than Acacia.

9. List the Miscellaneous Emulsifying Agents:

   _____: Soap, sulfonates, and sulfates

   _____: Benzalkonium Cl

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_____ : Spans and Tweens

_____ : Cholesterol and Wool Fat

_____ : Bentonite, Silica, Magnesium Hydroxide, and other fine powders

10. To prevent spoilage of carbohydrate emulsifying agents, they should be kept in a TLRC, preserved and _____ .

11. The Dry Gum (Continental Method) is used to prepare emulsions of fixed oils, _____ oils, or nonvolatile oils.

12. The ratio of the Dry Gum method is 4 parts _____, 2 parts _____, 1 part emulsifying agent.

13. The Dry Gum method requires you to add oil to the emulsifying agent and add the _____ ALL AT ONCE.

14. When making an emulsion, the primary emulsion is "rested" so that the emulsifying agent can _____ .

15. The Wet Gum (English Method) is used to prepare emulsions of fixed oils, _____ oils, or nonvolatile oils.

16. The Wet Gum method is more difficult than the Dry Gum method in that the oil is added after the _____ .

17. The Bottle Method (Forbes Method) is used to prepare emulsions of _____ oils, or nonviscous oils.

18. The ratio of the Bottles method is 2 parts _____, 2 parts _____, and 1 part emulsifying agent.

19. The Chemical Reaction Method is a reaction between fatty acids and a weak _____ base. No emulsifying agent is needed.

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20. The gums (acacia, pectin, and tragacanth) have a common storage problem which is _____ and as a result, they must be _____ and preserved.

21. The preservatives used in emulsions must be soluble in the _____ phase.

22. List the following preservatives:

_____: 7% to 15% of the TOTAL of the water used in the entire preparation.

_____: 0.2% of the aqueous phase of the primary emulsion.

_____: 0.1% of the aqueous phase of the primary emulsion.

23. Acacia Emulsions are stable over a wide range (2 to _____ pH).

24. Tragacanth Emulsions and Pectin Emulsions are stable only in an acid (1- _____ pH).

25. Match the Following:

Palatable source of Vitamins A&D _____   a. Mineral Oil Emulsion-N.F.

Irritant Cathartic _____   b. Castor Oil Emulsion

Emollient and Protectant _____   c. Cod Liver Oil Emulsion

Cathartic _____   d. Calamine Emulsion

30 ml dose _____

15 ml dose _____

External Use Only _____

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OINTMENTS

QUESTIONS

1. Soft, semi-solid preparations usually containing medicinal agents intended for application to the skin or mucous membrane with or without rubbing is the definition of _____.

2. Ointments are classified by composition or by therapeutic action based on _____.

3. _____ ointment bases includes fixed oils of vegetable origin, fats obtained from animals and semisolid hydrocarbons obtained from petroleum.

4. Oleaginous ointment bases are highly compatible, good emollients but they are difficult to remove from skin and clothes, unstable, and not good _____ absorbers.

5. _____ bases are generally anhydrous substances which have the property of absorbing considerable quantities of water and still retain their ointment-like consistency. They are highly compatible, relatively heat stable but are unpleasant to use and not

_____.

6. Emulsion bases are actually _____ emulsions.

7. Emulsion bases are water washable, easily applied and removed but they must be preserved and are subject to _____ loss.

8. Water soluble ointment bases have a wide range of compatibilities, do not support mold growth, are nonirritating, adhere well to skin, and are easily _____ off.

9. Match the Following:

Acts on the surface of the skin to produce local
effect _____

a. Epidermic

b. Endodermic

Penetrates into the deeper layers of the skin
but not through the skin _____

c. Diadermic

Penetrates through the skin and medication may
be absorbed _____

10. Ointments are prepared by Mechanical Incorporation or _____.

11. Solid substances having high melting points are incorporated into
ointments by _____.

12. When the materials used to prepare an ointment are all soft at room
temperature, the method of preparation would be mechanical
_____.

13. Ointment bases of fats and oils may become _____.

14. Emulsion bases will support _____ growth.

15. Sulfur Ointment USP is a _____

16. Whitfield's Ointment is an _____.

17. Ointment-like mixtures which generally contain a higher percentage of
powdered materials are called _____.

18. Semisolid emulsions containing suspensions or solutions of medicinal
agents for external use are called _____.

19. Cold Cream USP is used as a base, _____,
and cleansing agent.

20. Vioform HC (Iodochlorhydroxyquin and Hydrocortisone) is an anti-
infective _____.

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21. Vioform and Hydrocortisone cream should be prepared by using a

_____ spatula.

SUPPOSITORIES

1. Solid bodies of various weights and shapes adapted for introduction into one of the orifices of the body and usually melting, softening or dissolving at body temperature is the definition of _____ _____.

2. Rectal suppositories are bullet shaped, cylindrical and tapered to a point with a weight of _____ Gm.

3. Vaginal suppositories are globular or balloon shaped, weigh _____ Gm and are sometimes called a pessary.

4. _____ suppositories are rod or pencil shaped and have a weight of 2 Gm (Female) and 4 Gm (Male).

5. A disadvantage of suppositories is inconvenience of _____.

6. Suppositories are made by Cold Compression, Hand Shaping, or by _____.

7. Match the Following:

For Migraine headaches ____   a. Glycerin Suppositories

Antiasthmatic ____   b. Aspirin Suppositories

Analgesic, Antipyretic ____   c. Ergotamine Tartrate and
                                        Caffeine Suppositories
Laxative ____   (Cafergot)

Rectal Evacuant ____   d. Aminophylline Suppositories

Astringent   e. Tannic Acid Suppositories

                                     f. Bisacodyl (Dulcolax)

PARENTERALS

QUESTIONS

1. Sterile solutions, suspensions or emulsions for injection under or through one or more layers of skin or mucous membrane are called _____.

2. An injection into the substance of the muscles is called _____ _____.

3. An injection into the vein (most rapid onset of action) is called _____.

4. An injection into the corium or substance of the skin is called _____.

5. An injection administered beneath the skin but not into the muscle is called _____.

6. The therapeutic introduction of a fluid, usually a large volume, into a vein by gravity flow is called _____.

7. Parenterals are classified by their _____ characteristics.

8. Sterile _____ have dissolved medicaments in aqueous, oily, or organic solvents.

9. Sterile _____ have solid medicaments in aqueous or oily vehicles.

10. Sterile Solid Medications yield a _____ upon the addition of a suitable vehicle.

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11. Sterile Solid Medications can also yield a _____ upon the addition of a suitable vehicle.

12. Sterile _____ are water-in-oil or oil-in-water and are not suitable bases for antibiotics.

13. To increase the local action, _____ are used with local anesthetics.

14. Soluble, filterable, thermostable, substances resulting from the decomposition of certain strains of bacteria are called _____.

15. Parenteral administration is available for many drugs which are _____ by gastric juices.

16. Ampules are all glass, have a constriction at the neck, and are usually _____ dose.

17. _____ are stoppered glass containers that can be single or multiple dose.

18. Stoppered glass containers which preserve, in a sterile condition, multiple doses of parenteral medications are called _____.

19. Syringe containers (Tubex) are the most convenient in the administration of emergency, life-saving drugs. (TRUE/FALSE)

20. The potency of antibiotic parenterals can usually be extended by keeping them in the _____.

21. _____ are chemical agents which are added to parenteral solutions to enable them to resist a change in pH.

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22. A long-acting parenteral would probably have an _____
    base.

23. The container of choice for the administration of Narcotics would be
    a _____.

BULK COMPOUNDING AND PREPACKAGING

QUESTIONS

1. Bulk compounded items are prepared for inpatient use, outpatient use, and _____ _____.

2. Bulk compounding saves time, saves money, and provides a _____ _____ system.

3. When using pharmaceutical equipment, the most important consideration is _____.

4. A water still can either be steam operated or _____.

5. The water produced by a still should be _____.

6. The food blender (Waring Blender) is an excellent device for making _____, lotions, mixtures, magmas, suspensions, and gels.

7. The Laboratory Magnetic Stirrer-Hot Plate (Thermo Magna Stir) is used for mixing preparations of low viscosity and is used with an _____ flask because of the vortex caused by the magnet.

8. The Alsop Mixer is used for mixing and filtering amounts over 4,000 ml and is extremely efficient and excellent for making Simple Syrup USP by the _____ method.

9. The main advantage of using a Suppository Compression Machine in the preparation of Cocoa Butter Suppositories is that the _____ of the base is not changed.

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10. The major factor to be considered when determining the quantity of an item to be compounded in bulk is the amount to be used in the _____.

11. The 3 factors of Quality Control in Bulk Compounding are:

    a. Quality Control Forms

    b. Lot Numbers

    c. _____ Letters.

12. Any drug reported in the Air Force Medical Materiel Office Letter as unsuitable for use can only be identified by a _____ number.

13. The expiration date of any dated item compounded in the pharmacy will be determined by the expiration date of the _____ drug to expire in that preparation.

14. All labels made for bulk compounded preparations will be written using the _____ name only.

15. Guidelines for prepackaging medications are established in AFM _____.

16. The primary factor to be considered when determining which medications to prepackage for outpatient dispensing is _____ _____ of use.

17. Prepackaged medication labels must have the prescribing physician's name. (TRUE/FALSE)

18. Prepackaged medications must have the original manufacturer's lot number on the label OR have a lot number assigned by the _____ _____.

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19. A disadvantage that may arise from prepackaging bulk compounds is that

it can cause a critical _____ problem.

20. The bottle filling machine is used to fill _____

bottles.

21. The Mini-Counter is designed to count _____ or Capsules.

22. The Prescription Label Imprinter is primarily used for printing

_____ labels.

23. Which of the following would not normally be prepackaged?

a. Ointments

b. Parenterals

24. When the pharmacy transfers the contents from an original stock

container of 500 tablets, to five stock containers of 100 tablets each,

the procedure is called _____ .

25. Quality Control is lost once the medication is dispensed to the

_____ .

INTRAVENOUS ADMIXTURES

1. Asepsis is the prevention of the access of _____
   _____.

2. Aseptic technique does not assure _____ but prevents
   further contamination by microorganisms.

3. When preparing I.V. admixtures, the disinfectant of choice is
   _____.

4. The possibility of upper respiratory microorganisms contaminating the
   aseptic environment could be reduced by wearing a _____
   _____.

5. The primary purpose of the laminar flow hood is to provide an
   _____ air flow.

6. To slow down or to prevent bacterial growth, I.V. admixtures are stored
   in the _____.

7. A needle and syringe with a 2 way valve is used as the equipment of
   choice for _____ reconstitution.

8. In-line filtration and random sampling is used to check for
   _____ contamination.

9. Light and Dark field observation is used to check for _____
   _____ matter.

10. I.V. admixtures must be sealed with a _____
    cap.

11. I.V. admixtures will automatically expire within _____
    hours from time of preparation.

12. When preparing I.V. admixtures, most contamination is caused by poor

_____ technique.

13. After receiving an I.V. admixture prescription, the next step in the

workflow pattern would be to research _____.

14. List the 4 transfer techniques:

a.

b.

c.

d.

15. When the exact quantity of an additive is required from an ampule or

vial, the _____ and _____

transfer method is used.

16. Total parenteral feeding of a patient by the use of protein hydrolysate,

carbohydrates, vitamins, and electrolytes is called _____

_____.

17. The method used to prepare I.V. Hyperalimentation solutions would

involve the use of a _____ _____

set.

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IV CHECKLIST

1. Clean equipment

   a. Was isopropyl alcohol 70 percent used on everything except plexiglass?
   b. Was Benzalkonium Cl used on plexiglass?

2. Check for incompatibilies

   a. Was an incompatibility found using proper reference materials?
   b. Was an instructor notified if an incompatability was found?

3. Label

   a. Start before (typed) - date and time left blank
   b. Patient's name, ward, and bed number
   c. Today's date
   d. Bottle number
   e. Start time
   f. Ingredients (same as on the prescription)
   g. Amounts (same as on the prescription)
   h. In... (base solution)
   i. Infusion rate
      (1) How many hours
      (2) Gtts/min
      (3) ml/hr (if over 150 ml)
   j. Doctor's name
   k. Facility

4. Assemble tray (checked by the instructor)

   a. Are there proper ingredients?
   b. Is there correct equipment for reconstitution of each drug, if necessary?
      (1) Size of syringe
      (2) Proper diluent
   c. Is there correct equipment for transfer?
      (1) Double needle for the entire contents of vial
      (2) Needle and syringe for specific quantity
         (a) Same needle and syringe may be used for reconstitution and transer
             of the same drug
         (b) Same N&S may be used for reconstitution of the same drug
   d. Was a N&S requisition form turned in?
   e. Is there a correct base solution and quantity?
   f. Is there a tamper-proof cap?
   g. Is there a scorer if necessary?
   h. Is the prescription included?
   i. Is the label included?
   j. Is there a mask?
   k. Were all ingredients taken out of <u>cardboard</u> containers?

5. Prepare IV under laminar flow hood

   a. Was hood cleaned with isopropyl alcohol 70 percent and Benzalkonium Cl?
   b. Was tray cleaned?
   c. Were glass containers cleaned?
   d. Was mask put on?
   e. Were all ingredients taken off tray except   mask, prescription, label, and
      scorer?

f. Were ingredients placed in a line parallel to back of hood with no item blocking another from the air flow?

g. Are all procedures done in front of the 6" line?

h. All stoppers cleaned with isopropyl alcohol 70 percent before <u>each</u> needle insertion?

i. Are all items (gauze wrapper, syringe packages, and ampuls) opened away from the working area, preferably over the tray?

j. Were all items using a double needle inserted first to utilize the vacuum?

k. Were lyophilized drugs reconstituted?
   (1) Proper dilution
   (2) Proper diluent

l. Were needle and syringe assembled and used properly?
   (1) Sterile paper wrap opened like a banana
   (2) Was student aware of sterility of needle hub, needle, and syringe end?
   (3) Was protective cap on syringe kept on until needle was ready to be attached?
   (4) Was needle sheath kept on when not in use?
   (5) Was the plunger kept sterile, i.e., not touched?

m. Were all needles inserted at a 45 degree angle to prevent coring?

n. Were all additives inserted in proper area on IV solution stopper?

o. With double needle transfers, were vials raised to keep needle end in solution?

p. With a needle and syringe transfer using an ampule, was the needle kept in solution by tilting the ampule at a 45 degree angle with the needle end at the top or deepest part?

q. Were ampules opened properly?
   (1) Scored once
   (2) Use of gauze
   (3) Opened away from technician

r. Was the IV shaken after each additive?

s. Were all paper scraps thrown away, while all other materials (needle, syringes, ampules, vials, etc.) kept on the tray after use?

t. Was IV stopper cleaned with isopropyl after the last additive and prior to the tamper-proof cap being added?

6. Check for particulate matter using light and dark field examination

a. Was the solution turned on end and swirled gently?

b. Was the admixture held up to a dark field to detect light particles?

c. Was the admixture held up to a light field to detect dark particles?

d. Was the instructor notified of any particulate matter?

7. Label affixed

a. Was the label affixed so it could be read while the admixture was hanging?

b. Was the label affixed so it would not cover the manufacturer's bold faced print on label?

c. Was expiration time and date put on label?

d. Was particulate matter notated on label?

e. Was "Refrigerate" label affixed?

8. Tray check

a. Was tray checked by partner?

b. Was tray checked for proper ingredients and proper amounts?

c. Was tray checked against label and prescription?

9. Area clean up
a. Were needles and syringes destroyed?
b. Were all other materials thrown away?

10. Delivery

a. Was IV admixture delivered to the instructor with prescription and checklist?

GLOSSARY OF PHARMACEUTICAL LAB TERMS

1. AROMATIC WATER. Solutions of volatile oils or other aromatic or volatile substances in purified water.

2. ANTAGONISM. The effect of two or more drugs having opposite actions when administered together.

3. BUFFERING AGENTS. Those substances which resist a change in hydrogen ion concentration (pH) by reducing the ionization of acids or alkalies.

4. BULK POWDERS. Powders dispensed in bulk, usually measured out by the patient.

5. CAPSULE. Shells of gelatin used for containing individual doses of medication.

6. CHEMICAL INCOMPATIBILITY. When a new compound of undesirable nature forms from the interaction of two or more drugs, the incompatibility is chemical.

7. CHEMICAL REACTION METHOD. An emulsion formed by the reaction between a weak alkaline solution and a fatty acid.

8. COLD PLACE. Any temperature not exceeding 8 degrees C. or 46 degrees F.

9. COLLOID. A gelatinous substance made up of very small, insoluble, non-diffusible particles, larger than molecules but small enough so they remain suspended in a fluid medium without settling to the bottom; a colloid does not affect the freezing point, boiling point, or vapor tension of the medium in which it is suspended.

10. COMMINUTION. The process of physically reducing solid substances into smaller fragments or particles.

11. CONGEALING POINT. The point at which a melted solid becomes a solid again.

12. CONTINENTAL METHOD. "Dry Gum Method" for the use with fixed oils only. Use the ratio to form the primary emulsion only. (4:2:1)

13. CONTUSION. The process of placing in a heavy mortar and pounding with a heavy pestle to break down the cellular structure of fresh drugs.

14. COOL PLACE. Any temperature between 8 and 15 degrees C. (46 to 59 degrees F.)

15. CREAMS. Semi-solid emulsions containing suspension or solutions of medicinal agents for external application.

16. DELIQUESCENT SUBSTANCE. A substance that absorbs moisture from the atmosphere but to a greater degree than hygroscopic substances. Deliquescent substances finally liquify.

17. DISPERSING AGENT. A substance that breaks down or reduces globule size of oils which results in more complete mixing in an aqueous phase.

18. DISTILLATION. Separation of the constituents of a liquid mixture by vaporization and subsequent condensation of the vapors.

19. DIVIDED POWDERS. Powders dispensed with the dosage premeasured by the pharmacist.

20. EFFLORESCENT SUBSTANCE. A substance that is opposite in its reaction in the atmosphere and gives up moisture (water of crystallization). It spontaneously changes from crystalline nature to amorphous powder.

21. ELIXER. A clear, sweetened, hydro-alcohol liquid, medicated or nonmedicated and intended for oral use.

22. ELUTRIATION. Water softing.

23. ENGLISH METHOD. "Wet Gum Method" for use with a fixed oil only. Use the ratio to form the primary emulsion, but the water is added to the emulsifying agent to make a mucilage and the oil is added gradually. (4:2:1)

24. EUTECTIC MIXTURES. When certain drugs, solid at room temperature, are mixed, a lowering of the fusing or melting point occurs, causing the mixture to spontaneously liquefy without the aid of a solvent.

25. EVAPORATION. Driving off as a vapor the volatile portion of a liquid by application of heat.

26. EXCESSIVE HEAT. Any temperature above 40 degrees C. or 104 degrees F.

27. EXSICCATION. Removal of water of crystallization, or moisture, from a solid crystalline substance by heating strongly.

28. FORBES METHOD. "Bottle Method" for use with volatile and nonviscous oils. Made entirely in an appropriate size bottle in the ratio of 2:2:1.

29. FRESH DRUG TINCTURE. Must not exceed 50 percent active ingredient.

30. FUSION. Liquefying solid substances by the application of heat, without the use of a solvent. (Melting)

31. GARBLING. Hand picking or sorting.

32. GEL. Aqueous liquid preparations, containing suspended insoluble material of nearly colloid size intended for internal use.

33. GEOMETRIC DILUTION. The potent drug is first placed in the mortar with an equal bulk of diluent and triturated until mixed well, then an amount of diluent equal to the combined bulk of the potent drug along with its diluent is added and so forth until all of the necessary diluent has been added.

34. HYPERTONIC. More than isotonic; having a greater concentration of dissolved particles, fluid will be drawn into this solution from the less concentrated (hypotonic or isotonic) area.

35. HYPOTONIC. Less than isotonic; having a lesser concentration of dissolved particles, fluid will be drawn from this solution to the more concentrated (hypertonic or isotonic) area.

36. IGNITION. Process of strongly heating solid or semi-solid substances to a definite and limited degree. The residue or this is the product sought.

37. IMMISCIBLE. When two or more liquids are physically unable to mix homogenously, they are said to be immiscible.

38. ISOTONIC. Having the same osmotic pressure and the same number of particles (molecules or ions) in solution as another solution. Thus, we say that blood is isotonic with tear fluid and both blood and tear fluids have the same tonicity as a 0.9 percent solution of sodium chloride. They are isotonic.

39. LINIMENTS. Oily or alcoholic preparations for external use to be applied WITH friction.

40. LOTIONS. Liquid preparations, usually aqueous, containing insoluble material, intended for external use, and are to be applied WITHOUT friction.

41. MACERATION. Maceration is extraction by soaking. More exactly, maceration is the process of soaking the properly comminuted drugs or substance in the menstrum until the cellular structure is thoroughly penetrated and the soluble portions softened and dissolved.

42. MAGMAS. Viscous, aqueous liquid preparations containing suspended insoluble material-intended for internal use.

43. MIXTURES. Non-viscous aqueous preparation containing insoluble material intended for internal use.

44. NON-POTENT TINCTURE. Must not exceed 20 percent active ingredient.

45. OIL-IN-WATER EMULSION. When the oil is uniformly dispersed within the water or the internal phase is oil and the external phase is water.

46. OSMOTIC PRESSURE. That force causing a liquid to pass through a semi-permeable membrane from a lower to a higher concentration. The passing of fluid through the membrane is known as osmosis.

47. PHYSICAL INCOMPATIBILITY. When a change in physical state occurs in one or more substances in a mixture, producing a cloudy, unsightly, or otherwise undesirable product, the incompatibility is physical.

48. PHASE. This is a term which refers to either of the two liquid portions of the emulsion.

49. PASTES. Ointment-like mixtures which generally contain a higher percentage of powdered materials for external application.

50. PRESERVATIVES. A substance added to prevent the growth of microorganisms, to inhibit oxidation and other changes not desirable in the product.

51. PYROGEN. Soluble, filterable, thermostable, substances resulting from the decomposition of certain strains of bacteria.

52. REFRIGERATE. A cold place in which the temperature is held between 2 and 3 degrees C. (36 and 46 degrees F.)

53. RATE OF SOLUTION. The rate or speed of the solute (solid) to completely dissolve in the solvent (liquid) is referred to as the rate of solution.

54. RASPING, GRATING, CUTTING, SLICING AND CHOPPING. These procedures are also known as the 'salad process.' and they are all methods of preparing fresh drugs.

55. SOLUBILITY. The extent to which the solute (solid) dissolves in the solvent (liquid) is referred to as its solubility.

SOLUBILITY TABLE.

DESCRIPTIVE TERMS	PARTS OF SOLVENT FOR 1 PART OF SOLUTE
Very soluble	Less than 1
Freely soluble	From 1 to 10
Soluble	From 10 to 30
Sparingly soluble	From 30 to 100
Slightly soluble	From 100 to 1000
Very slightly soluble.	From 1000 to 10,000
Practically insoluble or insoluble . .	More than 10,000

56. SOLUTIONS. Aqueous solutions of non-volatile substances.

57. SPIRITS. Alcoholic or hydroalcoholic solutions of volatile substances.

58. SUBLIMATION. Separation of volatile solids from non-volatile solids; the product obtained is the sublimate.

59. SUPPOSITORIES. Solid bodies of various weights and shapes adapted for introduction into one of the orifices of the body and usually melting, softening at body temperature.

60. SUSPENSION. Liquid preparation containing suspended material for oral injection or ophthalmic use.

61. SYNERGISM. A joint action of two or more drugs combined so that their total effect is greater than would be expected from the sum of their individual effects.

62. SYRUP. A nearly saturated aqueous solution of sugar, with or without a medicinal or flavoring agent.

63. THERAPEUTIC INCOMPATIBILITY. When medications administered together produce a response different from that occurring upon individual administration, the incompatibility is therapeutic. Overdoses as well as the "wrong drug" also represent a therapeutic incompatibility.

64. TINCTURE. Alcoholic or hydro-alcoholic solution prepared from vegetable drugs or chemical sources.

65. TONICITY. The tension or concentration of a solution or substance.

66. TORREFACTION. Roasting certain organic substances in order to modify some of their constituents.

67. TRACER. a coloring agent used to color a potent drug and show its presence when siluted.

68. TRITURATION. The process of reducing substances to a powder by rubbing them in a mortar with a pestle.

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69. TURBIDITY. When water is added to a spirit and the alcohol content is lowered, the oil is separated from the alcoholic phase, and as a result, the preparation appears murky with a slight pearlescent sheen.

70. VAPORIZATION. Concerting a liquid or solid into a vapor.

71. VOLATILE SUBSTANCE. A substance that evaporates at rocm temperature usually giving off a characteristic odor.

72. WATER-IN-OIL EMULSION. When the water is uniformly dispersed within the oil or the internal phase is water and the external phase is the oil.

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716.

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DEPARTMENT OF BIOMEDICAL SCIENCES

PHARMACY SPECIALIST

PHARMACEUTICAL PREPARATIONS

August 1975

SCHOOL OF HEALTH CARE SCIENCES, USAF
SHEPPARD AIR FORCE BASE, TEXAS

Designed For ATC Course Use

DO NOT USE ON THE JOB

Department of Biomedical Sciences　　　　　WB 3ABR90530-III-3
School of Health Care Sciences, USAF　　　　　August 1975.
Sheppard Air Force Base, Texas 76311

PHARMACEUTICAL PREPARATIONS

OBJECTIVE

Given instructor assistance, necessary references, selected formulas, and laboratory preparation sheets, complete the preparation sheets, compound waters, spirits, elixers, tinctures, solutions, syrups, ear, eye, and nose preparations, mixtures, suspensions, gels, lotions, liniments, capsules, emulsions, ointments, pastes & creams, correcting any incompatabilities, using accepted methods and techniques. Student will then package the preparation in a suitable container and label in accordance with AFM 168-4.

EQUIPMENT

United States Pharmacopia
National Formulary
Martin's Dispensing of Medication
Necessary Laboratory Equipment

PROCEDURES

The object of this lesson is to acquaint you with proper extemporaneous pharmaceutical compounding procedures. Specifically, you will:

1. Calculate and reduce formulas given on AF Form 2381.

2. Record all pertinent information on AF Form 2380.

3. Properly utilize AF Forms 2382, 582, and AF Form 781.

4. Label and package all preparations in accordance with AFM 168-4.

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This supersedes WB 3ABR90530-III-3, May 1974

SAFETY CHECKLIST FOR PHARMACY
SPECIALIST COURSE 3ABR90530

I acknowledge that I have been informed about the safety hazards
involved in the use of the following areas and equipment.

1. Pharmacy Laboratory Area

    a. Pipettes
    b. Pill tiles
    c. Fisher burners
    d. Chemicals or caustic agents
    e. All pharmacy equipment:

        (1) Alsop mixer
        (2) Bottle filler
        (3) Mini-counter
        (4) Magnetic-heat stirrer
        (5) Labeling machine
        (6) Balances
        (7) Glassware
        (8) Needles and Syringes
        (9) Laminar flow hood
        (10) I.V. preparation bottles
        (11) Ampules and Vials

_____   _____   _____
Signature   Code #   Date

2

PHARMACY MASTER FORMULA	COST		ATTACH LABEL HERE
	12 OZ.	8 OZ.	
	1 OZ.	16 OZ.	
	2 OZ.	32 OZ.	
	4 OZ.		

PRODUCT
PEPPERMINT WATER   USP   p816

INGREDIENTS	AMOUNT
1. Peppermint oil	2 ml
2. Talc	15 Gm
3. Distilled water	1000 ml
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	

DIRECTIONS FOR MANUFACTURE:

Place 2 ml (_____) of peppermint oil in a small mortar to which has been added 15 Gm (_____) of talc. Then add a small amount of the 1000 ml (_____) of distilled water to form a paste. Add the remainder of the water to wash the contents of the mortar into a flask. Stopper and shake intermittently for ten minutes. Filter until clear.

LABELING
Keep out of the reach of children'

SPECIAL CONTAINER REQUIREMENTS
TLRC Store in a cool place

THEORETICAL YIELD
1000 ml

DATE	PREPARED BY	DATE	CHECKED BY

AF FORM JUN 71 2381   3

PHARMACY MANUFACTURING CONTROL DATA **FOR TRAINING PURPOSES ONLY**

PRODUCT		LOT NUMBER			ATTACH LABEL HERE

INGREDIENTS	MFG	LOT NUMBER	AMOUNT	WEIGHED BY	CHECKED BY
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

AF FORM JUN 71 2380

LABELING			
CONTAINERS UTILIZED		TYPE	SIZE
SPECIAL SPECIFICATIONS			

THEORETICAL YIELD	ACTUAL YIELD	REASON FOR DISCREPANCY (If any)	
MANUFACTURED BY		TIME	CONTROL ACTION

REMARKS			

DATE	PREPARED BY	DATE	CHECKED BY

U S GOVERNMENT PRINTING OFFICE 1974 O-450-352

B-24844

4

PHARMACY	COST			ATTACH LABEL
MASTER	12 OZ.	8 OZ.		
FORMULA	1 OZ.	16 OZ.		
	2 OZ.	32 OZ.		HERE →
	4 OZ.			

PRODUCT
SYRUP   USP   p706

	INGREDIENTS	AMOUNT
1	Sucrose	850 Gm
2	Purified water qsad	1000 ml
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

DIRECTIONS FOR MANUFACTURE

Heat about 450 ml (_____) of purified water to a slow boil. Remove the heat. Add the sucrose. Stir until dissolved. Gentle heat may be applied to aid solution. Add a sufficient quantity of purified water to make the product measure 1000 ml (_____). Filter through gauze.

NOTE: Do not heat for a prolonged period and do not boil as either will cause sucrose to invert and ultimately caramelize.

LABELING
Refrigerate

SPECIAL CONTAINER REQUIREMENTS
TLRC

THEORETICAL YIELD
1000 ml .

DATE	PREPARED BY	DATE	CHECKED BY

AF FORM JUN 71 2381   5

PHARMACY MANUFACTURING CONTROL DATA

PRODUCT	LOT NUMBER	ATTACH LABEL HERE

INGREDIENTS	MFG	LOT NUMBER	AMOUNT	WEIGHED BY	CHECKED BY

AF FORM 2380

FILLING

CONTAINERS UTILIZED		TYPE	SIZE

SPECIAL SPECIFICATIONS

THEORETICAL YIELD	ACTUAL YIELD	REASON FOR DISCREPANCY (If any)

MANUFACTURED BY	TIME	CONTROL ACTION

REMARKS

DATE	PREPARED BY	DATE	CHECKED BY

B-24844

6

747

PHARMACY MASTER FORMULA	COST		ATTACH LABEL HERE
	12 OZ.	8 OZ.	
	1 OZ.	16,02.	
	2 OZ.	32 OZ.	
	4 OZ.		

PRODUCT LERHAM'S SOLUTION   Local

	INGREDIENTS	AMOUNT
1	Ethylaminobenzoate	10.72 Gm
2	Phenol (liquid)	10.72 ml
3	Menthol	21.44 Gm
4	Alcohol	100 ml
5	Glycerin qsad	1000 ml
6		
7		
8		
9		
10		
11		
12		

DIRECTIONS FOR MANUFACTURE.

Dissolve the ethylaminobenzoate, menthol and phenol in the 100 ml (_____) of alcohol. Add a sufficient quantity of glycerin to make the product measure 1000 ml (_____).

LABELING
Keep out of the reach of children (For the ear)

SPECIAL CONTAINER REQUIREMENTS
TLRC

THEORETICAL YIELD
1000 ml

DATE	PREPARED BY	DATE	CHECKED BY

AF FORM 2381
JUN 71

7

PHARMACY MANUFACTURING CONTROL DATA **FOR TRAINING PURPOSES ONLY**

PRODUCT	LOT NUMBER		ATTACH LABEL HERE

INGREDIENTS	MEA	LOT NUMBER	AMOUNT	WEIGHED BY	CHECKED BY

AF 2380

LABELING			
CONTAINERS UTILIZED		TYPE	SIZE
SPECIAL SPECIFICATIONS			

THEORETICAL YIELD	ACTUAL YIELD	REASON FOR DISCREPANCY (if any)	
MANUFACTURED BY		TIME	CONTROL ACTION

REMARKS

DATE	PREPARED BY	DATE	CHECKED BY

*U S GOVERNMENT PRINTING OFFICE 1971 O—430-392

B-24844

FOR TRAINING PURPOSES ONLY

8

	COST		
PHARMACY	12 OZ.	8 OZ.	
MASTER	1 OZ.	16 OZ.	ATTACH LABEL
FORMULA	2 OZ.	32 OZ.	HERE
	4 OZ.		

PRODUCT

PHENYLEPHRINE HCL NASAL SOLUTION 1/4%   local

INGREDIENTS	AMOUNT
Phenylephrine HCl 1%	250 ml
Normal Saline qsad	1000 ml
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

DIRECTIONS FOR MANUFACTURE

Place 250 ml (_____) of phenylephrine HCl 1% in a graduate. Add a
sufficient quantity of normal saline to make the product measure 1000 ml
(_____).   Filter three times through long strand cotton that has been
previously wetted with normal saline.

LABELING

Keep out of the reach of children

SPECIAL CONTAINER REQUIREMENTS

TLRC

THEORETICAL YIELD

1000 ml

DATE	PREPARED BY		DATE	CHECKED BY

AF FORM 2381   9
JUN 71

PHARMACY MANUFACTURING CONTROL DATA **FOR TRAINING PURPOSES ONLY**

PRODUCT	LOT NUMBER	ATTACH LABEL HERE

	INGREDIENTS	MFG	LOT NUMBER	AMOUNT	WEIGHED BY	CHECKED BY
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						

AF FORM JUN 71 2380

LABELING

CONTAINERS UTILIZED		TYPE	SIZE

SPECIAL SPECIFICATIONS

THEORETICAL YIELD	ACTUAL YIELD	REASON FOR DISCREPANCY (If any)

MANUFACTURED BY	TIME	CONTROL ACTION

REMARKS

DATE	PREPARED BY	DATE	CHECKED BY

B-24844

FOR TRAINING PURPOSES ONLY

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751

PHARMACY	COST			
MASTER	12 OZ.	8 OZ.		
FORMULA	1 OZ.	16 OZ.		ATTACH LABEL
	2 OZ.	32 OZ.		HERE
	4 OZ.			

PROD C°

DIPHENHYDRAMINE HYDROCHLORIDE ELIXIR   USP   p209

	INGREDIENTS	AMOUNT	
1	Diphenhydramine HCl	2.5	Gm
2	Orange oil	0.24	ml
3	Cinnamon oil	0.11	ml
4	Clove oil	0.08	ml
5	Coriander oil	0.03	ml
6	Anethole (**substitute anise oil**)	0.03	ml
7	Amaranth solution	1.6	ml
8	Alcohol	15	ml
9	Syrup	350	ml
10	Purified water qsad	1000	ml
11			
12	Talc	15	Gm

DIRECTIONS FOR MANUFACTURE

Dissolve the diphenhydramine HCl in 250 ml (_____) of purified water, and
the flavoring oils and the anethole* in the alcohol. Mix the two solutions,
and add the syrup, the amaranth solution, and sufficient purified water to
make 1000 ml (_____). Mix, and filter if necessary. (May use talc)

NOTE: Add the alcoholic solution to the aqueous solution.

LABELING Diphenhydramine HCl
12.5mg/5ml

SPECIAL CONTAINER REQUIREMENTS
TLRC

THEORETICAL YIELD
1000 ml

DATE	PREPARED BY	DATE	CHECKED BY

AF FORM JUN 71 2381   11

PHARMACY MANUFACTURING CONTROL DATA **FOR TRAINING PURPOSES ONLY**

PRODUCT		LOT NUMBER			ATTACH LABEL HERE

	INGREDIENTS	MFG	LOT NUMBER	AMOUNT	WEIGHED BY	CHECKED BY
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

AF FORM JUN 71 2380

LABELING

CONTAINERS UTILIZED	TYPE	SIZE

SPECIAL SPECIFICATIONS

THEORETICAL YIELD	ACTUAL YIELD	REASON FOR DISCREPANCY (If any)

MANUFACTURED BY	TIME	CONTROL ACTION

REMARKS

DATE	PREPARED BY	DATE	CHECKED BY

8-24844

FOR TRAINING PURPOSES ONLY

12

PHARMACY	COST		ATTACH LABEL
MASTER	12 OZ.	8 OZ.	HERE
FORMULA	1 OZ.	16 OZ.	
	2 OZ.	32 OZ.	
	4 OZ.		

PRODUCT
SWEET ORANGE PEEL TINCTURE   USP   p463

	INGREDIENTS	AMOUNT
1	Sweet orange peel	500 Gm
2	Alcohol USP	900 ml
3	Alcohol USP qsad	1000 ml
4	Talc	15 Gm
5		
6		
7		
8		
9		
10		
11		
12		

DIRECTIONS FOR MANUFACTURE

Process M (see pg 816 USP)

Macerate 500 Gm (_____) of the sweet orange peel (NOTE – EXCLUDE THE INNER WHITE PORTION OF THE RIND) in 900 ml (_____) of alcohol and allow to set for three days. Complete the preparation with alcohol to make the product measure 1000 ml (_____). Use talc as the filtering medium.

LABELING

SPECIAL CONTAINER REQUIREMENTS
TLRC   Store in a cold place

THEORETICAL YIELD
1000 ml

DATE	PREPARED BY	DATE	CHECKED BY

AF FORM 2381
JUL 71

13

PHARMACY MANUFACTURING CONTROL DATA

FOR TRAINING PURPOSES ONLY

PRODUCT	LOT NUMBER		ATTACH LABEL HERE

INGREDIENTS	MFG	LOT NUMBER	AMOUNT	WEIGHED BY	CHECKED BY
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

AF FORM 2380

LABEL NO.				
CONTAINERS UTILIZED			TYPE	SIZE
SPECIAL SPECIFICATIONS				
THEORETICAL YIELD	ACTUAL YIELD		REASON FOR DISCREPANCY (If any)	
MANUFACTURED BY			TIME	CONTROL ACTION
REMARKS				
DATE	MANUFACTURED BY		DATE	CHECKED BY

FOR TRAINING PURPOSES ONLY

PHARMACY	COST		ATTACH LABEL
MASTER	12 OZ.	8 OZ.	
	1 OZ.	16 OZ.	
FORMULA	2 OZ.	32 OZ.	HERE
	4 OZ.		

PRODUCT

3% IODOCHLORHYDROXYQUIN SUSPENSION (Local)

	INGREDIENTS	AMOUNT
1	Iodochlorhydroxyquin	30 Gm
2	Talc	50 Gm
3	Zinc Oxide	50 Gm
4	Bentonite Magma	250 ml
5	Purified water qsad	1000 ml
6		
7		
8		
9		
10		
11		
12		

DIRECTIONS FOR MANUFACTURE

Triturate the powders until a fine state of subdivision is obtained. Dilute
the 250 ml (_____) of bentonite magma with an equal volume of purified
water. Slowly add the diluted mixture to the powders forming a thick paste.
Gradually add 200 ml (_____) of purified water, with constant trituration.
Transfer to a graduate and add a sufficient quantity of purified water to
make the product measure 1000 ml (_____).

LABELING

Shake well. For external use only. Keep from freezing

SPECIAL CONTAINER REQUIREMENTS

TLRC

THEORETICAL YIELD

1000 ml

DATE	PREPARED BY	DATE	CHECKED BY

AF FORM 2381
JUN 71

15

732

PHARMACY MANUFACTURING CONTROL DATA

PRODUCT		LOT NUMBER				ATTACH LABEL HERE

INGREDIENTS		MFG	LOT NUMBER	AMOUNT	WEIGHED BY	CHECKED BY
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

AF FORM 2380 (JUN 71)

LABELING			
CONTAINERS UTILIZED		TYPE	SIZE
SPECIAL SPECIFICATIONS			
THEORETICAL YIELD	ACTUAL YIELD	REASON FOR DISCREPANCY (If any)	
MANUFACTURED BY		TIME	CONTROL ACTION
REMARKS			
DATE	PREPARED BY	DATE	CHECKED BY

B-24844

16

757

PHARMACY	COST		
MASTER	2 oz.	8 oz.	
FORMULA	2 oz.	16 oz.	ATTACH LABEL HERE
	2 oz.	32 oz.	
	4 oz.		

PRODUCT: CALAMINE LOTION USP   p87

INGREDIENTS	AMOUNT
1 Calamine	80 Gm
2 Zinc oxide	80 Gm
3 Glycerin	20 ml
4 Bentonite magma	250 ml
5 Calcium hydroxide solution qsad	1000 ml
6	
7	
8	
9	
10	
11	
12	

DIRECTIONS FOR MANUFACTURE

Dilute the bentonite magma with an equal volume of calcium hydroxide solution. Mix the powders intimately with the glycerin and about 100 ml (_____) of the diluted magma, triturating until a smooth, uniform paste is formed. Gradually add the remainder of the diluted magma. Finally add enough calcium hydroxide solution to make 1000 ml (_____), and shake well.

If a more viscous consistency in the lotion is desired, the quantity of bentonite magma may be increased to not more than 400 ml (_____).

NOTE: Shake Calamine Lotion well before dispensing.

LABEL: Shake well, For external use

SPECIAL CONTAINER REQUIREMENTS: TLRC

THEORETICAL YIELD: 1000 ml

DATE	PREPARED BY	DATE	CHECKED BY

AF FORM 2381

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PHARMACY MANUFACTURING CONTROL DATA

ATTACH
LABEL
HERE

INGREDIENTS	MFS	LOT NUMBER	AMOUNT	WEIGHED BY	CHECKED BY

AF FORM 2380

LABELING		
CONTAINERS UTILIZED	TYPE	SIZE
SPECIAL SPECIFICATIONS		

THEORET DAILY YIELD	ACTUAL YIELD	REASON FOR DISCREPANCY (If any)

MANUFACTURED BY	TIME	CONTROL ACTION

REMARKS

DATE	PREPARED BY	DATE	CHECKED BY

9-24844

18

753

PHARMACY	COST		
MASTER	12 OZ.	8 OZ.	
FORMULA	1 OZ.	16 OZ.	ATTACH LABEL
	2 OZ.	32 OZ	HERE
	14 OZ		

PRODUCT

ASPIRIN CAPSULES   200 mg.   (local)

INGREDIENTS	AMOUNT
1 Aspirin	20 Gm
2 Lactose sufficient quantity	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

DIRECTIONS FOR MANUFACTURE

Punch a trial capsule using a #2 capsule.

Weight of trial capsule x 10 _____ (_____)
- Total weight of Act Ing x 10   20 Gm (_____)
Amount of lactose to use
as filler   _____ Gm (_____)

Triturate the aspirin and lactose. (Mix by geometric dilution) Add 10 drops of yellow food color as a tracer. Punch and weigh each capsule. (Each capsule should equal the weight of the trial capsule) Clean each capsule with sucrose.

LABEL N

Keep out of the reach of children

SPECIAL CONTAINER REQUIREMENTS

TLRC

THEORETICAL YIELD

100 capsules

DATE	PREPARED BY	DATE	CHECKED BY

AF FORM JUN 71 .2381   19

PHARMACY MANUFACTURING CONTROL DATA

FOR TRAINING PURPOSES ONLY

| PRODUCT | LOT NUMBER | | ATTACH LABEL HERE |

INGREDIENTS	MFG	LOT NUMBER	AMOUNT	WEIGHED BY	CHECKED BY
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

AF FORM JUN 71 2380

LABELING

CONTAINERS UTILIZED	TYPE	SIZE

SPECIAL SPECIFICATIONS

THEORETICAL YIELD	ACTUAL YIELD	REASON FOR DISCREPANCY (If any)

MANUFACTURED BY	TIME	CONTROL ACTION

REMARKS

DATE	PREPARED BY	DATE	CHECKED BY

U S GOVERNMENT PRINTING OFFICE 1971 O—438-392

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FOR TRAINING PURPOSES ONLY

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76

PHARMACY MASTER FORMULA	COST		ATTACH LABEL HERE
	12 OZ.	8 OZ.	
	4 OZ.	16 OZ.	
	2 OZ.	32 OZ.	
	4 OZ.		

PRODUCT: CASTOR OIL EMULSION 50% (local)

INGREDIENTS	AMOUNT
1 Castor oil	60 ml
2 Acacia	15 Gm
3 Peppermint oil	0.02 ml
4 Glycerin	11 ml
5 Cocoa	7 Gm
6 Purified water qsad	120 ml
7	
8	
9	
10	
11	
12	

DIRECTIONS FOR MANUFACTURE

Place 15 Gm of acacia in a mortar. Slowly add 60 ml of castor oil and triturate well. Add 0.2 ml of a 1:10 stock solution of peppermint oil and mix well. Add 30 cc of purified water all at once, and triturate rapidly until a thick, creamy emulsion is formed. Let rest. In a separate mortar mix the glycerin and the cocoa and combine this with the primary emulsion. Transfer to a graduate and add a sufficient quantity of purified water to make the product measure 120 ml.

NOTE: The mortar should be warm, rough and dry.

LABEL: Shake well, Refrigerate

SPECIAL CONTAINER REQUIREMENTS: TLRC

THEORETICAL YIELD: 120cc

DATE	PREPARED BY	DATE	CHECKED BY

AF FORM 2381

PHARMACY MANUFACTURING CONTROL DATA **FOR TRAINING PURPOSES ONLY**

PRODUCT	LOT NUMBER		ATTACH LABEL HERE

INGREDIENTS	MFG	LOT NUMBER	AMOUNT	WEIGHED BY	CHECKED BY

AF FORM 2380

LABELING			
CONTAINERS UTILIZED		TYPE	SIZE
SPECIAL SPECIFICATIONS			
THEORETICAL YIELD	ACTUAL YIELD	REASON FOR DISCREPANCY (If any)	
MANUFACTURED BY		TIME	CONTROL ACTION
REMARKS			
DATE PREPARED BY		DATE	CHECKED BY

5-24944

FOR TRAINING PURPOSES ONLY

PHARMACY		COST		
MASTER		12 oz	8 oz	
		1 oz	16 oz.	ATTACH LABEL
FORMULA		30 oz	32 oz	HERE
		4 oz.		

PRODUCT 3% IODOCHLORHYDROXYQUIN - 1% HYDROCORTISONE
OINTMENT (local)

	INGREDIENTS	AMOUNT
1	Iodochlorhydroxyquin	30 Gm
2	Hydrocortisone	10 Gm
3	Propylene Glycol	10 ml
4	Water soluble ointment base	950 Gm
5		
6	to make about	1000 Gm
7		
8		
9		
10		
11		
12		

DIRECTIONS FOR MANUFACTURE

Levigate the iodochlorhydroxyquin and the hydrocortisone with the propylene glycol. Add the ointment base in small portions mixing well after each addition.

NOTE: Do not use a metal spatula.

LABEL NO
For external use only

CONTAINER REQUIREMENT
Avoid metal caps

QUANTITY A. RX
1000 Gm

DATE	PREPARED BY	DATE	CHECKED BY

AF FORM 2381
JUN 71

23

PHARMACY MANUFACTURING CONTROL DATA **FOR TRAINING PURPOSES ONLY**

PRODUCT	LOT NUMBER		ATTACH LABEL HERE

	N REC NTR	MFG	LOT NUMBER	AMOUNT	WEIGHED BY	CHECKED BY

AF FORM 2380

LABELING			
CONTAINERS UTILIZED		TYPE	SIZE
SPECIAL SPECIFICATIONS			
THEORETICAL YIELD	ACTUAL YIELD	REASON FOR DISCREPANCY (If any)	
MANUFACTURED BY		TIME	CONTROL ACTION
REMARKS			
DATE	PREPARED BY	DATE	CHECKED BY

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FOR TRAINING PURPOSES ONLY

24

765

PHARMACY	COST				
	1·2 OZ·	8 OZ			
MASTER	1 OZ	16 OZ·		ATTACH LABEL
FORMULA	2 OZ·	32 OZ		HERE
	4 OZ·				

PRODUCT

SULFUR OINTMENT   USP p701

INGREDIENTS	AMOUNT
1 Precipitated sulfur	100 Gm
2 Mineral oil	100 Gm
3 White ointment	800 Gm
4	
5	
6	
7	
8	
9	
10	
11	
12	

DIRECTIONS FOR MANUFACTURE

Levigate the sulfur with the mineral oil to a smooth paste, and then incorporate
with the white ointment.

LABELING

SPECIAL CONTAINER REQUIREMENTS

Preserve in well closed containers and avoid prolonged exposure to excessive heat.

THEORETICAL YIELD

1000 Gm

DATE	PREPARED BY	DATE	CHECKED BY

AF FORM 2381
JUN 71

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742

PHARMACY MANUFACTURING CONTROL DATA FOR TRAINING PURPOSES ONLY

				ATTACH LABEL HERE

SOURCE DATA	MFG	LOT NUMBER	AMOUNT	WEIGHED BY	CHECKED BY

AF FORM 2380

LABELING			
CONTAINERS UTILIZED		TYPE	SIZE
SPECIAL SPECIFICATIONS			
THEORETICAL YIELD	ACTUAL YIELD	REASON FOR DISCREPANCY (if any)	
MANUFACTURED BY		TIME	CONTROL ACTION
REMARKS			
DATE	PREPARED BY	DATE	CHECKED BY

FOR TRAINING PURPOSES ONLY

26

767

PHARMACY	COST		ATTACH LABEL
	12 OZ.	8 OZ.	
MASTER'	1 OZ.	16 OZ	
FORMULA	2 OZ.	32 OZ	HERE
	4 OZ.		

PRODUCT

COLD CREAM   USP   pg143

INGREDIENTS	AMOUNT
1. Spermaceti	125 Gm
2. White wax	120 Gm
3. Mineral oil	560 Gm
4. Sodium borate	5 Gm
5. Purified water	190 ml
6.	
7. to make about	1000 Gm
8.	
9.	
10.	
11.	
12.	

DIRECTIONS FOR MANUFACTURE

Reduce the spermaceti and white wax to small pieces, melt them on a steam bath. with the mineral oil, and continue heating until the temperature of the mixture reaches 70°C. Dissolve the sodium borate in the purified water, warmed to 70°C, and gradually add the warm solution to the melted mixture, stirring rapidly and continuously until it has congealed.

LABEL

External use only

SPECIAL CONTAINER REQUIREMENTS

Preserve in tight containers

1000 Gm

	PREPARED BY	DATE	CHECKED BY

PHARMACY MANUFACTURING CONTROL DATA

	LOT NUMBER			ATTACH LABEL HERE

	INGREDIENTS	MFG	LOT NUMBER	AMOUNT	WEIGHED BY	CHECKED BY
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

AF FORM 2380
JUN 71

LABELING			
CONTAINERS UTILIZED		TYPE	SIZE
SPECIAL SPECIFICATIONS			

THEORETICAL YIELD	ACTUAL YIELD	REASON FOR DISCREPANCY (If any)	
MANUFACTURED BY		TIME	CONTROL ACTION

REMARKS

DATE	PREPARED BY	DATE	CHECKED BY

S-24544

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AF FORM 781

When an AF Form 781 is required for compounding, it will be
completed using the example below. All AF Forms 781 will be com-
pleted by the student prior to presentation to an instructor for
his signature.

AF FORM AUG 73 781 REPLACES DD FORM 1289, 1 NOV 71, WHICH IS OBSOLETE IN THE USAF.			MULTIPLE ITEM PRESCRIPTION		
Rx (cross out unused blanks below)	STRENGTH	AMOUNT	DIRECTIONS	Rx NUMBER	REFILL
1. ALCOHOL USP	--------	54 ml	Used to make Elixir of Terpin Hydrate 120 ml	Initials Rx # Time	-------
2.			Used by: Student's name		
3.					
4.					

NAME OF PATIENT	SIGNATURE OF PRESCRIBER
PHARMACY STOCK	INSTRUCTOR'S SIGNATURE
ADDRESS SHCS / SAFB	PRESCRIBER IDENTIFICATION (Name, SSAN or BSDD, Grade, Degree, Service and Facility)

TELEPHONE IAB	AGE -------	DATE TODAY

REMARKS (Use reverse, if necessary)

FOR TRAINING PURPOSES
ONLY

NAME _____

CLASS NUMBER _____

1. Please consider each area of the course carefully and rate the elements of instruction according to the following scale:

    a. Excellent

    b. Good

    c. Fair

    d. Poor

2. After rating the elements, make specific comments which you feel will help to improve the course. Feel free to praise a deserving instructor or to offer constructive suggestions to aid him.

    a. OVERALL COURSE

	E	G	F	P
(1) Course Length				
(2) Course Content				
(3) Difficulty Level				
(4) Examinations				
(5) Instructors				
(6) Field Trip				

Comments:

    b. Pharmaceutical Calculations I

	E	G	F	P
(1) Course Content				
(2) Training Aids, etc.				
(3) Instructors				
(4) Handouts, Study Guides				
(5) Examinations				
(6) Overall Effectiveness				

Comments:

30

c. Pharmaceutical Inorganic Chemistry   E   G   F   P

   (1) Course Content   ___ ___ ___ ___

   (2) Training Aids, etc.   ___ ___ ___ ___

   (3) Instructors   ___ ___ ___ ___

   (4) Handouts, Study Guides   ___ ___ ___ ___

   (5) Examinations   ___ ___ ___ ___

   (6) Overall Effectiveness   ___ ___ ___ ___

Comments:

d. Pharmaceutical Organic Chemistry   E   G   F   P

   (1) Course Content   ___ ___ ___ ___

   (2) Training Aids, etc.   ___ ___ ___ ___

   (3) Instructors   ___ ___ ___ ___

   (4) Handouts, Study Guides   ___ ___ ___ ___

   (5) Examinations   ___ ___ ___ ___

   (6) Overall Effectiveness   ___ ___ ___ ___

Comments:

e. Pharmacy Administration   E   G   F   P

   (1) Course Content   ___ ___ ___ ___

   (2) Training Aids, Films   ___ ___ ___ ___

   (3) Instructors   ___ ___ ___ ___

   (4) Handouts, Study Guides   ___ ___ ___ ___

   (5) Examinations   ___ ___ ___ ___

   (6) Overall Effectiveness   ___ ___ ___ ___

Comments:

f. Pharmaceutical Dispensing

	E	F	G	P
(1) Course Content				
(2) Training Aids				
(3) Instructors				
(4) Handouts, Study Guides				
(5) Individual Lab Supervision				
(6) Written Examinations				

Comments:

g. Pharmaceutical Calculations II

	E	F	G	P
(1) Course Content				
(2) Training Aids				
(3) Instructors				
(4) Handouts, Study Guides				
(5) Examinations				
(6) Overall Effectiveness				

Comments:

h. Pharmacology

	E	F	G	P
(1) Course Content				
(2) Training Aids				
(3) Instructors				
(4) Handouts, Study Guides				
(5) Examinations				
(6) Overall Effectiveness				

Comments:

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i. Course Administration

    (1) Scheduling

    (2) Were you kept informed?

    (3) Textbooks (Make specific comments below)

    (4) Counseling

Comments:

E	F	G	P