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IDENTIFIERS Military Curriculum Project

ABSTRACT

This course, adapted from military curriculum materials for use in technical and vocational education, is of interest to food service personnel and to some food service supply personnel. Designed for independent study, the course includes the principles of nutrition, including nutrients and the effects of digestive processes on each individual's caloric and nutritive requirements. It gives the basic food groups, explains the composition of foods, and specifies the importance of each in menu planning. It outlines nutritional standards, adult energy requirements, and methods of nutritional evaluation and analysis. The 16 food groups used in menu construction for item substitution are described, with emphasis on the importance of planning for acceptability. The course consists of a lesson assignment, contents pages, lesson text, self-grading lesson exercises, and a student inquiry sheet. A final examination, to be sent to the student's school for grading, completes the course. A glossary of nutrition and menu planning terms is appended. (KC)

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## 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.

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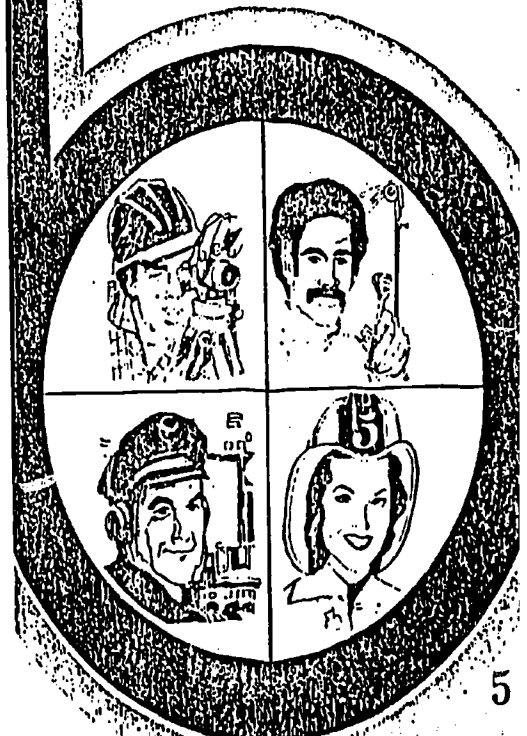
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# Military Curriculum Materials for Vocational and Technical Education

Information and Field  
Services Division

The National Center for Research  
in Vocational Education



# 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 & Construction	Heating & Air Conditioning
Trades	Machine Shop
Clerical Occupations	Management & Supervision
Communications	Meteorology & Navigation
Drafting	Photography
Electronics	Public Service
Engine Mechanics	

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.

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*This Subcourse is Designed for Lesson Self-Grading*

9-3

**U.S. ARMY QUARTERMASTER SCHOOL  
CORRESPONDENCE SUBCOURSE**



**QM0326**

**NUTRITION AND MENU PLANNING**

**ACCOMPANYING MATERIALS:**

**SPBK 326(SA)**



Prepared by  
United States Army Quartermaster School  
Fort Lee, Virginia 23801  
Supply Training Center of the Army School System



**SEPTEMBER 1972**  
**[Reprint (B), July 1975]**

#### MOS RELATIONSHIPS

Off Area 4 - Proc, Sup, Maint, and  
Rep Svc - job proficiency. WO MOS  
941A - Fd Svc Tech - job proficiency.  
Enl MOS 94B20 94Z50 - Fd Svc Sgt,  
Fd Svc Supv - MOS qualification and  
test preparation.

Q M 0 3 2 6

N U T R I T I O N   A N D   M E N U   P L A N N I N G



SECTION I

INTRODUCTION

1. SCOPE. This subcourse includes the principles of nutrition, including nutrients and the effects of digestive processes on each individual's calorie and nutritive requirements. It gives the basic food groups, explains the composition of foods, and specifies the importance of each in menu planning. It outlines nutritional standards, adult energy requirements, and methods of nutritional evaluation and analysis. The 16 food groups used in menu construction and for item substitution are described, with emphasis on the importance of planning for troop acceptability.

2. APPLICABILITY. This subcourse is of general interest to all food service personnel and to certain subsistence supply personnel. It is of particular interest to food service sergeants, food service supervisors, food technicians, and food advisers. This subcourse provides a working knowledge of the function, composition, and nutritive value of food, its value in menu construction, and the requirement for troop acceptability. With this knowledge, the student reinforced by experience or additional training will be able to operate effectively in an assignment involving menu planning and the application of nutritional principles.

3. PROGRAM OF CONTINUING STUDY. When you successfully complete this subcourse, we recommend that you apply to take one or more of the following:

- a. QM0348, Prevention of Food Poisoning.
- b. QM0394, Food Service Sanitation.
- c. QM0529, Selection and Purchase of Foods.



## SECTION II

### ADMINISTRATIVE INSTRUCTIONS

4. MATERIALS CHECK. Check to make sure you have any study materials listed on the cover. If anything is missing, unreadable, or not in order, let us know right away. Use a Student Inquiry Sheet; we've bound one into this booklet at the end of each lesson. Take a look at your examination answer form. Is the subcourse number on the form the same as the number of this subcourse? If not, get the word to us; we'll have a correct answer form on its way as fast as we can. Don't forget to include your social security account number (student number), mailing address, and ZIP code when you write.

5. SUBCOURSE ORGANIZATION. This subcourse is organized into this single booklet containing materials needed to complete the subcourse. If additional materials are needed they are indicated on the booklet cover. This subcourse booklet consists of lessons and an examination (see paragraph 7). Each lesson consists of a lesson assignment, contents pages, lesson text, self-grading lesson exercises, and a student inquiry sheet.

6. LESSON EXERCISES. Each lesson in this subcourse is designed for self-evaluation. This is done through the self-grading exercises which you must work after studying each lesson text. You will find instructions for completing the exercises in each lesson. Because you complete the lesson exercises and verify your own work, you do not submit your answers to the School for grading. This is what is meant by the self-evaluation characteristic of this subcourse's lessons. You will receive credit for the total hours of this subcourse upon successful completion of the examination.

7. EXAMINATION. Take the examination only after you have studied all the lessons and successfully worked all the lesson exercises. Remember, your answers must be based on the study assignments, not on personal experience or information from other sources. Further instructions are with the examination. Be sure to read them.

a. If you are a Quartermaster School student, use the machine-process answer form for your answers to the examination exercises. We know you want to receive credit for this subcourse, so be sure to send the completed form to the School for grading. Please don't tear, bend, or puncture this form; if you do, the grading machine will toss it back at us, ungraded.

b. If you are a student of another school, use the instructions and answer form provided by that school.

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<u>LESSON</u>	<u>TITLE</u>	<u>CREDIT HOURS</u>	<u>PAGE</u>
1	Nutrition	2	1
2	Composition of Foods	2	33
3	Menu Planning and Nutritional Evaluation	3	63
EXAMINATION		<u>1</u>	101
	TOTAL	8	

LESSON ASSIGNMENT

<b>SUBJECT</b>	Nutrition.
<b>STUDY ASSIGNMENT</b>	Lesson Text.
<b>SCOPE</b>	Principles of nutrition, including nutrients and the effects of digestive processes on each; individual's caloric and nutrient requirements; basic food groups, and importance of each in menu planning.
<b>OBJECTIVES</b>	As a result of this assignment the student will be able to-- <ol style="list-style-type: none"><li>1. Define nutrition and recognize physical signs of balanced nutrition.</li><li>2. Describe nutrients and digestive processes.</li><li>3. Specify basic energy requirements and nutrients involved.</li><li>4. Specify daily food allowances.</li><li>5. Define calorie and give caloric requirements.</li><li>6. Identify the six classes of nutrients and the function of each.</li><li>7. Give basic food groups and identify foods in each group.</li><li>8. Describe function of water and roughage.</li></ol>

## LESSON TEXT

### NUTRITION

#### 1. INTRODUCTION

a. An outraged cry from the prosperous nations of the world brought help from individuals, religious and social groups, and the governments of other countries to the starving people of tiny Biafra in 1969. The dangerous night flights of plane loads of food onto unmarked and crude landing strips under frequent heavy fire was a dramatic manifestation of worldwide concern with the ravages of hunger and starvation. It was an effort made for the most part by people who themselves had never suffered real hunger nor a lack of the basic foods to support life. Such awareness grew from the research of nutritionists begun decades ago, from the expanding knowledge concerning needed nourishment, and from the conscience of well-fed populations.

b. The outward physical signs of starvation are widely recognized — the distended belly of a starving street child in India, the unhealed sores of numbers of Africans, the languor and debility of the children of city slums and the rural poor. The prosperous and the educated are seeking ways to eliminate such abject want.

c. The history of mankind and of developing civilization is basically a history of man's ability to provide himself with food. In those times when his entire effort was directed to procuring enough food to stay alive, civilization had little time in which to advance. But as food became more abundant, as the physical effort to supply it lessened, spare energy was directed toward the arts and sciences. It was scientific knowledge that made food more available to provide even more energy and to lessen the need for labor in producing food.

d. It has been said that the true history of the world will not be written until someone compiles the history of hunger, for it is the very real and terrible hunger — or starvation, if you will — of the masses that is the basis for the events that change the world; that characterize a nation; that provide the social customs of a people, the economy of nations, and the political environment of the world.

e. Hunger is the pain felt in an empty belly. Practically any bulk will stop those pains — grass or the cellulose of paper will do the job. But starvation is a deprivation of the nutritive elements essential to life and no substitute can take their place.

f. There are about 50 different food nutrients. For simplicity, these 50 substances are divided into six chemical classes of nutrients that are similar in content and function. These classes are protein, fat, carbohydrate, minerals, vitamins, and

water. They must be provided in the proper amount and proportion to achieve and maintain life in full health. These essentials of life are contained in the food people eat. The proper amount and proportion of each nutrient depends on selection of foods that provide them.

## 2. EFFECTS OF GOOD NUTRITION

a. Certain nutritional requirements are necessary to meet the nutritional needs of the body. Good nutrition is the basis for good health, which is maintained by eating proper foods.

b. Nutrition is now a science because enough facts have been discovered through research to form a scientific basis for determining the foods required for an adequate diet. The total of the foods eaten and the use of the foods in the body after they are digested and absorbed directly affect the overall health of the individual.

## 3. OUTWARD SIGNS OF GOOD NUTRITION

The American Dietetic Association lists the following as evidences of balanced and good nutrition in an individual:

Body: well developed

Weight: correct for height and age

Muscles: well developed and firm

Skin: smooth, clear, and slightly moist

Hair: smooth and glossy

Eyes: clear and without dark circles below

Facial expression: alert without strain

Posture: good, i.e., head erect, chest up, shoulders flat, abdomen in

Attitude: good natured, full of life, buoyant

Sleep: sound

Digestion and elimination: good

Appetite: good

Appearance: of general well-being

#### 4. DEFINITIONS

Before we learn on what the outward signs of good nutrition are based, we need to understand the meaning of some of the words as they are used in this study guide. Other terms are defined as they appear in the text.

a. *Nutrition* may be defined as the body condition resulting from food consumed. It involves all of the processes by which an individual receives and utilizes the materials necessary for growth, for the replacement or repair or production of tissue, and for transformation to energy.

b. *Diet* is the daily allowance of food and drink.

c. *Therapy* is the treatment of disease.

d. *Diet therapy*, therefore, is the treatment of disease by the daily food and drink allowance. Early physicians recognized the uses of diet in medical treatment so definitely that the Greeks characterized medical practice as being of three types – that which treated by means of medicine, by mechanical means, or by diet.

e. *Food*, or subsistence, is material consisting of carbohydrate, protein, fat, minerals, vitamins and water that is taken or absorbed into the body of an organism in order to *sustain growth, repair tissues*, and to *furnish energy* for all activities of the organism and all its vital functions.

f. *A nutrient* is an essential element of food. It is carbohydrate, protein, fat, mineral, vitamins, or water.

#### 5. DIGESTION

How does the food man eats become the heat and energy he needs to survive and to work and play? The turning of food into energy or into materials to build or repair tissues is called "digestion;" it is the process that changes the foods that are consumed into forms the body can absorb and utilize.

a. The process of digestion is an intricate one that is accomplished along a roadway (fig. 1) about 30 feet long called the "alimentary canal" (an aliment is a nutrient). This canal begins at the lips where food is first introduced into the body and extends to the anus from which unused residues and waste matters are expelled. The digestive system (figs. 1 and 2) consists of the mouth with lips, teeth, tongue, and salivary glands; the pharynx and esophagus; the stomach and its associated glands; the small intestine and its glands and associated organs (liver, pancreas, and gallbladder); and the large intestine.

b. The mechanical processes of digestion consist of the mastication of food in the mouth, its impetus into and through the pharynx and esophagus into the stomach, its mixing in the stomach, and its progress through the intestines. Food is moved through the alimentary canal by muscular contractions (peristalsis) of the canal walls.

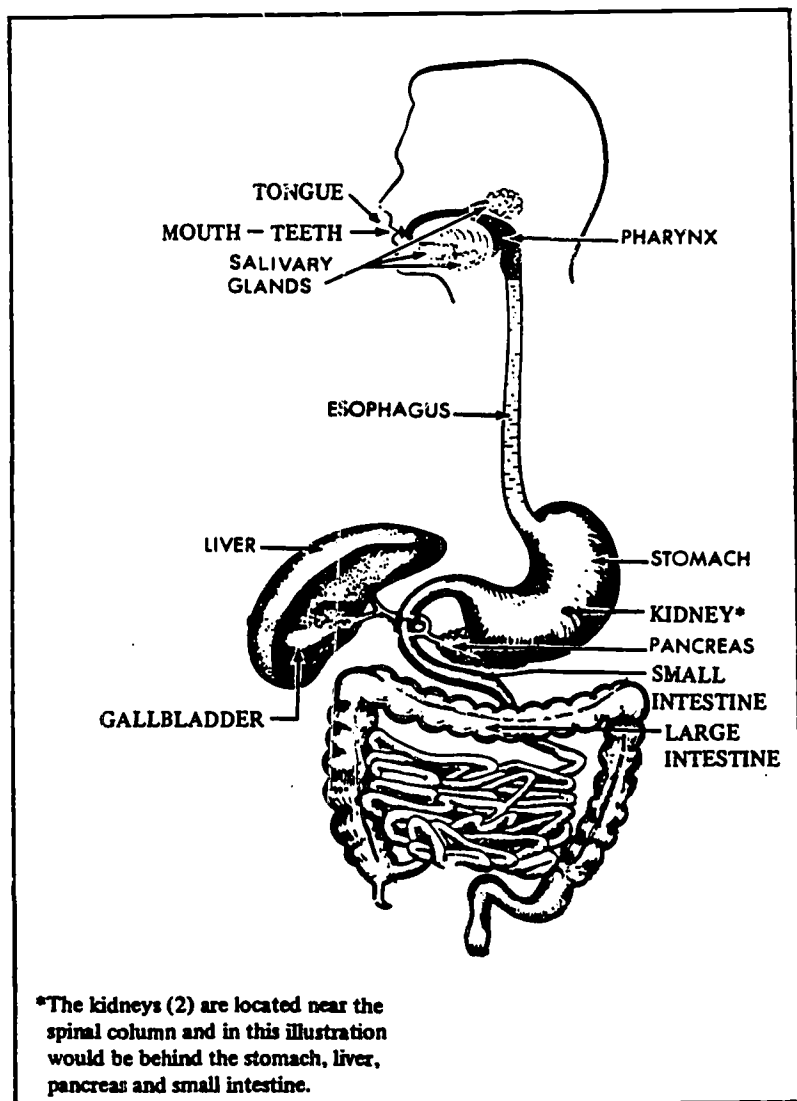


Figure 1. The digestive system.

c. The chemical processes of digestion also begin in the mouth with secretions from the salivary glands, continue in the stomach where food is mixed with gastric juices, including hydrochloric acid, and various enzymes, and in the small intestine where intestinal juices further simplify the chemical constitution of food and where the major part of absorption occurs.

## 6. PROCESSES OF DIGESTION

Let's follow the digestive process in greater detail.

a. Food is placed in the mouth where it is broken up into smaller bits by the chewing action of teeth (mechanical process). During chewing, it is mixed with secretions of the salivary glands which act to begin the breakdown of starches into simpler forms (chemical process), and which soften the food and lubricate its passage. This softened food mass is called a "bolus."

ORGAN	ACTION	ACTS ON	BODY USE OF FOOD
Mouth	Mechanical – grinding	All food	Energy, heat, repair and build tissue
	Chemical – salivary glands	Starch	Energy
Pharynx & Esophagus	Mechanical – passage	All	Energy, heat, repair and build tissue
Stomach	Mechanical – churning	All	Energy, heat, repair and build tissue
	Chemical – gastric juices	Proteins, milk	Repair and build tissue
Pancreas	Chemical – pancreatic juice	Starch	Energy
Liver	Chemical – bile	Fats	Energy
Small intestine	Mechanical – moves, absorbs	All Protein, fat, starch	Energy, heat, repair and build tissue
	Chemical – breakdown	Protein, starch, fat	Energy, heat, repair and build tissue
Large intestine	Mechanical – absorbs, eliminates	Water, wastes	Repair and build tissue

Figure 2. Processes of the digestive system.



b. The tongue moves the food into the pharynx and esophagus which together form the passageway to the stomach (mechanical process).

c. The churning action of the stomach (mechanical process) mixes gastric juices with the food (chemical process). This chemical action consists chiefly of the breaking down of proteins into simpler forms and the initial chemical action on milk.

d. When the food mass passes from the stomach to the small intestine (mechanical process), it is in liquid form called "chyme." In the first section of the small intestine, called the "duodenum," the liquefied food mixes with secretions from the pancreas and with bile from the liver (chemical process). It is in the small intestine that the final steps are taken to prepare foods so the body can use them (chemical process). The nutritive elements are now all in liquid form.

(1) Carbohydrates are reduced to simple sugars (monosaccharides).

(2) Proteins become amino acids.

(3) Fats are first broken into tiny globules by bile and then into fatty acids and glycerol by enzymes.

e. Absorption of nutrients occurs almost entirely in the small intestine. There is a small amount of absorption in the mouth (simple sugar), very little in the stomach, and a negligible amount in the large intestine. The walls of the small intestine are lined with minute, finger-like projections called "villi" which greatly increase the surface area for absorption. Carbohydrate products are absorbed directly into the blood stream through the small intestine walls. Protein and fat products are carried through the lymph system to the bloodstream. The monosaccharides (simple sugars), amino acids, and fatty acids move from the bloodstream to tissue cells where they repair tissue and furnish heat and energy.

f. Some water is absorbed into the body from the large intestine where the undigested elements of food and waste products of the body are changed to a semisolid state and secreted as feces. Feces consist of undigested material, unabsorbed end products of digestion, bile pigments, waste material, and water. Foods rich in bulk, or cellulose, stimulate muscle contractions when they reach the large intestine, thus aiding bowel movements.

## 7. MEASUREMENT OF ENERGY

Foods supply energy when they are converted to use in the body (digested). This energy is measured by calories. Calories are the fuel on which the human body runs. A Calorie (or a kcal) is the amount of heat required to raise the temperature of one kilogram (a little more than a quart) of water one degree Centigrade. For example, an egg which contains 77 calories produces enough heat when burned to raise the temperature of one kilogram of water from 23° to 100° Centigrade. Calories are continuously used in the body, even during sleep. When "calorie" is used in this study guide, it refers to the kcal.

## 8. ENERGY NEEDS OF THE HUMAN BODY

The human body expends energy on three types of activity which are:

a. *Vital processes*, such as control of body temperature, breathing, and the beating of the heart. About 50 percent of total energy expended is for such life-sustaining activities. About 50 percent of the food ingested is used for these activities. The caloric expenditures for these life-sustaining activities are the basic caloric requirements of the human body.

b. *Expense of digestion*, which is the energy consumed in the transference of food to the body, including such actions as the secretion of digestive juices and the muscular movements of the digestive system. About 10 percent of the calories required for sustaining life are used for the activities of eating.

c. *Voluntary activity*, which is the remainder of the energy expended and includes the activities involved in sitting, standing, and lying as well as work and recreational activities. Every movement of the body, no matter how slight, requires the expenditure of energy that is supplied by food. For example, to sit and read costs about 1.29 calories per minute, while walking upstairs one step at a time requires 18.58 calories per minute. Normal, recreational swimming uses 11.49 calories per minute.

## 9. TOTAL CALORIC REQUIREMENTS

The total daily caloric requirement is the sum of the calories required for basal needs, muscular and organic activities, and for the processes of eating and digestion for the full 24 hours. When the caloric value of the food intake equals the total requirements, and adequate water is drunk, body weight will remain unchanged. Body weight increases when the caloric intake is more than required and decreases when the intake is less than required. Since it takes 3500 calories in excess of total daily requirements to add one pound of weight, conversely it requires a decrease of 3500 calories below the total daily requirements to lose a pound.

## 10. ADJUSTMENT OF CALORIC NEEDS

a. As a point of reference for adjusting the caloric needs of individuals, a man and a woman, known as the "reference man" and the "reference woman" (fig. 3), aged 22, moderately active, and living in a temperate climate with a mean environmental temperature of 20° C. have been chosen. The reference man weighs 70 kilograms (154 pounds); the reference woman, 58 kilograms (128 pounds). A daily food allowance of 2800 calories is recommended for the man, of 2000 calories for the woman.

b. Adjustments in caloric intake must be made for persons who differ from the reference man or woman in age, desirable body weight, or activity (figs. 4 and 5), and for women during pregnancy and lactation.

**FOOD AND NUTRITION BOARD, NATIONAL ACADEMY OF SCIENCES-NATIONAL RESEARCH COUNCIL**  
**RECOMMENDED DAILY DIETARY ALLOWANCES,\* REVISED 1968**  
 Designed for the maintenance of good nutrition of practically all healthy people in the U.S.A.

AGE (years)	WEIGHT (kg) (lbs)	HEIGHT (cm) (in.)	kcal	FAT-SOLUBLE VITAMINS				WATER-SOLUBLE VITAMINS						MINERALS						
				PROTEIN (g)	VITA- MIN A	VITA- MIN D	VITA- MIN E	ASCOR- BIC	FOLA- CIN *	NIA- CIN	RIBO- FLAVIN	THIA- MIN	VITA- MIN B <sub>6</sub>	VITA- MIN B <sub>12</sub>	CAL- CIUM	PHOS- PHORUS	IODINE	IRON	MAG- NESIUM	
					(IU)	(IU)	(IU)	(mg)	(mg)	(mg)	(mg)	(mg)	(mg)	(mg)	(μg)	(g)	(g)	(μg)	(mg)	(mg)
Infants	0-1/6	4 9	55 22	kg X 120	kg X 2.2*	1,500	400	5	35	0.05	5	0.4	0.2	0.2	1.0	0.4	0.2	25	6	10
	1/6-1/2	7 15	63 25	kg X 110	kg X 2.0*	1,500	400	5	35	0.05	7	0.5	0.4	0.3	1.5	0.5	0.4	40	10	60
	1/2-1	9 20	72 28	kg X 100	kg X 1.8*	1,500	400	5	35	0.1	8	0.6	0.5	0.4	2.0	0.6	0.5	45	15	70
Children	1-2	12 26	81 32	1,100	25	2,000	400	10	40	0.1	8	0.6	0.6	0.5	2.0	0.7	0.7	55	15	100
	2-3	14 31	91 36	1,250	25	2,000	400	10	40	0.2	8	0.7	0.6	0.6	2.5	0.8	0.8	60	15	150
	3-4	16 35	100 39	1,400	30	2,500	400	10	40	0.2	9	0.8	0.7	0.7	3	0.8	0.8	70	10	200
	4-6	19 42	110 43	1,600	30	2,500	400	10	40	0.2	11	0.9	0.8	0.9	4	0.8	0.8	80	10	200
	6-8	23 51	121 48	2,000	35	3,500	400	15	40	0.2	13	1.1	1.0	1.0	4	0.9	0.9	100	10	250
	8-10	28 62	131 52	2,200	40	3,500	400	15	40	0.3	15	1.2	1.1	1.2	5	1.0	1.0	110	10	250
Males	10-12	35 77	140 55	2,500	45	3,500	400	20	40	0.4	17	1.3	1.3	1.4	5	1.2	1.2	125	10	300
	12-14	43 95	151 59	2,700	50	5,000	400	20	45	0.4	18	1.4	1.4	1.6	5	1.4	1.4	135	18	350
	14-18	59 130	170 67	3,000	60	5,000	400	25	55	0.4	20	1.5	1.5	1.8	5	1.4	1.4	150	18	400
REFERENCE MAN	18-22	67 147	175 69	2,800	60	5,200	400	30	60	0.1	18	1.6	1.4	2.0	5	0.8	0.8	140	10	400
	22-35	70 154	175 69	2,800	65	5,000	—	30	60	0.4	18	1.7	1.4	2.0	5	0.8	0.8	140	10	350
	35-55	70 154	173 68	2,600	65	5,000	—	30	60	0.4	17	1.7	1.3	2.0	5	0.8	0.8	125	10	350
	55-75+	70 151	171 67	2,400	65	5,000	—	30	60	0.4	14	1.7	1.2	2.0	6	0.8	0.8	110	10	350
Females	10-12	35 77	142 56	2,250	50	1,500	400	20	40	0.1	15	1.3	1.1	1.4	5	1.2	1.2	110	18	300
	12-14	44 97	151 61	2,300	50	5,000	400	20	45	0.4	15	1.1	1.2	1.6	5	1.3	1.3	115	18	350
	14-16	52 114	157 62	2,400	55	5,000	400	25	50	0.4	16	1.4	1.2	1.8	5	1.3	1.3	120	18	350
	16-18	54 119	160 63	2,300	55	5,000	400	25	50	0.4	15	1.5	1.2	2.0	5	1.3	1.3	115	18	350
REFERENCE WOMAN	18-22	58 128	163 61	2,000	55	5,000	400	25	55	0.1	13	1.5	1.0	2.0	5	0.8	0.8	100	18	350
	22-35	58 128	163 61	2,000	55	5,000	—	25	55	0.1	13	1.5	1.0	2.0	5	0.8	0.8	100	18	300
	35-55	58 128	160 63	1,850	55	5,000	—	25	55	0.4	13	1.5	1.0	2.0	5	0.8	0.8	90	18	300
	55-75+	58 128	157 62	1,700	55	5,000	—	25	55	0.1	13	1.5	1.0	2.0	6	0.8	0.8	80	10	300
Pregnancy				+200	65	6,000	400	30	60	0.8	15	1.8	+0.1	2.5	8	+0.4	+0.1	125	18	450
Lactation				+1,000	75	8,000	400	30	60	0.5	20	2.0	+0.5	2.5	6	+0.5	+0.5	150	18	450

\* The allowance levels are intended to cover individual variations among most normal persons as they live in the United States under usual environmental stresses. The recommended allowances can be attained with a variety of common foods, providing other nutrients for which human requirements have been less well defined. See text for more-detailed discussion of allowances and of nutrients not tabulated.  
 Entries on lines for age range 22-35 years represent the reference man and woman at age 22. All other entries represent allowances for the midpoint of the specified age range.

\* The folacin allowances refer to dietary sources as determined by *Lactobacillus casei* assay. Pure forms of folacin may be effective in doses less than 1/4 of the RDA.  
 \* Niacin equivalents include dietary sources of the vitamin itself plus 1 mg equivalent for each 60 mg of dietary tryptophan.  
 \* Assumes protein equivalent to human milk. For proteins not 100 percent utilized factors should be increased proportionately.

Figure 3. Recommended daily dietary allowances.

Height <sup>1</sup> inches	Weight <sup>1</sup> in pounds	
	Men	Women
60 .....	.....	109±9
62 .....	.....	115±9
64 .....	133±11	122±10
66 .....	142±12	129±10
68 .....	151±14	136±10
70 .....	159±14	144±11
72 .....	167±15	152±12
74 .....	175±15	

<sup>1</sup>Heights and weights are "without shoes and other clothing." To convert inches to centimeters, multiply by 2.54. To convert pounds to kilograms, multiply by 0.454.

Figure 4. Desirable weights for height.

(1) After early adulthood the calorie intake should be reduced. There is a decline in energy requirement due to diminishing physical activity and decreasing metabolic rate. The recommendations are a reduction in calories of 5 percent for between the ages 22 and 35 years, an additional reduction of 3 percent for each decade from 35 to 55 years, with a further decrease of 5 percent from 55 to 75 years. After 75, calories should be reduced another 7 percent.

(2) Adjustment of calories for body size in adults is made according to the desirable weight for height (fig. 4). The recommended calories adjusted for body weight and age are shown in figure 5.

(3) Men living in extremes of temperature have increased requirements for calories to produce energy. A degree Centigrade rise in environmental temperature between 30°-68° C. (86°-104° F.) probably increases caloric requirements by .5 percent of the normal caloric allowance per degree over 30° C. In subzero environments caloric requirements are slightly increased over those for temperate climates chiefly by the extra energy needed for shivering or for wearing heavy clothing.

(4) Pregnancy and lactation increase the need for calories as shown in figure 3.

(5) Calorie allowances for infants, children, and adolescents are approximate since the rate of growth, body size, and activity vary.

(6) Adjustment of calories for activity cannot be achieved by any single scheme. Weight and general health indicate the adequacy of the caloric intake. Figure 6 shows caloric expenditures for several activities of the reference man and woman. Persons doing heavy labor seldom need more than 25 percent above the standard allowance of calories.

(At a mean environmental temperature of 20° C. (68° F.) assuming average physical activity)				
Desirable Weight		Calorie Allowance <sup>1</sup>		
kgs.	pounds	25 years	45 years	65 years
MEN		(1)	(2)	(3)
50	110	2,200	2,000	1,850
55	121	2,350	2,150	1,950
60	132	2,500	2,300	2,100
65	143	2,650	2,400	2,200
70	154	2,800	2,600	2,400
75	165	2,950	2,700	2,500
80	176	3,050	2,800	2,600
85	187	3,200	2,950	2,750
90	198	3,350	3,100	2,800
95	209	3,500	3,200	2,900
100	220	3,700	3,400	3,100
WOMEN		(4)	(5)	(6)
40	88	1,550	1,450	1,300
45	99	1,700	1,550	1,450
50	110	1,800	1,650	1,500
55	121	1,950	1,800	1,650
60	128	2,100	1,850	1,700
65	143	2,200	2,000	1,850
70	154	2,300	2,100	1,950
Formulas				
(1) $725+31W$		(2) $650+28W$	(3) $550+23.5W$	
(4) $525+27W$		(5) $475+24.5W$	(6) $400+20.5W$	
W = weight in kg.				
<sup>1</sup> Values have been rounded to nearest 50 calories. To convert formulas for weight in pounds, divide factor by 2.2.				

Figure 5. Adjustment of calorie allowances for various body weights and ages.

Activity	Time hrs.	Man		Woman	
		Rate cal/min	Total	Rate cal/min	Total
Sleeping <sup>1</sup> and lying .....	8	1.1	530	1.0	480
Sitting <sup>2</sup> .....	7	1.5	630	1.1	460
Standing <sup>3</sup> .....	5	2.5	750	1.5	450
Walking <sup>4</sup> .....	2	3.0	360	2.5	300
Other <sup>5</sup> .....	2	4.5	540	3.0	360
			2,810		2,050

<sup>1</sup>Essentially resting metabolic rate.  
<sup>2</sup>Includes normal activity carried on while sitting, e.g., reading, driving automobile, eating, playing cards, and desk or bench work.  
<sup>3</sup>Includes normal indoor activities while standing and walking intermittently in limited area, e.g., personal toilet, and moving from one room to another.  
<sup>4</sup>Includes purposeful walking, largely outdoors, e.g., home to commuting station to work site, and other comparable activities.  
<sup>5</sup>Includes intermittent activities in occasional sports, exercises, limited stair climbing or occupational activities involving light physical work. This category may include weekend swimming, golf, tennis, or picnics using 5 to 20 cal/min for limited time.

Figure 6. Examples of energy expenditure by reference man and woman.

c. The dietary allowances serve as a standard in planning food intakes to meet the nutritional needs of healthy persons in the United States. They are recommended by the Food and Nutrition Board of the National Academy of Sciences/National Research Council. These recommended dietary allowances fulfill the minimal nutritional needs of average individuals with the wide variations that exist among them and provide a margin of safety above these minimal needs.

d. The recommended dietary allowances are not adequate to meet the unusual requirements of hospital patients. They do aid in assessing the quality of diets offered to patients.

## 11. DAILY DIETARY REQUIREMENTS

While calories provide for the basic energy and heat needs of individuals, nutrients are required to perform specific essential tissue repair and building tasks and to control and regulate food nutrients in the body.

a. In figure 3, the caloric and essential nutrient needs of individuals are shown for a normal body weight and height by age and sex. Requirements of the reference man and woman are boxed for quick identification.

b. Figure 7 shows the roles played by each class of nutrients in meeting body requirements.

## 12. NUTRIENT REQUIREMENTS

Figure 3 shows the requirements of normal persons for many essential nutrients. Some other requirements for essential nutrients (para 13a-c below) are not shown in this figure because the well-balanced diet provides them in sufficient quantity. Still other nutritive elements are necessary (para 13d, e below) but no daily allowance is recommended because the amount required is still in question.

a. *Protein* is essential in the diet to furnish the nitrogen required for tissue composition and maintenance. The daily protein intake recommended for normal adults of all ages (fig. 3) is 0.9 gram (g.) per kilogram (kg.) of desirable body weight. This assumes that the diet is adequate in calories and other essential nutrients.

b. Some vitamins are fat-soluble vitamins ((1)-(3), below and para 13e(1)); others are water-soluble ((4)-(10), below and para 13e(2), (3)).

(1) *Vitamin A* is necessary for the building and growth of all cells; for the function and maintenance of the membranes lining air passages, the alimentary canal, and the genitourinary tract; and for normal vision. Suggested intake for the reference man and woman is 5000 international units (IU) per day.

(2) *Vitamin D* is concerned with the absorption of calcium and phosphorus from the intestine and with the calcification processes of bones and teeth. Since vitamin D can be acquired by exposure to sunlight, no suggested intake of vitamin D is made for the reference man and woman.

(3) *Vitamin E* helps prevent deterioration caused by oxidation in certain foodstuffs and thus protects vitamin A from destruction in the small intestine. It also plays a role in the formation and life span of red blood cells. Other functions of this vitamin in the human are under study. A daily allowance of 30 IU is recommended for the reference man and of 25 IU for the reference woman.

(4) *Ascorbic acid* is important in the development and maintenance of blood vessels and the intercellular material of cartilage, bone, and dentine.

Build & Repair Body Tissue	Control & Regulate Food Nutrients Used	Supply Body Energy
Proteins	Vitamins	Fats
Minerals	Minerals	Carbohydrates
Water	Proteins	Proteins
	Water	
	Carbohydrates	

Figure 7. Functions of nutrients.

(5) *Folacin* (folic acid) is necessary for blood formation and seems to be involved in other body processes such as reproduction, normal skin, and hair growth. The recommended daily allowance for the reference man and woman is 0.4 milligrams (mg.).

(6) *Niacin* functions in breakdown of carbohydrates, release of energy, tissue respiration, and fat synthesis. One of the amino acids (tryptophan) can contribute to the niacin supply of the body and 60 milligrams of tryptophan are considered to be converted to 1 mg. of niacin. Therefore, allowances for niacin are expressed as niacin equivalents. The requirements are estimated from the calorie intake and 6.6 mg. niacin equivalents per 1000 calories are recommended for all ages.

(7) *Riboflavin* requirements are related to body size, metabolic rate, and rate of growth. The recommended intake is approximately 0.6 mg. per 1000 calories for all ages.

(8) *Thiamine* (thiamin) serves an important function in the intermediary metabolism of carbohydrates (para 13a below). The recommended intake is based upon the calorie intake and 0.5 mg. per 1000 calories is recommended for individuals of all ages.

(9) *Vitamin B<sub>6</sub>* aids enzymes which participate in amino acid metabolism, and carbohydrate and fat metabolism. The recommended daily intake of 2 mg. for the reference man and woman is provided by the ordinary diet.

(10) *Vitamin B<sub>12</sub>* is essential for the formation of red blood cells in the bone marrow. Five  $\mu$ g.(micrograms) is the recommended daily intake for adults under 55 years of age. Six micrograms are recommended for those over 55 years of age.

c. Minerals for which essential requirements have been established are:

(1) *Calcium*. Calcium in the body is located principally in the bones and teeth although small amounts in the body fluids are essential for blood coagulation and for normal function of the heart, muscles, and nerves. The recommended intake of calcium for the reference man and woman is 0.8 g. per day.

(2) *Phosphorus*. Phosphorus is combined in bone structures with calcium and is present in soft tissues and body fluids. The recommended allowance for phosphorus is the same as that for calcium for all ages except infants.



(3) *Iodine*. Iodine is involved in the control of the function of the thyroid gland. The thyroid gland regulates energy metabolism of the body, stimulates the growth and development of the brain, bones, hair, and skin, and is essential for sexual development during adolescence. It promotes an adequate milk supply during lactation. The recommended daily allowance for the reference man is 140 micrograms, for the reference woman, 100 micrograms.

(4) *Iron*. Iron is involved in cellular respiration, that is, in the transportation of oxygen from the lungs to body tissues and the return of carbon dioxide from tissues to lungs. Iron combines with protein to form hemoglobin. Hemoglobin is the element of red blood cells that carries essential-to-life oxygen to body tissues. The recommended intake of iron for the reference man is 10 mg. per day and for the reference woman 18 mg. per day.

(5) *Magnesium*. Magnesium is present in soft tissues and in bones in combination with calcium and phosphorus. It is required for some enzyme systems, thermal regulation, and protein synthesis. Magnesium requirements are estimated to be 300 mg. per day for the reference woman and 350 for the reference man.

### 13. ESSENTIAL NUTRIENTS WITHOUT RECOMMENDED ALLOWANCES

a. *Carbohydrates* are the most abundant of natural foods and they constitute the body's most economical source of energy. They furnish a direct and immediate source of energy to body tissues and can be stored in the liver or converted to fatty tissue. They provide from 40 to 60 percent of the calories in the American diet. The combined intake of carbohydrates and fats should be sufficient to prevent the utilization of protein for energy and to maintain body weight. There are three kinds of carbohydrates:

(1) Sugars, which consist of simple sugars (glucose, fructose, and galactose) and double sugars (sucrose, maltose, and lactose).

(2) Starches, which are more complex sugars and the cheapest source of energy.

(3) Cellulose, which supplies the roughage necessary to the digestive process.

b. *Fats* are the most concentrated sources of energy. They serve as padding around vital organs, help conserve body heat, spare the use of proteins as source of energy, act as lubricants in the gastrointestinal tract, and delay the emptying of the stomach. They transport the fat-soluble vitamins, A, D, E, and K.

c. *Water* is the most important item in the diet. An individual can live for weeks without food, but for only a few days without water. Dehydration (loss of water) may be fatal. The body is in a state of water balance when the amount of water taken in equals the amount of water excreted. Fifty percent of the total body weight is water with 75 percent within the cells and the rest circulating plasma and extracellular

fluids. Water is the basis for body fluids (such as blood, bile, perspiration, and urine). Water holds the products of digestion in solution for absorption, carries nutritive elements to the cells, carbon dioxide to the lungs, and waste material to the kidneys. Water is a lubricant preventing friction between moving parts of the body and it regulates body temperature through evaporation from the skin and lungs. In temperate climates 1.5 liter (6 cups) of water or other beverages per day is considered a suitable allowance for adults. Thirst serves as an adequate guide for water intake for healthy adults except in conditions of extreme heat.

d. There are minerals which are vital to human health, other than those named in paragraph 12c, for which no specific daily requirements have been established. Consumption of a well-balanced diet will provide them.

(1) *Sodium* maintains the proper water balance within the body and preserves normal muscle response to stimulation. The usual intake of sodium per day ranges from 6 to 18 g. of table salt.

(2) *Potassium* functions with sodium to maintain the proper balance between the cells and extracellular fluid. Potassium chloride is found principally within body cells, while sodium chloride is located principally in the blood plasma and the extracellular fluid.

(3) *Copper* is essential for the use of iron in the formation of hemoglobin. An intake of two mg. per day seems to maintain a balance in adults. The normal diet provides 2 to 5 mg.

(4) *Fluorine* is essential for the development of dental enamel. In areas where the fluorine content of water is low, it may be added to drinking water and will effectively reduce dental decay.

(5) *Micronutrients*, so named because they are present in the human body in smaller quantities than other minerals, are chlorine, sulphur, cobalt, zinc, molybdenum, chromium, and selenium. An adequate diet will provide sufficient quantities of these minerals.

e. Vitamins for which no specific daily allowance has been established are:

(1) *Vitamin K* necessary for the formation of prothrombin which is essential for proper clotting of blood.

(2) *Pantothenic acid* involved in carbohydrate and fat metabolism.

(3) *Biotin* probably essential for enzyme systems. Deficiencies of biotin have only been recognized in man when diets have contained large amounts of raw egg white containing avidin which prevents the absorption of the vitamin. The average diet provides 150 to 300 micrograms of biotin per day which is adequate to maintain health.

## 14. MILITARY DAILY DIETARY ALLOWANCE

a. Nutritional standards for the daily food allowance of personnel of the military services (fig. 8) differs slightly from that of the reference man and woman. It has been established in the age range of 17-25 years for individuals of average height and weight. For men this average is 68-70 inches (173-178 cm.) tall weighing 146-170 pounds (66-77 kg.); for women 63-64 inches (160-163 cm.) tall weighing 120-130 pounds (55-59 kg.). Caloric allowances should be increased for individuals of body size greater than the average and decreased for those of smaller size.

b. The dietary standards shown in figure 3 recommend levels for certain nutrients not shown in figure 8. Information concerning amounts of these nutrients in foods is not complete enough to assure that the prescribed levels are being met. When such information becomes available, the following daily levels should be met by the military diet:

(1) Vitamins — same level for men and women — D — 400 IU; E — 30 IU; folacin — 0.4 mg.; B<sub>6</sub> — 2.0 mg.; and B<sub>12</sub> — 5 micrograms.

(2) Minerals — magnesium — 400 mg. for men, 350 mg. for women; phosphorus — adequate if calcium intake is adequate; iodine — use iodized table salt to assure adequate intake; and fluorine — 1 p.p.m. (part per million) in water supply to assure protection.

## 15. BASIC FOOD GROUPS

There are various ways of determining whether a diet provides the necessary nutrients. Some of these calculations are very involved and are time consuming. However, there is a simple way to plan to meet the daily nutrient requirements. A division of foods into four basic groups (fig. 9) provides a simple guide for balanced meal planning. The Home Economics Research Report No. 3, U.S. Department of Agriculture, published in 1957, suggested that similar foods with comparable nutrient content be grouped together. The four basic food groups are the milk, meat, vegetable-fruit, and bread-cereal groups. Each of these groups has a special job to do. The four together provide all or most of the following nutrients in the recommended dietary allowances: calories, protein, vitamins A, D, and E, ascorbic acid, folacin, niacin, riboflavin, thiamine, vitamins B<sub>6</sub> and B<sub>12</sub>, calcium, phosphorus, iron, and magnesium.

## 16. THE MILK GROUP

Milk, cheese, and ice cream are the foods included in this group. Milk is a leading source of calcium, phosphorus, riboflavin, and protein. It also provides many other vitamins and minerals. When milk is lacking in the diet, calcium and sometimes riboflavin are apt to fall below the amounts recommended. Cheese and ice cream provide these same nutrients in smaller quantities. Any form of milk counts toward the

	Amount	Men	Women
Calories	kcal	3400	2400
Protein	g.	100	80
Fat	g.	(*)	(*)
Calcium	mg.	800	800
Iron**	mg.	14	18
Thiamine	mg.	1.7	1.2
Riboflavin	mg.	2.0	1.7
Niacin	mg.	22	16
Ascorbic acid	mg.	60	60
Vitamin A	IU	5000	5000

\*Because the desirable proportion of total caloric intake from fat sources is less than 40 percent, fat should not exceed 40 percent in planned menus. Carbohydrates will provide those calories not furnished by protein and fat.

\*\*For women, it may be necessary to use a supplement to assure an adequate iron intake.

Figure 8. Daily dietary allowances for military personnel moderately active in a temperate climate.

total required as shown in figure 9. The amount of either cheese or ice cream to replace part of the milk is figured on the basis of calcium content. Common portions of cheese and ice cream and their milk equivalents in calcium are:

1-inch cube cheddar-type cheese = 1/2 cup milk.

1/2 cup cottage cheese = 1/3 cup milk.

2 tablespoons cream cheese = 1 tablespoon milk.

1/2 cup ice cream = 1/4 cup milk.

## 17. THE MEAT GROUP

Foods in the meat group are important in supplying primarily protein, but also iron, thiamine, riboflavin, niacin, fat, and other vitamins and minerals. The recommended two servings from the meat group for an adult will provide about one-half of the day's protein and iron requirements. Foods and their recommended quantities in this group are boneless beef, veal, lamb, fish and shellfish, and poultry, cheese, 2 to 3 oz. (60 to 90 g.); the same quantity of variety meats (liver, heart, kidneys); 2 eggs or 1 cup of dry beans, dry peas, lentils, nuts, or peanuts or 4 tablespoons of peanut butter. The remainder of the day's protein requirements will be provided by items from the milk and the bread-cereal groups.

**BASIC FOOD GROUPS**



Figure 9. Basic food groups.

## 18. THE VEGETABLE-FRUIT GROUP

Vegetables and fruits are rich sources of vitamins and minerals in the diet. They also provide cellulose (roughage). The four or more servings daily from this group should emphasize items providing ascorbic acid and vitamin A. To assure sufficient ascorbic acid, the daily diet should include either one serving of: grapefruit or grapefruit juice, orange or orange juice, cantaloupe, raw strawberries, broccoli, brussels sprouts, green pepper, or sweet red pepper, or two servings of: honeydew melon, lemon, tangerine, watermelon, asparagus tips, raw cabbage, collards, mustard greens, potatoes or sweet potatoes (cooked in skin), spinach, tomatoes or tomato juice. The diet should also include at least one serving every other day of a rich source of vitamin A such as dark green vegetables (broccoli, chard, kale, spinach), deep yellow vegetables (carrots, sweet potatoes, winter squash), apricots, or cantaloupe. The serving size of raw fruits and vegetables is that usually eaten -- 1 medium banana, or 1/2 grapefruit. A cooked vegetable or fruit serving is 1/2 cup (4 oz.). By following these suggestions all of the day's need for ascorbic acid is met and over one-half of the vitamin A requirement. The rest of the day's need for ascorbic acid and vitamin A is met by items selected from the milk group or by eggs and an occasional serving of liver from the meat group.

## 19. THE BREAD-CEREAL GROUP

Bread and cereal products are important sources of food energy because they are rich in carbohydrates and in vitamins of the B-complex group (the water-soluble vitamins). They also furnish proteins and iron. Foods in this group include whole grains or processed grains that have been enriched, that is, that have had their original nutritive value in iron, thiamine, riboflavin, or niacin restored. A serving in this group is one slice of bread or 1 oz. of ready-to-eat cereal, or 1/2 cup of cooked cereal.

## 20. OTHER FOODS

The basic four food groups do not include the extras that accompany most meals such as butter, salad dressing, and sugar which make a contribution to the total value of a meal but do not correct nutrient deficiencies. Their chief contribution is calories. Beverages provide part of a day's requirement for water.

## 21. IMPORTANCE OF FOOD GROUPS TO MENU PLANNING

The basic food groups are a valuable tool when used as a checklist for all planned menus. These menus should provide food selection in at least the minimal amount from each food group for each day's meals.

## 22. SUMMARY

a. This text discusses the relevance of diet to good nutrition of humans, the process -- digestion -- which makes consumed food available for body use, and the calories and nutrients needed by individuals of varied ages, weights, and activity to

provide heat, energy, and the materials to build and repair tissue. The energy needs of the human body are met by the calorie values of food that is eaten. Each individual must have the energy necessary for vital processes such as temperature control, breathing, and heart action, for the digestive processes, and for the activities of working and playing. These needs vary with age, body weight, and activity. In order to repair and build tissues, each individual must also receive a minimum amount of essential nutrients -- proteins, carbohydrates, fats, minerals, and vitamins and water. The uses of each class of nutrients in the body are explained and the quantity required for good health named.

b. For maximum health each individual must consume food that contains sufficient calories to provide for his energy needs and sufficient nutrients to meet body building and repair requirements.

APPENDIX

REFERENCES

- AR 30-1            The Army Food Service Program
- AR 40-25           Nutritional Standards
- TM 10-405          Army Mess Operations



SELF-GRADING  
LESSON EXERCISES

REQUIREMENT. Exercises 1 through 25 are multiple choice. Each exercise has only one single-best answer. Indicate your choice by circling the appropriate letter.

1. Which of the following is an outward manifestation of good nutrition?
  - a. Muscles: long and smooth.
  - b. Skin: fine grained.
  - c. Eyes: clear and uncircled.
  - d. Facial expression: intense.
  
2. The name applied to such essential elements of food as proteins, carbohydrates, etc., is
  - a. nutrition.
  - b. nutrient.
  - c. diet.
  - d. subsistence.
  
3. The processes by which man takes in and utilizes food are, when considered as a whole, called
  - a. diet.
  - b. diet therapy.
  - c. digestion.
  - d. nutrition.

4. The alimentary canal is so named because it is the passageway
  - a. from lips through mouth, pharynx and esophagus to stomach.
  - b. along which nutritive elements move and are absorbed.
  - c. which serves as a reservoir for essential water.
  - d. in which all bodily secretions are deposited.
5. The digestive system includes
  - a. glands.
  - b. organs.
  - c. intestines.
  - d. all body parts listed above.
6. Food consumed is changed to forms in which the body can utilize it by a chemical or
  - a. a biological product.
  - b. a mechanical process.
  - c. a glandular process.
  - d. all processes or products listed above.
7. Food elements are chiefly absorbed by the body from the
  - a. small intestine.
  - b. large intestine.
  - c. stomach.
  - d. liver.

8. The finger-like projections called "villi" do which of the following?
- Assist the movement of food through the digestive system.
  - Provide an enlarged area for absorption of food elements.
  - Differentiate between the various essential food elements.
  - Sort waste materials from food elements.
9. Why is roughage needed in the diet?
- To provide energy.
  - To satisfy hunger.
  - To stimulate intestinal muscle contractions.
  - To absorb water.
10. A calorie is a (n)
- essential food element.
  - vegetable rich in minerals.
  - expenditure of energy.
  - measurement of heat.
11. The body's basic requirement for energy is to provide fuel for such activities as
- breathing.
  - sleeping.
  - swimming.
  - climbing.

12. Vital processes use how much of the energy expended by the human body?
- a. 10%.
  - b. 20%.
  - c. 50%.
  - d. 60%.
13. The "reference" man and woman serve as a point of reference for the adjustment of caloric intake for
- a. age.
  - b. weight.
  - c. activity.
  - d. all factors listed above.
14. The recommended daily allowance of calories does which of the following when an individual's age increases, but his weight remains the same?
- a. Decreases.
  - b. Increases.
  - c. Remains the same.
  - d. Varies from day to day.
15. Additional calories may be required in cold climates because of
- a. additional activity of shivering.
  - b. energy needed to wear heavy clothing.
  - c. either "a" or "b" above.
  - d. neither "a" nor "b" above because additional calories are not required.

16. If the recommended daily food allowance of a man pursuing moderate activity is 2800 calories, what would be the maximum number of calories recommended for a man of the same weight and height who does heavy labor?

- a. 2900.
- b. 3100.
- c. 3250.
- d. 3500.

17. The human body utilizes those elements of food that

- a. build tissue.
- b. supply energy.
- c. regulate heat.
- d. accomplish all of the above.

18. The primary function of vitamins is to

- a. assist the body to use food elements effectively.
- b. build bones and teeth.
- c. produce the clotting factor in blood.
- d. increase resistance to infection.

19. Proteins are essential in human nutrition to

- a. repair cells.
- b. provide energy.
- c. regulate heat.
- d. eliminate hunger pangs.

20. Among the minerals proven to be essential to the human body is (are)
- a. iron.
  - b. biotin.
  - c. thiamine.
  - d. those listed above.
21. The food elements which are chiefly relied on for body energy are fats and
- a. calcium.
  - b. carbohydrates.
  - c. phosphorous.
  - d. ascorbic acid.
22. When carbohydrate cellulose enters the human body, it functions as
- a. a starch.
  - b. a simple sugar.
  - c. roughage.
  - d. a protein.
23. The role of water in the human body is to
- a. form the basis of body fluids.
  - b. carry essential food elements and waste.
  - c. regulate body temperature.
  - d. do all of the above.

24. The human body requires how much water daily?
- a. As much as it excretes.
  - b. 6-8 quarts.
  - c. As much as is lost in perspiration.
  - d. The sum of the above.
25. The daily caloric intake of a 155 pound, 22 year old male soldier serving as a file clerk in a temperate climate should be
- a. 3400 calories.
  - b. 2800 calories.
  - c. 2200 calories.
  - d. 1500 calories.

HAVE YOU COMPLETED ALL EXERCISES?  
DO YOU UNDERSTAND EVERYTHING COVERED?  
IF SO , TURN TO THE NEXT PAGE AND  
CHECK YOUR ANSWERS AGAINST THE  
SOLUTIONS.



LESSON 1

# SOLUTION SHEET

Check your work against the solutions given below. If you have made a wrong response or omitted a required response, correct your work. Then, go back and restudy the appropriate text portion once more (references follow each solution).

<u>Ex</u>	<u>Sol</u>	<u>Ref</u>
1.	c	para 3
2.	b	para 4f
3.	c	para 5
4.	b	para 5a; fig. 1
5.	d	para 5; fig. 1
6.	b	para 5b, c.; fig. 2
7.	a	para 6e
8.	b	para 6e
9.	c	para 6f; 13a(3)
10.	d	para 7
11.	a	para 8a
12.	c	para 8a
13.	d	para 10a, b; figs. 3 - 6
14.	a	fig. 5
15.	c	para 10b(3)
16.	d	para 10b(6)
17.	d	para 10, 11, 13a; fig. 7
18.	a	para 11, 11b; fig. 7
19.	a	para 12a
20.	a	para 12c(4); See also 12b(8), 13e(3)
21.	b	para 13a
22.	c	para 13a(3)
23.	d	para 13c
24.	a	para 13c
25.	a	para 14a; fig. 8

All references are to the Lesson Text.

HAVE YOU CHECKED YOUR ANSWERS, MADE CORRECTIONS, AND RESTUDIED THE TEXT, IF NECESSARY? IF YOU HAVE, GO ON TO THE NEXT LESSON OF THE SUBCOURSE.

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#### MODIFICATIONS

Pages 31-32 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.

## LESSON ASSIGNMENT

SUBJECT	Composition of Foods.
STUDY ASSIGNMENT	Lesson Text.
SCOPE	Nutritional contents of specific foods; identification of 16 food groups used for menu substitutions; nutritional standards and energy requirements; sources and values of carbohydrates, fats, proteins, minerals, vitamins, and water.
OBJECTIVES	<p>As a result of successful completion of this assignment, the student will be able to--</p> <ol style="list-style-type: none"><li>1. Identify foods according to nutritional contents.</li><li>2. Specify value of nutrients in body processes.</li><li>3. Give nutritional standards required for daily food allowance for military personnel.</li><li>4. Describe value and functions of carbohydrates, fats, and proteins.</li><li>5. Explain function of water and its effect on human body.</li><li>6. List minerals and vitamins essential to balanced diet and describe functions and sources of each.</li><li>7. Identify deficiencies resulting from inadequate nutrients.</li><li>8. Specify food labeling requirements.</li></ol>

## SECTION I

### NUTRITIONAL CONTENT OF FOODS

1. INTRODUCTION. Food is composed of many substances or nutrients which include carbohydrates, proteins, fats, minerals, vitamins, and water. In the human diet, no single food is essential. Some foods contribute nutrients in useful amounts while others provide only calories or even sheer bulk. For this reason and others, nutritional analysis and careful dietary planning are required to insure good health. These processes are particularly important in the Army, which must insure the proper nourishment of large numbers of individuals of varying ages and tastes and in a wide variety of environments. This is accomplished primarily through the development and use of the Master Menu, which insures the provision of a nutritionally balanced diet.

a. An understanding of the nutritional content of foods is essential to the individuals who develop the Master Menu. It is also of importance to those who must implement it in the field, which includes selecting nutritionally adequate substitute items when those specified are not available. Background knowledge in this area is also of great value to all supervisory and advisory food service personnel.

b. At present, the Army is testing the concept of providing choices of various kinds of foods and even of types of meals. Short order items, snacks, and specialties such as Italian and Spanish items are being offered in many dining halls to encourage the troops to use these facilities by making Army food more closely comparable with contemporary dining habits. As these experimental concepts become more widely adopted, knowledge of the nutritional content of foods will become even more important in insuring that the variety of items provided will meet nutritional requirements to the same degree as the standard Master Menu.

c. For convenience and accuracy in determining nutritional content, the Army divides the four basic food groups into 16 more definitive groups. In general, menu substitutions are made within these groups. The 16 food groups are described briefly in paragraphs 2 through 17 below. The substitutions discussed are based on nutritional equivalence, not on popularity.

2. MEAT, FISH, AND POULTRY. The meat, fish, and poultry food group includes animal muscle tissues and organs such as liver, kidney, and heart. This group is the primary source of protein for the ration as well as a valuable source of iron, phosphorus, thiamine, riboflavin, and niacin. Food items in this group have a high caloric value. Organs are richer in iron and vitamins than muscle meats. They should be prepared in the most acceptable manner and included frequently. Eggs and cheese may be substituted when meat, fish, and poultry are not available.

3. EGGS. Eggs are rich in high-quality protein and in calcium, phosphorus, iron, vitamin A, and riboflavin. Dehydrated or frozen eggs may be used when fresh eggs are not available.

4. MILK AND MILK PRODUCTS. The milk and milk products food group includes whole milk, skim milk, buttermilk, cheese, dried milk, evaporated milk, and ice cream. Milk contains all of the known essential nutrients, but its most valuable contributions are calcium, riboflavin, and protein. The daily diet must include some form of milk or cheese for adequate quantities of calcium and riboflavin. Cheese has a high content of good-quality protein and may be substituted for items in the meat, fish, and poultry food group. Evaporated or dry whole milk may be substituted for fresh milk. When milk is not available, an adequate supply of calcium can be obtained by increasing the consumption of cheese, leafy green and yellow vegetables, and beans.

5. BUTTER AND OTHER SPREADS: The chief value of butter, margarine, or butter spreads is to improve the taste or flavor of other foods. The items in this food group are sources of concentrated energy, but they do not contribute greatly to meeting the energy requirement because the quantities used are small.

6. FATS AND OILS. This food group includes lard, lard substitutes, vegetable oils, meat drippings, and salad dressings. These items are sources of energy and provide essential unsaturated fatty acids and vitamin E.

7. SUGARS, JAMS, AND OTHER SWEETS. Sugars include cane sugar and other pure sugars, as well as sirups, jams, preserves, honey, and dessert powders. These food items should be included in the daily diet because they are quick sources of energy and because they add flavor and improve the taste of other food items. In addition to these functions, pure sugars contribute only energy. Crude sugars, such as molasses and sorghum, supply minerals as well as energy and contribute nutritive value to the diet.

8. LEGUMES. Legumes include peas, beans, and nuts. These food items contain a high ratio of proteins and fats as well as a good quantity of calcium, phosphorus, riboflavin, thiamine, and niacin. Food items in this group may be nutritionally substituted for meat, fish, and poultry if necessary.

9. CEREALS AND OTHER GRAIN PRODUCTS. Grain products include breads, flours, and cereals. Breads and cereals have a high carbohydrate value and are excellent sources of energy. They are also sources of protein and, when enriched, of thiamine and riboflavin. Whole grain products, such as rolled oats and whole wheat, are higher in food value from a vitamin and mineral standpoint than are unenriched refined products.

10. TOMATOES AND TOMATO PRODUCTS. Raw or canned tomatoes, tomato juice, and catsup or puree are excellent sources of vitamin C and contribute a considerable quantity of vitamin A. The vitamin C content in this group of food items is more stable than that in leafy green and yellow vegetables.

11. CITRUS FRUITS. Citrus fruits include oranges, lemons, limes, grapefruit, and their fresh or canned juices. These food items are excellent sources of ascorbic acid (vitamin C).

12. POTATOES. White potatoes are usually served daily because they are a staple item in the American diet and may be prepared according to a variety of recipes. This food group supplies quantities of iron, thiamine, niacin, and ascorbic acid. If potatoes are not available, larger quantities of other vegetables should be included in the diet. Sweet potatoes contain a large quantity of vitamin A which is not contained in white potatoes. Sweet potatoes also contain more vitamin C than white potatoes.

13. LEAFY, GREEN, AND YELLOW VEGETABLES. Leafy green and yellow vegetables include lettuce, cabbage, green beans, carrots, asparagus, broccoli, and brussels sprouts. This group of food items cannot be replaced by any other food group because leafy green and yellow vegetables contribute to the daily diet a large part of the vitamin A and ascorbic acid as well as a considerable quantity of calcium, thiamine, riboflavin, and niacin. Food items in this group also contribute most of the vegetable fiber or bulk needed in the diet and should be included in the menu each day.

14. OTHER VEGETABLES. Other vegetables include bean sprouts, cauliflower, corn, mushrooms, okra, and cucumbers, in addition to onions, beets, turnips, rutabagas, and parsnips (sometimes called root vegetables). They do not contain appreciable quantities of essential nutrients and add little to the vitamin and mineral content of the diet. These items are included in the menu chiefly to add variety.

15. FRUITS AND FRUIT JUICES (OTHER THAN CITRUS). The nutritive value of fruits other than citrus fruits is roughly comparable to that of root vegetables. This food group includes berries of all kinds, cherries, peaches, pears, and prunes, apricots, peaches, apples, raisins, and dates. These food items are sources of cellulose bulk fiber, and they add to the vitamin and mineral content of the daily diet. If fresh fruits are not available, canned or dried fruits may be substituted since they contribute about the same nutritive value. Fruits are very popular food items, and they may be included in the daily diet to add variety.

16. BEVERAGES. Coffee, tea, and other beverages contain little nutritive value, but they provide water, which is essential. Also, they are popular and stimulating.

17. MISCELLANEOUS ITEMS. Condiments and relishes, such as spices, sauces, mustard, pickles, olives, and vinegar, have little or no nutritive value. Items in this food group improve the flavor or taste and add to the appearance of other foods.

## SECTION II

### NUTRITIONAL STANDARDS AND REQUIREMENTS

18. **NUTRITIONAL STANDARDS.** The Surgeons General of the Army, Navy, and Air Force are responsible for establishing and maintaining the nutritional standards of the daily food allowance for military personnel. With certain adjustments, the nutritional levels adopted as standards are based upon the National Academy of Sciences--National Research Council publication, "Recommended Daily Dietary Allowances, Revised 1968" and AR 40-25, Nutritional Standards, March 1970. These standards designate the amounts of nutrients adequate to maintain good nutrition of military personnel under normal operating conditions. When military personnel must be fed under special operating conditions, adjustments in nutritional standards are recommended by the appropriate surgeon general. Special operating conditions are the external circumstances encountered in climatic extremes and in other special situations. Adjustments in nutritional standards may be required to meet extreme variations.

a. **Age.** The nutritional standard for personnel of the military services has been established for men and women of ages ranging from 17 to 25 years. Generally, energy requirements decline progressively after the years of early adulthood because of a decrease in the basal metabolic rate and in physical activity.

b. **Size.** The nutritional standard for daily food allowance has been established for average heights and weights; for men 68 to 70 inches and 146 to 170 pounds; for women, 63 to 64 inches and 120 to 130 pounds. Caloric allowances must be adjusted for the variations in energy requirements because of differences in body sizes.

c. **Activity.** The nutritional standard has been established for military personnel who are normally active. In rare instances when troops are undergoing sustained vigorous physical activity, the daily caloric expenditure may exceed the daily caloric allowance.

d. **Climate.** The nutritional standard has been established for military personnel on active duty in a temperate climate.

19. **ADULT ENERGY REQUIREMENTS.** The human body uses energy to make every motion and to carry out each vital process. Nutrients provide the major source of energy, but the body converts the food into energy by a process called metabolism (fig. 1). Carbohydrates, fats, and proteins are the specific nutrients that provide fuel to yield energy in the body. When these nutrients are present in quantities more than sufficient to meet immediate needs, they may contribute to the production of fat, which is the body's chief form of stored food.

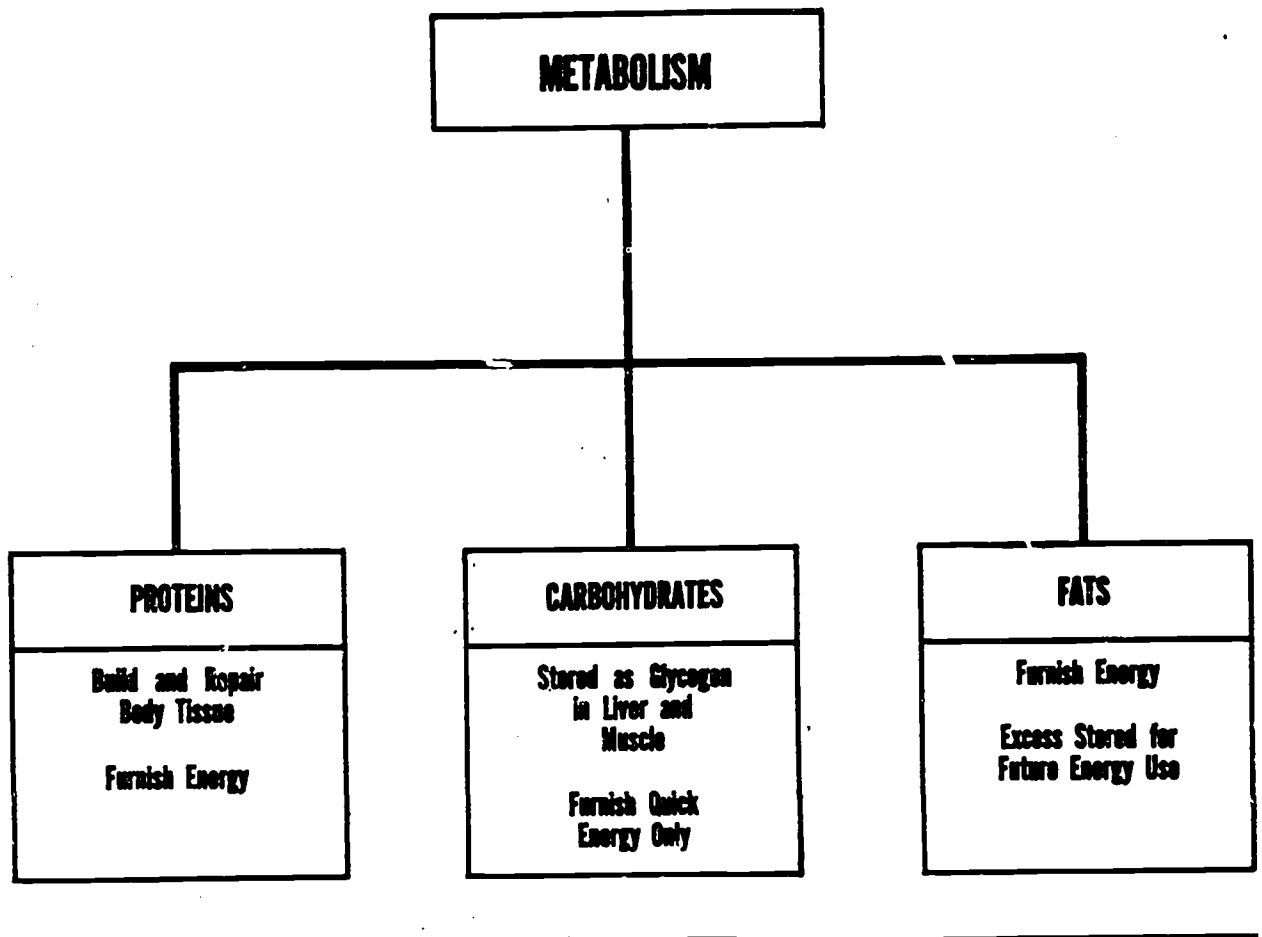


Figure 1. Nutrients converted to energy by metabolism.



a. Body size and surface area. Since the difficulty of work is influenced by the amount of weight displaced while a person is working, the energy requirement of any bodily motion is directly influenced by the weight of the body. Body shape is also a factor in determining heat loss from the surface of the body, because the normal body temperature (98.6° F.) is higher than the average temperature of air (75° F.).

b. Body composition. Lean muscle tissues are more active than fatty tissues and require more energy for their maintenance. A body which is composed of more fatty tissues requires less energy than one of lean musculature.

c. Voluntary motions (work). Energy requirements are increased by voluntary motions or work in direct proportion to the degree of difficulty of the work. The following factors influence the amount of energy required to support voluntary motions or work:

(1) Activity. In addition to the amount of energy needed for normal body functions, the human body needs energy to perform a variety of duties associated with daily living. Every movement of the body is work and thus increases the energy requirements. The difficulty of the work depends upon the amount of weight displaced during performance. Because energy requirements are in direct proportion to muscular activity, the kind of work performed by a person determines his energy requirements. For example, energy requirements for office workers or personnel who are engaged in other sedentary occupations are less than those for individuals doing heavy manual labor. An office worker expends about 2,800 calories per day but a physical laborer expends up to 8,000 calories. The degree of difficulty of the work performed is the basis for the difference.

(2) Temperament. A person who works under great muscular tension has a higher energy requirement than one who works under relaxed conditions. The tense individual, therefore, uses more energy.

(3) Environmental temperature. Temperature extremes require more energy for the same activity than moderate temperatures.

20. REGULATORY FACTORS. Various substances obtained from foods are involved in the metabolism of nutrients and in regulatory functions. These substances influence the functional capacities of muscles and nerves, their osmotic pressure, and other properties. Some of the regulatory functions are interrelated and involve more than one factor. The following regulatory factors are involved:

a. Cellulose and fiber. Cellulose and fibers hold water somewhat like a sponge, and retain moisture and provide bulk. This bulk rubs against the intestinal wall and stimulates the nerve endings which cause muscular contraction leading to evacuation.

b. Gas. Gas in the digestive tract in moderate amounts aids digestion and elimination. The action of bacteria on gas-producing foods causes fermentation in the lower intestinal tract.

c. Organic acids. Fruits and vegetables contain an organic acid which increases the action of the intestinal walls. Dried fruits are effective because they absorb water in the intestinal tract. At least two fruits a day in the diet are valuable to intestinal hygiene, as they supply water, fiber, and other needs.

d. Deleted.

21. FOOD LABELING REQUIREMENTS. According to the General Regulations of the Food, Drug, and Cosmetic Act, labeling includes all written, printed, or graphic matter accompanying an article in interstate commerce or when it is held for sale after shipment or delivery. A false or misleading statement on the label is a form of misbranding. The major requirements of the food industry for labeling packaged food are statements which provide the following information:

a. Identity. The contents of the package must be identified by name.

b. Manufacturer, packer, or distributor. The name and address of the manufacturer, packer, or distributor of the packaged food must be shown on the label.

c. Quantity. The contents of the package must be declared on the label. Quantity may be expressed in terms of weight, measure, numerical count, or a combination of numerical count and weight or measure.

d. Ingredients. The specific names of ingredients must be shown on the label except for spices, flavorings, or colorings.

e. Date of pack. Labels on most packaged foods must declare the date of pack (usually in code).

### SECTION III

#### CARBOHYDRATES, FATS, AND PROTEINS

22. **NUTRIENTS FOR ENERGY.** \* The energy supplied by nutrients is basically heat and is measured in calories. The following three nutrients supply the body energy (fig. 2):

a. Carbohydrates. Carbohydrates are primarily sugars and starches of plant origin. Since plant foods are widely abundant as well as inexpensive and the body readily converts them into energy, carbohydrates are the principal source of energy for the human body. They break down quickly within the body and can provide an energy pickup in a very short time.

b. Fats. Fats are the most concentrated form of energy. They yield two and a quarter times as many calories as carbohydrates and proteins. When an excess of fats is eaten, however, neutral fat is stored throughout the body until needed.

c. Proteins. Proteins are the basic material from which muscle is made. They are made up of amino acids, which are the so-called "building blocks" of living cells. The principal functions of proteins in the body are to build new cells for growth and repair wornout or damaged tissues. They are important in regulating body processes and can also be used to provide heat and energy whenever there is a lack of carbohydrates and fats. This particular use of proteins is expensive because of the relatively high cost of protein foods. Foods of animal origin provide more concentrated and complete proteins than plant foods, although protein requirements can also be provided by combinations of plant foods.

23. **VALUE OF CARBOHYDRATES.** Carbohydrates furnish energy to carry out the work done by the body and are easier to digest than any other energy nutrient. They provide four calories per gram of pure carbohydrate. An adequate supply of carbohydrates in the daily diet can preserve both fats and proteins. An oversupply of carbohydrates, however, usually causes overweight. An undersupply of carbohydrates conversely can cause physical weakness because fats and proteins must then be used for generating energy. If the carbohydrate food items are sufficient to provide for the energy needs of the body, the fats and proteins are not required for generating energy.

a. Nutritive value. Carbohydrates are primarily sugars and starches. They are highly digestible and serve as an important energy source. The appetite is dulled by eating large quantities of sweets between meals, however, and this should be avoided.

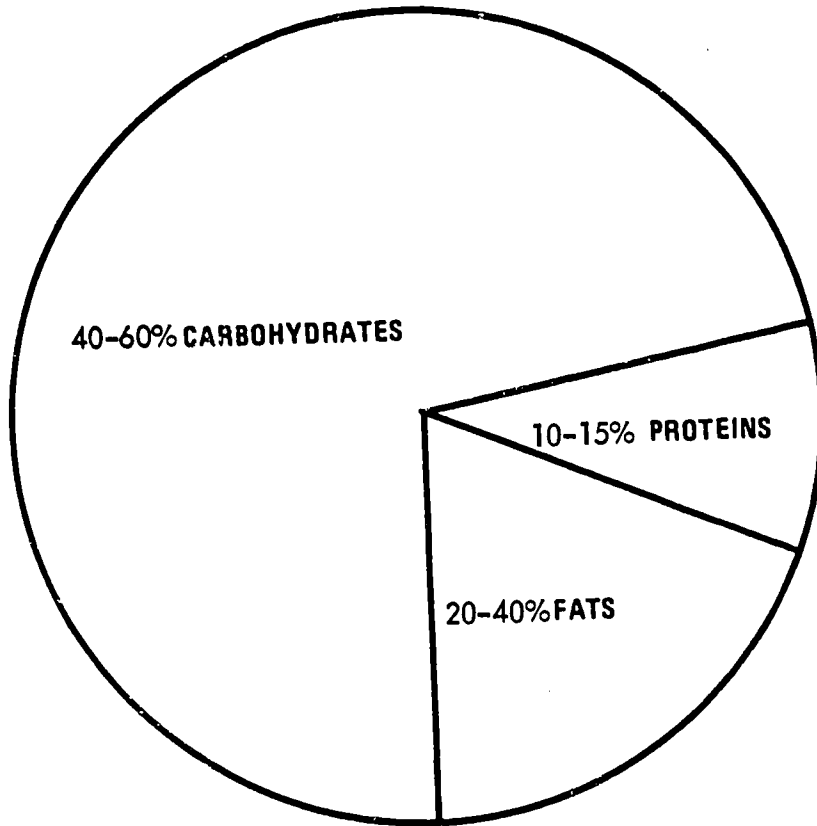


Figure 2. Relative percentages of energy nutrients in an ideal daily diet.

b. Digestive value. Carbohydrates are the most readily available and easily digested of the energy nutrients.

24. VALUE OF FATS. Fats are valuable as sources of energy and because their flavor, richness, and the sense of fullness they impart. Some fats and oils contain fatty acids essential to good nutrition; others are sources of vitamins A, D, E, and K. An oversupply of fats, however, can cause incomplete digestion, a diseased condition, or simply obesity. In obesity, the excess energy values of fatty substances are stored by the body in the form of fatty tissue. When insufficient fat is supplied in the ration but other nutrients are provided in sufficient quantity, regulatory and building functions in the body will be impaired.

25. VALUE OF PROTEINS. Proteins provide amino acids and nitrogen. They also contain carbon, hydrogen, oxygen, sulfur, iron, phosphorus, and other trace elements. The chief value of proteins is to promote growth and maintain life. Protein is provided primarily from animal sources such as meat, fish, eggs, milk, and cheese. In the United States, approximately 50 percent of the protein intake is provided through meat.

## SECTION IV

### WATER, MINERALS, AND VITAMINS

26. **GENERAL.** In addition to the nutrients for energy, other substances are needed to repair tissues and regulate body functions. These include the following:

**a. Water.** Water is not strictly a food, but in its natural state it may contain essential nutrients. Life cannot be sustained without water, and water is also required for breaking down the components of most foods into absorptive nutrients. Water is the liquefying medium of all body fluids and the transporter of waste materials.

**b. Minerals.** Minerals such as calcium and phosphorus are needed for bone growth and maintenance. As body regulators, minerals help to maintain the normal neutral condition of the blood.

**c. Vitamins.** Vitamins are chemical compounds which are essential to bodily function. Although vitamins are present only in minute traces in most foods, they are body regulators and aid in building and repairing tissues.

**d. Cellulose.** Cellulose is the wood fiber in the cell walls of plants. Cooked vegetables provide the major source of cellulose in the daily diet. Cellulose has no nutritive value, but it is needed as a body regulator.

27. **FUNCTIONS OF WATER.** Of all the components in the body, water is present in the largest quantity. Water is contained in every cell of the body. It is considered to be the most critically needed nutrient. Man has been known to live without food for 65 days, but he can expect to survive without water for only 3 days. Water is essential to carry out the following functions of the body:

**a. Assimilation.** Water carries nutrients to their destinations in the body.

**b. Conduction.** Water is an efficient heat conductor and helps to maintain the body temperatures required for good health. Evaporation of water from the skin is an important process in which surplus heat is removed from the body.

**c. Protection.** Water protects the internal organs by cushioning external shock. The surfaces of all of the joints are also lubricated by moisture, and the central nervous system is bathed by a cerebrospinal fluid containing water.

d. Equalization. Water is contained in a bound form in the tissues and is required to maintain equilibrium. In dehydration, the body tries to compensate for water loss by excess combustion of food and body tissues. In edema, which is the filling of body cavities with water, the tissues retain extra water because of a protein deficiency in the blood.

28. **FUNCTIONS OF MINERALS.** Minerals are needed in the body as tissue building materials. Minerals total only about 4 percent of body weight, but several of them are vitally important.

a. Calcium. Calcium builds bones and teeth, helps to coagulate blood, regulates or controls normal heart rhythm, helps the body use iron, and contributes to vitality and longevity. Milk and cheese are the best sources of calcium. Other sources are clams, egg yolks, nuts, soybeans, broccoli, cabbage, cauliflower, mustard greens, and turnip greens.

b. Phosphorus. Phosphorus is involved in the metabolism of fat and carbohydrates and also contributes functionally to the activation of enzymes, to cell activity, and to cell multiplication. Good sources of phosphorus are milk, cheese, eggs, meat, legumes, nuts, whole grain cereals, and vegetables.

c. Magnesium. Magnesium is used to build bones and teeth. Good sources of magnesium are cereals, dried fruits, cocoa, chocolate, molasses, nuts, wheat germs, and bran.

d. Potassium. Potassium maintains intracellular fluid balance and regulates nervous and muscular irritability. Good sources of potassium are bananas, meats, turnips, honey, milk, fruit, potatoes, and greens of all kinds.

e. Sulfur. Sulfur helps develop the amino acids, the hormones, insulin, and vitamins in the thiamine group.

f. Sodium. Sodium maintains water balance in the system, controls muscular and nervous irritability, and helps to relax the heart. Good sources of sodium are salt, meat, white bread, milk, cheese, butter, margarine, and egg whites.

g. Chlorine. Chlorine regulates osmotic pressure, stimulates enzyme action, and regulates normal heart action. Deficiencies of chlorine cause digestive disturbances, poor water retention, and loss of body weight.

h. Iron. Iron is a component of bone and of hemoglobin, which carries oxygen to the tissues. Lack of iron causes deficiencies of hemoglobin, contributes to anemia, and lowers vitality. The best source of iron is liver, but good sources are peaches, apples, apricots, prunes, raisins, grapes, meat, legumes, molasses, and egg yolks.

i. Iodine. Iodine is a trace element required for the development and functioning of the thyroid gland. Extreme deficiencies of iodine will cause enlargement of the thyroid gland, which is commonly called simple goiter. They also cause a low rate of metabolism and stunted growth. The best source of iodine is iodized salt. Good sources of iodine are seafoods and foods grown in iodine-containing soils.

j. Copper. Copper contributes to the use of iron in making hemoglobin, and it is essential to cell respiration. Deficiencies of copper retard hemoglobin production because of poor use of iron and may cause anemia. The normal diet provides adequate traces of copper.

k. Manganese. Manganese is essential to normal growth and reproduction. Good sources of manganese are liver, seafoods, legumes, whole grain cereals, vegetables, rye bread, and oatmeal.

l. Zinc. Zinc is also required for normal growth. It is provided amply in the normal diet.

m. Fluorine. Fluorine helps to prevent tooth decay. Good sources of fluorine are rye bread, beef, canned salmon, butter, cheese, and egg yolks.

n. Cobalt. Cobalt regenerates hemoglobin. Its main sources are spinach, turnip greens, lettuce, and cabbage.

o. Silicon. Silicon combined with fluorine is thought to be one of the contributing factors to the hardness of enamel on the teeth. Detailed information has not been developed on it.

29. FUNCTIONS AND SOURCES OF VITAMINS. Although vitamins are required in very small amounts, these highly complex chemical substances are essential for regulating body processes. Vitamins cannot be burned for energy or used as building blocks, but they produce the reaction required for digesting and using nutrients for energy and body building. Manufacturers of pharmaceutical products can make vitamins from certain substances or extract them from foods. Since small amounts of vitamins are required by the body, correspondingly small measurements must be used: the milligram and international unit (I.U.). A milligram is one twenty-eight-thousandth part of an ounce; an international unit is any amount, normally less than a milligram, as prescribed for a given vitamin by international agreement. Generally, vitamins are easily destroyed in food substances and cannot be stored to an appreciable amount in the human body. Therefore, most diseases caused by nutritional deficiencies develop from insufficient vitamin intake. Vitamin deficiencies may be prevented by eating a good variety of foods each day. The known facts for most of the vitamins are their chemical composition, bodily function, best sources, and daily requirements. Vitamins are classified into two groups according to their solubility as follows:



a. Water soluble. The B complex vitamins and ascorbic acid (vitamin C) belong to the water-soluble group which can be leached out of food in cooking and lost unless the cooking water is used. Water-soluble vitamins are easily destroyed and cannot be stored in the body. This makes them more critical in the daily food supply than fat-soluble vitamins. Of the more than 10 vitamins in the B complex, three are of major concern, because they are involved in the digestion of energy nutrients. Once the major vitamins in the B complex are provided in sufficient amounts, all B complex vitamins are provided adequately because of the characteristic linkage between the major vitamins and other vitamins in the B complex. Following are the major vitamins in the B complex and for ascorbic acid.

(1) Thiamine (B<sub>1</sub>). Thiamine is involved in carbohydrate metabolism. This vitamin promotes growth, creates a feeling of well-being, counteracts fatigue, and steadies nerve reactions. Considerable amounts of thiamine are destroyed in the cooking of foods, and because there is almost no storage of this vitamin in the body, daily resupplies are required. The minimum daily requirements for thiamine as established for the military services are 1.4 milligrams for active male troops and 1.0 milligrams for sedentary male and all female troops. Unless sufficient amounts of thiamine are received each day, the individual will feel tired, become depressed and nervous, lose appetite, show decreased growth, have stomach trouble, and experience problems with coordination. The best sources of thiamine are lean pork cuts, other meats, fish, eggs, whole grains, milk and potatoes.

(2) Riboflavin (B<sub>2</sub>). Riboflavin deficiencies are rather frequent in the United States, partially because heat, alkali, and sunlight destroy appreciable amounts of it and the human body cannot store excess intakes. Riboflavin functions in the digestion of all energy nutrients. In addition, this vitamin is required for maintaining the health of digestive and respiratory tissues as well as maintaining normal growth and functioning of nerve and brain tissues. In instances of under-supply of riboflavin, an individual will first notice marked fatigue and nervous irritation and then cracking of the skin at the corners of the mouth. Later, various sores develop on the face, skin becomes oily, eyes become sore and vision is blurred, and the ability of mental concentration rapidly decreases to a point where the person becomes extremely forgetful. Frequent digestive disturbances are also a deficiency symptom. The minimum daily requirements for riboflavin as established by the military services are 2.0 milligrams for males and 1.8 milligrams for females. Good food sources of riboflavin are brewer's yeast, meats, milk, eggs, and whole grains.

(3) Niacin (B<sub>3</sub>). Niacin, or nicotinic acid, is the most resistant vitamin in the B complex group and suffers small losses from heat treatment. Losses can occur, however, when cooking water is discarded. In addition to assisting in the digestion of carbohydrates and proteins, niacin is required for normal growth and healthy skin. When

insufficiently supplied, the initial symptoms are listlessness, loss of appetite and weight; then, headache and backache, and eventually, nausea. The minimum daily requirements of niacin have been established for the military services at 22 milligrams for males and 16 milligrams for females. Liver is the best food source of niacin; other valuable sources are peanut butter, lean meats, legumes, and bread.

(4) Ascorbic acid. Ascorbic acid (vitamin C) promotes bone formation and repair and aids in the healing of wounds. A marked deficiency of ascorbic acid causes the disease called scurvy; a slight deficiency lowers resistance to infections. Deficiencies of ascorbic acid may be indicated by tender and bleeding gums, skin cuts that are slow to heal, and skin that is easily bruised. Ascorbic acid is the least stable of all vitamins; therefore, the minimum daily requirements must be met to maintain good health. Adults should consume not less than 60 milligrams of ascorbic acid each day. The best sources of vitamin C are citrus fruits or their juices, tomatoes and their byproducts, and leafy vegetables. These foods should be kept in storage, and the vegetables should be cooked very briefly in order to avoid excessive loss of vitamin content.

b. Fat-soluble Vitamins. Usually, fat-soluble vitamins are not as easily destroyed as water-soluble vitamins, and they can be stored in the body to some extent. Following are the fat-soluble vitamins:

(1) Vitamin A. Vitamin A (rhodopsin) is an essential vitamin because it helps the eyes to adjust to varying intensities of light. It also aids normal growth and is essential in the proper functioning of the moist and pliable surface tissues and mucous membrane. When the required amounts of vitamin A are not available, night blindness and infections of the respiratory and digestive tracts may develop. Although the body can store some vitamin A, a minimum daily requirement of 5,000 I.U. has been established for members of the military services. Food sources of vitamin A are liver and liver oils; egg yolk; milk, cheese, and butter; carrots, sweet potatoes; and squash; apricots, peaches, and melons; and leafy green vegetables.

(2) Vitamin D. Vitamin D is essential in the use of minerals required for bone formation as well as for maintenance of good muscle tissues. This vitamin is called the sunshine vitamin because animals, including man, can generate vitamin D in the presence of sunlight. The minimum intake levels for vitamin D have not been established, but all grade A milk for marketing is artificially fortified at a rate of 400 I.U. per quart. A deficiency of vitamin D can cause rickets, which is a disease more common in children.

(3) Vitamin E. The principal value of vitamin E in human nutrition is its action in preventing oxidation of vitamin A in the stomach. The basic requirements for vitamin E may be met by consuming a variety of foods, including wheat germ, cottonseed oil, soybean oil, fortified margarine, beans, eggs, and both green and yellow vegetables.

(4) Vitamin K. Vitamin K is the substance that makes coagulation of the blood possible. Sources of vitamin K are spinach, cabbage, kale, and cauliflower.

**APPENDIX**  
**REFERENCES**

AR 40-25	Nutritional Standards
ST 10-408-1	Nutrition and Menu Planning
TM 8-501	Nutrition

SELF-GRADING  
LESSON EXERCISES

**REQUIREMENT.** Exercises 1 through 6 are matching exercises. Column I lists foods that are the source of certain nutrients required for an adequate diet. Column II lists some of the principal nutrients. Match the nutrients in column II with the food sources in which they are found in column I. Indicate your answer by writing the column II letter below the column I number. Choices in column II may be used once, more than once, or not at all.

Column I

1. Liver and kidneys.
2. Milk and milk products.
3. Pure sugars and honey.
4. Bread and whole grain cereals.
5. Tomatoes and oranges.
6. Sweet potatoes.

Column II

- a. Ascorbic acid.
- b. Calcium.
- c. Fats.
- d. Iron.
- e. Carbohydrates.

**REQUIREMENT.** Exercises 7 through 10 are matching exercises. Column I lists **regulatory** elements necessary for the digestive processes; column II lists the functions performed by these elements. Select the regulatory function in column II performed by the element in column I, and indicate the answer by writing the column II letter below the column I number. The choices in column II may be used once, more than once, or not at all.

Column I

7. Cellulose.
8. Gas.
9. Organic acid.
10. Fiber.

Column II

- a. Balance out acid-forming food.
- b. Retains moisture and provides bulk which causes muscular contraction leading to evacuation.

Column I

Column II

- c. Oxidizes the organic portion of the food, leaving only minerals and ash.
- d. Fruits and vegetables increase the action of the intestinal walls.
- e. Assists in forming acidic elements in the body.

REQUIREMENT. Exercises 11 through 14 are matching exercises. Column I lists minerals found in the body; column II lists the functions of these minerals. Select the function in column II performed by each mineral in column I, and indicate your answer by writing the column II letter below the column I number. The choices in column II may be used once, more than once, or not at all.

Column I

Column II

- 11. Calcium.
- 12. Phosphorus.
- 13. Potassium.
- 14. Sulfur.

- a. Aids in the development of the amino acids, the hormones, insulin, and vitamins in the thiamine group.
- b. Aids in the metabolism of calcium and phosphorus.
- c. Helps to coagulate blood and regulates or controls normal heart rhythm.
- d. Maintains intracellular fluid balance and regulates nervous and muscular irritability.
- e. Contributes to cell activity and to cell multiplication.

REQUIREMENT. Exercises 15 through 18 are matching exercises. Column I lists minerals found in the body; column II lists the functions of these minerals. Select the function in column II performed by each mineral in column I, and indicate your answer by writing the column II letter below the column I number. The choices in column II may be used once, more than once, or not at all.

Column I

- 15. Sodium.
- 16. Chlorine.
- 17. Iodine.
- 18. Copper.

Column II

- a. Contributes to the use of iron in making hemoglobin and is essential to cell respiration.
- b. Regulates the functioning of the thyroid gland.
- c. Contributes functionally to the activation of enzymes, to cell activity, and to cell multiplication.
- d. Stimulates enzyme action and regulates normal heart action.
- e. Maintains water balance in the system, controls muscular and nervous irritability, and helps to relax the heart.

**REQUIREMENT.** Exercises 19 through 22 are matching exercises. Column I lists vitamins that are necessary to prevent certain maladies; column II lists the maladies. Match each malady in column II with the vitamin in column I necessary to prevent the malady. Indicate your answer by writing the column II letter below the column I number. Choices in column II may be used once, more than once, or not at all.

<u>Column I</u>	<u>Column II</u>
19. Thiamine (B <sub>1</sub> ).	a. Skin cuts that are slow to heal.
20. Riboflavin (B <sub>2</sub> ).	b. Rapid decrease in mental concentration and extreme forgetfulness.
21. Niacin (B <sub>3</sub> ).	c. Depression, nervousness, and loss of appetite.
22. Ascorbic acid (C).	d. Burning sensation in the hands and feet.
	e. Stunted growth and unhealthy skin.

**REQUIREMENT.** Exercises 23 through 32 are true-false. Indicate your answer by writing a T or an F next to the exercise number.

23. Jams, preserves, and sirups are quick sources of energy.
24. The vitamin C content in leafy green and yellow vegetables is more stable than in raw or canned tomatoes.
25. White potatoes are a good source of iron and ascorbic acid.
26. Onions, beets, and turnips are high in essential nutrients.
27. Dried prunes, raisins, and apples lose some of their vitamin content in drying.
28. The date of pack is not required on the label of packaged food.



29. The label of packaged food must include the weight, measure, numerical count, or a combination of numerical count and weight or measure.
30. The specific name of a spice, flavoring, or coloring used in packaged food must be included on the label.
31. Man can live longer without food than he can without water.
32. Water helps to maintain the body temperatures required for good health.

REQUIREMENT. Exercises 33 through 40 are multiple choice. Each exercise has only one single-best answer. Indicate your answer by circling the appropriate letter.

33. When military personnel must be fed under special operating conditions, such as in the arctic or in tropical climate, adjustments are recommended in nutritional standards. Who is responsible for recommending these adjustments?
  - a. The nearest food adviser.
  - b. The mess sergeant.
  - c. The commanding officer.
  - d. The appropriate surgeon general.
34. The nutritional standard for daily food allowance of personnel has been established for average heights and weights; for men 68 to 70 inches and 146 to 170 pounds. If a man is larger than the average size, his calorie allowance should
  - a. remain the same.
  - b. be decreased.
  - c. be increased according to weight.
  - d. be increased or decreased according to age.

35. Adult energy requirements are affected by certain factors. Which of the following factors does not affect the energy requirements of an individual from 20 to 25 years of age?
- a. Amount of muscular activity.
  - b. Temperament of individual.
  - c. Weight and shape of the body.
  - d. Age of individual.
36. What is the effect on the body of an oversupply of carbohydrates?
- a. Overweight.
  - b. Physical weakness.
  - c. Indigestion.
  - d. Increase in appetite.
37. What is the effect on the body of an oversupply of fats?
- a. Damage to nerve and brain tissue.
  - b. Onset of rough skin.
  - c. Incomplete digestion and a diseased condition.
  - d. Impairment of regulatory functions. ~~is~~
38. The chief value of protein is to
- a. add to the accumulation of acid in the system.
  - b. promote growth and maintain life.
  - c. help the body store excess protein for energy.
  - d. provide an easily digestible nutrient.

39. Minerals are needed in the body primarily to
- a. preserve fats.
  - b. increase the flow of digestive juices.
  - c. build tissues.
  - d. regulate osmotic pressure and water balance.
40. The iodine content of the body is only about .00004 percent. Which of the following may be caused by extreme deficiencies of iodine?
- a. Pernicious anemia.
  - b. Stunted growth.
  - c. Lesions of the skin.
  - d. Tooth decay.

HAVE YOU COMPLETED ALL EXERCISES?  
DO YOU UNDERSTAND EVERYTHING  
COVERED? IF SO, TURN TO THE NEXT  
PAGE AND CHECK YOUR ANSWERS AGAINST  
THE SOLUTIONS.

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U.S. ARMY QUARTERMASTER SCHOOL  
FORT LEE, VIRGINIA 23801

LESSON 2

# SOLUTION SHEET

Check your work against the solutions given below. If you have made a wrong response or omitted a required response, correct your work. Then, go back and restudy the appropriate text portion once more (references follow each solution).

<u>Ex</u>	<u>Sol</u>	<u>Ref</u>	<u>Ex</u>	<u>Sol</u>	<u>Ref</u>
1.	d	para 2	23.	T	para 7
2.	b	para 4	24.	F	para 10
3.	e	para 22a	25.	T	para 12
4.	e	para 9	26.	F	para 14
5.	a	para 10 & 11	27.	F	para 15
6.	a	para 12	28.	F	para 21e
7.	b	para 20a	29.	T	para 21c
8.	d	para 20b	30.	F	para 21d
9.	d	para 20c	31.	T	para 27
10.	b	para 20a	32.	T	para 27b
11.	c	para 28a	33.	d	para 18
12.	e	para 28b	34.	c	para 18b
13.	d	para 28d	35.	d	para 19a, b, c
14.	a	para 28e	36.	a	para 23
15.	e	para 28f	37.	c	para 24
16.	d	para 28g	38.	b	para 25
17.	b	para 28i	39.	c	para 28
18.	a	para 28j	40.	b	para 28i
19.	c	para 29a(1)			
20.	b	para 29a(2)			
21.	e	para 29a(3)			
22.	a	para 29a(4)			

All references are to the Lesson Text.

HAVE YOU CHECKED YOUR ANSWERS, MADE CORRECTIONS, AND RESTUDIED THE TEXT, IF NECESSARY? IF YOU HAVE, GO ON TO THE NEXT LESSON OF THIS SUBCOURSE.

#### MODIFICATIONS

Pages 61- 62 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.

## LESSON ASSIGNMENT

SUBJECT	Menu Planning and Nutritional Evaluation.
STUDY ASSIGNMENT	Lesson Text.
SCOPE	Menu construction and revision, meal patterns, ration issue frequency; breakfast, lunch, and dinner menu requirements; food groups used for menu planning and item substitutions; short order menus; nutritional evaluations.
OBJECTIVES	<p>As a result of successful completion of this assignment, the student will be able to--</p> <ol style="list-style-type: none"><li>1. Give objectives of master menu.</li><li>2. Explain construction and development of master menus.</li><li>3. Specify types of foods included in meal patterns and explain the different types of ration issue frequency.</li><li>4. Explain menu revision and restrictions at installation level.</li><li>5. Indicate food requirements for breakfast, lunch, and dinner, including nutritional values.</li><li>6. Identify basic considerations in menu planning.</li><li>7. Specify food classifications and groupings.</li><li>8. Explain methods of nutritional evaluation.</li></ol>

## LESSON TEXT

### SECTION I

#### MASTER MENU

1. **OBJECTIVES.** The Army Master Menu is the basic directive for preparing meals served in the Army dining facilities. These menus, as revised by the installation menu board, must provide nutritionally balanced meals which are acceptable to the troops. While medical personnel are responsible for nutritional evaluation of menus, the menus are developed by food service personnel themselves or dietitians employed by activities that are supervised by food service personnel. Unless the food service individual is knowledgeable in the functions of various nutrients, the availability of nutrients in various foodstuffs, and the minimum daily intake requirements for these nutrients, he will not be able to develop or supervise development of menus that require approval by medical personnel. The U.S. Army Troop Support Agency develops basically two different menus, the Army Master Menu and the Standard B Ration Menu, both of which are programed for local changes depending upon troop food preferences and availability of food items. Regulations provide that the food adviser recommends issue factor changes and substitutions to the master menu at installation menu board level. Also, the strongly recommended substitution of compatible, locally available fresh food items for "B" Ration components in operational situations is incumbent upon food service personnel. In such situations, changes are frequently made without prior approval of medical experts.

2. **MENU CONSTRUCTION.** The master menu is developed from the Army Annual Food Plan, which is the basis for the centralized procurement of foods. The master menu is in the process of development from 7 to 15 months before the actual feeding date specified on the menu. For planning purposes the menu board uses the food items specified in the Annual Food Plan for constructing the master menu. The master menu is tested for nutritional adequacy, approved by the appropriate surgeon general, and reviewed by the installation menu board before it is distributed for use at Army dining facilities. By the time the master menu is received by the installation, many of the menu items have been procured. The installation menu board is authorized to make adjustments, including changes and substitutions, but it is not authorized to delete depot-stocked items from the menu. All changes and substitutions recommended by the installation menu board are subject to review by the local surgeon who makes a statement that the menu, as revised, is nutritionally adequate.

3. **FACTORS IN MENU CONSTRUCTION.** The master menus, as revised by the installation menu board, must provide nutritionally balanced meals which are acceptable to the troops. The main dish is the basis for the planning and constructing of any menu. The other food items should be selected to provide variety in color, texture, and flavor. In constructing menus, the following factors must be considered.

a. Meal patterns. A meal pattern is a design which indicates the type of food to be included in each meal. The meal pattern is the basis for menu construction. The master menu provides the following meal patterns used by the Army:

(1) Breakfast.

Fruit or juice.  
Cereals.  
Fresh milk.  
A la carte.  
Toast.  
Butter or margarine.  
Jams or jellies.  
Sweet rolls.  
Coffee.  
Hot tea with lemon slices.

(2) Lunch and dinner.

Appetizer, salad, soup, or juice.  
Main dish.  
Gravy or sauce.  
Potatoes.  
Two vegetables.  
Dressings (assorted).  
Bread.  
Butter.  
Relish tray.  
Dessert(s).  
Iced beverage.  
Milk.

b. Ration issue frequency. The ration issue frequency is determined by the commissary officer in accordance with AR 31-200. The most preferred issue frequency is the daily frequency, so named because issues are made each day of the week for consumption the following day.

4. GUIDES FOR MENU REVISION. To meet local feeding requirements, the installation menu board must make certain adjustments in the master menu. These adjustments are based on information concerning the availability of food items as published by the Defense Personnel Support Center in the "Supply Source of Standard Nonperishable Subsistence, A Guide for DPSC Requisitioners" and in the monthly newsletter from the regional headquarters. Also, information obtained from acceptability surveys should be used when food substitutions are required. Reference should be made to Supply Bulletin 10-501 when menu revisions are made for female personnel. Other considerations for menu revisions are as follows:

a. Substitutions. Under certain circumstances, suitable substitution of items on the master menu is authorized. The monetary value of the items selected as substitutes must not exceed the monetary value of the



basic daily food allowance. Substitution of menu items is specifically authorized as follows:

- (1) When items on the master menu are not available.
- (2) To permit use of locally available authorized fresh and frozen fruits, fruit juices, and vegetables.
- (3) To meet dietary requirements of specific feeding groups such as units composed principally of allied personnel.

b. Minimum changes. Changes in the menu must be kept to a minimum. Installation menu boards are restricted to certain changes when the master menu is revised to meet local requirements. Ration items (for issue to troops) and retail items (for sale in the retail commissary store) may be used interchangeably for both issue and retail sale.

c. Basic considerations. The basic considerations (section II) of menu planning must be adhered to when changes or adjustments are made in the menu. Usually, the quantity of food to be substituted is determined on the basis of experience, but many reliable tables are available for this purpose. The table of food equivalents is provided for item substitutions. (See figure 1.) A food item that is substituted in a planned menu should be nutritionally equivalent to the item which it replaces.

d. Restrictions on prefabricated foods. Additions may be made to the master menu, but prefabricated, processed, or specialty foods that can be prepared or closely approximated from components already in the Army supply program are not prescribed for troop feeding. Introducing prefabricated foods into the supply system could complicate storage because these foods often do not have the keeping qualities of the basic food items.

e. Meal accompaniments. Meal accompaniments such as soups, salads, and desserts should vary depending upon whether a heavy meal or a light meal is being served.

(1) Heavy meal. More time is needed to digest a heavy meal than an average meal. The lunch meal is usually heavier than the breakfast and dinner meals. A heavy meal consists of many individual items, and it is high in calories because it usually contains fatty foods. Therefore, a light soup, light salad, and light dessert should be served with a heavy meal (table 1).

Table 1. Recommended accompaniments for balanced meals

Accompaniment	Heavy Meal	Light Meal
Soups	Clear	Cream
Salads	Raw fruit Raw vegetable	Protein (Poultry and meat)
Desserts	Jellied Ices Chilled fruit	Cakes Pastries Pies Puddings

Table 3-1. Table of Food Equivalents—Continued

Basic item	Weight (pounds)	Substitute items	Weight (pounds)
<b>Group VII Cereals and Other Grain Products</b>			
Bread, fresh, white	1.00	Bread, fresh, French	1.00
		Bread, fresh, raisin	1.00
		Bread, fresh, rye...	1.00
		Bread, fresh, whole wheat	1.00
		Crackers, soda, salted	.63
		Bread and roll-mix.	.75
		Biscuit mix.	.72
Cereals, ready-to-eat	1.00	Cereal, uncooked: rolled oats, wheat farina, whole wheat meal, hominy grits	1.00
Macaroni	1.00	Spaghetti	1.00
		Noodles	1.00
		Rice, parboiled	1.00
<b>Group VIII. Legumes</b>			
Beans, white, dry	1.00	Beans, blackeye, dry	1.00
		Beans, kidney, dry	1.00
		Beans, lima, dry	1.00
		Beans, pinto, dry	1.00
		Beans, white, canned, w' pork in tomato sauce	2.32
<b>Group IX. Leafy, Green, and Yellow Vegetables</b>			
Asparagus, fresh	1.00	Asparagus, canned	0.74
		Asparagus, frozen	.57
Beans, green, fresh	1.00	Beans, green, canned	1.13
		Beans, green, frozen	.87
		Beans, green, dehydrated, raw	.17
		Peas, canned	1.13
		Peas, frozen	.87
Broccoli, fresh	1.00	Broccoli, frozen	.67
Brussel sprouts, fresh	1.00	Brussel sprouts, frozen	.71
Cabbage, fresh	1.00	Cabbage, dehydrated, raw	.10
Carrots, fresh	1.00	Carrots, canned	1.14
		Squash, fresh, winter (all varieties)	.96
		Squash, fresh, summer (all varieties)	.96
		Squash, frozen, summer	.87
Greens, fresh: collards, endive, escarole, kale, spinach, lettuce	1.00	Greens, leafy, frozen	.67
		Cabbage, dehydrated, raw	.08
		Spinach, canned	.82
		Spinach, frozen	.67

Figure 1. Extract from AR 30-1, showing page from Table of Food Equivalents.

(2) Light meal. In a light meal, the total caloric count is low, because there are few individual items and fatty foods. Therefore, a heavy soup, heavy salad, and heavy dessert should be served with a light meal (table 1).

5. **BREAKFAST, LUNCH, AND DINNER REQUIREMENTS.** Acceptable menus must be constructed for breakfast, lunch, and dinner to meet the nutritional standards prescribed for military personnel. Certain types of foods are basic and must be included on the menu for each meal.

a. Breakfast. A substantial breakfast is a "good starter" for a busy or "hard day." Individuals who lead a strenuous life should eat a well-planned breakfast, which usually includes the following items:

(1) Fruit. Citrus fruits, or their juices, are often the preferred choices for breakfast because they are potent sources of vitamin C. Other fruit juices, sliced bananas, and fresh, dried, or canned fruit are also included in the menu for breakfast. Most fruits make a strong appeal to the appetite through the senses of sight, smell, and taste. Most fruits are comparatively low in calories, which in itself may be an asset. They have a high proportion of water which aids in the exchange of body nutrients and metabolic end products. A significant contribution of fruits to the diet is their vitamin content, which varies according to the type of fruit. The caloric value of fruits is proportionate to their carbohydrate content, which is usually in the form of sugar. Dried fruits from which a large quantity of water has been removed are comparatively high in calories. When dried fruits are cooked with water, they have practically the same proportion of carbohydrates as fresh fruits. Canned fruits have more calories because of the sugar sirup in which they are processed. Fruits contain cellulose, hemicellulose, and pectin in varying proportions. These materials aid in the digestive process either as bulk or as stimulants to peristalsis.

(2) Cereals. Cereals are one of the great staples of the human diet because of their widespread cultivation, the comparative ease of transportation, their keeping qualities, and the great variety of products manufactured from them. A hot cereal, such as oatmeal or a whole wheat product, is often served for breakfast, especially in cold weather. The ready-to-eat cereals are convenient when time is a factor, even though they are more expensive than homecooked cereals. Many cereals of both types now have one or more vitamins and minerals added to help restore them to whole grain nutritive value. Whole milk should always be served with the cereals; very often this milk can replace a portion of the milk that should be served each day.

(3) Milk. Although milk is not a perfect food, it is the best single food provided by nature and the only animal food biologically intended for food. No other food can take its place, and it is almost impossible for any combination of other foods to provide as much food value.

(4) Eggs and bacon. Eggs rank next to milk in nutritional value and are among the most valuable foods. They are richer than milk in vitamins, and they contain less calcium but more phosphorus and iron than milk. The protein content of eggs is almost equal to that of milk. An egg

yolk is of greater value than the white because the yolk contains most of the minerals and vitamins. Of the 70 calories furnished by the average egg, about 60 are in the yolk because of the fat in the yolk. Egg white is chiefly a solution of albumin in water. An egg a day, as recommended by many nutritionists, and bacon are excellent menu items for breakfast. Bacon has a high fat content, but bacon and eggs are largely protein and fat and are less likely to stimulate a rapid rise and subsequent drop in blood sugar than carbohydrates. This reaction causes the exhaustion experienced by individuals who eat a light breakfast with a large proportion of starch and sugar.

(5) Toast or rolls. Usually, toast or rolls are served for breakfast. These items may supplement the cereal, or if taken in sufficient quantities, may serve as a replacement for the cereal.

(6) Butter or margarine. Usually, butter contains about 85 percent fat, which has a very high fuel value, about 3,500 calories per pound. Aside from this concentration of fuel value, butter is an excellent source of vitamin A and may contain some vitamin D. These vitamins are retained with the fat when it is removed from the milk. Many butter-like substances called margarine are manufactured from animal or vegetable fats and oils, mainly cottonseed or coconut. These oleomargarines are as nutritionally adequate as butter if they have been fortified with vitamin A. They are less expensive, their fuel value ranks with or above that of butter, and they are completely digestible.

(7) Beverages. Beverages are served either hot or cold. A hot beverage is a desirable item for most adults. In the United States, coffee is the usual choice for breakfast, but tea or cocoa is often used for other meals. Both coffee and tea are highly acceptable because they impart pleasant flavors and provide relatively large quantities of water in the diet. Hot beverages seem to stimulate a sluggish digestion.

b. Lunch. Usually, lunch is the main meal of the day. Certain types of menus are customarily used at this meal. The main course for lunch generally consists of meat, potatoes, at least one green vegetable, bread in some form, a salad, a dessert, and a beverage. A hot soup or a consomme is usually chosen as a lunch soup. Soup has a very definite place in feeding military personnel. Clear soups contain only a slight nutritive value but serve a purpose in stimulating the secretions of the stomach to greater activity. A nutritious cream soup may serve as a substantial basis for a meal. For a well-planned lunch, special consideration must be given to the following menu items:

(1) Meat. Main dishes for lunch menus consist of fresh, variety, prepared, and cured or smoked meats. Various cuts of meat as well as various kinds of poultry or fish are prepared and served in different styles for maximum acceptability. These acceptable styles are influenced by food habits, food preferences, and nutritional considerations. A diet

consisting entirely of vegetables may supply most of the nutrients needed to maintain the body, but the addition of some foods of animal origin is required for proper functioning of the body. The modern Army meets the established requirements for meat by providing at least two entrees for each lunch menu and sufficient quantities of variety and prepared meats for short-order menus.

(2) Fish. Like meat, fish contains both protein and fat. Fish is composed of short muscle fibers, making it easy to chew and digest.

(3) Cheese. Cheese, which shares the high food value of milk, is made by the precipitation of the curd of milk. Since the water is largely removed, it is a concentrated food which retains the original content of milk except albumin (one of the proteins), certain salts, and a portion of the milk sugar and water-soluble vitamins. The vitamin A content is valuable, but the fat content is high in the whole-milk cheeses, which form the bulk of the market varieties. Ordinarily, the food value varies with the water content, which is determined by the softness or hardness of the cheese. Therefore, different types of cheese naturally vary in food value. Cheese in any form is a valuable food with a protein content that is beneficial to the diet. American cheddar cheese, which is most often used, is high in fat, minerals, and protein. Cheese has a distinct, though not strong, flavor which makes it an acceptable meat substitute to individuals who are not content with other foods of milder flavor. The highly flavored, luxury cheeses, both imported and domestic, cost more than American or cheddar cheese. Cottage cheese is usually made from skimmed milk and is less expensive than other cheeses. It is more readily digested than other forms of cheese because of its lesser degree of concentration and because it can be easily chewed. Cheese should be served in combination with other foods as a main dish or as an accompaniment to a salad or a dessert. For example, pie with cheese not only appeals to the appetite but makes a satisfactory and nutritionally adequate dessert.

(4) Vegetables. For a well-balanced diet, vegetables must be included in the daily diet. They are an excellent source of vitamins and some minerals. Dark-green and deep-yellow or red vegetables have a high vitamin A content. The dark-green vegetables include broccoli, collards, kale, spinach, and turnip greens. The deep-yellow or red vegetables are carrots, sweet potatoes, and winter squash. Properly cooked vegetables add interest and enjoyment as well as nutrition to a meal. More flavor and better texture are preserved when vegetables are cooked only long enough to make them tender. Vegetables may be cooked and served according to a variety of styles as shown in table 2. A well-planned lunch menu usually includes the following items:

(a) Potatoes. The food value in potatoes is high mainly because they contain a good amount of minerals, as well as water and vitamins. These nutrients are needed daily for body functions. The warning against

Table 2. Suggested styles for cooking and serving vegetables

	Au Gratin	Baked	Boiled	Cheese Sauce	Creamed	Croquettes	Egg Sauce	Fried	Fritters	Mashed	Raw	Salad	Sandwich	Scalloped	Soup	Spanish Sauce	Steamed	Stuffed	Tomato Sauce
Asparagus	x		x	x	x		x					x		x	x				
Beans, green lima			x	x	x		x					x		x	x				
Beans, dry lima		x				x		x				x	x	x	x				x
Beets			x									x		x	x				
Broccoli	x		x	x	x		x					x		x	x				
Brussels sprouts	x		x	x	x									x	x				
Cabbage	x		x	x	x						x	x	x	x	x	x		x	x
Carrots	x	x	x	x	x	x	x		x	x	x	x	x	x	x				
Cauliflower	x		x	x	x							x		x	x	x			x
Celery	x			x	x	x			x		x	x	x	x	x	x		x	
Corn	x	x	x			x		x				x	x	x	x	x			
Cucumbers									x		x	x	x					x	
Eggplant	x	x	x	x	x				x				x		x	x		x	x
Lettuce					x						x	x	x	x					
Onions	x	x	x	x	x	x		x	x		x	x	x	x	x	x		x	x
Peas			x	x	x	x			x			x	x	x	x				
Peppers						x		x	x		x	x	x	x	x	x		x	
Potatoes	x	x	x	x	x	x	x	x		x		x	x	x	x			x	
Sauerkraut		x	x									x	x						
Spinach (greens)	x		x	x	x		x					x		x	x		x		
Squash (Hubbard)		x				x				x							x	x	
Stringbeans, green	x		x	x	x							x	x	x	x				
Tomatoes	x	x	x	x	x			x				x	x	x	x	x		x	x

"the bread, meat, and potato diet" is not directed against the potato when it is supplemented by green vegetables. Sweet potatoes cooked in the jacket are high in vitamin C.

(b) Other vegetables. Vegetables other than potatoes contain mineral salts and vitamins. They provide the body with considerable cellulose, but most of them are low in caloric value because of their high water content (75 to 95 percent). Some vegetables such as broccoli are rich in vitamin C. Collards, kale, spinach, and turnip greens contain a fair amount of vitamin C; others such as asparagus tips, brussels sprouts, raw cabbage, and tomatoes or tomato juice are rich in vitamin C. Vegetables are served cooked and raw, as in salads.

(5) Salads. The term "salad" has become an all-inclusive term applied to innumerable combinations of vegetables, fruits, meat, poultry, eggs, and fish served crisp and cold with a dressing and garnish. Salads may be served as a meat course or as a separate course. The type of salad served depends upon the following factors:

(a) Classification. Salads are classified according to their value as a food. Some salads serve as appetizers or savories but have little food value; usually, they are made of raw fruits and vegetables with a mineral and vitamin content. Other salads are made from fish, meat, eggs; cheese, and nuts and are usually combined with lighter fruits and vegetables. These salads have a high nutritive value and a high protein content. They may be used as the main course for dinner but are seldom prepared for lunch.

(b) Ingredients. Lettuce is the most popular and most plentiful of the salad greens, but other delicious, succulent leaves are often used. Celery is a stalk rather than a leaf, and it is used as a salad ingredient perhaps more than any other vegetable except lettuce. Other popular vegetable ingredients include romaine, escarole, endive, chicory, watercress, cabbage, and raw spinach.

(6) Desserts. Most desserts are high in sugar and fats but low in other nutrients. Desserts can make a significant contribution to a meal that has a low energy value. If the meal is comparatively rich or heavy, the dessert should be simple. Desserts that are excessively rich in sugars or fats should be avoided, especially in the diet of females. Most acute digestive disturbances are caused by excessive amounts of fats or carbohydrates. Unless milk has been used abundantly in the preparation of other dishes, it is a wise plan to use a portion of the daily milk quota in the dessert. Fresh fruits are excellent desserts because they are easily digested and are rich in vitamins.

c. Dinner. Dinner may serve as a means of making up any diet deficiency that may have existed in the other two meals (breakfast and lunch).

If the full quota of milk has not been consumed, it is advisable to serve a cream soup or chowder, cocoa for the beverage, or a dessert with a custard foundation. If the leafy vegetable has not been used in the lunch meal, a salad is advisable. Modifications can be made to meet the recommended food allowances when it is necessary to cut food costs or when certain foods are not available. More economical cuts of meat or fish may be used; the meat serving may be reduced; and other protein foods, such as peanut butter or soybeans, may be used. Canned tomatoes, raw vegetables, canned grapefruit juice, or low-cost in-season fresh fruits may be used instead of orange juice. Oleomargarine reinforced with vitamin A may be substituted for butter. Evaporated milk may replace a portion of the fresh milk; dry skim milk (fat-free milk solids) is even cheaper and is a good source of all milk nutrients except the fat.

d. Short order menus. To meet troop preferences and requirements, the master menu even provides a menu for short order meals, which may be served daily at noon in addition to the regular lunch meal prescribed. Figure 2 illustrates the short order menu included with the master menu, the a la carte breakfast menu, and the standard short order menu. Implementation of the short-order/specialty house concept also encourages the use of short order menus. Although a specialty house is established primarily to prepare and serve a few select popular dishes as a continuous feature, short order menus are prepared and served as a regular feature.

6. FOOD GROUPS USED BY ARMY MENU PLANNERS. For purposes of menu planning and food analysis, the Armed Forces use a system of food classifications developed by the U.S. Department of Agriculture in cooperation with the Defense Supply Agency. All foods are grouped into 16 food categories. The foods in each category, whether fresh, canned or processed, are similar in nutritive content and in their contribution to the diet. The 16 food groups used by the Army for menu planning are as follows:

- a. Meat, fish, and poultry (Group 1).
- b. Eggs (Group 2).
- c. Milk and milk products other than butter (Group 3).
- d. Butter and other spreads (Group 4).
- e. Other fats and oil dressings (Group 5).
- f. Sugars, sirups, and other sweets (Group 6).
- g. Cereals and other grain products (Group 7).
- h. Mature beans and other legumes (pulses); nuts (Group 8).
- i. Leafy, green, and yellow vegetables (Group 9).



Thursday, May 1, 1975

BREAKFAST

Chilled Grapefruit and  
Pineapple Juice  
Chilled Tomato Juice  
A la Carte Menu  
Baked Bacon Slices (L-2)  
Hot Hominy Grits (E-2)  
Raisin Toast

SHORT ORDER MEAL

Chicken Noodle Soup (P-24)  
Crackers  
Standard Short Order Menu  
Barbecued Beef on Buns (L-26)  
Spring Salad (M-44)  
Vinaigrette Dressing (M-71)  
Stuffed Celery (B-6)  
Butterscotch Brownie a la  
Mode (H-3)  
Banana Cream Pudding (J-20)  
Milk  
Tea  
Coffee (C-5)  
Soft Drinks

LUNCH

Chicken Noodle Soup (P-24)  
Crackers  
Beef Stew  
Parsley Buttered Potatoes(Q-77)  
Baked Knockwurst with  
Sauerkraut (L-60)  
Scalloped Potatoes (Q-53)  
Buttered Whole Grain Corn  
Q-G-1  
Spring Salad (M-44)  
Vinaigrette Dressing (M-71)  
Stuffed Celery (B-6)  
Assorted Breads  
Butter  
Butterscotch Brownie a la  
Mode (H-3)  
Banana Cream Pudding (J-20)  
Milk  
Tea  
Coffee (C-5)  
Soft Drinks

DINNER

Roast Turkey (L-143)  
Turkey Gravy (D-16)  
Baked Ham (L-69)  
Raisin Sauce (D-10)  
Mashed Potatoes (Q-57)  
Glazed Sweet Potatoes (Q-68)  
Buttered Mixed Vegetables  
Q-G-3  
Jellied Cranberry and  
Pineapple Salad (M-24)  
Salad Dressing  
Garden Vegetable Salad (M-19)  
French Dressing  
Pan Rolls (D-33)  
Butter  
Assorted Ice Cream  
Fruit Bars (H-7)  
Yellow Cake (G-32)  
Maple Butter Cream  
Frosting (G-39)  
Milk  
Tea  
Coffee (C-5)  
Soft Drinks

DAILY ALA CARTE BREAKFAST MENU

\*Chilled Fruit or Juice  
Ready-to-Eat Cereal  
\*Hot Cereal  
Fresh Milk  
Eggs to Order  
Griddle Cakes w/Hot Maple Sirup  
French Toast w/Hot Maple Sirup  
\*Meat  
\*Potatoes  
\*Special Hot Breads  
Toast - Butter  
Jam or Jelly  
Tea - Coffee

\*These foods are indicated on the  
daily breakfast menu.

STANDARD SHORT ORDER MENU

\*Soup w/Crackers  
Hamburgers/Cheeseburgers  
Frankfurters  
\*Special of the Day  
Catsup, Mustard, Pickle Relish,  
Chopped Onions  
French Fried Potatoes  
Potato Chips  
\*Salads and Salad Dressings  
Hamburger Buns  
Frankfurter Rolls  
\*Desserts  
\*Beverages

\*As indicated on the daily Short  
Order Meal menu.

Figure 2. Extracts from Master Menu for May 1975, showing menus for  
1 day and a la carte and standard short order menus.

- j. Tomatoes and tomato products (Group 10).
- k. Citrus fruits (Group 11).
- l. Potatoes and sweet potatoes (Group 12).
- m. Other vegetables (Group 13).
- n. Fruits other than citrus (Group 14).
- o. Beverages (Group 15).
- p. Miscellaneous items (includes soups, pickles, relishes, condiments, etc.) (Group 16).

7. SUBSTITUTION OF FOOD ITEMS. When making substitutions in the master menu, the installation menu board uses a table of food equivalents. (See figure 1.) In the table, subsistence items are divided into food groups similar to the groups described in paragraph 6. Each food group is composed of foods that are similar in nutritive contribution and in their use in menu planning. In each food group, one or more foods have been selected as basic. Basic foods are listed in column 1 and substitute items in column 3. Column 4 shows the weight of the substitute item that issue experience has found to be equivalent to 1.0 pounds of the basic item. Since the nutritive value of the quantity shown for each substitute item is equivalent to the nutritive value of 1.0 pound of the basic item, each substitute item in a given group is nutritionally equal to every other item in the group. For example, in group VII, the 72 pounds of biscuit mix are equal to 100 pounds of fresh white bread. The table of food equivalents provides food advisers, menu boards, depot personnel, and other personnel concerned with class I supplies with a means of making proper substitutions in ration planning, menu planning, and issue of subsistence items.

## SECTION II

### BASIC CONSIDERATIONS IN MENU PLANNING

8. **BALANCED DIET.** Meals must be well planned if they are to produce a balanced diet. A balanced diet supplies all of the essential needs of the body and reduces the possibility of disease and physical degeneration. The menus for military personnel are planned by resourceful persons who are on the lookout for the new dishes, new recipes, new ideas, new formulas, or new methods of preparation. They plan the menu to meet the requirements for nutritional adequacy of the diet, acceptance of foods, and practical use of foods on the basis of availability and adaptability of the items for preparation. Menus must afford sufficient variety and nutritional balance for a continuing high standard of acceptability and an adequate diet for military personnel. The requirements for menu planning include a knowledge of various foods, food values, food flavors, and the appearance of cooked foods.

9. **FOOD HABITS.** Nationality and racial food customs are as much a part of the culture of a person as his speech or his mode of dress. When menu planning is influenced by nationality and racial food customs, special consideration must be given as follows:

a. Allied military personnel. Installation menu boards often have the opportunity to guide allied military personnel toward an adequate choice of food. Food customs and religious regulations must be considered when the board recommends menu changes.

b. Cultural patterns. Specific food habits based upon nationality usually persist as long as the cultural pattern, of which they are a part, is continued. For example, individuals accustomed to highly seasoned foods will reduce the use of vegetables cooked in a conventional manner far below that necessary for health. The great problem in menu acceptance is to make these individuals aware of the value of milk and vegetables in the diet.

c. Local consideration. Food habits are also affected by locality. Certain foods are highly acceptable in one part of the country, but these same foods have no appeal in other parts. For example, hush puppies, black-eye peas, and cornbread are very popular in the South; these same foods would not be as acceptable in the New England states.

10. **SEASONAL CONSIDERATIONS.** A good menu should provide food suitable for the season. Digestive disturbances are usually more prevalent in the summer than at any other time. Therefore, all foods during the summer season, especially, meat, milk, fish, and all leftover cooked foods, should be kept in the refrigerator. Occasionally, several persons become ill from food served for some special event, and the incident of illness is traced to

spoilage of a protein food such as chicken salad that has not been properly refrigerated. Menus that include high-calorie foods, especially those rich in fat, should be avoided in the summer. Since energy requirements are slightly higher during winter months, these items are more appropriate for cold weather than for hot. The season of the year also influences the variety of foods on the market and their cost. During the winter months, the variety of fruits and vegetables may be limited. Fruits and vegetables should be used in quantities during the height of the season when they are inexpensive. Seasonable foods offer a particular advantage for the limited food budget. The difference between the menu in the Arctic and in the Tropics is not so much in the foods as in the proportions in which they are used. Troops stationed in frigid zones may require a slight increase in calories.

11. OCCUPATIONAL CONSIDERATIONS. Menus are also influenced by the type of exercise and work performed. Periods of increased activity may often encourage individuals to eat foods that are not too well liked. However, in the military services, any increase or change in menus is made by the installation menu board.

12. FOOD AVAILABILITY AND COST. The most perishable foods are available at nominal cost because of modern methods of transportation and distribution. Therefore, fresh meats, milk, and vegetables may be obtained in large and small localities remote from their production areas. Citrus fruits are available at relatively similar costs throughout the United States. Improvements in canning and preserving processes also make available a wide variety of foods. The availability of food influences the diet, but seasonal availability must be considered in menu planning for the military services. Foods are purchased when they are in season or plentiful and their prices are low. For example, fresh strawberries may appear on the menu during June but never in midwinter. Corn on the cob is a menu item during the summer months. Some foods are substandard during certain times of the year and should not be used at those times. The current food market should be a guide for economy in menu planning. When current foods become too expensive, their use in the menu should be kept to a minimum and necessary substitutions made.

13. FOOD SPECIFICATIONS. The Federal Government has established military and Federal specifications for all food items to insure that military personnel are supplied with wholesome food. Vendors must be sure that their products conform to these specifications when food items are sold to the military services.

14. PERSONNEL CONSIDERATIONS. Successful menu planning cannot be undertaken without carefully considering the food service personnel available to prepare the food. Menu planning is affected by the number of food service personnel assigned to the average military food service facility and their

experience or lack of experience. The efficient use of time by food service personnel must also be considered in menu planning. For example, a menu including cream of tomato soup, broiled steak, stuffed baked potatoes, fresh asparagus, muffins, individual salads, and strawberry shortcake presents difficulties in last-minute preparation. Some dishes are recommended only for special occasions because their preparation requires an excessive amount of time. Examples are canapes, potato balls cut from fresh potatoes, baked Alaska, and french fried onions. Efficient planning for a period of several days should provide a balanced time-expenditure that will occasionally permit serving foods such as fresh peas and french fried onions without creating undue pressure. The use of numerous foods that require lengthy and last-minute preparation and time-consuming labor can cause the usually heavy workloads. These conditions can endanger the morale of the food service personnel, disrupt the organization, and prove expensive. In menu planning, cooks must be considered, but the menu should not be planned especially for their convenience.

15. EQUIPMENT CONSIDERATION. Equipment and layout of food service facilities must be considered in menu planning. For example, limited oven space prevents the preparation of roasts, quick breads, and cakes for the same meal unless some of the items are prepared in advance. This practice is not desirable, because it prevents serving the foods when their flavor and texture are at their best. Inadequate refrigeration may complicate the problem if jellied salads and cornstarch pudding are planned for the same meal. Both of these items are appetizing only when they are served well chilled. Increased use of convenience (frozen) foods also places severe requirements on already overtaxed refrigerated facilities. The type of service depends greatly upon the layout and the equipment on hand.

16. SPECIAL OCCASIONS. Special consideration should be given to menu planning for special occasions such as Christmas, Thanksgiving, Washington's Birthday, St. Patrick's Day, or Independence Day. Christmas and Thanksgiving are always celebrated with large feasts, but cherry pie on Washington's Birthday, heart-shaped cookies on St. Valentine's Day, and Kelly green cake decorations on St. Patrick's Day are morale builders; their values should not be overlooked.

17. STAYING QUALITIES. Well-planned meals should include foods that give a feeling of satisfaction which lasts until almost time for the next meal. Both the form and composition of food influence the staying quality which is largely dependent upon the rate of digestion of the food and its subsequent passage from the stomach. The time during which the food is retained in the stomach depends upon quantity and quality. Water usually enters the small intestines within 15 to 30 minutes after its ingestion, but protein and fats and meals composed of mixed food items may require several hours for their complete reduction. Fats always serve as retarding agents. When large amounts of fats are consumed, digestion of the whole meal may be delayed. If foods are coated with fat, either in cooking or serving, the digestive juice must penetrate the coat before it can reach the protein and carbohydrates. This action lengthens the time required for digestion.

18. **DIETETIC VALUES.** Although the present field ration system insures a well-balanced diet, a general background of practical dietetics is required for successful menu planning. Dietetic values are usually determined on the basis of the following factors:

a. Nutritional standards. The basic nutritional standards established by the Surgeon General represent the minimum amounts of essential nutrients which, if properly used and consumed, meet the requirements for health. The standards are established for personnel operating under average or normal conditions of activity and consequent expenditure of energy over periods exceeding 1 week.

b. Activity. Some troops will require diets with more or fewer calories than those prescribed. Likewise, troops of the "teen-age" group require more nutrients for growth purposes in addition to normal energy expenditure. In these cases, dietary levels must be determined by local medical authority.

c. Climate. Weather temperatures should be considered in menu planning. For example, when temperatures in Arctic areas are in the subzero level over periods of more than 1 week, the ration should be adjusted to provide an adequate caloric level.

19. **KEEPING QUALITIES.** Regulations require that certain foods such as ham salad, chicken salad, cream fillings, cream sauces, custards, and hash must not be prepared more than 3 hours in advance of serving time because of potential food poisoning dangers. Ice cream or other highly perishable foods should not be included in the menu unless delivery dates coincide with the menu. Since all foods deteriorate to some extent, even under the most favorable storage conditions, the issue and consumption dates must be carefully aligned to prevent unnecessary loss of food values.

20. **NUTRITIONAL BALANCE.** A tasty meal is not always well-balanced, nor is a well-balanced meal always tasty. A well-balanced meal should contain bulky foods such as fruits, vegetables, or whole grain products; alkaline foods such as nuts, milk, fruits, and vegetables; sugar and starches, especially from fruits and vegetables; proteins such as meats, fish, eggs, or cheese; minerals from foods such as fruits and vegetables; vitamins from milk, fruits, and vegetables; and sufficient liquids.

21. **DIRECTIVES.** Certain directives may be issued from higher headquarters or local commanders to include or exclude various items in the master menu. The U.S. Army Troop Support Agency may issue a directive to incorporate changes or substitutions to the master menu. Local commanders may issue directives to certain units when additions to the master menu are needed to provide added nutritive requirements as specifically recommended by the installation surgeon.

22. **TROOP ACCEPTABILITY.** Food must taste, smell, and look good to be acceptable. In menu planning, special consideration must be given to high standards of preparation and service as well as to interesting combinations of foods. When raw materials of high quality are carelessly prepared, overcooked, or cooked with too much heat, the finished meal will be unpalatable. Foods should provide variety and flavor as well as contrast in texture and color.

a. **Variety.** To meet troop acceptability requirements, variety in choice and preparation of foods is important in menu planning. Many food items may be cooked by several different cooking methods. For example, fish may be fried, broiled, or baked; white potatoes may be baked, boiled, or fried; ham may be baked, boiled, or fried; and oysters may be baked, fried, or stewed.

b. **Flavor.** Menus should be planned to avoid the repetition of flavors in each meal. For example, a salad containing grated cheese should not be served with macaroni and cheese; a tomato salad should not be served with meat loaf having a tomato sauce. Similar vegetables, such as green beans, lima beans, and english peas, should not be used on the same plate. General likes and dislikes affect the use of flavor combinations; two strong flavors which are not generally well liked should not be used in the same meal. All sharp or all bland flavors spoil the taste and appetite appeal of a meal. Foods with mild flavors are often served with an accompaniment to pep up the flavor and add zest to the meal. For example, turkey is usually served with cranberry sauce; and lettuce salad is served with roquefort cheese dressing. Relishes often add the extra flavor which many foods lack. A good balance of flavor can be maintained by including a little sweet, a little sour, and a little bland in each menu.

c. **Color.** The appetite and ingestion are influenced by color and color combinations of food. The natural colors of certain foods may be preserved during the cooking process. For example, spinach will retain its green color and present an appetizing appearance if it is properly cooked. A meal consisting of food items of the same color is not as attractive as one having items of contrasting colors. When the meal is planned according to a color scheme, often the colors detract from the meal--for example, a Christmas dinner with too many red and green foods and garnishes or a St. Patrick's Day party overemphasizing green. Artificial coloring of food is not highly recommended, and it should be attempted only with discretion and after careful thought. Garnishes improve the color and appearance of food, but even an excess of these should be avoided.

## SECTION III

### NUTRITIONAL EVALUATION OF MASTER MENU

23. **GENERAL.** The evaluation of menus to determine their nutritional adequacy is a responsibility of medical personnel. The Surgeon General is responsible for the nutritional adequacy of the CONUS master menu, and the Command Surgeons for inspecting the separate theater menus. If any local changes are made to these menus, the local surgeon is responsible for evaluating the menus for nutritional adequacy. However, the actual development of the menu is a food service function. Therefore, food service personnel must be familiar with nutritional criteria, such as nutritional standards, evaluation procedures, and composition of foods, used by medical personnel. Food advisers (MOS 4114) and food service technicians (MOS 941A) usually make nutritional evaluations of the master menu just before attending the installation menu board meeting. The primary purpose of their analyses is to become familiar with the percentage of nutrients in the master menu which helps to conserve time and effort in making computations because of changes, additions, deletions, and substitutions. Nutritional evaluations, varying in degrees of accuracy, can be made for differing menu periods, which range from one meal to several years. The typical analysis period is 1 month, which corresponds to the time period of most standard menus. The methods of nutritional evaluations range from the simple thumbnail analysis to the complex long-method analysis.

24. **THUMBNAIL ANALYSIS.** A nutritional evaluation of the master menu by the thumbnail analysis method requires only a few minutes. This evaluation provides a guide for menu substitutions involving energy nutrients. Thus the total caloric values and gram values of these nutrients are necessary for the evaluation, as well as the acceptable percentage range of each in a well-balanced meal. A knowledge of basic mathematics is also necessary to make a few simple computations.

a. Acceptable caloric values of nutrients. The caloric value of a nutritionally adequate ration should range from 40 to 60 percent for carbohydrates; 20 to 40 percent for fats; and 10 to 15 percent for protein. Generally, a fat content below 40 percent is desirable; fats should not account for more than 40 percent of the total calories, whichever is less.

b. Caloric value of menu. Since only carbohydrates (4 calories/gram), fats (9 calories/gram), and proteins (4 calories/gram) can yield energy, the total caloric value of the menu must be provided by these three nutrients. The master menu contains a list which shows the total calories in the ration as well as the fat and protein content (grams). When specific procedures are followed, the caloric value of each nutrient can be quickly determined. By turning to the first two pages of the master menu and converting the values listed into percentages, the protein, fat and carbohydrate content can be established as acceptable or nonacceptable. By adding



the calories contributed by protein and fats and subtracting this sum from the total caloric value of the menu, the difference indicates the calories provided by carbohydrates.

c. Example: Total calories in menu, 4,200; protein content, 126 grams; fat content, 203 grams.

Step 1. Convert protein content listed in grams to calories (1 gram protein equals 4 calories) and find percent of total caloric value:

$$126 \text{ grams} \times 4 = 504 \text{ calories}$$

$$\frac{504}{4,200} = .12 \text{ or } 12 \text{ percent (protein percentage)}$$

Step 2. Convert fat content listed in grams to calories (1 gram fat equals 9 calories) and find percent of total caloric value:

$$203 \text{ grams} \times 9 = 1,827 \text{ calories}$$

$$\frac{1,827}{4,200} = .43 \text{ or } 43 \text{ percent (fat percentage)}$$

Step 3. Find carbohydrates content by adding protein and fat content, and subtracting sum from total calories in menu.

$$504 \text{ calories (protein)} + 1,827 \text{ calories (fat)} = 2,331 \text{ calories}$$

$$4,200 \text{ calories (Total in menu)} - 2,331 \text{ calories} = 1,869 \text{ calories (carbohydrates)}$$

$$\frac{1,869}{4,200} = .45 \text{ or } 45 \text{ percent (carbohydrates content)}$$

Step 4. Compare percentage values of protein, fat, and carbohydrate contents with acceptable percentage range:

<u>Nutrient</u>	<u>Percentage (Menu)</u>	<u>Acceptable Percentage Range</u>
Protein	12	10-15
Fat	43	20-40
Carbohydrate	45	40-60

Conclusion: Fat content approaches upper tolerance level; therefore fat content is higher than desirable. (See a above.) Protein content is well within acceptable range. Carbohydrates content is bordering on lower range.

Decision: If substitutions are made, the fat content should be reduced and the carbohydrate content increased.

25. **SHORT METHOD ANALYSIS.** If the thumbnail analysis reveals a serious deficiency or if a more detailed evaluation is required, the short method analysis should be used to determine if the menu as planned provides the minimum required amounts of essential nutrients. (See figure 3.) When nutritional evaluation is made by the short method analysis, the quantity of each essential nutrient supplied by the ration is computed for each food group, assuming that each food group within the analyzed menu is balanced to provide a nutrient content as listed in table 3.

Computation. To make the short method analysis, take the following steps:

Step 1. Using the recapitulation data, break out lean pork and liver from the meat, fish, and poultry groups. (Liver is high in vitamin A, and lean cuts of pork (loins, ham, shoulder, butt) are high in thiamine (B<sub>1</sub>). Therefore on the evaluation form they are listed in subcategories from other meat, fish, and poultry. In computing their quantity, a 5 percent allowance in total weight should be subtracted to allow for preparation loss.)

Step 2. Identify each food item programed in the menu according to one of the food groups listed in table 3, which lists the nutrient composition of an average pound of food by food groups. Compute actual food value of the menu by multiplying individual nutrient values by FMPD (provided one man per 1 day of the menu) corrected.

Step 3. Add individual nutrient values, for each food group and compare results with minimum daily requirements as listed in table 3.

Step 4. In the event that some nutrient is provided below the level specified in minimum daily requirements as listed in table 3, seek to increase food item high in the desired nutrient. If no adjustments are required the computation is complete.

26. **LONG METHOD ANALYSIS.** The long method of nutritional analysis goes into considerable qualitative detail and therefore requires a long period of time to complete. It differs from the short method in that each and every item included in the menu is computed independently. The individual nutrient content of the daily issue for one man is computed for each item, totaled, and then compared to minimum daily requirements. Any necessary adjustments that emerge from this comparison can then be made on individual food items instead of on a food group basis as in the short method.

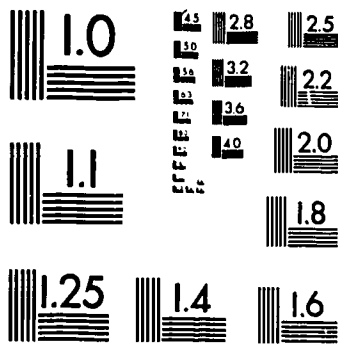
Food groups	Pounds per man per day	Calcium	Protein (gm)	Fat (gm)	CHO (gm)	Calcium (mgm)	Iron (mgm)	Vitamin A I.U.	Thiamin (mgm)	Riboflavin (mgm)	Niacin (mgm)	Ascorbic acid (mgm)
Meat, fish and poultry.	0.87	738	49	59	3	29	5.7	190	.80	.33	9.0	.....
Lean pork.....	0.14	145	8	13	0	4	1.1	0	.27	.07	1.4	.....
Liver.....	0.02	9	1	0	0	1	.9	1368	.01	.16	.8	2
Eggs, fresh.....	0.185	91	7	7	0	33	1.7	699	.05	.18	0	.....
Milk products.....	1.237	568	25	33	42	909	.6	148	.20	1.21	.7	6
Butter.....	0.095	283	0	31	0	6	.1	1209	0	0	0	.....
Fats, other.....	0.07	213	0	23	0	1	.1	16	0	0	0	.....
Sugars.....	0.285	421	1	0	108	18	.9	2	0	0	.1	1
Cereal products.....	0.51	659	20	6	131	95	5.2	7	.59	0	5.2	.....
Legumes.....	0.038	46	30	15	50	147	9.2	8	.06	0	0	.....
Vegetables, leafy green and yellow.	0.440	45	2	0	8	37	1.4	5300	.06	.08	.5	11
Tomatoes.....	0.114	184	6	1	38	49	2.9	5668	.29	.17	4.1	67
Citrus fruits.....	0.225	677	9	2	155	153	2.5	668	.38	.14	1.4	32
Potatoes, Irish.....	0.526	123	5	.....	28	23	1.5	36	.13	.06	1.8	18
Vegetables, other.....	0.269	51	2	0	10	20	.4	58	.03	.04	.2	4
Fruits, other.....	0.422	97	1	0	23	16	.5	479	.05	.03	.4	8
Fruits, dried.....	0.015	17	0	0	4	4	.3	94	0	.01	.1	0
<b>TOTAL (PMPD).</b>	<b>5.461</b>	<b>4367</b>	<b>164</b>	<b>190</b>	<b>600</b>	<b>1545</b>	<b>35.0</b>	<b>15948</b>	<b>2.42</b>	<b>2.48</b>	<b>25.7</b>	<b>144</b>

Figure 3. Nutritional evaluation form showing computations based on weighted nutrient values given in table 3.



Table 3. Nutrients per pound of food groups "as purchased" (corrected to yield nutrients consumed)

Food group	Calories	Protein (gm)	Fat (gm)	CNO (gm)	Calcium (mg)	Iron (mg)	Vitamin A I.U.	Thiamin (mg)	Riboflavin (mg)	Niacin (mg)	Ascorbic acid (mg)
Meat, fish, and poultry.....	848	56	68	3	33	6.5	218	0.35	0.39	10.3	0
Lean pork.....	1036	56	90	0.21	29	7.8	0	1.93	0.50	10.1	0
Liver.....	471	70	12	21	28	43.2	68,380	0.63	8.00	43.0	77
Eggs, fresh.....	492	40	36	2	180	9.0	3,780	0.27	1.00	0.2	0
Milk products.....	459	20	27	34	735	0.5	1,200	0.12	0.90	0.6	5
Butter.....	2977	3	330	2	65	0.8	12,723	0.01	.04	0.4	0
Fats, other.....	3041	1	334	7	19	1.3	228	.03	.03	0	0
Sugars.....	1476	2		379	64	3.3	8	.01	.01	0.3	2
Cereals.....	1292	40	12	256	186	10.2	13	1.17	1.30	10.3	0
Legumes.....	1200	78	50	132	388	24.2	199	1.08	1.10	20.7	5
Vegetables, leafy green and yellow.....	103	5	1	19	85	3.2	12,045	0.13	0.16	1.0	24
Tomatoes.....	161	5	1	33	43	2.5	4,970	.25	.15	3.6	59
Citrus fruits.....	301	4	1	69	68	1.1	297	.17	.06	0.6	140
Potatoes.....	233	5		54	43	2.8	69	.25	.12	3.4	24
Vegetables, other.....	190	6	2	37	74	1.5	215	.10	.14	1.0	13
Fruits, other.....	229	2	1	54	38	1.2	1,134	.12	.06	1.0	20
Fruits, dried.....	1132	10	2	269	243	16.8	6,293	.28	.52	5.9	29
Miscellaneous.....	408	12	20	45							



MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS  
STANDARD REFERENCE MATERIAL 1010a  
(ANSI and ISO TEST CHART No. 2)

## APPENDIX

### REFERENCES

- AR 30-1                    The Army Food Service Program
- AR 40-25                   Nutritional Standards
- SB 10-260                  Master Menu
- TM 8-501                   Nutrition
- FM 10-23                   Army Troop Feeding Operations
- ST 10-408-1               Nutrition and Menu Planning
- Harris, Florence L., and Withers, Rex T., Your Foods Book, D. C. Heath and Company, Boston, Massachusetts, 1964
- McDermott, Irene E., Trilling, Mabel B., and Nicholas, Florence W., Food for Modern Living, J. B. Lippincott Company, New York, 1967.
- Stevenson, Gladys T., and Miller, Cora, Introduction to Foods and Nutrition, John Wiley and Sons, Inc., New York, 1960

## LESSON 3

SELF-GRADING  
LESSON EXERCISES

REQUIREMENT. Exercises 1 through 34 are multiple choice. Each exercise has only single-best answer. Indicate your answer by circling the appropriate letter.

1. Who has basic responsibility for developing the Army Master Menus?
  - a. The Surgeon General.
  - b. The Installation Menu Boards.
  - c. The U. S. Army Troop Support Agency.
  - d. The Army food advisers.
  
2. What is the objective of the Army Master Menu?
  - a. To be used as a menu guide by dining facility personnel.
  - b. To save money on food items by buying in bulk quantities.
  - c. To ensure that all troops are fed the same meals.
  - d. To provide nutritionally balanced meals that are acceptable to the troops.
  
3. Who recommends issue factor changes and substitutions to the master menu at installation menu board level?
  - a. Installation commander.
  - b. Food adviser.
  - c. Surgeon.
  - d. Company commander.

4. What use is made of the Army Annual Food Plan in the construction of the master menu?
  - a. Food items specified in the plan are used for menu planning purposes.
  - b. Master Menu Board procures food for the menu according to the Annual Food Plan.
  - c. Annual Food Plan is used to insure nutritional adequacy.
  - d. Annual Food Plan is used to determine caloric requirements.
  
5. To meet local feeding requirements, certain adjustments must be made in the master menu by the
  - a. installation commander.
  - b. surgeon.
  - c. food adviser.
  - d. installation menu board.
  
6. Who gives the final approval at installation level to a change in the Army master menu?
  - a. Installation food adviser.
  - b. Installation menu board.
  - c. Local surgeon.
  - d. Installation commander.
  
7. Which one of the following is the basis for menu construction?
  - a. The food groups.
  - b. The meal pattern.
  - c. The nutritional standards.
  - d. The meal accompaniments.



8. The Army Master Menu provides a meal pattern for menu construction. Which of the following groups of food items contain items specified for breakfast only?
- Appetizer, cereal, and jam.
  - Cereal, main dish, and salad.
  - Juice, potatoes, and jam.
  - Fruit, cereal, and jelly.
9. Under which one of the following circumstances are items authorized for substitution in the master menu?
- When the total caloric count of the menu is low.
  - To permit use of locally available vegetables.
  - When installation troop strength increases.
  - To permit use of excess quantities of a particular item.
10. Which one of the following statements represents a basic consideration of menu planning?
- Meal accompaniments selected should be of one type which is suitable for any meal.
  - A variety of changes should be made in the master menu to promote troop acceptability.
  - A substitute food item in a planned menu should be nutritionally equivalent to the items it replaces.
  - Prefabricated foods are recommended as substitutes for master menu items because they have similar nutritional values.
11. Which of the following would have the nutritional equivalent of 100 pounds of fresh green beans?
- 113 pounds of canned peas.
  - 113 pounds of frozen green beans.
  - 87 pounds of canned green beans.
  - 67 pounds of frozen broccoli.

12. Fruit and fruit juices should be included in a well-planned breakfast because of the benefits derived from their
- low caloric value, high mineral content, and high fuel value.
  - high proportion of water, low caloric value, and high vitamin C content.
  - low caloric value, high fuel value, and high food value.
  - high vitamin content, high caloric value, and high proportion of water.
13. Eggs and bacon are excellent menu items for the breakfast meal because of their value as a
- dietary supplement for whole-grain nutritive value cereals.
  - source of nutrients that prevent fluctuations in blood sugar.
  - combination food containing a high concentration of minerals.
  - source of carbohydrates which aids in the digestive process.
14. Fresh fruits are excellent desserts because they are
- easy to procure and prepare.
  - usually good substitute items for richer foods.
  - easily digested and rich in vitamins.
  - easily stored until serving time.
15. For a nutritionally adequate daily diet, the menu for the dinner meal should provide a
- variety of wholesome food items that are not appropriate for the breakfast and lunch meals.
  - combination of food items selected according to nationality and racial food customs.
  - supply of nutrients that will make up for the nutritional deficiencies in the breakfast and lunch meals.
  - choice of food items selected according to the local tastes of military personnel.

16. For which meal(s) does the master menu prescribe a short order menu?
- Breakfast.
  - Lunch.
  - Dinner.
  - Lunch and dinner.
17. For menu planning, the Armed Forces use food classifications based on
- 15 food groups.
  - 16 food groups.
  - 17 food groups.
  - 18 food groups.
18. A meal planned for hot summer months should AVOID
- foods prepared with milk and eggs.
  - jellies, jams, and sirups.
  - foods rich in fats.
  - fruits and vegetables.
19. The installation board is making substitutions to the master menu. Which of the following will NOT require primary consideration by the board?
- Food habits of installation personnel.
  - Food availability and cost.
  - Convenience of the food service personnel.
  - Nutritional balance of each meal.

20. In menu planning, consideration should be given to three of the following factors. Select the factor that should NOT be considered.
- Time required for food preparation.
  - Local refrigeration facilities.
  - Kitchen equipment available.
  - Quality of food procured.
21. Menus planned for special occasions such as Christmas, Thanksgiving, and Washington's birthday are important as
- nutritional equivalents.
  - morale builders.
  - dietetic factors.
  - historical factors.
22. Which nutrient affects the staying quality of food by delaying digestion?
- Protein.
  - Carbohydrates.
  - Fats.
  - Vitamins.
23. The basic nutritional standards established by the Surgeon General for the minimum amounts of essential nutrients to meet the requirements for health are
- for personnel operating under normal conditions for 1 day.
  - for personnel operating under normal conditions for 1 week.
  - for personnel operating under normal conditions for periods exceeding 1 week.
  - for personnel operating under unusual conditions for 1 week.

24. The caloric requirements for meals are NOT affected by
- weather temperature.
  - energy expenditure.
  - troop age.
  - time of day.
25. Regulations require that certain foods must not be prepared more than 3 hours in advance of serving. Which items must meet these requirements?
- Sweet rolls, bread, and muffins.
  - Ham salad, chicken salad, and custard.
  - Roast, chicken, and fish.
  - Pie, cake, and jello.
26. A nutritionally balanced menu obtains its bulky foods from
- nuts, vegetables, and meats.
  - cheese, eggs, and whole grain products.
  - fruits, vegetables, or whole grain products.
  - sugar, starches, and nuts.
27. A nutritionally balanced meal should contain
- a supply of vitamins, carbohydrates, fats, sugar and starches, vegetables, alkaline foods, and minerals.
  - adequate minerals, proteins, bulky foods, vitamins, fats, trace elements, and starches.
  - a bulky food, proteins, alkaline foods, sugar and starches, minerals, vitamins, and liquids.
  - sufficient liquids, trace elements, alkaline foods, acid foods, starches and fats, proteins, and minerals.

28. Variety is attained in menus by
- a. preparing food items in suitable alternate styles.
  - b. cooking foods at different temperatures.
  - c. providing foods with varying caloric contents.
  - d. offering a choice of food items.
29. Nutritional evaluation of menus is usually made on the basis of
- a. one day.
  - b. one week.
  - c. one month.
  - d. one year.
30. What is the purpose of a nutritional evaluation of the master menu?
- a. To convert fats to carbohydrates.
  - b. To recommend substitutions for food items.
  - c. To determine the caloric count of each meal.
  - d. To determine the adequacy of the ration.
31. A thumbnail evaluation of the master menu requires a
- a. few minutes.
  - b. few days.
  - c. few weeks.
  - d. few months.

32. A well balanced ration should have a certain percentage of each energy nutrient. What should be the proper caloric proportions of a nutritionally adequate ration?
- a. Fats, 40 to 60 percent; carbohydrates, 10 to 15 percent; proteins, 20 to 40 percent.
  - b. Carbohydrates, 40 to 60 percent; proteins, 10 to 15 percent; fats, 20 to 40 percent.
  - c. Proteins, 70 to 75 percent; carbohydrates, 20 to 25 percent; fats, 5 to 10 percent.
  - d. Carbohydrates, 30 to 40 percent; fats, 15 to 25 percent; proteins, 40 to 60 percent.
33. A thumbnail analysis of the master menu requires a knowledge of the caloric value and gram value of fats and proteins. Which of the following choices has the correct caloric and gram values for each?
- a. 1 gram fat equals 7 calories; 1 gram protein equals 3 calories.
  - b. 1 gram fat equals 9 calories; 1 gram protein equals 4 calories.
  - c. 1 gram fat equals 12 calories; 1 gram protein equals 6 calories.
  - d. 1 gram fat equals 15 calories; 1 gram protein equals 7 calories.
34. A nutritional evaluation by the long method analysis is primarily concerned with the
- a. caloric value of each nutrient in each food item as computed for each food item.
  - b. individual nutrient content of the daily issue for pounds per man per day as computed for each food item.
  - c. caloric value of each nutrient in each food item as computed for each food group.
  - d. nutrient content of the daily issue for pounds per man per day as computed for each food group.

REQUIREMENT. Exercises 35 through 50 are true-false. Indicate your answer by writing a T or an F next to the exercise number.

35. The table of food equivalents is used to determine the quantity of food items to be used in making substitutions in the master menu.
36. Additions may be made to the master menu by using prefabricated, processed, or specialty foods.
37. A simple dessert should be served after a light meal to provide adequate energy value.
38. Most fruits appeal to the appetite through sight, smell, and taste.
39. When dried fruits are cooked with water, they contain about the same proportion of carbohydrates as fresh fruits.
40. Milk is the best single food provided by nature.
41. Eggs are richer in vitamins and contain more phosphorus and iron than milk.
42. Usually, breakfast is the main meal of the day.
43. Meats are required in the daily diet to supply most of the nutrients needed to maintain the body.
44. Fish is easy to chew and digest because it is composed of short muscle fibers.
45. Most desserts are high in sugar and fats but low in other nutrients.
46. Short order menus and select popular dishes are prepared and served in the specialty house.



47. Food items from one food group may be substituted for items in another food group without seriously affecting the nutritional value of the menu.
48. Usually, the installation menu board furnishes guidance to Allied military personnel in choosing adequate food in U.S. military dining facilities.
49. Food products delivered by vendors are not required to conform to military specifications.
50. The flavor of food items may be changed by the amount of heat and the length of time required for cooking them.

HAVE YOU COMPLETED ALL EXERCISES?  
DO YOU UNDERSTAND EVERYTHING COVERED?  
IF SO, TURN TO THE NEXT PAGE AND CHECK  
YOUR ANSWERS AGAINST THE SOLUTIONS.



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# SOLUTION SHEET

Check your work against the solutions given below. If you have made a wrong response or omitted a required response, correct your work. Then, go back and restudy the appropriate text portion once more (references follow each solution).

<u>Ex</u>	<u>Sol</u>	<u>Ref</u>	<u>Ex</u>	<u>Sol</u>	<u>Ref</u>
1.	c	para 1	26.	c	para 20
2.	d	para 1	27.	c	para 20
3.	b	para 1	28.	a	para 22a
4.	a	para 2	29.	c	para 23
5.	d	para 2	30.	d	para 23
6.	c	para 2	31.	a	para 24
7.	b	para 3	32.	b	para 24a
8.	d	para 3a	33.	b	para 24b
9.	b	para 4a	34.	b	para 26
10.	c	para 4c	35.	T	para 4c
11.	a	para 4c & fig. 1	36.	F	para 4d
12.	b	para 5a(1)	37.	F	para 4e(2)
13.	b	para 5a(4)	38.	T	para 5a(1)
14.	c	para 5b(6)	39.	T	para 5a(1)
15.	c	para 5c	40.	T	para 5a(3)
16.	b	para 5d	41.	T	para 5a(4)
17.	b	para 6	42.	F	para 5b
18.	e	para 10	43.	F	para 5b(1)
19.	e	para 14	44.	T	para 5b(2)
20.	d	para 14, 15	45.	T	para 5b(6)
21.	b	para 16	46.	T	para 5d
22.	e	para 17	47.	F	para 7
23.	e	para 18a	48.	T	para 9a
24.	d	para 18a, b, & c	49.	F	para 14
25.	b	para 19	50.	T	para 22

All references are to the Lesson Text.

HAVE YOU CHECKED YOUR ANSWERS, MADE CORRECTIONS, AND RESTUDIED THE TEXT, IF NECESSARY? IF YOU HAVE, GO ON TO THE EXAMINATION FOR THIS SUBCOURSE.

#### MODIFICATIONS

Pages 99-100 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.

# EXAM 326

## *Correspondence Subcourse Examination*

# WAIT

DO NOT GO ON TO THE EXAMINATION EXERCISES UNTIL YOU HAVE STUDIED AND COMPLETED ALL LESSONS IN THIS SUBCOURSE. READ THE SPECIAL INSTRUCTIONS (NEXT PAGE) BEFORE STARTING EXAMINATION.

## SPECIAL INSTRUCTIONS

1. **PREPARING FOR EXAMINATION.** Before completing this examination, it is suggested that you review each lesson in the subcourse. Check your answers against the solutions given at the back of each lesson. If you have any questions regarding lesson text, lesson exercises, or exercise solutions, use the student inquiry sheet accompanying the lesson.

2. **COMPLETING EXAMINATION.** Read all directions before completing examination exercises. Check off your answer to each exercise in this examination booklet before indicating your answer on the answer form. Finally, complete the exercises following instructions in NIPUB 203, Correspondence Course Instruction Booklet (sent to you previously). Check your answers before sending in your completed examination answer form. It is suggested that you complete all exercises in this examination. An educated guess is better than an omission.

3. **RETURNING ANSWER FORM.** When you have completed all examination exercises, return the examination answer form in the addressed envelope provided.

4. **EVALUATING SUBCOURSE.** You will find a form, student evaluation of subcourse, at the end of the examination exercises. Before filling out this form, read the INSTRUCTIONS at its top. After filling out the form, return it with your examination answer form.

5. **USING INQUIRY FORM.** A student inquiry sheet is bound in this booklet at the end of the examination. You may use this form for questions regarding administrative matters or legibility of examination materials. The form may also be used for requesting enrollment in an additional correspondence course or in specific subcourses upon completion of current correspondence-course commitments.

**EXAMINATION ASSIGNMENT**

<b>SUBJECT</b>	Nutrition and Menu Planning.
<b>STUDY ASSIGNMENT</b>	Review all lesson study assignments.
<b>SCOPE</b>	Principles of nutrition, including nutrients, and effects of digestive processes on each individual's caloric and nutritive requirements; basic food groups, and importance of each in menu planning; composition of foods and nutritional contents; nutritional standards and adult energy requirements; meal patterns and ration issue frequency; identification of 16 food groups used in Army/Air Force menu-construction and nutritional evaluation.
<b>OBJECTIVES</b>	To test student attainment of lesson objectives and to emphasize points that have previously been studied.

## EXAMINATION EXERCISES

REQUIREMENT. Exercises 1 through 33 are multiple choice. Each exercise has only one single-best answer. Indicate your answer on the answer form.

1. Which of the following contains four outward signs of good nutrition?
  - a. Correct weight for height and age; skin fine grained; hair glossy; full of vitality.
  - b. Muscles long and smooth; eyes clear; appetite good; expression alert.
  - c. Chest up; sleep eight hours; elimination good; body well-developed.
  - d. Eyes clear; head erect; attitude buoyant; shoulders flat.
  
2. Nutrition is defined as
  - a. the treatment of disease by the kind of food consumed.
  - b. any combination of nutrients.
  - c. the body condition resulting from the food consumed.
  - d. the sum of the energy producing nutrients.
  
3. Which of the following is a (are) class(es) of nutrients?
  - a. Cellulose.
  - b. Vitamins.
  - c. Ketones.
  - d. All nutrients listed above.

4. The primary function of the digestive system is to
  - a. change food into a form the body can utilize.
  - b. mix food items as they are consumed so that they lose their identity.
  - c. move food that is consumed through the body from lips to anus.
  - d. utilize the body secretions in the absorption of chemicals.
  
5. Some of the chemical processes of digestion are accomplished in or by the
  - a. small intestine.
  - b. large intestine.
  - c. esophagus.
  - d. teeth.
  
6. At one stage in digestion, consumed food is called
  - a. peristalsis.
  - b. gastric juice.
  - c. bile.
  - d. chyme.
  
7. The human body expends energy for vital processes such as control of body temperature, breathing, and the beating of the heart. What percent of total body energy is expended for the above vital processes?
  - a. 75 percent.
  - b. 70 percent.
  - c. 60 percent.
  - d. 50 percent.



8. A soldier assigned from a temperate climate to a tropical one will require
- a. more calories each day.
  - b. less calories each day.
  - c. the same number of calories each day whatever the climate.
  - d. a varied caloric intake dependent on small variations in temperature.
9. When carbohydrates and fats provide all of the energy needed by the human body, what is the role of protein?
- a. To protect the body from disease.
  - b. To build and repair tissue.
  - c. To control body temperature.
  - d. To accomplish all of the choices listed above.
10. A 22 year old man, who is 5 feet 9 inches tall and who weighs 154 pounds, is a file clerk in his Army duty. He is assigned in a temperate climate. How many calories should his diet contain each day?
- a. 2,000.
  - b. 2,800.
  - c. 3,400.
  - d. 4,000.
11. The basic food groups provide a
- a. plan for varying daily menus.
  - b. guide for determining daily caloric requirements of individuals.
  - c. method of planning to satisfy nutrient requirements in a person's daily diet.
  - d. means of exchanging one food for another of similar nutrient value.

12. In addition to the meat group, the basic food groups are
- a. fats, carbohydrates, and protein.
  - b. milk, vegetables-fruit, and bread-cereals.
  - c. vegetables, Group A; vegetables, Group B; and fruit.
  - d. fruit, milk, and bread.
13. Which food group is the primary source of protein for the ration?
- a. Meat, fish, and poultry.
  - b. Milk and milk products.
  - c. Beans and other legumes.
  - d. Potatoes.
14. The nutritional standard is established for men and women of the military services ranging in ages from
- a. 18 to 25 years.
  - b. 18 to 30 years.
  - c. 17 to 28 years.
  - d. 17 to 25 years.
15. In the food industry, the major requirements for labeling packaged food are accurate statements declaring the
- a. name of the food; manufacturer, packer, or distributor; date of shipment; kind; and date of pack.
  - b. date of pack; identity; ingredients; manufacturer, packer, or distributor; and quantity.
  - c. quantity; ingredients; contents; date of shipment; and manufacturer, packer, or distributor.
  - d. manufacturer, packer, or distributor; kind; name of the food; name of brand; and ingredients.

16. An adequate supply of carbohydrates must be included in the daily diet to
- promote growth and sustain life.
  - provide proper maintenance of body tissues.
  - promote concentration of sugar molecules.
  - provide energy for the needs of the body.
17. In addition to the nutrients for energy, other nutrients are needed to
- maintain water balance and osmotic pressure.
  - regulate body functions and repair tissues.
  - maintain acid-base balance and water balance.
  - build new cells for growth and repair damaged tissues.
18. What are the food sources of vitamin A?
- Citrus fruits; tomatoes; leafy vegetables; and white potatoes.
  - Wheat germ; soybean oil; fortified margarine; beans; eggs; and green and yellow vegetables.
  - Liver; egg yolk; milk, cheese, and butter; carrots; sweet potatoes; and peaches.
  - Brewer's yeast; meats; milk; eggs; and whole grains.
19. A periodic publication that prescribes the breakfast, dinner, and supper menus for each day of the month is the
- installation menu.
  - master menu.
  - annual food plan.
  - cooks' worksheet.

20. For breakfast, the meal pattern used by the Army and Air Force includes
- a. bread, jam or jelly, a main dish, and an appetizer.
  - b. a cereal, fruit or juice, a main dish, and gravy or sauce.
  - c. a la carte, a beverage, bread, and butter.
  - d. fruit or juice, a main dish, gravy or sauce, and milk.
21. For lunch and dinner, the meal pattern used by the Army and Air Force includes
- a. a main dish, gravy or sauce, potatoes, and jam or jelly.
  - b. bread, butter, a main dish, and an appetizer or soup.
  - c. a beverage, a main dish, jam or jelly, and vegetables.
  - d. fruit or juice, milk, potatoes, and a main dish.
22. The preferred frequency for issuing subsistence is
- a. once a month.
  - b. once a week.
  - c. three times a week.
  - d. daily.

23. Which of the following is not specific authorization for the substitution of menu items?
- to compensate for items on the master menu which are not available.
  - to permit use of locally available authorized fresh and frozen fruits, fruit juices, and vegetables.
  - to meet dietary requirements of specific feeding groups such as units composed principally of allied personnel.
  - to provide items that exceed the monetary value of the basic daily food allowance.
24. Which of the following food items has a nutritional value comparable to 100 pounds of spinach? (Refer to figure 1, SLAB 326C.)
- 82 pounds of canned spinach.
  - 67 pounds of winter squash.
  - 87 pounds of canned peas.
  - 113 pounds of frozen broccoli.
25. A well-balanced breakfast should include milk, because it provides
- a perfect food.
  - a high proportion of water.
  - more food value than any other food.
  - some materials that aid in the digestive process.
26. Butter or fortified margarine provides the diet with
- a good quantity of vitamin C.
  - an excellent supply of trace elements.
  - a high concentration of fuel value.
  - a supply of vitamins A and D.

27. Usually the main dish of a well-planned dinner consists of
- a. meat, fish, cheese, or vegetables.
  - b. meat, poultry, game, or fish.
  - c. eggs, cheese, beans, or nuts.
  - d. poultry, vegetables, meat, or meat products.
28. Cheese is an excellent menu item because it provides the diet with
- a. valuable protein.
  - b. essential fatty acids.
  - c. high fuel value.
  - d. valuable minerals.
29. In calculating the nutritive value of diets, the Armed Forces use which of the following food groupings:
- a. potatoes, other vegetables, and fruits; milk, cheese, and ice cream; citrus fruit and tomatoes; and other vegetables and fats.
  - b. milk, cheese, and ice cream; butter and fortified margarine; dried beans, peas, and nuts; and fruits, other than citrus.
  - c. vegetables; milk; meat; and bread and cereals.
  - d. citrus fruit and tomatoes; flour, cereals, and baked goods; fats and oils; and sugar, sirups, and preserves.
30. In menu planning, staying quality is a basic consideration which is dependent upon the
- a. composition and preparation of food.
  - b. flavor or taste of food items.
  - c. basic rate of digestion.
  - d. amount or quantity of carbohydrates.

31. Which of the following is an important factor in troop acceptability of the menu items?
- Nutritional balance.
  - Out of season items.
  - High-calorie foods.
  - Variety, flavor, and color in foods.
32. At installations, nutritional evaluation must be made by the
- food adviser.
  - local surgeon.
  - dietitians for the military services.
  - cooks and cooks' assistants.
33. The thumbnail analysis requires that the computed value of each energy nutrient be
- compared with the computed values of vitamins in the ration.
  - added to the computed values of other nutrients in the ration.
  - compared with the recommended limit for each energy nutrient.
  - multiplied by the recommended limit for each energy nutrient.

**REQUIREMENT.** Exercises 34 through 36 are matching exercises. Column I lists food items included in a well balanced nutritional menu; column II indicates the nutrients found in food items. Select the nutrients in column II that are found in the specific foods listed in column I, and indicate your answer on the answer form. The choices in column II may be used once, more than once, or not at all.

<u>Column I</u>	<u>Column II</u>
34. Butter.	a. Rich in high quality protein and in calcium, phosphorus, iron, vitamin A, and riboflavin.
35. Eggs.	b. Supplies quantities of iron, thiamine, niacin, and ascorbic acid.
36. Legumes.	c. Good source of vitamin A and D.
	d. High ratio of protein and fats as well as a quantity of calcium, phosphorus, riboflavin, thiamine, and niacin.

**REQUIREMENT.** Exercises 37 through 40 are matching exercises. Column I lists the fat-soluble vitamins; column II lists the functions performed by these vitamins. Select the function in column II performed by the vitamin in column I, and indicate the answer on the answer form. The choices in column II may be used once, more than once, or not at all.

<u>Column I</u>	<u>Column II</u>
37. Vitamin A.	a. Acts to prevent oxidation of vitamin A in the stomach.
38. Vitamin D.	b. Makes possible the coagulation of blood.
39. Vitamin E	c. Helps the eyes to adjust to varying intensities of light, especially at night.
40. Vitamin K.	d. Counteracts fatigue and steadies nerve reaction.
	e. Aids minerals that are required for bone formation and maintenance of good muscle tissues.



REQUIREMENT. Exercises 41 through 50 are true-false. Indicate the answer on the answer form by using A for TRUE and B for FALSE.

41. Grain products are an excellent source of carbohydrates.
42. Temperature extremes require more energy for the same activity than moderate temperatures.
43. DELETED
44. Carbohydrates are the principal source of energy for the human body.
45. Cellulose is needed in the body as a regulator, but it has not nutritive value.
46. Water is considered to be the most critically needed nutrient.
47. Minerals are needed in the body for tissue building.
48. The serving of short order meals daily is mandatory.
49. Butter and milk are included in the same food group for item substitution.
50. When a nutritional evaluation is made by the long method analysis, each food item in the group is computed separately.

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**SPBK 326(SA)**

*Supplementary Booklet:*

# **GLOSSARY OF NUTRITION AND MENU PLANNING TERMS**

**U.S. ARMY QUARTERMASTER SCHOOL  
FORT LEE, VIRGINIA**

**SUPPLY TRAINING CENTER OF THE ARMY SCHOOL SYSTEM**

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**GLOSSARY OF NUTRITION  
AND MENU PLANNING  
TERMS**

Absorption. The assimilation of fluid or other substances by the skin or by absorbent vessels.

Acid. A compound containing replaceable hydrogen.

Acidosis. Any condition in which the body's alkaline reserve is depleted. It may result from abnormal loss of alkaline salts or from abnormal accumulation of acid salts.

Albumin. A type of protein found in nearly all animal and some vegetable tissues.

Alkaline reserve. The quantity of alkali in the body that may be used to neutralize acid.

Allergy. Exaggerated susceptibility to a substance which in similar amounts is harmless to most persons.

Amino acids. Organic acids containing nitrogen, sulfur, and sometimes phosphorus and iron, that are compounded to form proteins.

Anemia. A condition of the blood in which there is either a deficiency in the number of red blood cells or in the amount of hemoglobin within the red blood cells.

Appetite. The desire to eat as distinguished from hunger, or compelling necessity to eat.

Ascorbic acid. Chemical name for Vitamin C.

Base. A substance which combines with acids to form salts.

Biotin. A minor water-soluble vitamin linked with carbohydrate metabolism.

Boiling point. The temperature at which a liquid vaporizes; the point at which the vapor pressure is equal to the atmospheric pressure.

Butterfat. Natural fat of cow's milk.

Calcification. The process by which tissue becomes hardened by deposits of calcium salts within its substance.

Calorie. A unit of energy. A large calorie is the amount of heat needed to raise the temperature of 1 kilogram of water 1° centigrade.\* A small calorie is the amount of heat required to raise 1 gram of water 1° centigrade. The large calorie is the unit of measurement for the energy (heat-producing) value of food.

\*(or 4 lbs. water by 1° F.)

Carbohydrate. An organic compound, such as sugar, starch, or cellulose, which contains carbon, hydrogen, and oxygen.

Carbon dioxide. Compound containing 1 part carbon and 2 parts oxygen. It is the gas that we exhale during breathing.

Carotene. Yellow pigment found in various foods. Known to be the precursor of Vitamin A, it is often called "pro-Vitamin A."

Casein. The primary protein in milk.

Catalyst. A substance which alters the rate of a chemical change, but itself remains unchanged during the reaction.

Cell. One of the small units which make up living tissues.

Cellulose. A complex carbohydrate which makes up the rigid or woody structure of plants and trees.

Centigrade. A thermometer scale on which 0° is the freezing point and 100° the boiling point of water.

Cholesterol. A sterol of animal origin found in bile, blood and brain.

Chlorophyll. The green coloring matter in plants. It permits plants, in the presence of sunshine, to form carbohydrates by combining carbon dioxide from the atmosphere and water from the ground.

Citric acid. An organic acid found in citrus fruits.

Combustion. Any chemical process that produces light and heat such as burning.  
The combination of any substance with oxygen. Rapid oxidation.

Complete protein. A type of nutrient containing all the known essential amino acids.

Compound. A combination of two or more elements united in definite proportions by weight. The components may be separated only by chemical means.

Connective tissues. Tissues which support and connect other body tissues; for example, muscle connected to bone.

Curd. The coagulated part of milk separated from the whey, or watery part.

Deamination. The process by which the ammonium group is split from an amino acid molecule.

Dextrin. A complex sugar. Polysaccharide.

Dextrose. Glucose, or blood sugar. A simple sugar, Monosaccharide.

Digestion. A bodily function that changes the form of food so that it can be absorbed by the body.

Disaccharide. A double sugar.

Diuretic. A substance that causes excessive urination.

Duodenum. The first part of the small intestine.

Emulsion. A suspension of fine particles or globules of one liquid in another liquid.

Endocrine glands. Ductless glands which secrete substances into the blood or lymph.

Enzyme. A substance produced by living organisms which has catalytic properties; a chemical ferment which causes the breaking down of a larger molecule into a smaller molecule without itself being changed in the process.

Esophagus. The tube connecting the mouth with the stomach.

Essential amino acids. A group of amino acids which maintain life and promote growth. They cannot be formed by the human body.

Fatty acids. Organic compound of carbon, hydrogen, and oxygen which combines with glycerol to make fat.

Fructose. A simple sugar or monosaccharide which is also called levulose.

Galactose. A simple sugar; component part of milk sugar, lactose.

Glucose. A simple sugar; also called dextrose, grape sugar, blood sugar.

Glycogen. A complex sugar. The form in which carbohydrates are stored in the liver or muscle tissues.

Gram. Unit of weight in the metric system. One ounce avoirdupois equals 28.4 grams.

Hemorrhage. Escape of blood from a blood vessel.

Hemoglobin. Coloring matter of red blood cells.

Hormone. Chemical compounds secreted by the ductless glands which, when conveyed to another part of the body, increase its functional activity and capacity for secretion.

Hydrolysis. Chemical decomposition by which a compound is resolved into other compounds by taking in water.

Insulin. The active substance of the internal secretion of the pancreas. It aids in the metabolism of carbohydrates.

Intercellular. Between cells.

Invert sugar. A mixture of glucose and fructose resulting from the chemical breakdown of sucrose. It does not crystallize readily.

Ketone. An organic compound released in the metabolism of fats.

Kilocalorie. A large calorie.

Lacteal. Any of the minute lymph glands which convey chyle (emulsified fat) from the small intestine to the thoracic duct.

Lactic acid. An organic acid commonly found in sour milk.

Lactose. A double sugar found in milk. Also called milk sugar.

Lipid. An all-inclusive term for fats.

Maltose. A double sugar, also called malt sugar.

Melting point. Temperature at which a solid changes to a liquid.

Metabolism. The sum of the processes or chemical changes in an organism, or in a single cell, by which food is built up (anabolism) into living protoplasm, and broken down (catabolism) into simpler compounds with the exchange of energy.

Monosaccharide. A simple sugar such as glucose, fructose, or galactose.

Nutrient or Nutriment. An essential element of food, which nourishes the body.

Osmosis. The tendency of a fluid to pass through a semipermeable membrane into a solution whose concentration of solids is higher, thus equalizing conditions on both sides of the membrane.

Osmotic pressure. A physico-chemical property shown by a substance in solution. Under these conditions water passes through the membrane into the more concentrated solution.

Oxidation. The process in which oxygen combines with another substance.

Pectin. A neutral substance, apparently of several different varieties, occurring in many vegetable tissues. It is used as an ingredient of jellies to stiffen them. A polysaccharide.

pH. Measure of acidity or alkalinity.

Photosynthesis. Process by which plants convert carbon dioxide and water into starch and cellulose (plant tissues) by means of the sun's energy and the chlorophyll in the plant.

Pituitary. Gland which affects most bodily functions.

Polysaccharide. A complex sugar.

Precursor. A substance which is converted into another substance such as carotene, the precursor of Vitamin A.

Protein. A nutrient substance containing carbon, hydrogen, oxygen, nitrogen, and sometimes sulfur, phosphorus, and iron. It may be either animal or vegetable and is present in all living tissue.

Protoplasm. The essential substance of both the cell body and nucleus of cells of animals and plants. Regarded as the only form of matter in which the phenomena of life are manifested.

Provitamin. A chemical substance that must be changed by the body into a usable vitamin.

Putrefaction. The decay of proteins, accompanied by a disagreeable odor.

Rancidity. Fat deterioration caused by oxidation or enzyme action. The fat takes on a tallow flavor and odor.

Respiration. Breathing. The act of inhaling air and exhaling carbon dioxide and water.

Riboflavin. Vitamin B<sub>2</sub>.

Specific dynamic action. The increase in heat production that follows the digestion and metabolism of food.

Starch. A complex sugar present in practically all plants.

Sucrose. A double sugar found in cane and beet sugar.

Vitamin. A group of unrelated organic substances found in many foods in small amounts. Absence or deficiency of one or more may lead to a disease, such as scurvy.

Volatile. Tending to evaporate quickly.