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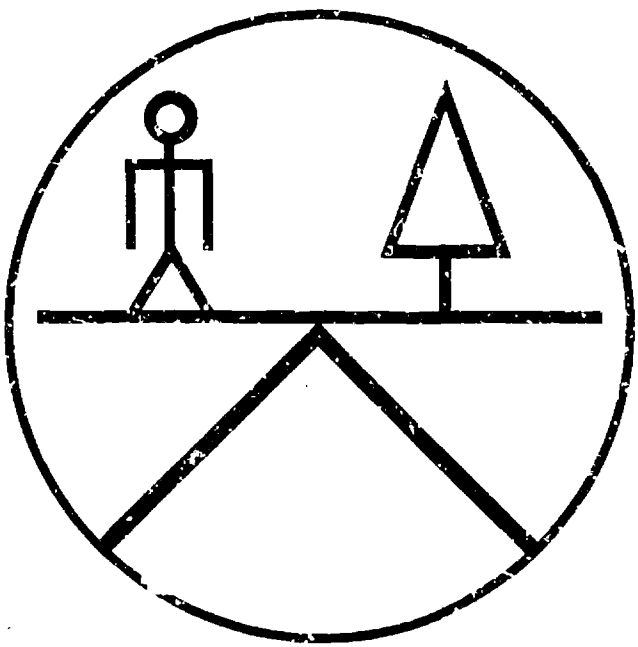
ABSTRACT

This supplementary document contains career ladders that have been designed to enable post secondary students to prepare for entrance into environmental health occupations at a level commensurate with their abilities where they will be capable of meaningful contributions and can obtain advanced standing in employment. Contents are: (1) Food Sanitation, (2) Environmental Health Seminar I, II, (3) General Sanitation, (4) Milk Sanitation, and (5) Sanitary Chemistry. These course outlines consist of main topics, number of lecture periods, objectives, reference citations and other related information. This document is a supplement to "Career Ladders in Environmental Health," a previously processed document available as ED 047 097. (GB)

Supplement to

CAREER LADDERS IN

ENVIRONMENTAL HEALTH



VEA 70-2-386

ERIE COMMUNITY COLLEGE

Buffalo, N.Y.

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This supplement to the original "Career Ladders in Environmental Health" contains the course outlines for "Food Sanitation", "Environmental Health Seminar I, II", "General Sanitation", "Milk Sanitation", and a revised and expanded "Sanitary Chemistry". These are to be used to complete the document mailed in the Fall of 1970.

COURSE OUTLINE

A. Course Title: Food Sanitation

B. Curriculum Name: Chemical Technology (Environmental Science Option)

C. Number of Class Periods: Three lecture hours, three lab hours per week for 16 weeks, credit - 4 hours

D. Textbook Used: No current texts are sufficiently comprehensive to cover all aspects of this outline. Pamphlets, standards, publications, newsletters, personal reports and memoranda, experiences, slides and film strips need to be utilized. An adequate reference list is appended. Instructor may select texts of his choice.

E. Prepared By: Norman W. Bartz, DVM, Associate Sanitarian, New York State, Training Officer Environmental Health Services, Erie County Department of Health

F. Objectives and Discussion of Course:

1. To instruct the student in various aspects of the food and beverage industries. This will include the terminology, equipment used, practices and procedures followed in the food service and vending operations.

2. To provide sufficient exposure to various aspects of food processing and commissary operations, including wholesale distribution, to make him conversant with the usual procedures in these major segments of the food industry. The ability to exercise authority during plant visits and inspections has the prerequisite of understanding and familiarity with plant equipment and operations.

3. To build upon this familiarity with operations of the trade by next turning attention to sanitation aspects of food operations. Basic sanitation principles will complement those provided the student in the other sanitation courses.

4. To teach the ways in which elements of our normal diet can be harmful, toxic or disease-producing and to cover in detail the means of preventing these occurrences.

5. To instruct the students in methods of safe preparation of food in quantity as an adjunct to knowledge of the epidemiology of food-borne outbreaks of illness.

6. To study various ordinances, laws and codes regulating the food industry and to provide practical working experience with these rules by having each student apply them in the field.

The food and beverage service industry ranks fourth in size among all the industries of the nation. Americans spend almost $75 billion annually for food and beverages; consumed both in the home and outside. An average of 78 million meals are served daily in the nation's varied types of food and beverage establishments. Moreover, the ancillary activities of segments of the food industry are rapidly increasing and expanding. Two decades ago the food shopper could choose from only 3,000 items. In today's supermarkets the American housewife can select from a variety of 7,000 to 8,000 items.

Multiple opportunities for transmission of illness or other harm exist from the complexities of this sophisticated trade. Contamination and adulteration possibilities for these diet items are infinite, and their control and quality safeguards need attention from a huge force of workers. Graduates of the Environmental Science option will be well equipped to be employed in these areas of responsibility. Successful completion of this course will prepare graduates to fit adequately and comfortably into the private segments of the food and beverage industries or into governmental units exercising jurisdiction and control over their operations.

Variations of the philosophies of the profit-making segments of the industry, from the philosophy and approach of the non-profit regulatory agencies will be explored during lecture sessions. This will enable students to understand reasons why voluntary conformance does not occur universally or sufficiently often to guarantee the wholesomeness and safety of our food supply, which would preclude the necessity for governmental regulation.

Some control programs will be studied in detail to determine if they are efficient and adequate. The new era of convenience foods will be examined as part of the changing industry patterns.

The trend of this instructional effort will be to approach the subject on a new basis; a problem oriented basis, so as to emphasize the impact of the handling of wastes, discharges, emissions, processing and packaging remains from the food industry, on the total ecology.

LECTURE NUMBER	MAIN TOPICS
1 & 2	History of the Sanitarian Chronologue of important dates and events in sanitation history The growth and development of the professional sanitarian Sanitarian licensing in New York State. Professional Sanitarian Organizations. Professional Journals.
3	The International Aspect of Food Production, distribution and importance to civilization and economy
4	Methods of Preserving Foodstuffs 1. Basic historical handling of foods a. Natural methods of preservation b. Physical methods c. Chemical methods of preservation 2. Sophisticated food handling of the future a. Radiation as a means of preservation b. Freeze drying
5	Food Processing 1. Categories of processing methods 2. Status of mechanization 3. Typical examples of equipment used
6	Food Storage Examples of proper and improper storage - slides as visual aids

LECTURE NUMBER	MAIN TOPICS
7	The Frozen Food Industry - International Implications Growth of Convenience Foods 1. Pre-packaged 2. Pre-cooked 3. Portion control
8	Food Microbiology 1. Useful micro-organisms, deteriorative micro-organisms 2. Pathogenic micro-organisms
9	How Food Can be Harmful - See following sheet for typical lecture outline.

Lecture should be complemented with slides, diagrams and newspaper clippings shown by means of an opaque projector, case reports, and the narrative itself may be presented to the students in its summarized form by screening the notes via a transparency projector.

LECTURE NUMBER

9
(Typical Single
Lecture Outline)

MAIN TOPICS

How Food Can Be Harmful

Poisons - Plant Poisons - Mushrooms - Soybeans - Similar examples
Shellfish - Raw Egg - Biotin

Chemicals - Additives - Nicotinic acid
Sulfites

Industrial or Commercial
Crop Sprays - Cranberries incident
Fly Sprays - DDT

Accidental - Fl Spillage
Salt - Binghamton Hospital
Lead from paint
Cadmium
Lye Crystals

Criminal - Intentional additions

Infestations - Parasites - Trichinosis
Tapeworms

Intoxications - Botulism - Fish
Staphylococcus toxins

Infections - From contamination by bacteria; either animal infection or from a human carrier

Streptococcus	Typhoid
Staphylococcus	Shigella
Salmonella	

Sources in people - Upper Respiratory Infections
Boils, Acne, Carbuncles, Pimples, Infected
Eponychium - Dental Cavities
Feces, Stools, Discharges from wounds and lesions

Means of transfer - Droplet Contamination
Coughing, sneezing, nose blowing

Direct Transfer - Via hands after toilet use or handling lesions

Feces - Proper toilet practices

Inanimate Objects - Meat Block - work surfaces
Cooking Utensils
Cloths

Intermediate Agents - Flies Insects
Mice Cockroaches (Salmonella)
Rats

Bacterial Growth Requirements - Moisture
Oxygen - p^H
Food - Temperature

Control - Cold, heat, disinfectants, cleansing; by means of thorough cooking
Heat treat - protect - refrigerate - don't contaminate prior to service

Personal Hygiene -

Physical Exam - TB X-ray, Lesions, Stool Exam, if necessary

Between Exams - No food handling, if ill
Treat lesions, diarrhea, cavities

Hand & Arm Cleansing - Disinfectant soap - foot pedal sinks
After toilet - fingernails - arms, if exposed
Screen out flies
Plastic Gloves - use tongs, ladles
Clean outer clothing - head coverings
Don't smoke

Keep out flies, rats, mice, crawling insects

Keep outsiders out of kitchen - all of them, including nightime visitors; i.e., janitors, security men

Report lesions - delegate employee to non-food handling activity

Report Illnesses of Customers - Save samples, refrigerate

Proper Kitchen Practices - Separate meat blocks (plastic)

Separate work surfaces

Separate cooling facilities - defrosting

Separate cooking and preparation areas and equipment for easily contaminable foods, such as perishable desserts. Example: W.N.Y. Central Commissary outbreak in which cream pie was incriminated - patients transported to hospitals by ambulance. Cause: Filling became contaminated while cooling in common water vat exposed to all personnel traffic because of its location in common corridor that was routeway to other rooms, including toilet room.

LECTURE NUMBER	MAIN TOPICS
10	Food-borne Illnesses - Outbreaks and Epidemics 1. Typical examples of outbreaks 2. Investigation of suspected food-borne illnesses
11	Prevention of Food-Borne Illness - Food Handler Training - Owner Reponsibility Supervisory Training and Responsibility
12	Basic Components of a Comprehensive Food Sanitation Program Planning a budget - job description, assignment, scheduling, supervision and self-inspection
13	Basic Requirements for Location of a Food Operation
14	Submission and Examination of Plans for Regulatory Agency Approval 1. Traffic and food flow patterns 2. Sanitation considerations commonly overlooked by architects and designers - national franchise operations and improving standardized plans. Holiday Inn experience.
15	Efficient Food Establishment Design and Lay-Out Typical examples: Small eating and drinking establishment - movable, portable, fixed equipment Institutional kitchens, including bakery and special diet section
16	Principles of Sanitary Design of Equipment
17	Principles of Sanitary Construction and Fabrication 1. Acceptable sanitary materials - design and finish 2. Initial pre-use clean-up

LECTURE NUMBER	MAIN TOPICS
18	The Chemistry of Cleaning 1. Time, temperature, pressure and chemical cleaning agent relationship 2. Manual methods 3. Mechanical 4. Automatic cleaning
19	Food Additives 1. Methods of approval 2. Tolerance standards
20	The Rest of the Food Industry Story - The Necessity to Think Ahead 1. Disposal of discharges 2. Solid waste disposal 3. Avoidance of air pollution 4. Rodent-proof structures
21	Insects of Importance in Food Sanitation
22	Rodent Infestation and Rodent Control
23	Ultra-Violet Light as an Inspection Tool
24	Instruction of the Food Handler Pre-employment and periodic Food handler physical examinations The New York City experience

LECTURE NUMBER	MAIN TOPICS
25 & 26	Agencies Concerned with Food Sanitation 1. Governmental regulatory agencies 2. Educational agencies 3. Consumer oriented agencies 4. Private industry trade associations 5. Food grading program
28, 29 & 30	The United States Public Health Service Food Ordinance and Code 1. U.S.P.H.S. Food Sanitation Manual 2. The Public Health Service Program
31	The Food and Drug Administration History, law, objectives, organization and field programs
32	The Agriculture and Markets Law of New York State The Public Health Law of New York State
33	Enforcement Procedures 1. Education and persuasion 2. Enforcement and compliance procedures 3. Hearings - formal and informal 4. Court action 5. Publicity

LECTURE NUMBER	MAIN TOPICS
34	Inspection Procedures 1. The need for records 2. Score sheets - check lists 3. Approach and introduction at establishment 4. Identification 5. Supportive material for findings - need for adequacy and integrity 6. The necessity for praise
35	"Sanitary Surveys" - Their usefulness and effectiveness Typical examples - When to utilize a survey approach
36	Institutional Inspections
37	Industry Self-Inspection Programs 1. The New York City experience 2. Can they work? 3. Industry's responsibility
38	Summary of Course and Review
39	Seminar Session - Question and Answer Period
40	Industry Attitudes Regarding Governmental Sanitation Control - Industry representatives The Future of the Food Industry Industry representatives from: The processing and frozen food industry The New York State Restaurant Association Area fruit and vegetable growers and packers Convenience foods and portion control processors.

Appropriate time will be devoted to quizzes, preliminary and final examinations.

LABORATORY

1. Inspectional Tools - Sampling Equipment

2. Laboratory Tests on Food:
   - Additives - Preservatives
   - p^H Readings
   - Filth Determinations
   - Bacterial Counts
   - Pathogenic Bacteria Determinations
   - Swab Testing

3. Field Tests for Contamination and Spoilage
   - Agar Plate Demonstrations
   - Changes in Food Due to Deterioration

4. Field Visit to Food and Drug Administration Headquarters, Including Laboratory Floors

5. Visit to Approved Health Laboratory Performing Food and Water Examinations

6. Field Visit to Rodent Control Headquarters - Models and Visual Aids Shown

7. Field Visit to Bait Preparation Station

8. Field Visit to a Food Freezing Plant

9. Field Visit to a Large Commercial Bakery

10. Field Visit to a Food Processing Establishment

11. Field Visit to an Ice Manufacturing Plant

12. Field Visit to a Beverage Manufacturing Plant

13. Field Visit to a Bottled Water Plant

14. Field Visit to a Hospital Kitchen Utilizing Tray Conveyor

15. Field Visit to an Institutional Cafeteria - E.C.C.

16. Field Visit to a Quality Control Laboratory

17. Field Visit to the Geneva Experiment Station - New York State College of Agriculture

18. Field Visit to Bison Cheese Company - Food Processing Operations

19. Field Visit to Food Equipment Manufacturing Plant

20. Field Visit to Vending Machine Commissary and Vending and Dispensing Machine Route

21. Field Visit to Flight Kitchen at International Airport

22. Mock Hearing for Alleged Violation of Food Regulations; Students Taking All Parts Except that of Hearing Officer

23. Typical Investigation and Solving of a Mock Food-borne Outbreak of Illness

24. Field Testing of Automatic Dishwashers

25. Detection, Demonstration and Field Observation of Rodent and Insect Infestations

26. Food Handlers Demonstrations Using Ultra-Violet Light

27. Field Visit to an Institution Utilizing Flight-type Dishwasher and Conveyor-Tray Meal Make-Up

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"Food Ordinance and Code of the Public Health Service" - Publication #934 - U. S. Government Printing Office - Washington, D.C.

"Sanitary Food Handling" - Delmar Publishers - Orange Street and Broadway - Albany 7, New York

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"Protecting Our Food - The Yearbook of Agriculture - 1966" - 89th Congress, 2nd Session - House Document #349 - Superintendent of Documents - Washington, D.C.

"Sanitarians Handbook" - Theory and Administrative Practice - Ben Freedman, M.D. - Peerless Publishing Company - 605 Baronne Street - New Orleans, Louisiana

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"Foods" - Vail and Justin - 1967 - 5th Edition - Houghton Mifflin Company - Boston, Massachusetts

"The Lifeline of America" - Hampe & Wittenberg - McGraw-Hill - 1964 - H.D. 9005/.H27 - E.C.C. Library

"Food Poisoning" - Gail M. Dack, M.D. - University of Chicago Press

"Municipal and Rural Sanitation" - Ehlers and Steel - McGraw-Hill Book Company - New York City

"The Investigation of Foodborne Disease Outbreaks" - Library of Congress Catalogue #66-25675 - International Association of Milk, Food and Environmental Sanitarians, Inc. - Box 437 - Shelbyville, Indiana 46176

"A Study of State and Local Food and Drug Programs" - A report to the Commissioner of the Food-Drug Administration - Public Administration Service - 1965 - Chicago, Illinois

"Hospital Dietary Services" - A Planning Guide - Donovan and Ives - 1966 - Public Health Services Publication #930-C-11 - Superintendent of Documents - Washington 25, D.C.

"Use of Chemical Additives in Food Processing" - National Academy of Sciences Publication #398 - National Research Council - Washington 25, D.C.

"U.S. Public Health Service Food Ordinance and Code" - Superintendent of Documents - Washington 25, D.C.

"Environmental Sanitation Handbook" - Irwin Krasnoff, M.P.H. - University Hospital - 1964 - University of Michigan - Ann Arbor, Michigan

COURSE OUTLINE

A. Course Title: Environmental Health Seminar I, II

B. Curriculum Name: Chemical Technology (Environmental Health Option)

C. Number of Class Periods: Two lab hours per week for 16 weeks - 2 credit hours

D. Textbook Used: Choice of tests to be selected by the instructor. No current single textbook covers all areas adequately. An ample reference material list, including a variety of textbooks, is appended. Texts selected should reflect the philosophy of the course as developed by this outline.

E. Prepared By: Norman W. Bartz, DVM, Associate Sanitarian, New York State, Training Officer, Environmental Health Services, Erie County Department of Health

F. Objectives and Discussion of Course:

1. To present to the students an overview of the "Man and His Environment" picture as seen through the eyes of current authorities in the environmental field.

2. To expose future workers in the environmental field to the current philosophies of private industry and government leaders connected with pollution and control, since both the private and public sectors are co-contributors to whatever pollution exists and whatever control programs are in effect.

3. To review the history of public health, industrial hygiene and environmental control, the instigating factors and development of programs in these fields.

4. To determine, as a class, the progress and accomplishments of environmental control programs and to measure these against the role of build-up and expansion of the problems.

In order for prospective environmentalists to properly understand the contemporary problems they must deal with, their orientation should explore the historical beginnings of public health movements, conditions provoking their initiation, the early epidemics and how ecological cycles have been affected by the manner in which increasing population, urbanization, and concentrated industrialization, have developed.

Where control of environmental pollution has been either delayed or lacking in areas where adequate laws exist to allow such control, reasons for non-conformance will be explored. Guest lecturers and seminar participants may elaborate on reasons for success in meeting program goals, factors affecting their programs, decision making, power groups, economics as a reason for non-conformance, and possible needs for additional effort. Examples of programs which have achieved success will be studied in detail.

The seminar sessions will start with an assessment of our current environmental situation and after touching on all health areas, will narrow to considerations of environmental problems, including the role which epidemiology has played in illustrating the cause - effect relationships necessary to better understanding of the need for correction of some pressing pollution situations.

Students will have opportunity to hear the expressed views of ecologists, biologists, conservationists and public health directors as guests and be able to question them. Problems of air pollution as related to health and disease, mercury contamination of surface waters, solid waste disposal, radiological contamination, etc., will be referred to in this seminar series.

LECTURE NUMBER	MAIN TOPICS
1	The Story of Environmental Pollution
2 & 3	"Crisis in Our Environment" - An awareness lecture The present status of pollution of our land, air and water. Exploring the nature and extent of the problem; present methods of coping with some aspects; long range control methods. (Since some experts disagree on specific conditions and issues, the student will have opportunity to formulate an opinion on the status of our environment from hearing both sides of the "crisis" question.) If a "crisis" does exist, was it preventable? Could we have observed similar mistakes in the older countries from which our forefathers emigrated? Can we now benefit from these observations in planning the future?
4	History of Public Health The Colonial Period 1600-1790
5	The Pioneer Period 1790-1861
6	The Pioneer Period Plus an Elaboration of Industrial Hygiene - from Colonial Days to the Twentieth Century
7	The Awakening of Public Health in Europe and its Influence Upon America.
8	The Shattuch Report and the Development of Health Departments
9	The Development of Environmental Sanitation During the Nineteenth Century
10	Communicable Disease Control and Epidemiology from the Civil War to the End of the Nineteenth Century
11	Various Disciplines of Public Health and Preventive Medicine - Their Early Beginnings, Development and Relation to the Total Public Health Movement in the United States.

LECTURE NUMBER	MAIN TOPICS
12	Current Public Health Programs - Federal and International. World Health Organization - United Nations, National Institutes of Health, etc.
13	State Health Programs and the Federal-State Relationships - Guest Lecturer
14	Research and Public Health National Institutes of Health, Bethesda, Maryland; Private Foundations.
15	Environmental Research and Control Programs Specialized In-Service Training Courses Taft Engineering Center - Cincinnati, Ohio Communicable Disease Center - Atlanta, Georgia Various USPHS laboratories and centers
16	Local Public Health Programs County and City; their relationship to State and Federal programs

Environmental Health Seminar II

1 & 2	The Development of Epidemiology by C.E.A. Winslow First man in United States to describe a milk-borne outbreak of Septic Sore Throat. Research into water-borne diseases. Winslow's study of an epidemic of typhoid fever - Newport, Rhode Island 1900
3	Man and Epidemics - the evolution of Public Health Programs
4	The Problem of Pure Water
5	Disposal of Human Wastes
6	A Pure Milk Supply and its Associated Problems
7	Insects and Their Roles in Disease Transmission

LECTURE NUMBER	MAIN TOPICS
8	Scourges of the Past and Future Challenges
9	Population Increase and Its Relation to Environmental Pollution
10	The Great Sanitary Awakening The Public Health Council and the Public Health Law of New York State The State Sanitary Code
11	Student-Teacher Dialogue to Elicit Questions About Environmental Problems to Set Direction of Some of the Future Lectures - Critique
12	Continuation of above, leading to some answer and discussion by the instructor. Summarization and fashioning of major concerns of the student body. Guest representative from League of Women Voters
13	Guest lecturer from Federal Agency performing Pollution Control Work in various fields
14	Guest lecturer from State Agency - Commissioner of New York State Department of Environmental Conservation, Albany, New York
15	Guest lecturer from Erie County - Commissioner of Health
16	Panel Discussion - members of local and regional offices of State and County Environmental Control Departments. Panel to include an ecologist and conservationist. To be moderated by an impartial faculty member who refers student questions (from Session 12) to various speakers.
17	Setting precise goals; the systems approach, systems analysis, factors effecting performance in organizations, community action organizations and public action groups

It is suggested that an invitation be extended to the Governor of New York State to be guest lecturer at an appropriate time during the course.

Guest lecturers will be freely substituted during the conduct of the individual sessions. Appropriate interruptions will be made for quiz and examination purposes.

REFERENCES

"The Epidemiology of Charles E. A. Winslow" by Roy A.Acheson - American Journal of Public Health - Vol. 91 No. 1 January 1970

"The Conquest of Epidemics" - C.E.A. Winslow - Hafner Publications - New York City 1967

"Man and Epidemics" - C.E.A. Winslow 1952 - Princeton University Press

"Public Health - Its Promise for the Future" - Wilson G. Smilie - The MacMillan Company - New York City 1955

"Cure for Chaos" - Simon Ramo - David McKay Company - New York City 1969

"Principles of Public Health Administration" - John Hanlon, M.D.,-CC. V. Mosby Company - St. Louis, Missouri

"The Public Health Law of New York State" - Chapter 45 , Consolidated Laws of New York State - New York State Department of Health

"Pollution - Crisis in Our Environment" - Filmstrip Series with Audio Cassette - Wards Natural Science Establishment, Inc. - P. O. Box 1712 - Rochester, New York 14603

"Administrative Rules and Regulations and The Sanitary Code of New York State" - New York State Department of Health

"Organizations" - March and Simon - 1967 - John Wiley and Sons, Inc. - New York City

"Public Health Law" - James A. Tobey - Commonwealth Fund - 41 E. 57th Street - New York 22, New York

"Crisis in Our Cities" - Lewis Herber - 1965 - Prentice Hall, Inc. - Englewood Cliffs, New Jersey

"Ecological Crisis" - National Geographic Magazine - December 1970

"Pollution Control" - 2nd Edition - 1968 - Department of Air Resources - New York City - Printed by New York State Department of Health - Albany, New York

"Precision, A Measure of Progress" - Public Relations Staff - General Motors - Detroit, Michigan 48202

COURSE OUTLINE

A. Course Title: General Sanitation

B. Curriculum Name: Chemical Technology (Environmental Science Option)

C. Number of Class Periods: Three lecture hours, three laboratory hours per week for 16 weeks - credit 4 hours

D. Textbook Used: Texts that were surveyed were inadequate in that they failed to cover all major subject areas of this course. An ample reference list is attached, including a variety of textbooks. A combination of texts, instructional manuals and technical publications may be selected from this reference list, by the instructor.

E. Prepared By: Norman W. Bartz, DVM, Associate Sanitarian, Training Officer, Environmental Health Services, Erie County Department of Health

F. Objectives and Discussion of Course:

To expose the student to the broadness of the existing civil efforts of environmental control and to offer instruction and orientation in the many programs now employed. It is thereby intended that prospective workers in the environmental areas will better understand and be able to appraise the effectiveness of current efforts in these fields of public concern.

Control of the total environment in our contemporary society requires a multi-disciplinary approach. Many segments are regulated by programs which draw in measure from several of the sciences studied elsewhere, and some thus lose the individuality that might justify a complete semester of study on each program as an entity. Some others are so highly specialized it would not be feasible to attempt their individual study in the semesters available for specialization in this curriculum. However, since graduates of this program of study may find employment opportunities in these separate environmental activities, certain of them will be co-joined into a "General Sanitation" course and presented to the student body in sufficient detail so as to afford a comprehensive understanding of the total expanse of environmental control.

Examples of these "separate" programs and activities are found in the Hospital and Nursing Home Inspection programs (100% state funded programs throughout the state), Farm Labor and Migrant Worker Camp Inspection, Wildlife Control and Conservation activities, Agricultural Extension Services, Institutional Inspections, Health Education Programs, Meat Inspection, Rodent Control Programs (a one million dollar annual budget program in Erie County alone), and others.

Furthermore, the Environmental Science course of study is planned so that graduates finding employment with the State or a County or Municipal health agency will be exempted from the Sanitary Code requirement of a one-year traineeship, of a 12-week Environmental Health Course and a 145 day on-the-job orientation program; thereby permitting employment at a higher title and salary level. Inclusion of instruction in these multi-faceted program activities will justify the granting of this exemption by state officials.

Only after exposure to the broadness of already existing civil programs in the field of euthenics will the student appreciate and understand the multi-faceted contemporary approach to environmental control.

Appropriate laboratory sessions will complement the classroom lectures. These may include field visits and group assignments to observe activities of the many workers in environmental control both in the public as well as the private industrial sector.

As a final training effort, the students may conduct a "Community Survey" on either a surveillance or block by block canvass basis, to enlighten them on the value of a survey as an environmental control tool. Such survey may help determine the need for control activities in a virgin area; may suggest initial approaches by defining the extent of a potential program, or it may be used to measure the effectiveness of methodology employed by evaluating results obtained in a current control program.

LECTURE NUMBER	MAIN TOPICS
1	Health Care Programs of a Social Nature - Medical Assistance Programs - Medical Rehabilitation Programs
2	Public Health Education
3	Fluoridation and Dental Health
4	Bio-Statistics and Their Use - Introduction to Survey Methods
5	Conservation Programs
6	Vector Diseases and Insect Control
7	Vector Diseases and Insect Control
8	Pesticides - Their Public Health Importance
9	Refuse Disposal - Solid Waste Disposal
10	Accident Prevention and Safety Programs
11	The Physiology of Carbon Monoxide Poisoning
12	Heating Hazards - Venting and Back Draft Defects; Piping Inadequacies; New York City Experiences
13	Fire Safety
14	Plumbing Hazards Cross-Connections and Inter-Connections; Submerged Inlets.
15	Housing - Its Impact on Health The Multiple Dwelling Code

LECTURE NUMBER	MAIN TOPICS
16	Current Housing Programs - Their Effectiveness and Duplication of Effort
17	Radiological Health - The Basics of Ionizing Radiation
18	Radiological Health - Effects of Over-Exposure, Thermal Pollution, Surveying and Monitoring; Control Programs
19	Industrial Hygiene - Historical Background - Present Day Programs
20	Hospital and Nursing Home Inspections
21	Extended Care Facilities; Day Nurseries
22	Swimming Pool and Bathing Beach Inspection
23	The Federal Food & Drug Administration and Its Various Programs
24	Temporary Residences and Migrant Labor Camp Inspection
25	Realty Subdivision Control; Percolation Tests
26	Rodents - Their Public Health Significance and Their Control
27	Rodents - Their Public Health Significance and Their Control
28	Records and Reports - Function and Use
29	Statistics in Environmental Control
30	Marine Biology
31	Meat and Poultry Sanitation and Inspection Programs
32	Agricultural Extension Services - From the State Agricultural College - From the Farm Bureaus

LECTURE NUMBER	MAIN TOPICS
33	Rabies Control
34	Environmental Laboratory Services
35	Sanitary Surveys - Further Introduction to Survey Methods
36	Sketching - Use of Levels, Map Reading, Use of Blueprints and Plans, The Need for Accuracy
37	Examination of Plans, Blueprints, Sketches
38	Refrigeration and Its Many Applications in the Environment
39	Institutional Inspections and School Inspections; Safety, Sanitation, Adequacy
40	Application of Computer Systems to Environmental Problems
41	Private and Public Nuisances; Public Health Nuisances; Complaints and Their Investigation
42-47	Quizzes and Preliminary Examinations - Appropriately Placed at Intervals Throughout the Lecture Sessions
48	Final Examination

It is suggested that a term paper or report be required from each student taking this course. Individual investigation into a single field of environmental activity, requiring extra-curricular reading and field visits, on a subject approved by the instructor, will enlarge the students knowledge of a subject area and sharpen his enthusiasm for more detailed study of a specialization in future courses. Oral presentation of the completed report, to the class, may also be considered.

LABORATORY

1. General Orientation and Indoctrination.
   Explanation of proceedings in laboratory sessions.
   General planning for subsequent laboratory work.

2. Visit to Computer Center at Erie Community College
   Discussion of potential application to environmental programs.

3. Visit to Public Laboratory Performing Environmental Sample Analysis

4. Visit to Marine Biology Laboratory
   Toxicology Laboratory - University of Buffalo at Buffalo General Hospital

5. Field Visit to Food & Drug Administration Laboratory to Observe Pesticide Testing Demonstrations

6. Application of Photography to Environmental Control
   Methods, equipment, uses, mistakes, court admission as evidence, etc.
   Infra-red photography

7. Field Visit to Private Industry Quality Control Laboratory

8. Housing Inspection - Field Visit to Observe an On-Going Program

9. Field Visit to Wildlife Refuge or Conservation Area.

10. Field Visit to Erie County Civil Defense Headquarters, Chestnut Ridge Park, Orchard Park, New York
    Radiological monitoring instruments
    Field survey of radioactive isotope location and monitoring

11. Field Visit to Monitor a Local X-Ray and Fluoroscopy Installation

12. Field Visit to a Commercial Plant Using Industrial X-Ray

13. Field Visit to Nuclear Waste Disposal and Reclaiming Facilities - Springville, New York

14. Sanitary Landfill Visit
    Incinerator Site Visit - Detection of rodent signs, control procedures.

15. Subdivision Control - Field Visit to a Regional or District Office to Observe Program and Control Features. On-Site Visit to a Subdivision During Development.

16. Community Survey
    Selection of survey goals and area, objectives, methodology, planning and assignments; maps and identification.

17. Community Survey
    Field portion - performance of work.

18. Reporting, Tabulation and Compilation of Data.

19. Summary and Conclusions and Final Presentation.
    Determination of disposition of data.

20. Laboratory Clean-Up and Examination.

21. Critique Session

REFERENCES

"Environmental Sanitation" - Jos. A. Salvato, Jr. - John Wiley and Sons - New York City

"Municipal and Rural Sanitation" - Ehlers and Steel - McGraw-Hill Book Company - New York City

"Sanitarians Handbook - Theory and Administrative Practice" - Ben Freedman, M.D. - Peerless Publishing Company - 605 Baronne Street - New Orleans, Louisiana

"Water Supply and Plumbing Cross Connections - Hazards in Household and Community Systems" - Public Health Bulletin #957 - U.S. Superintendent of Documents - Washington, D.C.

"Control of Domestic Rats and Mice" - Bjornson, Pratt and Littig - Environmental Control Administration - Public Health Service Bulletin #563 - 1969 - Rockville, Maryland 20852

"Biologic Factors in Domestic Rodent Control" - Robert Z. Brown - Public Health Service - Publication #773 - 1969 - Environmental Control Administration - Rockville, Maryland 20852

"Diseases Transmitted from Animals to Man" - Thomas J. Hull, PhD - 1963 - Charles Thomas, Publisher - Springfield, Illinois

"Control of Communicable Diseases in Man" - 11th Edition - 1970 - American Public Health Association - 1740 Broadway - New York, New York 10019

"Civil Defense Information for Food & Drug Officials" - Lowrie Beacham, Jr. - Department of Health, Education & Welfare - Washington, D.C.

"Environmental Sanitation Handbook" - Irwin Krasnoff, M.P.H. - University Hospital - University of Michigan - Ann Arbor, Michigan

"Standard Methods for Analysis of Water, Sewage and Industrial Wastes" - American Public Health Association - 179 Broadway - New York 19, New York - Waverly Press - Baltimore, Maryland

"Control of Rats and Mice" - Joseph A. Salvato - 1969 - New York State Department of Health - Albany, New York

"Manual of Individual Water Supply Systems" - Public Health Service Publication #24 - 1963 - Superintendent of Documents - Washington, D.C.

"Fluoridation of Public Water Systems" - Regulations and Procedures - New York State Department of Health - 1968 - Albany, New York

"Hospital Dietary Services - A Planning Guide" - Donovan-Ives - 1966 - Public Health Service Publication #930-C-11 - Superintendent of Documents - Washington, D.C.

"Rodent Born Disease Control Through Rodent Stoppage" - Scott and Berom - 1968 - Communicable Disease Control Center - Atlanta, Georgia 30333

"Operation of Swimming Pools and Bathing Beaches" - Bulletin #27 - 1968 - New York State Department of Health - Albany, New York

"Environmental Health Manual" - New York State Department of Health - Albany, New York

"Public Health Law" - James A. Tobey - Commonwealth Fund - 41 E. 57th Street - New York 22, New York

"Water Fluoridation: The Search and The Victory " - U.S. Government Printing Office, Washington, D.C. 20202 - Frank J. McClure, PhD

"A To Z of Refrigeration, A Story of Man-Made Cold" - Public Relations Staff - General Motors - Detroit, Michigan 48202 - 12th Printing - 1964

COURSE OUTLINE

A. Course Title: Milk Sanitation

B. Curriculum Name: Chemical Technology (Environmental Science Option)

C. Number of Class Periods: Three lecture hours, three lab hours per week for 16 weeks, credit - 4 hours

D. Textbook Used: No current texts cover all areas adequately. An ample reference material list, including a variety of textbooks, is appended. A broad range of visual aids are available and need to be obtained and utilized by the instructor in order to make the lectures meaningful. Choice of textbooks to be selected by the instructor.

E. Prepared By: Norman W. Bartz, DVM, Associate Sanitarian, New York State, Training Officer Environmental Health Services, Erie County Department of Health.

F. Objectives and Discussion of Course:

1. To study the source and composition of milk, its dietary importance and the control measures necessary for wholesomeness.

2. To provide students with a familiarity of the dairy industry, from the farm, through the processing plant, to the consumer.

3. To approach the traditional content of the usual dairy science or dairy industry course, but not enter deeply into any individual aspect.

4. To depart from the "science" or "industry" technical aspects and to substitute instead the "sanitation" aspects which characterize the abilities of the technician, professional sanitarian or quality control worker; those who would attain supervision over the performance of producers, processors or industry workers.

5. To relate the applicable rules, regulations, laws, codes, ordinances and standards nominally employed to control the far-flung milk industry.

6. To afford the student an appreciation of the dairy industry as our most important agricultural resource.

Laboratory sessions will provide field visits to observe the operations described in lectures. Practice in performing various laboratory analysis of milk samples collected in the field will complement the field observations. Commercial equipment utilized in the production, transport, processing and distribution will be observed and handled at locations where it is being used.

The size and importance of the dairy industry in New York State is not widely appreciated by prospective students in our urban area. The presence of several large municipalities in our heavily populated and industrialized state overshadows the fact that New York ranks third in dairy production in the entire United States. It is below only Minnesota and Wisconsin. It is probably the leading state in our nation in production, when compared with consumption, of "fluid" or "bottled" milk.

Furthermore, the financial importance of the dairying industry in our heavily urbanized northeastern states is deceptively masked by the traditional reputation of the midwestern "dairyland" states. In one year, the marketing orders of the combined New York and New Jersey milk markets handled payments of 614 million dollars to dairymen for the basic farm production of fluid milk. This represents only the beginning step in a series of business handlings of this perishable product of diet necessity.

Few established industries have as much governmental supervision and control as the dairy and milk industry. This base is the origin of the many employment opportunities in the milk industry and in the milk control fields, and with the intricacies of the science justifies Milk Sanitation as an individual course of study.

Although mechanization of the industry and a shift from governmental to industry control is occurring, together with an invasion of traditional dairy products by imitations and dietary substitutes, workers in this field still need specialized instruction to establish competency and to enable them to exercise jurisdiction over other workers in the field. This course is designed to accomplish such competency.

LECTURE NUMBER	MAIN TOPICS
1	The History of Milk The Place of Milk in our Diet
2	The Physiology of Milk Production The Composition of Normal Bovine Milk
3	Adulteration 1. Definition 2. Methods of prevention 3. Means of detection 4. Applicable rules and regulations 5. Contamination by antibiotic residuals
4	The Dangers of Milk as a Medium of Disease Transmission 1. The story of Malta 2. The Owego outbreak 3. Comparison of milkborne outbreak dangers with other ingested disease carrier materials
5	Milkborne Disease Outbreak Investigation
6	Animal Health -- Disease Control Programs - Zoonotic Diseases of the Bovine
7	Mastitis - Its economic and public health significance Modern Mastitis tests and control programs
8	General Environment of Dairy Cattle Milk Production on the Farm - California Compared with New York State
9	Basic Environmental Factors 1. Water supply 2. Sewage disposal 3. Waste disposal

LECTURE NUMBER	MAIN TOPICS
10	The Changing Times of Farm Sanitation - The Effort Toward Efficiency as an Economic Necessity The Barn - Methods of Stabling 1. Stanchion stabling 2. Pen stabling - loafing area - feeding area 3. Comfort stalls 4. Ventilation, feeding and cleaning requirements
11	Construction and Operation of Milk Houses 1. The role of the extension service 2. Applicable rules and regulations
12	Milking Procedures - History and Progress 1. The modern milking parlor 2. Mechanical milking systems 3. Pipeline milkers - transport to milk house
13	The Cooling of Milk - old versus new Storage of Milk on the Farm
14	The Changing Methods of Milk Cooling, Pick-Up and Transport Transport to Receiving Stations and Processing Plants - From the Old to the New Bulk Pick-Up and Transport Vehicles - Procedures, Sanitation, Samplers License
15	Return to the Farm for Inspection Purposes The Control of Pre-Pasteurized Milk - Industry Inspection Programs
16	Quality, Wholesomeness and Safety of Milk Waste Disposal for the Milk House Sewage Disposal for the Farm Residence
17	The Receiving Deck - Basic Deck Tests and Automatic Sampling

LECTURE NUMBER	MAIN TOPICS
18 & 19	A Tour Through a Modern Processing Plant via Slides and Movies 1. Receipt of milk 2. Clarification 3. Cooling 4. Storage 5. Methods of expelling volatile odors 6. Homogenization 7. Pasteurization 8. Cooling 9. Bottling 10. Storage 11. Delivery
20	Thermal Inactivation of Bacteria in Sanitary Liquids Pasteurization - Definition - Legal Aspects - Physical and Bacteriological Aspects - Automatic Controls, Control Panels
21	Pasteurization Equipment 1. Batch or vat pasteurization 2. High temperature short time heat exchanger presses 3. Ultra-high temperature methods
22	Elements of an HTST Press - Flow Charts and Diagrams a Regeneration section b. Heating section c. Cooling section d. Holding tube e. Flow-diversion valve f. Balance or constant - level tank g. Thermometers and control panel h. Popular makes of HTST presses i. Anti-back siphonage preventors, static head

LECTURE NUMBER	MAIN TOPICS
	j. Booster pump k. Gauges and seals l. Required charts and records
23	All Welded-in-Place Pipelines 1. Methods of installing 2. Methods of inspection - photographing via boroscope during installation 3. Methods of routine surveillance - ball swabbing
24	Required Cooling Following Pasteurization. The Flow to the Bottler or Filler. Bottling Equipment and Satisfactory Containers. 1. Types of fillers 2. Types of containers 3. Proper identification of product
25	Storage and Delivery to the Distributor, Broker or Consumer 1. Code on containers 2. Required storage conditions 3. Proper labeling - prerequisite approval
26	Milk Products and Milk By-Products - Filled Milk, Imitation Milk
27	Milk Classification and Pricing 1. "Closed" or "Controlled" Markets 2. The Role of Department of Agriculture and Markets 3. Milk Marketing Administrations - Market Orders 4. Producers Bargaining Agencies
28	Cheese Manufacture - Butter Manufacture

LECTURE NUMBER	MAIN TOPICS
29	Condensing and Powdering Operations A Modern Problem; the Disposal of Milk Wastes 1. The Groce Dairy Story 2. The Bison Cheese Company Story 3. The Blasdell Story 4. The Grand Island Modern Experience } From personal experiences and reports
30	Insects of Importance to Milk Sanitation - Dangers of Insecticide Contamination. Handling of Complaints 1. The Pine Oil Incident - personal experience
31	Legal Aspects of Milk Sanitation 1. The Public Health Law 2. The New York State Sanitary Code - Erie County Sanitary Code 3. Required legal permits 4. The United States Public Health Service Suggested Ordinance and Code
32	The Role of Producer Cooperatives - Guest Lecturer Industry Self-Inspection; Requirements for Approved Personnel Required Refresher Courses
33	Requirements for Health and Regulatory Control Personnel 1. Environmental Aides 2. Public Health Technicians and Trainees 3. Public Health Sanitarians and Trainees 4. Public Health Engineers
34	Explanation of Official Dairy Farm - Inspection Score Sheet GEN 9 - Revised 1970 Items and Interpretations; major and minor. Pipeline inspection score sheet

LECTURE NUMBER	MAIN TOPICS
35	Explanation of Processing Plant Inspection Score Sheets; GEN 12, GEN 12A Use, interpretation and their application
36	The Interstate Milk Shippers Program
27, 28, 29 & 40	Other Agencies Concerned with Milk Sanitation Health Departments, Food & Drug Administration, N.Y.S. College of Agriculture, N.S.F., A & M, B.A.I., N.Y.S. Extension Service, International Association of Milk, Foods and Environmental Sanitarians, U.S P.H.S., Artificial Breeders, D.H.I.A., Industry Committees, N.Y.S. Department of Agriculture and Markets, U.S. Department of Agriculture, 3-A Committee Standards, National Sanitation Foundation, Taft Sanitary Engineering Center, Communicable Disease Control Center, Various Trade Associations, Milk Producer Co-operatives.
41	"Milk For Health" - Guest Lecturer
42	"American Dairy Association" - Guest Lecturer
43	"Milk Industry Foundation" - Guest Lecturer
44 - 48	Quiz, Preliminary and Final Examination Periods - Interspersed throughout lecture periods at appropriate times.

LABORATORY

1. Deck Tests

   A. Organolyptic
   B. Sampling, smearing of milk samples, Breed smear
   C. Sediment testing

2. Dairy Farm Visits

   A. Stanchion stabling
   B. Comfort stall
   C. Pen stabling
   D. Pipeline milkers
   E. Milking parlors
   F. Gutter cleaners
   G. Liquid manure handling
   H. Bulk tank cooling and storage
   I. Bulk milk collection and transport trucks
   J. Strip cup and methylene blue testing of milk

3. Plant and Official Laboratory Tests

   A. Breed smear - direct microscopic examination and direct microscopic count
   B. Agar plating
   C. Methylene blue test - results and usage
   D. Coliform counts - interpretation
   E. Cryoscopic methods
   F. Phosphatase test - field test, laboratory test
   G. Thermoduric bacteria counting - sources, interpretation
   H. Sediment testing - equipment, value of the test, abuses, standards of interpretation, enforcement
   I. Antibiotic presence tests
   J. Whiteside or California Mastitis Test - theory and demonstration
   K. Bottle and can rinse samples
   L. Acidity determination
   M. Direct microscopic somatic cell count

LABORATORY

4. Determination of Quality Problems

   A. Pipeline swabbing
   B. Swab testing - technique and interpretation
   C. Process sampling - sampling points
   D. Finished product sampling - representative portions

5. Tour Through Processing Plants

   A. Small-sized plants - examples of vat pasteurization
   B. Large plants - positive displacement pumps, centrifugal pumps, valves and piping, control panels

6. Tour Through a Surplus Plant; Powdering and Evaporating Plant

   A. Roll process
   B. Spray process - vacuum pans

7. Tour Through a Cheese Plant

8. Visit to Cornell Veterinary Diagnostic Laboratory

9. Visit to Official Laboratory Performing Tests on Milk and Milk Products (Erie County Laboratory)

10. Visit to an Approved Industry Quality Laboratory

11. Examination and Inspection of a Bulk Milk Collection and Transport Truck. Observation of cleaning and sanitizing; mechanical and programmed automatic cleaning.

LABORATORY

12. Inspection and "scoring" of Dairy Farms

13. Inspection and "scoring" of Pasteurization Plant

14. Use of an Electronic Timer - Test Equipment - Auxiliary Fittings and Ports
Salt test of HTST Unit

15. Thermometer Checks - Flow Diversion Valve Testing - Sealing of Timing Pumps

16. Sampling Points in Farm and Plant Situations - Interpretation of Results - Slides

17. Properties of Detergents, Sanitizers - Evaluation of Detergents with Recording of Results

18. Proper Cleaning of Equipment - "Milk Stone" on Equipment
Practice and Demonstration on Milking Machines and Pipelines

19. Studies of C.I.P. Cleaning - Use of Nylon Line; Swab-Ball Testing

20. Sealing of Equipment After Approval, Records to be Left

21. Operation of Clock Controls - Dangers of Handling

22. Examination of Thermometer Charts - Legal and Illegal Tracings - Identification and Proper Marking

23. Cut-In and Cut-Out of Flow Diversion Valve - Automatic Milk Stops - Proper Wiring

LABORATORY

24. Examination of Milk Cans and Containers - In-Plant Containers, Plastic Containers, Bulk Vending Machine Containers, Non-Returnables

25. Street Sampling with Laboratory Examination of Samples Collected

26. Odor Removal Equipment - Steam Injection

27. Automatic Contamination Detecting Machines for Returnable Plastic Containers

28. Ultra-High Temperature Pasteurization Equipment

REFERENCES

"Klenzade Dairy Sanitation Handbook" - Klenzade Products - 1960 - Beloit, Wisconsin

"Sanitarians Handbook" - Theory and Administrative Practice - Ben Freedman, M.D. - Peerless Publishing Company - 605 Baronne Street - New Orleans, Louisiana

"The Sanitary Code of New York State" - Administrative Rules and Regulations Manual of Procedure - N.Y.S. Department of Health - Albany, New York

"The Public Health Law" - Chapter 45, Consolidated Laws of New York State - N.Y.S. Department of Health - Albany, New York

"Municipal and Rural Sanitation" - Ehlers and Steel - McGraw-Hill Book Company - New York City

"Procedures for Testing Pasteurization Equipment" - Public Health Service Publication #731 - Superintendent of Documents - Washington D.C. 20402

"Manual for Milk Plant Operators" - Milk Industry Foundation - 1001 Fifteenth Street - Washington 5, D.C.

"Significance and Control of Coliform Bacteria in Pasteurized Milk - Diversey Corporation - 1820 Roscoe Street - Chicago 13, Illinois

"Home Water Treatment" - Winkelbeck - Extension Bulletin #372 - Cornell University - Ithaca, New York

"Manual of Septic Tank Practice" - Public Health Service Publication #526 - 1967 - Superintendent of Documents - U.S. Government Printing Office - Washington, D.C. 20201

REFERENCES

"Standard Methods of Analysis of Milk and Milk Products" - American Public Health Association - 179 Broadway, New York 19 - Waverly Press - Baltimore, Maryland

"Environmental Health Manual of Procedures" - New York State Department of Health

"Diseases Transmitted from Animals to Man" - Thomas J. Hull, PhD. - 1963 - Charles Thomas, Publisher - Springville, Illinois

"Milk Ordinance and Code" - United States Public Health Service - Superintendent of Documents - U.S. Government Printing Office - Washington, D.C.

"Environmental Sanitation" - Joseph A. Salvato, Jr. - John Wiley & Sons, New York City

"A to Z of Refrigeration, A Story of Man-Made Cold", Public Relations Staff, General Motors, Detroit, Michigan 48202, 12th Printing, 1964.

COURSE OUTLINE

A. Course Title: Sanitary Chemistry

B. Curriculum Area: Environmental Science

C. Number of Class Periods: Three one-hour periods and one three-hour labs per week for 16 weeks.

D. Textbook Used: Sanitary Chemistry For Engineers, Clair N. Sawyer, McGraw Hill Book Company, Inc., New York - Toronto - London

E. Prepared By: Anthony T. Voell, Director Environmental Health Services, Chautauqua Department of Health

F. Objectives: Prospective environmentalists probably have little, if any, knowledge of the sanitary chemistry of water, wastewater, foods, insecticides and air contaminants. This course is designed to provide basic concepts in these categories.

A working knowledge of the laboratory analysis performed on samples collected by the environmental health technician will emphasize the need for proper sample collection and storage. It will also allow the technician to perform routine surveillance tests in the field.

The objectives of this course in sanitary chemistry, then, are summarized as follows:

1. Develop ability to properly collect samples for laboratory analysis.

2. Become familiar with proper documentation that should accompany field samples.

3. Obtain working knowledge of laboratory procedures for sample analysis.

4. Develop ability to perform routine surveillance tests in the field and laboratory analysis.

5. Become familiar with terminology used in sanitary chemistry.

6. Develop talent to interpret results of laboratory analysis.

LECTURE NUMBER	SUBJECT MATERIAL COVERED
1	Course Orientation
2	Basic Concepts from General Chemistry
3	Basic Concepts from Qualitative Chemistry
4	Basic Concepts from Quantitative Chemistry
5	Basic Concepts from Organic Chemistry
6	Basic Concepts from Organic Chemistry
7	Basic Concepts from Organic Chemistry
8	Basic Concepts from Physical Chemistry
9	Basic Concepts from Physical Chemistry
10	Basic Concepts from Colloid Chemistry.
11	Basic Concepts from Biochemistry
12	Basic Concepts from Radiochemistry
13	Role of Technician in Collecting and Analyzing Water Supply Samples
14	Turbidity
15	Color
16	Standard Solutions
17	pH
18	Acidity
19	Alkalinity
20	Chemical Coagulation of Water
21	Hardness
22	Water Softening
23	Residual Chlorine and Chlorine Demand
24	Iron and Manganese
25	Flourides
26	Sulfates
27	Introduction to Wastewater Chemistry
28	Chlorides
29	Dissolved Oxygen
30	Biochemical Oxygen Demand
31	Chemical Oxygen Demand
32	Nitrogen
33	Solids
34	Phosphorus and Phosphates
35	Grease
36	Volatile Acids
37	Gas Analysis

LECTURE NUMBER	SUBJECT MATERIAL COVERED
38	Field and Laboratory Tests for Food and Milk Contamination
39	Field and Laboratory Tests for Food and Milk Contamination
40	Poisons (Heavy Metals and Rodenticides)
41	Poisons (Heavy Metals and Rodenticides)
42	Sampling and Analysis of Air Contaminants
43	Sampling and Analysis of Air Contaminants
44	Pesticides, Insecticides, Herbicides
45	Pesticides, Insecticides, Herbicides
46	Statistical Treatment of Laboratory Data
47	Legal Aspects of Sanitary Chemistry
48	Relation of Sanitary Chemistry to Regulatory Agencies

LABORATORY SESSION	SUBJECT COVERED
1	Orientation to Laboratory Procedures
2	Laboratory Exercise on Preparing Standard Solutions
3	Laboratory Analysis on Determinations of Color and Turbidity
4	Laboratory Exercise on Analysis of Acidity, Alkalinity and pH
5	Laboratory Exercise on Tests Performed with Regard to Chemical Coagulation of Water. Possible Field Visit to Water Treatment Plant Laboratory.
6	Laboratory Exercise on Tests to Determine Chemical Needs for Water Softening
7	Laboratory Exercise on Performing Analysis for Hardness
8	Laboratory Exercise on Performing Analysis for Flourides, Sulfates and Chlorides
9	Laboratory Exercise on Sampling and Analysis for Dissolved Oxygen and Biochemical Oxygen Demand

LABORATORY SESSION	SUBJECT COVERED
10	Laboratory Exercise on Sampling and Analysis for C.O.D.
11	Laboratory Exercise on Sampling and Analysis for Nitrogen Compounds
12	Laboratory Exercise on Sampling and Analysis for Solids
13	Laboratory Exercise on Sampling and Analysis for Phosphorous, Phosphates and Grease
14	Field Exercise on Tests for Contamination of Food and Milk Products
15	Laboratory and Field Exercise on Analysis of Air Contaminants
16	Laboratory Exercise or Visit to Laboratory that Performs Analysis on Insecticides, Pesticides, etc.

LECTURE NO. 1

NO. OF LECTURE HOURS: 1

Material Covered

The first lecture will be to orient the students to the objective of the course. The course outline would be briefly explained and handed out. The use of laboratories for this course and the relationship to the lecture periods would be explained. The textbooks used for the course would be discussed.

References:

1. 'Chemistry for Sanitary Engineers" - Clair N. Sawyer, McGraw Hill Book Company, Inc., New York - Toronto - London

LECTURE NO. 2

NO. OF LECTURE HOURS: 1

Material Covered

This lecture will cover the basic concepts from general chemistry. Included will be discussions on elements, symbols, atomic weights, and gram atomic weights. Other items which will be covered briefly will include: compounds, formulas, valences, chemical equations (weight relationships), oxidation - reduction equations, metals and non-metals, gas laws, solutions, the law of mass action and ionization.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 2 - Basic Concepts From General Chemistry

LECTURE NO. 3 NO. OF LECTURE HOURS: 1

Material Covered

These lectures will include discussions on chemical equilibria both homogeneous and heterogeneous, ways of shifting chemical equilibria and amphoteric hydroxides.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 3 - Basic Concepts from Qualitative Chemistry

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LECTURE NO. 4 NO. OF LECTURE HOURS: 1

Material Covered

The general operations of quantitative chemistry are covered in this lecture. General operations such as sampling, laboratory apparatus and reagents, precipitation and filtration of samples, drying or ignition of samples, and desiccation of samples are discussed. The use of the analytical balance in laboratory techniques is covered in this lecture as well as a discussion of gravimetric analysis. Volumetric analysis is discussed as it relates to sanitary chemistry. The use of colorimetry in sanitary analysis is covered in this lecture as well as physical methods of analysis.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 4 - Basic Concepts from Quantitative Chemistry

LECTURE NO. 5, 6, 7 NO. OF LECTURE HOURS: 3

Material Covered

A brief introduction in history of organic chemistry is presented in these lectures. The properties of organic compounds and the elements of organic compounds are discussed briefly. The sources from which organic compounds are derived are referred to.

Aliphatic compounds such as hydrocarbons (saturated and unsaturated) are discussed. Alcohols are covered briefly in these lectures. The method of classification of alcohols and the most common alcohols are outlined briefly, as well as their physical properties and the common nomenclature used for alcohols.

The next oxidation product of primary alcohols, aldehydes and Ketones are discussed. Also covered in these lectures is the makeup of acids, Esters, Ethers, and Alkyl Halides.

Also covered in these lectures is a discussion on the simple compounds containing nitrogen, the cyclic aliphatic compounds and the Mercaptans. (Aliphatic compounds that contain sulfur)

Other important areas that receive coverage in these three lecture periods in organic chemistry include the aromatic compounds with specific discussion on hydrocarbons, phenols, alcohols, aldehydes, Ketones and acids.

A general discussion is given on common foods and related compounds. These discussions include carbohydrates, Polysaccharides and included with relation to food are the fats, oils and waxes. Proteins and amino acids are covered briefly as they relate to the makeup of food and related compounds.

The makeup of detergents is discussed as it relates to organic chemistry. Soaps are covered as well as synthetic detergents and a brief discussion on the biological degredation of detergents is given.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 5 - Basic Concepts From Organic Chemistry.

LECTURE NO. 8 & 9 NO. OF LECTURE HOURS: 2

Material Covered

These two lectures will cover the basic concepts from physical chemistry. Included will be an introduction to physical chemistry. Also covered will be such basic concepts as Avogadro's number, vapor pressure of liquids, heat of vaporization, surface tension, Binary mixtures, solutions of solids in liquids, osmosis, Dialysis, electrolytic dissociation.

Other areas of interest that will be included are the principles of solvent extraction, chemical kinetics, Catalysis, absorption and the use of electromotive force.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 6 - Basic Concepts From Physical Chemistry.

LECTURE NO. 10 NO. OF LECTURE HOURS: 1

Material Covered

A general introduction to colloid chemistry is given in this lecture. Information is presented concerning the size, methods of formation and general properties of colloids.

Colloidal dispersions in liquids are covered, specifically solids in liquids, liquid in liquid systems and gas in liquid systems. In addition to the above colloidal dispersions in air are discussed specifically; fog, smog and smoke.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 7 - Basic Concepts From Colloid Chemistry.

LECTURE NO. 11 NO. OF LECTURE HOURS: 1

Material Covered

A general discussion is given concerning biochemistry in this lecture and how it deals with chemical changes that are brought about by living organisms.

Enzymes are covered through a discussion of their makeup and function in biochemical reactions.

Temperature relationships in biochemical reactions are detailed as well as the role of the hydrogen ion concentration (pH) as being one of the most important factors that influences the speed of biochemical reactions.

The use of buffers is covered along with discussions on major and trace elements and the biochemistry of carbohydrates and proteins.

Specific emphasis is placed on the biochemistry of man with individual time allotted to carbohydrates, fats, proteins, vitamins as they relate to man.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 8 - Basic Concepts From Biochemistry.

LECTURE NO. 12

NO. OF LECTURE HOURS: 1

Material Covered

Due to the involvement of the Environmental Health Technician in radiological health work, it is felt necessary that a brief discussion be held concerning basic concepts from radiochemistry.

This lecture will deal with an introduction to the science of radiochemistry with specific discussion on atomic structure (nuclear theory, electron orbits, nomenclature of isotopes, and neutron - proton concept of nuclear construction).

Brief coverage will be given to the subjects of natural radioactivity, the nature of radiations, energy of radiations, units of radioactivity, and half lives.

A brief discussion is included on the different types of nuclear reactions. Nuclear fission and nuclear fusion are covered along with the use of radioactive materials as tracers.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 9 - Basic Concepts From Radiochemistry.

LECTURE NO. 13 NO. OF LECTURE HOURS: 1

Material Covered

Because of the importance of chemical analyses of water supply samples, special treatment is given to the role of the Environmental Health Technician in collecting samples, taking field measurements, and participating in laboratory analysis of water samples.

A brief introduction is given to the different types of analyses that are done on samples collected.

References:

No specific reference is given for the above.

LECTURE NO. 14 NO. OF LECTURE HOURS: 1

Material Covered

This lecture will specifically cover the methods of analyzing water for turbidity. General considerations will be given concerning turbidity. The sanitary significance of turbidity with relation to public water supplies will be discussed. The three main reasons for considering this parameter will be covered (asthetic, filterability of water, and disinfection). The standard unit of turbidity will be presented and methods of determination will be covered. These methods would include the Jackson Candle Turbidimeter, Bottle Standards, as well as other devices.

Discussion will be held concerning the application of turbidity data with relation to water supply and sewage in industrial waste treatment.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 11 - Turbidity

LECTURE NO. 15 NO. OF LECTURE HOURS: 1

Material Covered

General consideration to the determination of color and the sanitary significance of color determinations as they relate to water supplies and surveys of receiving watercourses will be given in this lecture. In addition, methods of determination will be covered including standard color solutions and methods employing proprietary devices. The interpretation and application of color data will be covered in this lecture.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 12 - Color

LECTURE NO. 16 NO. OF LECTURE HOURS: 1

Material Covered

Because of the use of Normal solutions for determinations in many of the tests to be covered in subsequent lectures, a discussion is held in this lecture on the preparation on standard solutions. General considerations are discussed concerning Normal solutions. The selection of the proper normality is discussed and the preparation of a solution of proper normality is covered. The standardization of solutions with primary standards is discussed. Specific coverage is given to the preparation of solutions of basis and acids of the most commonly used solutions.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 13 - Standard Solutions

LECTURE NO. 17 NO. OF LECTURE HOURS: 1

Material Covered

A general discussion is held on the use of the hydrogen - ion concentration (pH). Theoretical considerations are also discussed briefly. The measurement of hydrogen - ion concentrations is covered. Different methods of measuring pH using colermetric measurements and measurement with glass electrodes are also included. A brief description of the interpretation of pH data is also given.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 14 - pH

LECTURE NO. 18 NO. OF LECTURE HOURS: 1

Material Covered

The sources and nature of acidity are covered in this lecture. The significance of carbon dioxide and mineral acidity are also discussed. The methods of measuring acidity due to carbon dioxide and mineral acidity are included. The application of acidity data is discussed as it relates to the work of the Environmental Health Technician.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 15 - Acidity

LECTURE NO. 19 NO. OF LECTURE HOURS: 1

Material Covered

A general discussion is held concerning the alkalinity of natural waters and its relationship to water supply and wastewater disposal. The sanitary significance of alkalinity is discussed briefly. Methods of determining alkalinity are discussed in this lecture. Methods of expressing alkalinity including phenolphthalein and total alkalinity, hydroxide, carbonate, and biocarbonate alkalinity are covered.

Application of alkalinity data is discussed with relation to chemical coagulation of water, water softening, corrosion control, buffer capacity, and industrial wastes. In addition new concepts concerning alkalinity are presented in this lecture.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 16 - Alkalinity

LECTURE NO. 20 NO. OF LECTURE HOURS: 1

Material Covered

The presentation of this lecture includes offering information on the chemical coagulation process which is used in water treatment practice. The purposes of chemical coagulation are discussed briefly. The nature of suspended matter in water is discussed as it relates to chemical coagulation.

The fundamental reactions involved in chemical coagulation are covered in these discussions. These include the flash mix, floculation and chemistry of the chemical coagulation process.

The optimum pH for chemical coagulation is covered briefly and discussions are held on the significance of laboratory studies on chemical coagulations. A brief look is taken at the different coagulant aids used in water treatment processing.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 17 - Chemical Coagulation of Water

LECTURE NO. 21 NO. OF LECTURE HOURS: 1

Material Covered

An introduction is given to hardness as it relates to water supplies and discussion is held on the causes and source of hardness and the sanitary significance of hardness.

Methods of determination of hardness including the calculation method, the soap method, the EDTA method are covered.

Different types of hardness are discussed including calcium and magnesium hardness, carbonate and non-carbonate hardness. In addition, a brief discussion is included on the application of hardness data in public practice.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 18 - Hardness

LECTURE NO. 22

NO. OF LECTURE HOURS: 1

Material Covered

The Environmental Health Technician is introduced to methods of water softening. Methods of water softening are offered, including the precipitation method and zeolite or base exchange softening. The significance of laboratory studies as they relate to the water softening process is discussed.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 19 - Water Softening

LECTURE NO. 23 NO. OF LECTURE HOURS: 1

Material Covered

Discussion in this lecture concentration on residual chlorine. In additon, chlorine considerations are discussed as to the prime purpose of chlorinating water supplies and the use of chlorine compounds. The chemistry of chlorination is looked at including the reaction of chlorine with water and its reaction with impurities in the water. The sanitary significance of chlorine residuals is discussed at length. Methods of determination of chlorine residuals both total, free and combined residuals and the measurement of chlorine demand is included in this lecture and the application of chlorine demand and chlorine residual data are covered in these discussions.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 20 - Residual Chlorine and Chlorine Demand

LECTURE NO. 24 NO. OF LECTURE HOURS: 1

Material Covered

Discourse in this lecture concerns general considerations as to the importance of iron and manganese in public water supplies. The sanitary significance of iron and manganese is also covered.

Methods for determining iron are described as well as those for determining manganese concentrations. Applications of iron and manganese data in public health practice are presented.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 27 - Iron and Manganese

LECTURE NO. 25 NO. OF LECTURE HOURS: 1

Material Covered

This lecture will deal with the dual importance of fluorides in public water supplies. It will cover the significance of high fluorides in water supplies and low fluorides in water supplies. In addition, some discussion will be held on the significance of fluorides in relation to air pollution. The chemistry of fluorine and its compounds are included. Methods for determining fluorides are covered and the application of fluoride data is also discussed.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 28 - Fluoride

LECTURE NO. 26

NO. OF LECTURE HOURS: 1

Material Covered

This lecture will deal with the importance of sulfates in public water supplies and its relation to sewage in industrial waste problems.

During this lecture there will be discussions on sulfates as they cause odor problems and a description of how sulfates contribute to the corrosion of sewers.

Methods of analysis for sulfates including the gravimetric and turbidimetric and volumetric methods will be presented. The applications of sulfate data to public health practice will also be discussed.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 29 - Sulfates

LECTURE NO. 27 NO. OF LECTURE HOURS: 1

Material Covered

An introduction is given to the use of sanitary chemistry for analysis of wastewater from domestic treatment plants, industrial waste treatment plants and receiving water courses.

Discussion includes the use of analytical data for design of wastewater treatment plants, legal documentation of violations and routine water quality surveillance networks.

References:

No specific reference is given.

LECTURE NO. 28 NO. OF LECTURE HOURS: 1

Material Covered

A general discussion is held concerning chlorides as they relate to public health work. The sanitary significance of chlorides is covered. Methods of determination of chloride concentration are discussed including the Mohr method and the mercuric nitrate method.

Finally the application of chloride data in work performed by the Environmental Health Technician is discussed.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 21 - Chlorides

LECTURE NO. 29 NO. OF LECTURE HOURS: 1

Material Covered

General consideration is given to the dissolved oxygen measurement as it is used in sanitary chemistry. The sanitary significance of dissolved oxygen is discussed as it relates to stream pollution, wastewater treatment plant operation, etc.

Discussion is held on method of collection of samples for determination of dissolved oxygen.

The choice of standard reagent for measuring dissolved oxygen is covered. Methods of determining dissolved oxygen are also included. Some of the methods covered include the Winkler method, the azide modification of the Winkler method, the Rideal - Steward modification of the Winkler method and the alkalin - hypochlorite modification. In addition, the many proprietary mechanical devices to measure dissolved oxygen are discussed. Finally the application of dissolved oxygen data is covered briefly.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 22 - Dissolved Oxygen

LECTURE NO. 30 NO. OF LECTURE HOURS: 1

Material Covered

Biochemical oxygen demand (B.O.D.) is covered in this lecture. General considerations are given to the B.O.D. tests and the nature of the B.O.D. reaction is included. Methods of measuring B.O.D. are discussed including the direct method and the dilution method. These are covered extensively. Additional discussion is held on the rate of the biochemical oxidations. The application of B.O.D. data in Environmental Health Technician's work is covered.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 23 - Biochemical Oxygen Demand

LECTURE NO. 31 NO. OF LECTURE HOURS: 1

Material Covered

As a complement to the biochemical oxygen demand, and material covered in the previous lecture, this lecture will deal with the chemical oxygen demand tests. General considerations are discussed concerning the C.O.D. tests. A brief history of the C.O.D. analysis is presented.

The method of determining chemical oxygen demand by dichromate is presented This material includes the selection of the normality of solutions to be used, the measurement of excess oxidizing agent, preparation of blanks, use of indicator solutions and calculations.

The application of the C.O.D. data is also discussed.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 24 - Chemical Oxygen Demand

LECTURE NO. 32

NO. OF LECTURE HOURS: 1

Material Covered

A general discussion is held concerning the nitrogen cycle and the relationship of organic nitrogen to ammonia, nitrates, nitrites, and human wastes.

The sanitary significance of nitrogen data is discussed. This discussion includes how it acts as an indicator of sanitary quality, its relationship to nutritional and related problems and how it is used as an indicator for control of biological treatment processes.

Methods of analyzing for the different constituent parts of nitrogen are discussed. These include ammonia, nitrogen, organic nitrogen, albuminoid nitrogen, nitrate and nitrite nitrogen.

Applications of nitrogen data are also discussed.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 25 - Nitrogen

LECTURE NO. 33 NO. OF LECTURE HOURS: 1

Material Covered

Because of the wide use of solids data in public health engineering and the work which would be done by the Environmental Health Technician, this lecture covers in detail the analyses used for determining solids in water and wastewater. General consideration is given to the makeup of solids including total solids dissolved and undissolved solids, volatile and fixed solids and settleable solids.

Instruction is included on the sanitary significance of solids determinations. A break-down in analysis is given as to the differences in determination of solids in water supplies vs. determinations applicable to polluted water and domestic sewage. A special discussion is held on the determinations for solids applicable to industrial wastes. The methods of analyzing for solids in sludges is also included in this lecture. The applications of solids data in public health engineering practice is also discussed.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 26 - Solids

LECTURE NO. 34

NO. OF LECTURE HOURS: 1

Material Covered

Phosphate as a contributor to water pollution and as a gross nutrient contributing to excessive growths of aquatic vegetation accents the need to cover this chemical in detail in this lecture.

The use of phosphate compounds in treating public water supplies, sewage and industrial wastes is discussed. The fertilizing value of sludges because of their phosphate content is discussed briefly and the use of phosphate compounds in treating boiler waters is also covered. Specific phosphorus compounds of importance are discussed. Methods of determining phosphorus or phosphates are covered in this lecture. The application of phosphorus data in public health practice is discussed briefly.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 30 - Phosphorus and Phosphates

LECTURE NO. 35

NO. OF LECTURE HOURS: 1

Material Covered

The importance of determining concentrations of grease as it is related to wastewater treatment is presented in this lecture. General consideration is given to the sources of grease both domestic and industrial, during these discussions. Grease and its measurement are covered and the methods of analysis for grease as is found in water, sewage and industrial wastes and sludges is included. Applications of grease data in public health practice are incorporated into this lecture.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 31 - Grease

LECTURE NO. 36 NO. OF LECTURE HOURS: 1

Material Covered

One of the most important analytical determinations in the control of anaerobic digestion is the volatile acid test. Because of the environmentalist's involvement in consulting with wastewater treatment plant operators, it is felt necessary that he be acquainted with this analysis.

This lecture deals generally with the need for the volatile acid tests including a theoretical consideration as to its development.

Different methods of determining volatile acids including direct distillation, steam distillation and other methods are covered. Special consideration is given to the application of volatile acid data in public health work.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 32 - Volutable Acids

LECTURE NO. 37 NO. OF LECTURE HOURS: 1

Material Covered

This lecture will deal with gas analysis. Anaerobic decomposition of material results in different percentages of carbon dioxide, methane, and other gases. Depending on the composition of the gas a determination can be made as to how well the decomposition process is proceeding. Therefore, during this lecture methods of analysis of gas will be discussed including methods for carbon dioxide, oxygen, hydrogen, methane, and nitrogen.

A presentation of the sources of error involved in gas handling are included, covering the collection, storage and handling of samples, the confining fluid, incomplete combustion of the methane, temperature changes and the volume of capillaries.

A special discussion is included on the measurement of hydrogen sulfide gase. Finally a brief discussion is included on the applications of gas analysis data.

References:

1. "Chemistry for Sanitary Engineers" - Chapter 33 - Gas Analysis

LECTURE NO. 38 & 39 NO. OF LECTURE HOURS: 2

Material Covered

Milk is the most nutritious food known, but also one of the most highly perishable foods as a result of bacterial action. Technician candidates would be exposed to the following tests involved in Milk Sanitation work - Sediment Test, Direct Microscopic Method (applications to raw milk, pasteurized milk, powdered milk and discussion of the sources of error in the method , Agar Plate Method, the Keeping Quality Test, Coliform Test, reduction methods of measuring bacterial densities, detection tests for inhibitory substances in milk - specifically for penicillin, the phosphatase test and pasteurizer timing.

This lecture will also cover the performance of field tests for determining food contamination. There are numerous tests which are run in the field in food control work. Some of the tests which could be covered in this lecture would include swab tests for food utensils, available chlorine in disinfectant solution, concentration of quaternary amonium compounds in sanitizing solutions, detection of adequacy of alkalinity in wash water, detection of decomposed or adulterated meat, as well as many others. A discussion on the sanitary significance of these tests would also be included.

References:

1. "Sanitarians Handbook" Theory in Administratative Practice, Third Edition - Ben Freedman, M.D. MPH Director of Bureau of Health Conservation, Louisiana State Department of Health, Peerless Publishing Company, P.O Box 30187, New Orleans, Louisiana

Chapter XVI & XVII - Quality of Milk and Market - Milk Control
Chapter XIX - Food and Drug Control
Chapter XXIII - Some simple tests for use in food control work

LECTURE NO. 40 & 41 NO. OF LECTURE HOURS: 2

Material Covered

Because of the increasing experience in poisoning cases caused by heavy metals and the use of various poisons in rodent control work, these lectures will briefly cover the makeup of heavy metals such as lead, cadmium, cyanide, mercury, etc. Also included would be discussions on rodenticides such as sodium flouroacetate (1080), warfarin ($C_{19}H_{16}O_4$), Pival ($C_{14}H_{14}O_5$) and others.

The effect of these poisons and methods of treatment in case of accidental poisoning, will be covered.

Reference:

1. "Sanitarians Handbook" - Third Edition - Ben Freedman, M.D. MPH, Director of Bureau of Health Conservation, Louisiana State Department of Health, Peerless

Chapter VIII - Rodent Control

LECTURE NO. 42 & 43

NO. OF LECTURE HOURS: 2

Material Covered

Because of the increasing importance on documentation of violations of air pollution control rules and regulations these two lectures will detail methods of sampling different types of air pollutants. There will be discussions on the affects of different types of pollutants, possible sources of these pollutants and available control measures to eliminate the pollution.

Different types of pollutants covered and the sampling methods will include the following list:

TYPE OF POLLUTANTS	AIR POLLUTION SAMPLING METHOD
Fallout particulate matter	Dust fall sampling - use of glass slides
Suspended particulate matter, smoke	No. 1 high volume filter sampler No. 2 AISI smoke sampler No. 3 visibility determinations
Hydrocarbons	flame ionization
Oxides of nitrogen	Saltzman method
carbon monoxide	a modification of the NBS colormetric detector tube technique
sulfur dioxide	West - Gaeke method
pollen	Collections on slides
odors	trained observers, panel of observers, volunteer observers

In addition to the above, methods of storage and transportation of air pollution samples will be outlined as well as the sanitary significance of the different types of air pollution.

References:

1. Any number of air pollution texts can be used for this lecture. It is suggested that the instructor obtain the text that will be most useful for this lecture.

LECTURE NO. 44 & 45 NO. OF LECTURE HOURS: 2

Material Covered

These lectures will deal with the sampling of waters for analysis for pesticides, insecticides, herbicides and other contaminates in this category.

Because of the amount of research going on in this area this lecture will discuss the research being done as far as sampling for the pollutants and the analysis being done for them.

General consideration will be given to the makeup of these pollutants and discussion will be held on the sanitary significance of the above mentioned chemicals. Among the insecticides covered will be the chlorinated hydrocarbon insecticides including the DDT series, chlordan series, benzene hexachloride series, also covered will be the organic phosphorus insecticides.

Inorganic insecticides will be discussed briefly.

References:

1. Many reference books are available on the above subject. It is suggested that the instructor obtain the most pertinent reference for the purpose of these lectures.

LECTURE NO. 46

NO. OF LECTURE HOURS: 1

Material Covered

This lecture will deal with statistical treatment of data resulting from laboratory analysis.

It is felt imperative that environmentalists be well acquainted with evaluation of laboratory data and the statistical treatment given to it in this interpretation.

References:

1. "Principles and Procedures of Statistics" - With special reference to the biological sciences - Robert G. D. Steel and James H. Torrie, McGraw Hill Book Company, Inc. - New York - Toronto - London 1960

LECTURE NO. 47

NO. OF LECTURE HOURS: 1

Material Covered

This lecture will cover the use of sanitary chemistry in legal cases. It is recommended that a guest lecturer be brought in to discuss the use of laboratory data in prosecuting violations of public health laws.

References:

1. It is suggested that case history be provided to the students as part of this lecture.

LECTURE NO. 48 NO. OF LECTURE HOURS: 1

Material Covered

This lecture will deal with the relation of sanitary chemistry and laboratory analysis to regulatory agencies.

It is suggested that a guest lecturer from a governmental agency be invited to provide this lecture. Items discussed would include standards for public water supplies, standards for wastewater disposal, receiving water quality criteria as well as food contamination and air pollution sampling.