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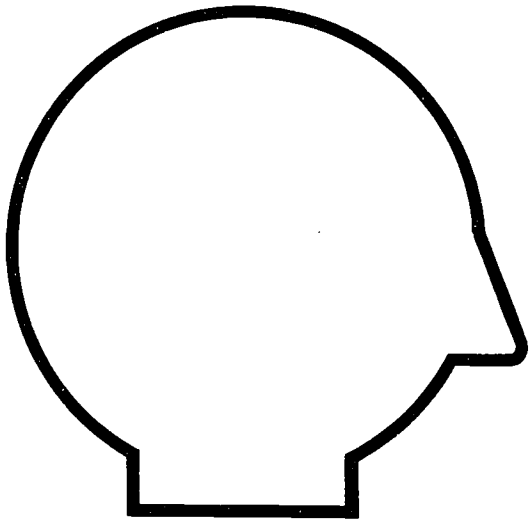
ABSTRACT

This module, one of 25 on vocational education training for careers in environmental health occupations, is on using modules in an environmental health training program. This informational document describes the prospective student, content and objectives of the modules, and how to select modules for use in an environmental health training program. An introductory section discusses expanding roles in the environmental health field and how module topics were selected. In the section titled "Description of the Self-Instruction Materials," various program areas are presented: acoustics (noise control), air pollution, occupational health/ventilation, radiation, sanitation, and water/wastewater. Also in this section is a catalog of modules. The description of each module includes module title, objective, sample graphics depicting the subject of the instruction, training prerequisites, and lesson objectives. References are appended. (CT)



Using Modules in an Environmental Health Training Program

Module 20

U.S. DEPARTMENT OF EDUCATION, Office of Vocational and Adult Education

ADDENDUM

Contract 300800088 was an 18-month contract awarded to Consumer Dynamics, Inc., on January 2, 1980, by the Curriculum and Instruction Branch of the Office of Vocational and Adult Education, U.S. Department of Education.

The activity which is the subject of this report was supported in whole or in part by the U.S. Department of Education. However, the opinions expressed herein do not necessarily reflect the position or policy of the Department of Education, and no official endorsement by the Department of Education should be inferred.

FOREWORD

The Curriculum and Instruction Branch of the Office of Vocational and Adult Education, U.S. Department of Education, identified a need to improve the training opportunities for vocational education students interested in pursuing careers in environmental health. To fulfill that need, Consumer Dynamics, Inc., a Rockville, Maryland, based company, was awarded the contract to develop performance-oriented, competency-based modules in the environmental health sciences.

USING MODULES IN AN ENVIRONMENTAL HEALTH TRAINING PROGRAM is an informational pamphlet that describes the prospective student, content and objectives of the modules, and how to select modules for use in an environmental health training program.

CONTENTS

INTRODUCTION

Practitioners in the field of environmental health are responsible for protecting and preserving human health. To carry out those responsibilities, the practitioner must apply a multidisciplinary approach to the recognition, evaluation, and control of environmental hazards that affect human health. The hazards produced by harmful biological, chemical, and physical agents are pervasive. Wherever they touch human life, they are capable of producing illness, injury, and sometimes death, depending on the nature and severity of the hazard.

As more knowledge is gained about the interrelationship between the environment and health, the more complex the practitioner's job becomes. The investigatory part of this job includes data collection, data analysis, and decisionmaking. To carry out responsibilities in the latter two components, the practitioner must have acquired extensive technical knowledge, skills, and attitudes (KSA's) about the cause-effect relationship among the agent, host, and environment; i.e., the biological, chemical, or physical agent; the human host; and the environment in which the agent and host interact. To determine how and where information about the agent, host, and environment is to be collected, the practitioner must judiciously apply the necessary KSA's. When the method and location for acquiring the information have been decided, the actual data collection often can be accomplished by someone with less environmental health training and education than the professional practitioner. The primary advantage to having support personnel provide data collection assistance is to permit the practitioner more time to analyze data and make decisions. The need to employ paraprofessionals in support roles in environmental health is increasing.

The Curriculum and Instruction Branch of the Office of Vocational and Adult Education, U.S. Department of Education, determined a need to provide increased vocational education training opportunities for those students

seeking careers as paraprofessionals in several program categories in environmental health, including:

- o Acoustics (Noise Control)
- o Air Pollution
- o Occupational Health and Ventilation
- o Radiation
- o Sanitation
- o Water/Wastewater

This pamphlet identifies the prospective trainee, describes the content and objectives of each module, and suggests how they can be used in existing environmental health vocational education programs.

EXPANDING ROLES IN THE ENVIRONMENTAL HEALTH FIELD

Rapidly expanding technology in the past four decades has generated hazards unknown when the environmental health practitioner, commonly referred to as a "sanitarian," was carrying out inspection duties to control communicable diseases during the 1930's and 1940's. At that time, duties of the sanitarian were described as the ". . . regulatory inspection which safeguards the life, health, and well-being of the community." (2) These early sanitarians were responsible for sewage disposal, communicable disease control, food sanitation, and water supply. As sanitarians gained more control duties by the 1960's, the description of their roles also changed:

> The Sanitarian is a specialist in the control of the environment for better health. He is an advocator and applier of practice for the purpose of controlling hazardous elements in the environment. He is an organizer of economic and social forces for the purpose of providing and maintaining a clean and sanitary environment for the betterment of mankind. (2)

During the late 1960's and 1970's, a dramatic increase in the incidence of chronic disease occurred, partly due to the increase of environmental and

workplace pollutants that are the byproduct of technological progress. As a result, the sanitarian's duties have become greatly diversified.

In a recent definition (1) of roles in environmental health, paraprofessional duties have been added:

PARAPROFESSIONAL TECHNICIAN

The paraprofessional technician works under the direct or general supervision of the environmental health practitioner and is involved primarily in performing routine and standardized inspections, field sampling, and testing.

Also in that current role definition provided by the National Environmental Health Association (NEHA) are included several groupings of activities (positions) performed by the professional practitioner: (2)

Position #1

In this position the...environmental health practitioner is involved primarily in inspections, field sampling, testing, enforcement, and public information activities.

Position #2

In this position the...environmental health practitioner is involved primarily in educational, investigative, consultative, planning, and enforcement activities.

Position #3

A. Administrative

In this position the...environmental health practitioner is involved primarily in supervisory, administrative, and planning activities; and directs enforcement and investigative programs.

B. Technical

In this position the...environmental health practitioner is involved primarily in directing educational and investigative programs; acts as a consultant to industry and governmental agencies; and demonstrates administrative ability in environmental management.

At both the paraprofessional and professional levels, two types of positions have been delineated by NEHA: the generalist and the specialist: (2)

THE GENERALIST

The generalist practitioner performs a variety of related activities in more than one program area. The generalist practitioner:

- o focuses on a broad arena in environmental health that encompasses more than one program area
- o may have some depth of expertise in one specific program area, but usually has this expertise spread rather evenly across a number of program areas
- o has limited responsibility in the arena of any particular environmental health specialist
- o has limited expertise in the arena of any particular environmental health specialist
- o because of the different setting locations (urban vs. rural) there appears to be a dichotomy of responsibilities among the generalist practitioner.

THE SPECIALIST

The specialist practitioner devotes himself to the performance of a particular branch of activities within a given program area, thereby narrowing and intensifying expertise in that area. The specialist practitioner:

- o focuses on a narrow arena in environmental health that emphasizes one or a few closely interrelated specific program areas
- o has greater depth of expertise in these program areas than does the generalist
- o has little or no responsibility in the total area of the generalist's work
- o has limited expertise in the broad areas of the generalist.

SELECTION OF MODULE TOPICS

The U.S. Department of Education (ED) determined that self-instruction materials should be developed to provide additional training opportunities for vocational education students seeking careers as generalists in environmental

health occupations. Consumer Dynamics was awarded a 20-month contract to conduct a survey of existing generalist environmental health program materials at the 2-year level; to develop self-instruction materials that would fill the training gaps between skill needs and current skill training opportunities at the vocational education level; and to disseminate information about the content and use of newly developed materials.

As part of the information collected to characterize skill needs, a task analysis was performed using position descriptions furnished by Federal agencies and State Departments of Personnel. The analysis revealed that tasks appropriate to, and currently performed by, those fitting the description of the generalist paraprofessional environmental health technician were largely hands-on oriented. To provide the additional competency-based education/ training opportunities sought by ED, selection of module titles was based largely on current requirements to calibrate and operate equipment used in the program areas of acoustics (noise control), air pollution, occupational health and ventilation, radiation, sanitation, and water/wastewater. The modules selected are consistent not only with current skills needs, but also with NEHA's role definition for the generalist, paraprofessional, environmental health technician.

In the following section entitled "Description of the Self-Instruction Materials," information about the module content is presented. Module descriptions, including the overall objective and individual lesson objective, will acquaint instructors and administrators of generalist environmental health programs at vocational education institutions with what modules have been developed under this ED contract and are available for use in existing programs.

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DESCRIPTION OF THE SELF-INSTRUCTION MATERIALS

The modules selected for development fall within several program categories. In order to show how instruction in the modules relates to the activities in each occupational category, general program area goals are provided. The purpose of this orientation is to provide a reference for the catalog of modules that follows.

ENVIRONMENTAL HEALTH PROGRAM AREAS

In a report (3) developed for the U.S. DHEW's Health Standards Manpower Branch, NEHA included a list of program area goals. These goals provide an overview of the program activities currently conducted in each of 14 environmental health program areas. The modules developed for ED by Consumer Dynamics include tasks that are performed to fulfill some of those program goals. The following list includes those goals that fit within the program areas selected by ED:

ACOUSTICS (NOISE CONTROL)

Noise Control: To protect the public from or prevent hazardous or annoying noise levels in residential, business, industrial, or recreation areas and structures.

AIR POLLUTION

Air Pollution Control: To assure a community air resource conducive to positive human health, which does not injure our environment and is esthetically desirable.

OCCUPATIONAL HEALTH/VENTILATION

Occupational Health and Safety: To assure the positive health and safety of workers in places of employment through controlling hazardous environmental factors.

RADIATION

Radiation Safety: To prevent unnecessary or hazardous exposure to any types of radiation.

SANITATION

Vector Control: To control insects, rodents, and other animals that adversely affect human health, safety, and comfort.

Water Supply: To assure the provision and maintenance of water supplies that are safe and adequate in quantity and quality.

WATER/WASTEWATER

Water Pollution Control: To restore or maintain the quality of water resources by the treatment or prevention of polluted water.

CATALOG OF MODULES

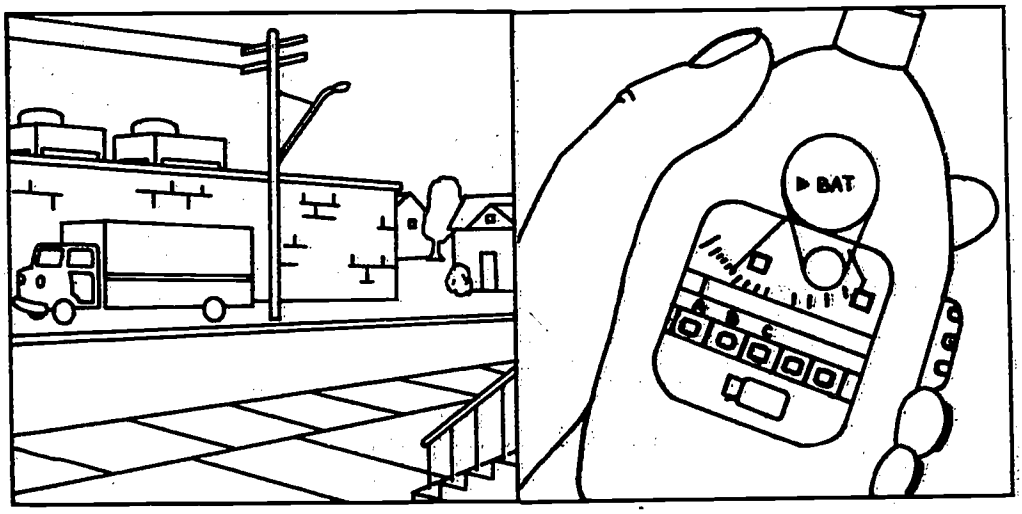
This catalog is provided to enable instructors and administrators to select the modules most appropriate to their program needs. The description of each module includes:

- Module title
- Module objective
- Sample graphics depicting the subject of the instruction
- Training prerequisites
- Lesson objectives.

To assist the user in finding a specific module in this catalog, a listing of the module titles is presented on the following page.

OBTAINING MEASUREMENTS OF STATIONARY ENVIRONMENTAL NOISE SOURCES

Students learn to determine the level of sound produced by stationary sources located in residential, industrial, and commercial land use zones.



Training Prerequisites

Before beginning this module, students should have a course in high school physics or have equivalent training, and should also have learned how to calibrate and use a Type 2 sound level meter.

Objectives

Upon completion of this module, students will be able to perform the following functions:

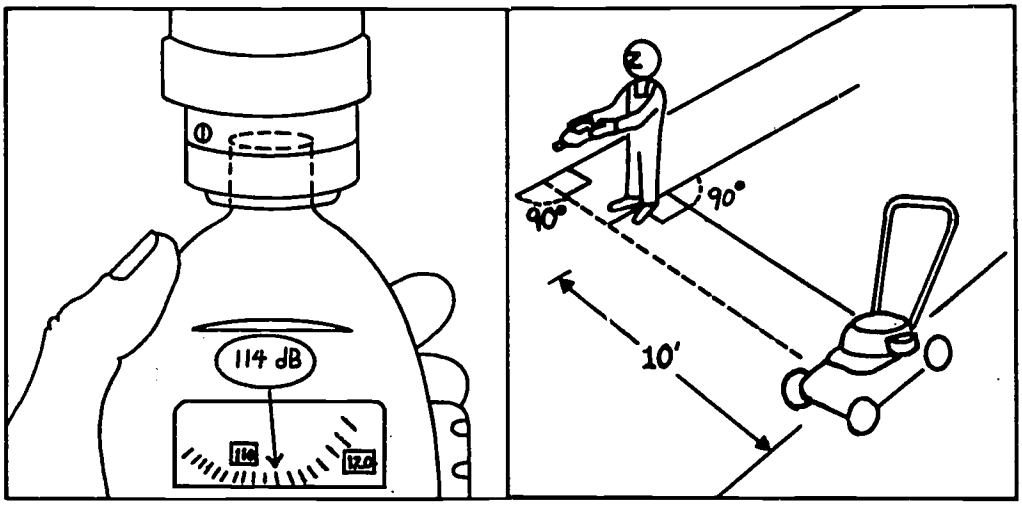
1. Identify and characterize stationary environmental noise sources located in residential, industrial, and commercial areas.

2. Check the operational readiness of a Type 2 sound level meter and sound level calibrator.

3. Make screening survey and sound level measurements of noise produced by stationary sound sources.

OPERATING SOUND MEASURING EQUIPMENT

Students learn to calibrate, operate, and position a Type 2 sound level meter (SLM) for taking accurate screening survey measurements.



Training Prerequisites

Before beginning this module, students should have some working knowledge of science.

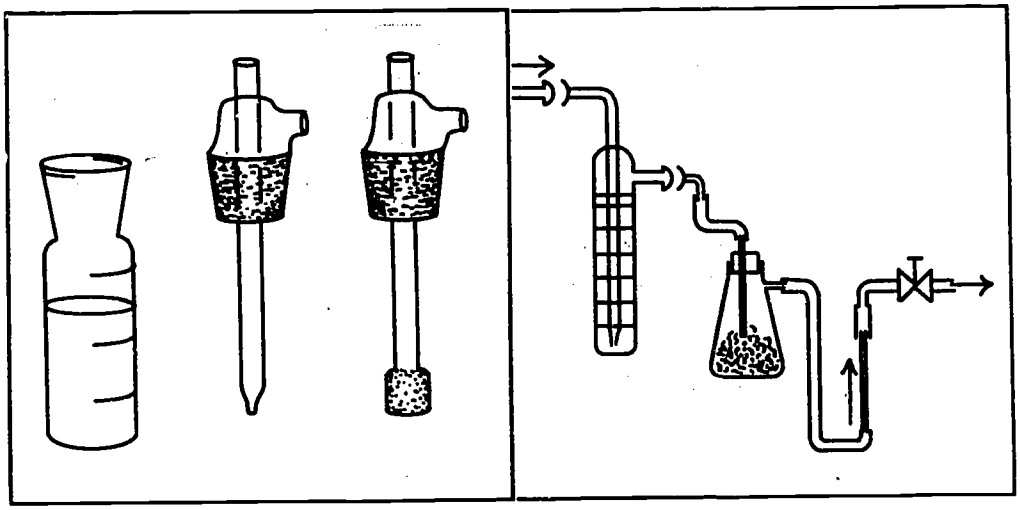
Objectives

Upon completing this module, students will be able to perform the following functions:

1. Select decibel ranges, check the condition of batteries, and set the SLM's response for measuring sound levels.
2. Test the SLM's decibel level response at the standard calibrating frequency, 1000 hertz (Hz), using a sound level calibrator as the calibration source.
3. Make screening survey measurements, using a gasoline-powered lawnmower as a noise source.

OPERATING GAS-ABSORBING EQUIPMENT

Students learn to use a calibrated gas-absorbing sampling train to obtain air samples for analysis of a specific gas or vapor.



Training Prerequisites

Before beginning this module, students should have gained experience and skill in (1) using a primary calibration standard, such as the bubble meter, to calibrate personal sampling pumps and devices, and using such sampling trains to measure occupational exposures; and (2) calibrating and using other portable pumps, including gasoline-operated or AC-operated (semiportable) pumps. Students also must have gained basic chemical laboratory skills, including use of volumetric glassware, learned in a high school chemistry course or through on-the-job training.

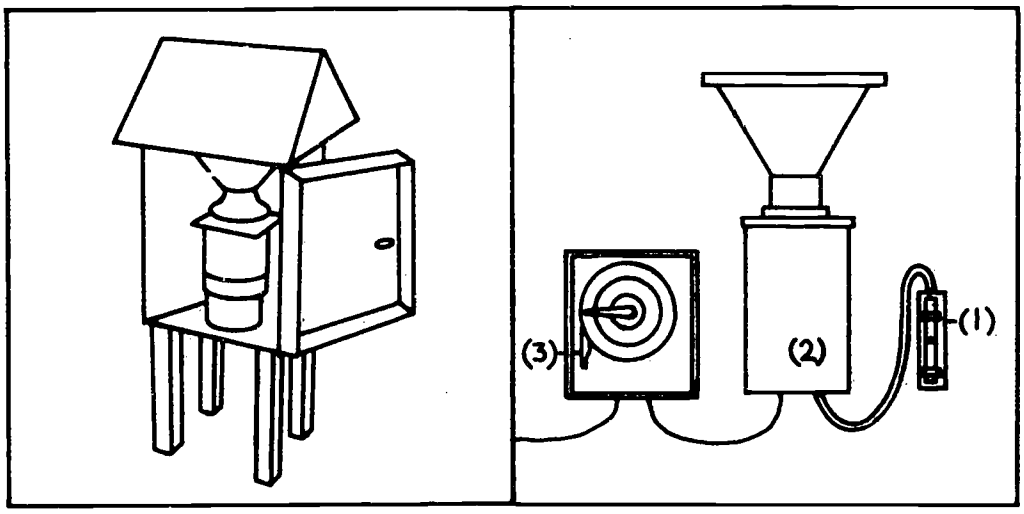
Objectives

Upon completion of this module, students will be able to perform the following functions:

1. Identify parts and functions of each component in a gas-absorbing sampling train.
2. Clean and calibrate a gas-absorbing sampling train.
3. Operate a gas-absorbing sampling train to obtain an enclosed area sample for analysis of sulfur dioxide.

OPERATING HIGH-VOLUME AIR SAMPLERS

Students learn to name and identify the major components of a high-volume air sampler as well as operate, maintain, and calibrate the unit in the field.



Training Prerequisites

Before beginning this module, students should have some working knowledge of science.

Objectives

Upon completion of this module, students will be able to perform the following functions:

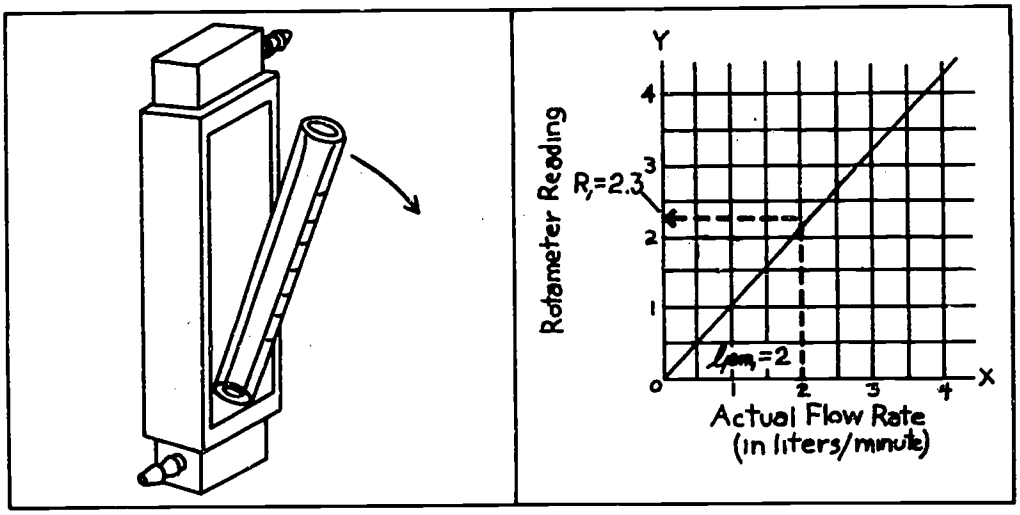
1. Dissasemble the high-volume sampler, name and identify its major components, and explain the purpose or function of each component.

2. Operate the high-volume air sampler, inspect it for defects, and perform routine maintenance procedures.

3. Plot a calibration curve for a field-type (visifloat) rotameter by using an orifice calibrator and a U-tube manometer.

USING PRECISION ROTAMETERS

Students learn to clean and calibrate a low-flow precision rotameter for use as a secondary calibration standard; as such, the rotameter can be used instead of the soapbubble meter to calibrate a personal sampling pump just before and after use.



Training Prerequisites

Before beginning this module, students should have gained skills in calibration, operation, and use of portable sampling pumps.

Objectives

Upon completion of this module, students will be able to perform the following functions:

1. Name the parts of a low-flow precision rotameter and describe how each part functions.
2. Disassemble, clean, and reassemble a low-flow precision rotameter.
3. Calibrate a precision rotameter, using a soapbubble meter.

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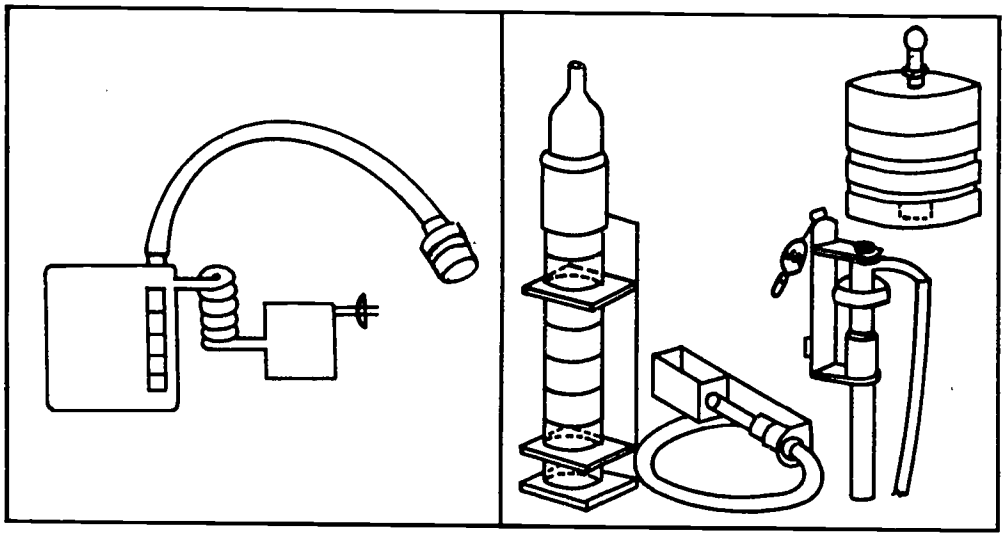
CALIBRATING PERSONAL AIR MONITORING DEVICES

Students learn to calibrate any personal air monitoring pump using the soapbubble meter calibration method.



Training Prerequisites

Before beginning this module, students should have taken a high school level course in algebra, geometry, or physics, or have gained the equivalent experience from working on the job.

Objectives

Upon completion of this module, students will be able to perform the following functions:

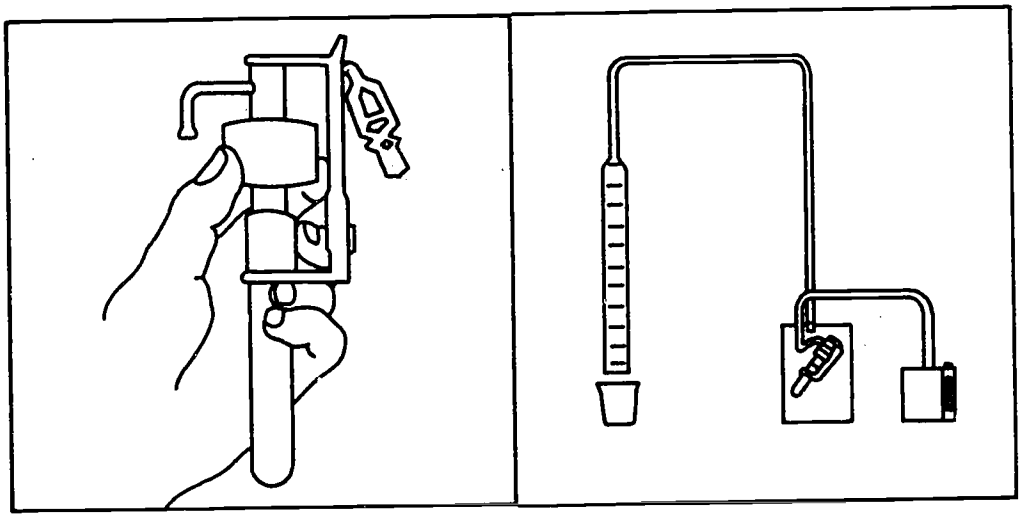
1. Name each part of the personal air monitoring assembly or sampling train, and the parts of the soapbubble meter calibration apparatus.

2. Assemble and prepare the sampling train and soapbubble meter for calibration.

3. Using a soapbubble meter, calibrate a sampling train, including a personal air sampling pump and filter cassette.

CALIBRATING A RESPIRABLE SAMPLING DEVICE

Students learn to identify the parts and functions of the cyclone respirable dust sampler; to clean the cyclone; and to calibrate a sampling train that includes a personal air sampling pump and cyclone sampling device.



Training Prerequisites

Before beginning this module, students should have taken a high school level course in algebra, geometry, or physics, or have gained the equivalent experience from working on the job.

Objectives

Upon completion of this module, students will be able to perform the following functions:

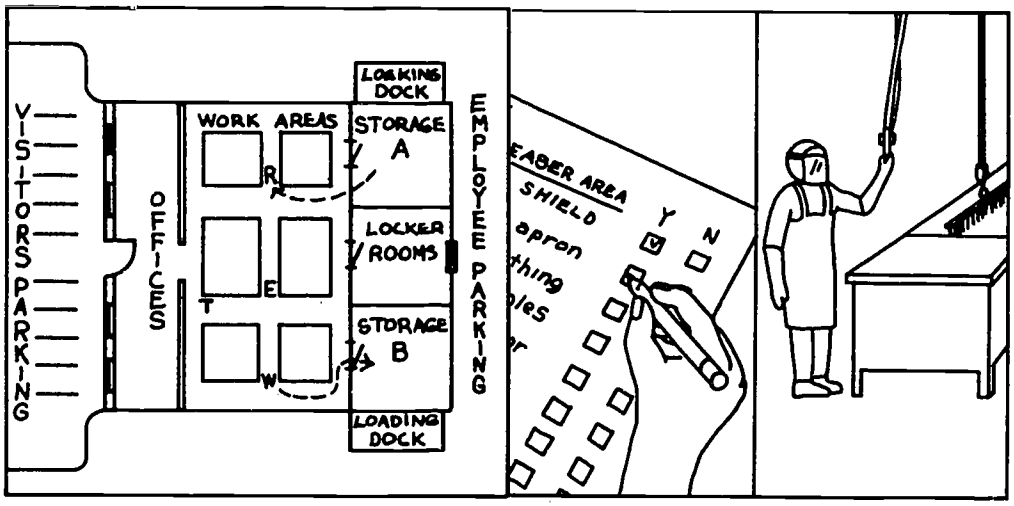
1. Name each part of the respirable dust sampling equipment and take the equipment apart, clean it, and reassemble it.

2. Assemble and prepare the calibration train, including a soapbubble meter, cyclone respirable dust sampling equipment and calibration container, and personal air sampling pump.

3. Calibrate a respirable dust sampling train using a soapbubble meter.

COLLECTING INDUSTRIAL HEALTH INFORMATION

Students learn to collect preliminary survey information that will add to that which the safety and health professional will obtain during a walk-through survey to characterize safety and health risks to each worker in an industrial facility.



Training Prerequisites

Before beginning this module, students should have taken at least three semesters of a 2-year program in environmental health or industrial hygiene, and be able to explain how the agent-host-environment concept applies to the study of industrial hygiene.

Objectives

Upon completion of this module, students will be able to perform the following functions:

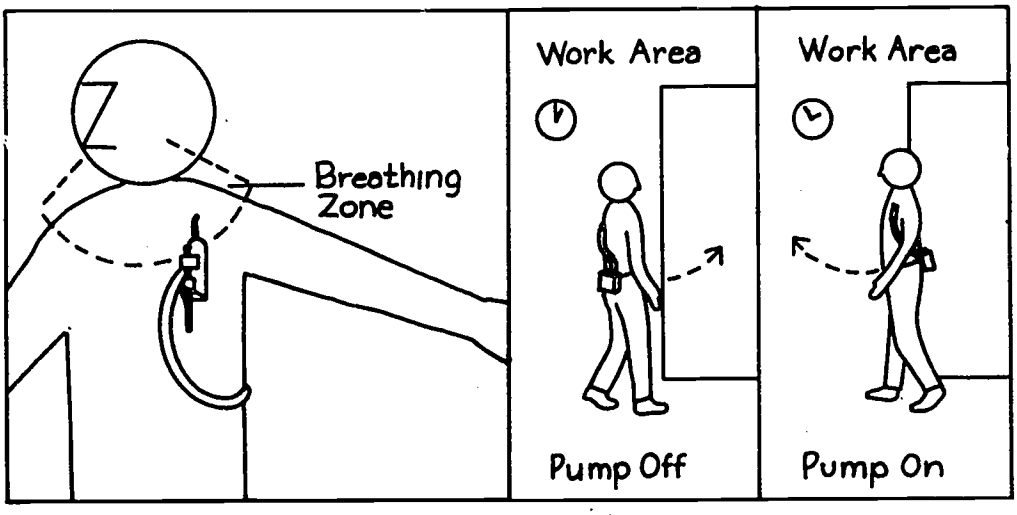
1. Collect and organize presurvey information about workflow and workers through use of a facility floor plan and by developing job aids.

2. Collect information about what biological, chemical, and physical agents are used, and where and how they are stored to prevent them from becoming hazards.

3. Collect information about the personal hygiene and sanitation practices workers follow to prevent accidental exposures to toxic or otherwise hazardous materials.

COLLECTING SAMPLES OF WORKPLACE AIR

Students learn to collect a sample of the air a worker breathes over a period of several hours, and to obtain the necessary information to verify the sampling conditions.



Training Prerequisites

Before beginning this module, students should be able to demonstrate skills necessary to calibrate and use a personal sampling pump and sampling trains for sampling with respirable dust devices, charcoal tubes, and midget impingers, and be able to read dry bulb and wet bulb thermometers.

Objectives

Upon completion of this module, students will be able to perform the following functions:

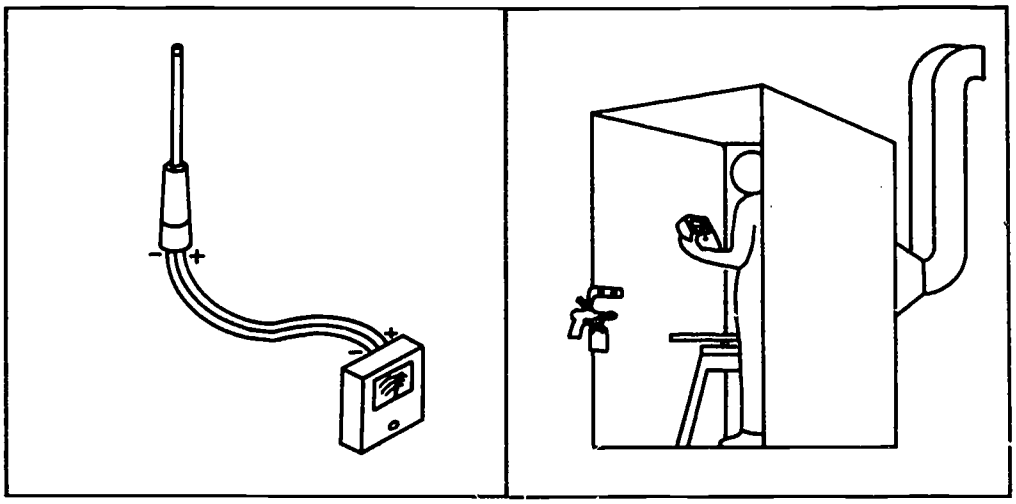
1. Collect information about sampling conditions and about the individual being sampled.

2. Position an air sampling train on an individual so that a representative sample can be obtained while allowing the worker freedom of movement.

3. Adjust the pump flow over the sampling period, and determine if and when a new sampling device may be needed.

MEASURING AIRFLOW IN LOCAL EXHAUST VENTILATION SYSTEMS

Students learn to measure airflow in hoods and ducts in local ventilation systems, using an anemometer.



Training Prerequisites

Before beginning this module, students should have some working knowledge of science, but do not need special preparation in mathematics or physics. They must, however, know how to use a swinging vane anemometer.

Objectives

Upon completion of this module, students will be able to perform the following functions:

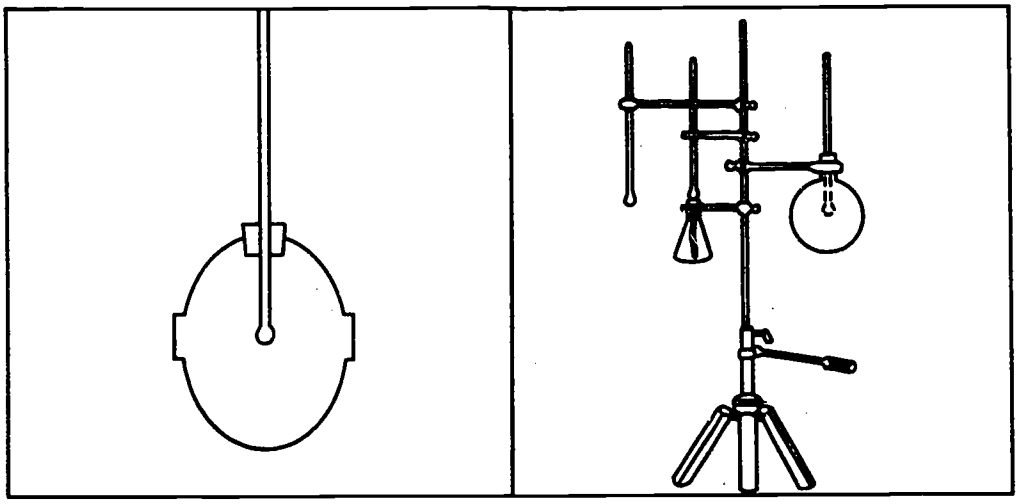
1. Name each part of the swinging vane anemometer and describe its function.

2. Assemble a swinging vane anemometer, check its operation, and demonstrate its use.

3. Make velocity measurements in hoods and ducts within the measurement accuracy of the anemometer used.

OBTAINING HEAT STRESS MEASUREMENTS

Students learn to take accurate measurements with the wet bulb, dry bulb, and globe thermometers, and to use these measurements to calculate the wet bulb globe temperature (WBGT).



Training Prerequisites

Before beginning this module, students should have completed at least one high school science course.

Objectives

Upon completion of this module, students will be able to perform the following functions:

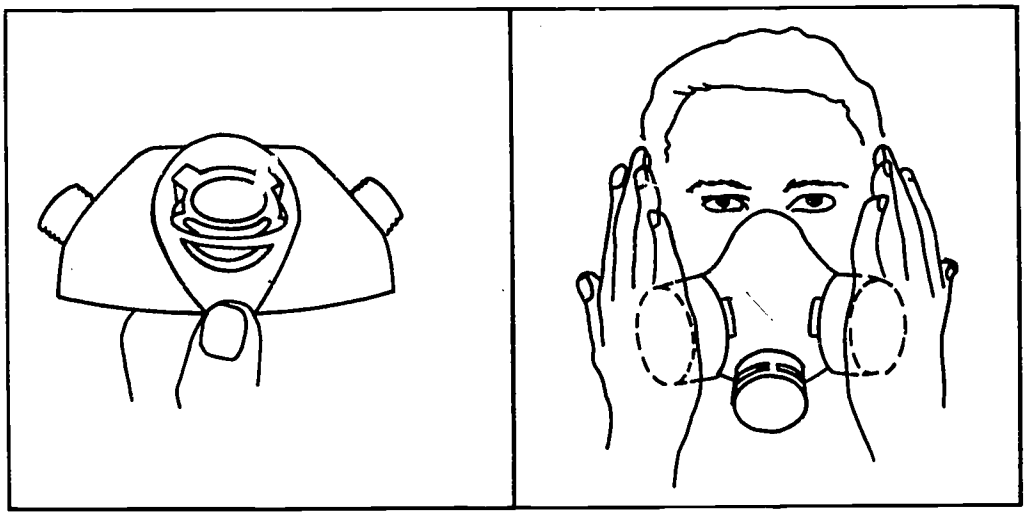
1. Name and describe the functions of the sections or parts of the dry bulb, wet bulb, and globe thermometers, and assemble and use the wet bulb and globe thermometers.

2. Assemble a wet bulb globe temperature (WBGT) apparatus and use it to measure WBGT.

3. Determine the WBGT using a Botsball thermometer.

USING AIR-PURIFYING RESPIRATORS

Students learn to clean and inspect a dual cartridge, air-purifying respirator, and to perform qualitative fit tests on this type of respirator.



Training Prerequisites

There are no prerequisites for using this module.

Objectives

Upon completion of this module, students will be able to perform the following functions:

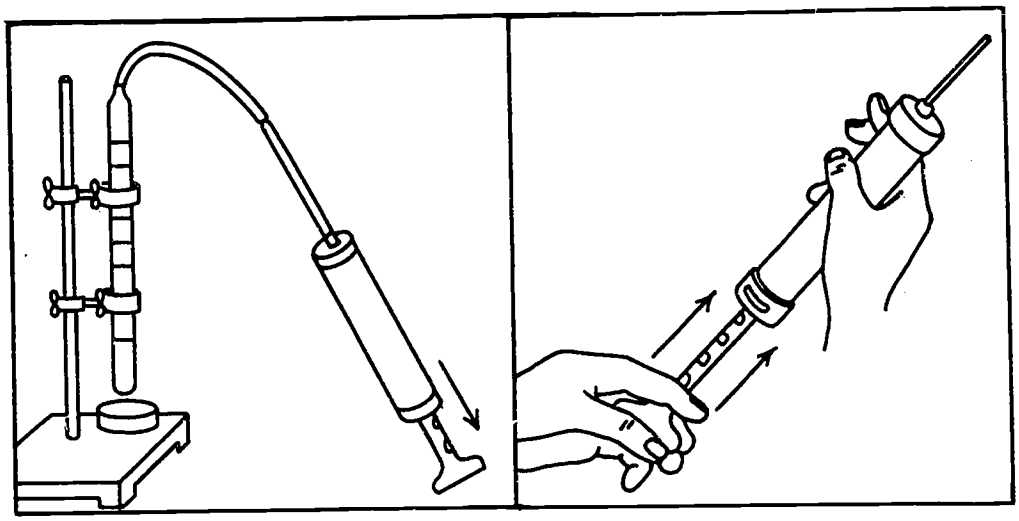
1. Describe how air flows through an air-purifying respirator, and disassemble an air-purifying respirator and tell how each part works or functions.

2. Clean and inspect each part of the air-purifying respirator, and reassemble it for storage or use.

3. Fit an air-purifying respirator so it makes a proper seal on the face, and, using a chemical cartridge respirator, test that fit using three types of qualitative fit tests: the positive pressure test, the negative pressure test, and a fit test using isoamyl acetate vapor (banana oil).

USING DETECTOR TUBES AND PUMPS

Students learn to calibrate and use a detector tube sampling pump and detector tubes.



Training Prerequisites

There are no prerequisites for using this module.

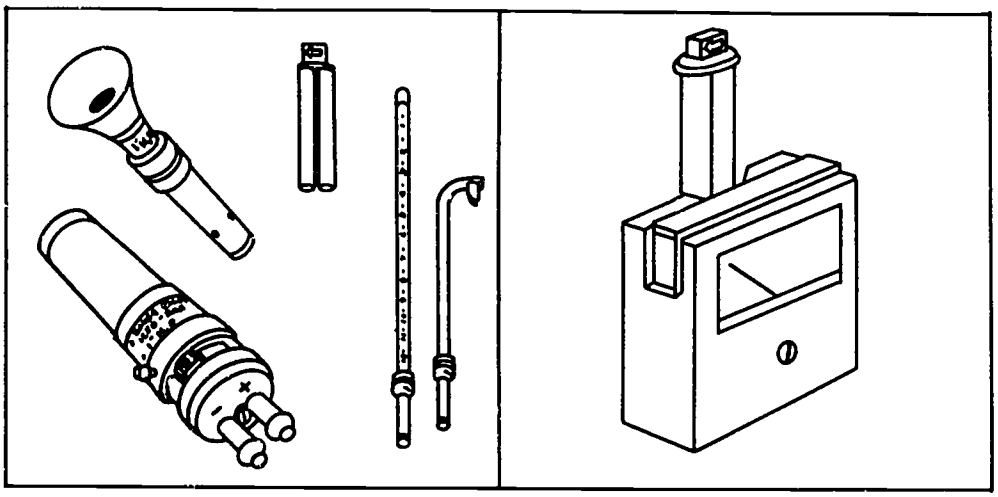
Objectives

Upon completion of this module, students will be able to perform the following functions:

1. Name the component parts of the sampling pump and detector tube.
2. Assemble and use a soapbubble meter for calibrating a detector tube sampling pump.
3. Measure the amount of CO in the air around a fossil-fuel-fired heater, using a detector tube.

USING A SWINGING VANE ANEMOMETER TO MEASURE AIRFLOW

Students learn to use a swinging vane anemometer (Alnor Velometer) to measure airflow.



Training Prerequisites

Before beginning this module, students should have some working knowledge of science.

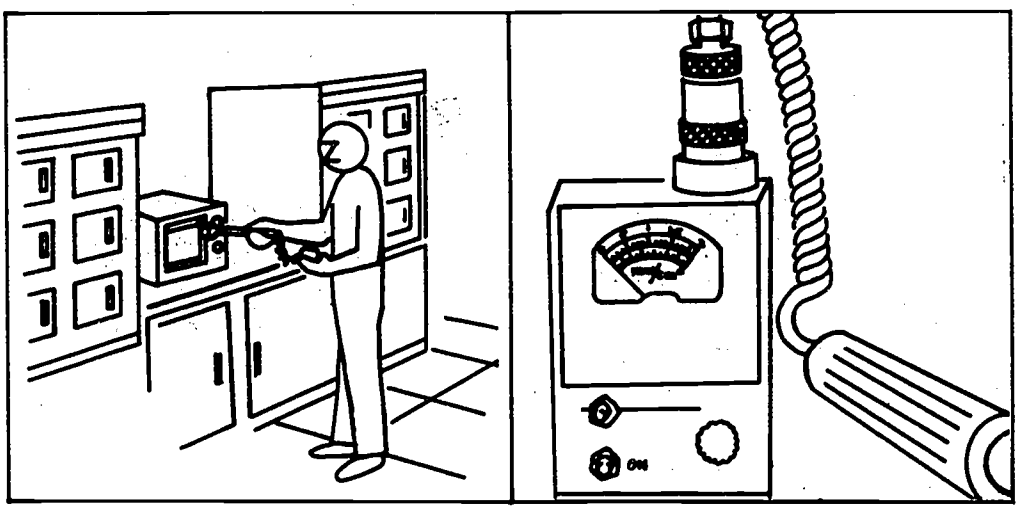
Objectives

Upon completion of this module, students will be able to perform the following functions:

1. Name each part of the swinging vane anemometer and describe its function.
2. Assemble a swinging vane anemometer and check its operation.
3. Measure airflow at air supply and exhaust vents using the swinging vane anemometer and its attachments.

OPERATING A MICROWAVE RADIATION DETECTION MONITOR

Students learn to leak test a microwave oven using a microwave radiation meter fitted with a probe sensitive to low-power density levels of microwave radiation.



Training Prerequisites

There are no prerequisites for using this module.

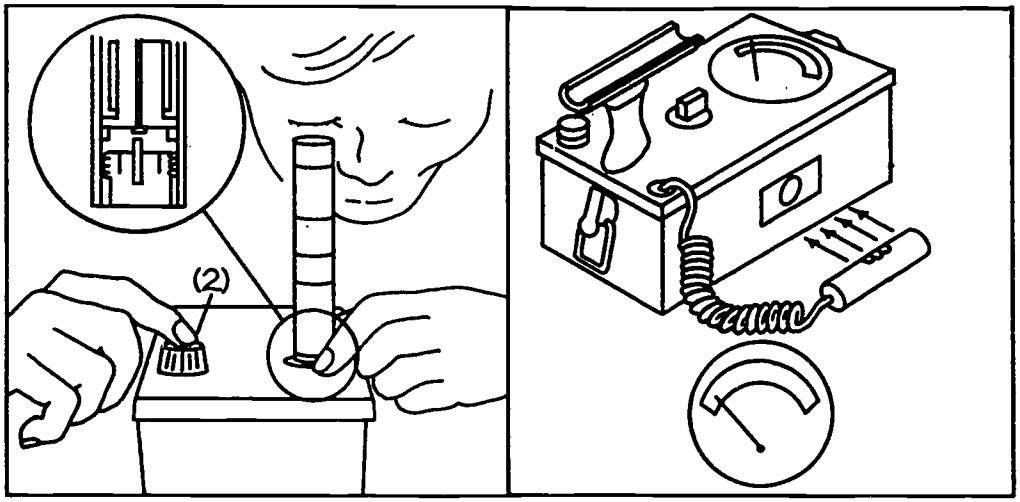
Objectives

Upon completion of this module, students will be able to perform the following functions:

1. Test the operation of a low-power density sensitive microwave radiation monitor.
2. Conduct a functional test of a commercially available microwave oven.
3. Conduct a microwave oven leak test survey using a low-power density sensitive microwave radiation detection monitor.

USING IONIZING RADIATION DETECTORS

Students learn to operate a geiger counter and read a pocket ion chamber dosimeter in demonstrating how radiation levels are affected by distance, shielding, and time.



Training Prerequisites

Before beginning this module, students should be or have been enrolled in a course on radiation safety or its equivalent at the 2-year technical-school or college level.

Objectives

Upon completion of this module, students will be able to perform the following functions:

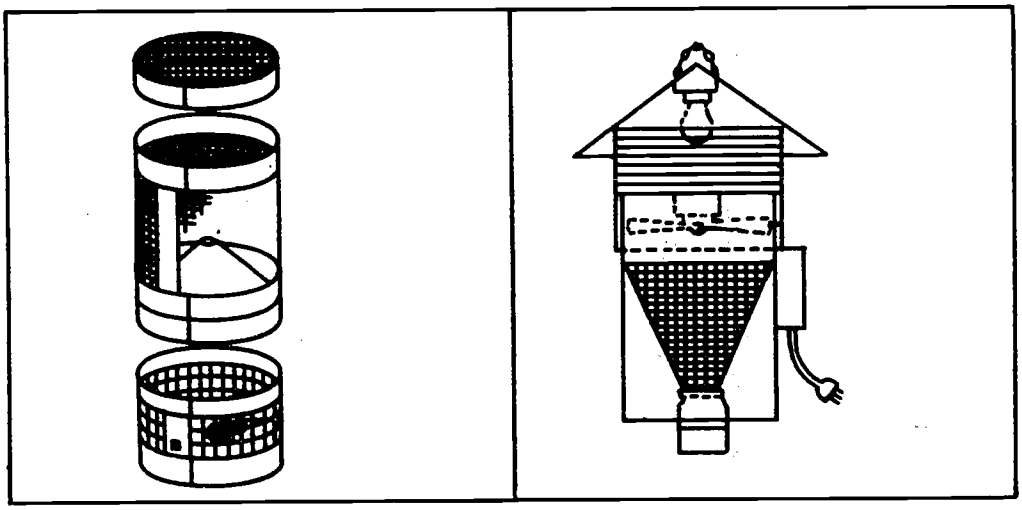
1. Name and tell the function of the major components of a geiger counter, and check its operation using a sealed check source of low radioactivity.

2. Read a pocket ion chamber dosimeter, and recharge the dosimeter using a dosimeter charger.

3. Demonstrate what effects distance, shielding, and time have on radiation levels.

COLLECTING PESTS FOR IDENTIFICATION

Students learn to collect pest specimens of rodents, flies, and mosquitoes, and to prepare the specimens for shipment to a laboratory for identification.



Training Prerequisites

Before beginning this module, students should have had a course in high school biology, have knowledge of basic differences between flies and mosquitoes and other insects, have learned how to use a stereo microscope, and be enrolled in a vector control course in a 2- or 4-year technical school or college.

Objectives

Upon completion of this module, students will be able to perform the following functions:

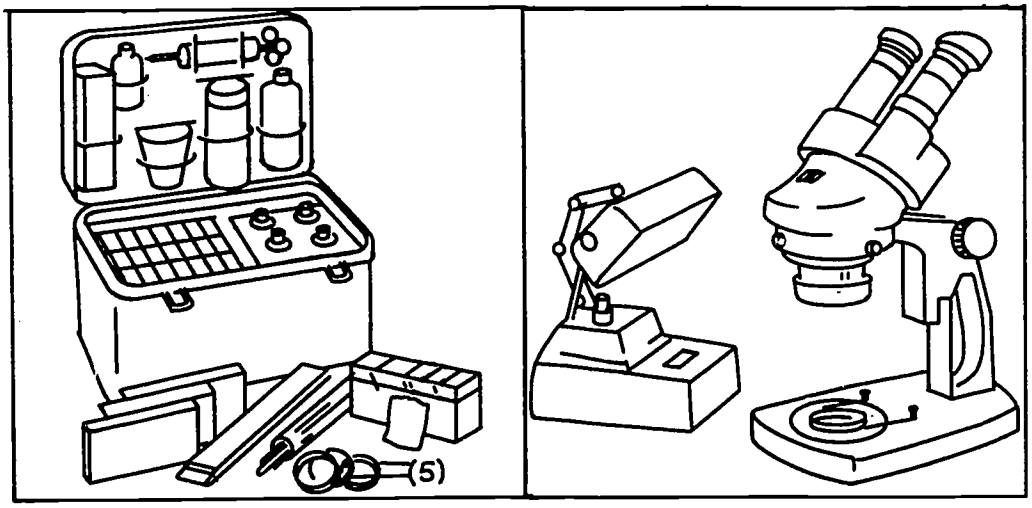
1. Identify the parts and functions of rodent and arthropod traps and collection devices.

2. Identify locations suitable for collecting rodent, fly, and mosquito specimens.

3. Set devices to collect pests, collect the pests from the traps, label specimens, and prepare the specimens for shipment and analysis.

PERFORMING ANALYSES FOR WATERBORNE BACTERIA

Students learn to perform an examination of drinking water for the presence of indicator bacteria (coliform).



Training Prerequisites

Before beginning this module, students should have had a course in high school biology, or have gained the equivalent knowledge through on-the-job training; know how to use laboratory pipets; and have learned how to use a stereo microscope.

Objectives

Upon completion of this module, students will be able to perform the following functions:

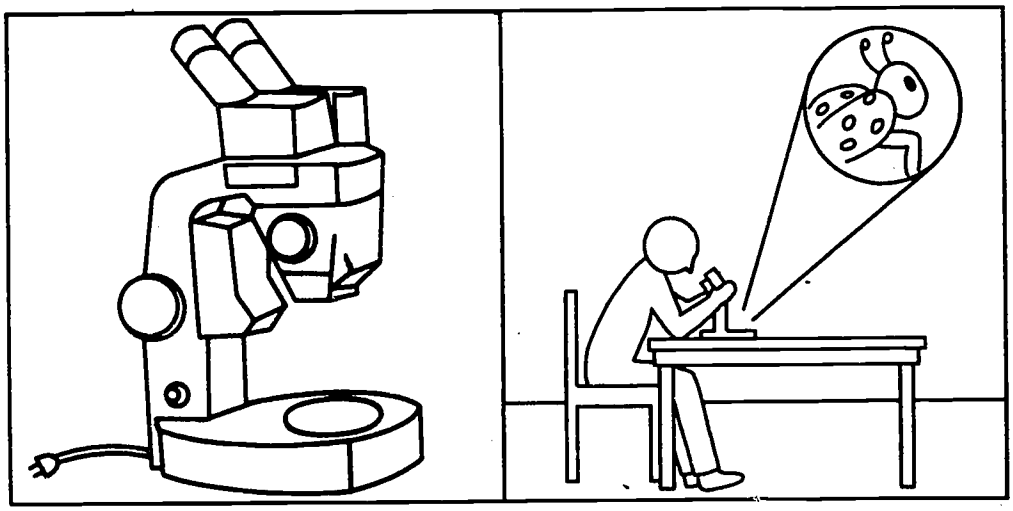
1. Name, sterilize, and assemble the component parts of a membrane filter test unit.

2. Suction a water sample through a membrane filter, using aseptic techniques, and prepare the membrane filter for incubation.

3. Determine the number of total coliform organisms in a water sample.

USING A STEREO MICROSCOPE

Students learn to correctly use a stereo microscope for observing materials and objects, and to use the instrument to classify insects on the basis of their body form.



Training Prerequisites

Before beginning this module, students should have some working knowledge of science.

Objectives

Upon completion of this module, students will be able to perform the following functions:

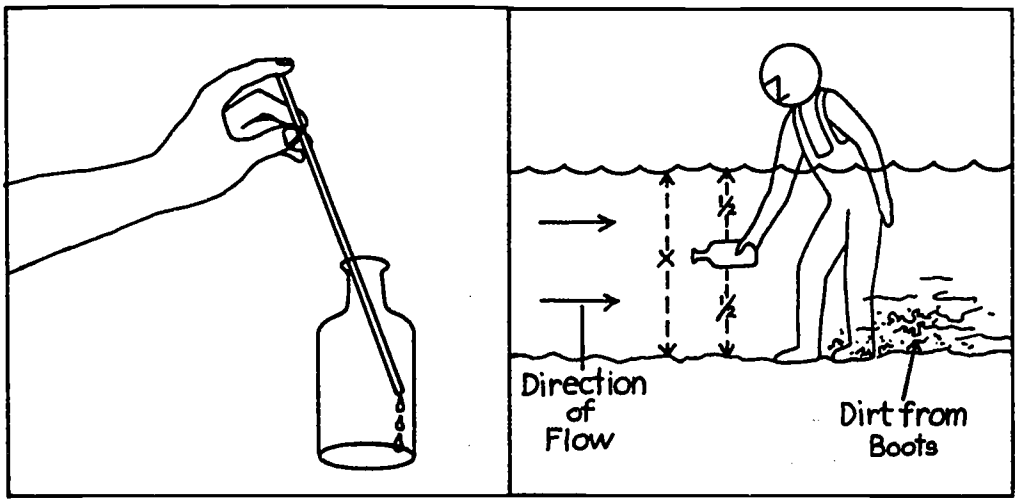
1. Accurately name each part of the stereo microscope, state the function of each part, and properly handle and clean the instrument.

2. Use the stereo microscope to examine and study various materials and objects.

3. Using a stereo microscope, classify insects into groups by utilizing the insect's morphology (body structure) as the basis of the classification process.

COLLECTING STREAM SAMPLES FOR WATER QUALITY

Students learn to collect stream samples for specific laboratory analyses.



Training Prerequisites

Before beginning this module, students must know how to work safely in a laboratory; adjust the pH of a solution to a given value, using an acid or a base; use a graduated Mohr pipet to deliver amounts of liquid accurate to 0.01 ml; read a Centigrade thermometer accurate to the nearest degree; and sterilize equipment using dry heat or an autoclave.

Objectives

Upon completion of this module, students will be able to perform the following functions:

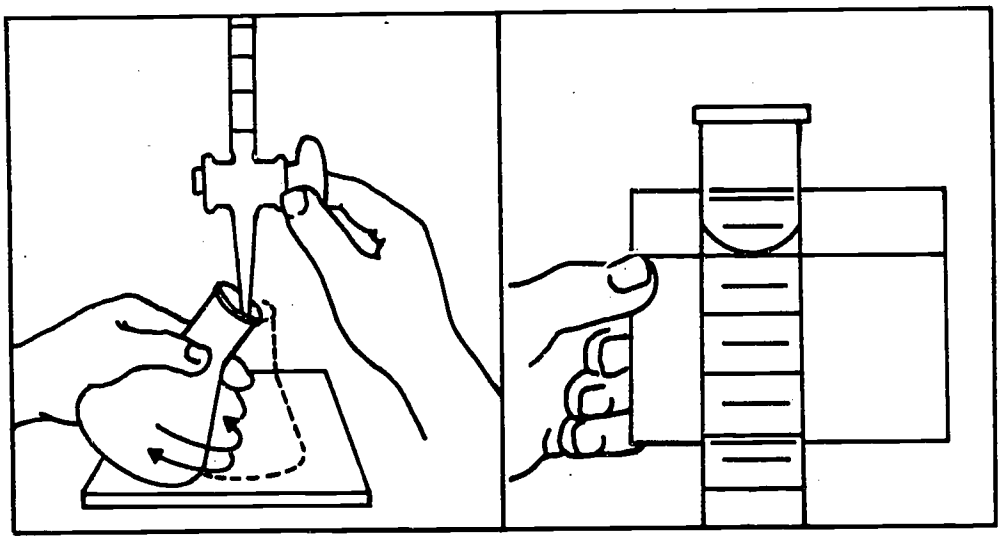
1. Use a job aid to identify all the equipment and reagents needed to collect stream samples for water quality analyses.

2. Clean and prepare sampling bottles needed for collecting stream samples for water quality analyses.

3. Select the most suitable location for collecting water samples at a predesignated sampling site at a stream, and take a grab sample.

PERFORMING TITRATION ANALYSES FOR WATER QUALITY

Students learn to perform a chemical test for water quality using the techniques of titration, including how to titrate or add small amounts of chemicals to a water sample, and how to do a test for dissolved oxygen (DO) using titration apparatus, reagents, and other laboratory supplies.



Training Prerequisites

Before beginning this module, students should have had a high school course in chemistry or learned the equivalent on the job. They should know how to handle acids and bases and how to prepare chemical reagents, using pipets and other volumetric measuring glassware and equipment.

Objectives

Upon completion of this module, students will be able to perform the following functions:

1. Name each part of the titrating apparatus and tell how each works or is used.

2. Get the titrating apparatus ready for use by putting it together and by cleaning the buret.

3. Reach the endpoint of a titration to standardize the titrating solution, sodium thiosulfate.

COMMUNICATING WITH ENVIRONMENTAL HEALTH STAFF

Students learn some basics in communicating with other environmental health staff.

Training Prerequisites

There are no prerequisites for using this module.

Objectives

Upon completion of this module, students will be able to perform the following functions:

1. Identify and develop seven positive work attitudes.
2. Identify and develop effective communication techniques.
3. Apply positive work attitudes and effective communication techniques toward resolving work-related communication problems.

PREPARING DATA FOR ANALYSIS

Students learn to construct a table, a graph, and a chart, using any of a wide variety of environmental health data.

Figure 1. A General Graph.

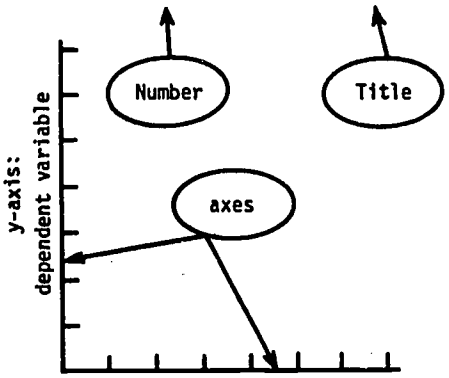
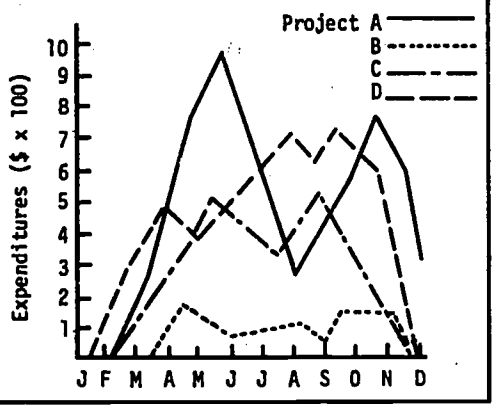


Figure 11. Monthly Expenditures on Four Projects, 1979.



Training Prerequisites

Before beginning this module, students should have had a course in high school mathematics and have a basic knowledge of data collection and preparation techniques.

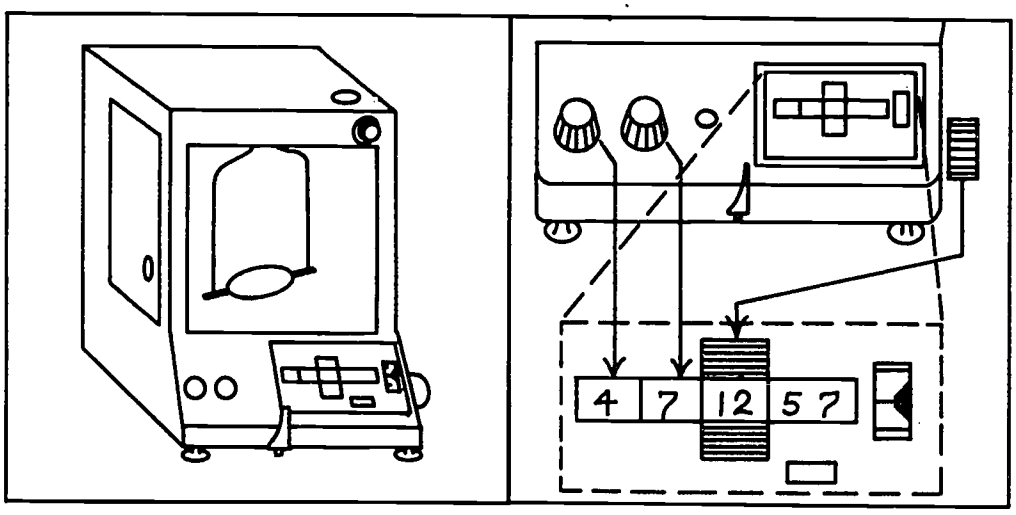
Objectives

Upon completion of this module, students will be able to perform the following functions:

1. Construct a table by organizing data into rows and columns.
2. Construct graphs, including a line graph, a histogram, and a frequency polygon, by displaying the relationship between two sets of exact data--one set lying along the horizontal axis and the other along the vertical axis.
3. Construct charts, including bar charts and geographic coordinate charts, by displaying statistical information using only one set of exact data.

USING AN ELECTRIC SINGLE PAN ANALYTICAL BALANCE

Students learn to use an electric single pan analytical balance to weigh an object that weighs between 0.0001 g and 99 g.



Training Prerequisites

Before beginning this module, students should have some working knowledge of science.

Objectives

Upon completion of this module, students will be able to perform the following functions:

1. Identify and explain the function of each part required to operate the electric single pan analytical balance.
2. Operate the balance to accurately weigh a sample object.
3. Use the balance to add desired weights of different substances to a container, and to determine the unknown weight of a sample.

SELECTING MODULES FOR USE

Although each module is designed to be used independently of other modules, some include instructions that can be used either as the basis for developing more advanced skills or for applying previously learned skills in the performance of more complex tasks. For example, the module, "Operating Sound-Measuring Equipment," contains instructions for operating a meter to take sound level measurements, but does not contain instructions for taking several sound level measurements to characterize a particular sound source as does the module, "Obtaining Measurements of Stationary Environmental Noise Sources."

Figure 1, Summary of KSA's Among Modules, provides a means for rapidly identifying interrelated modules that provide instruction on the use or application of:

- the same equipment (bubble meter, balance, pumps)
- the same general skill (cleaning, using mechanical skills)
- the same attitudes (applying work attitudes).

As an example of how to use Figure 1, work through the following:

Step 1. Identify your teaching needs. For illustration, say you are an instructor teaching the use of personal sampling pumps in an occupational health/industrial hygiene course at a 2-year community college.

Step 2. Count the modules that include instruction on using personal sampling pumps, and list them:

- Operating Gas-Absorbing Equipment
- Using Precision Rotameters
- Calibrating Personal Air Monitoring Devices
- Collecting Samples of Workplace Air
- Calibrating a Respirable Dust Sampling Device

	Applying Work Attitudes*	Reading Meters and Making Measurements	Using Potentially Harmful Biological, Chemical, or physical Agents	Cleaning/Inspecting Mechanical Parts	Using Mechanical Skills in Disassembly/Assembly	Construction/Using Tables, Graphs, Charts, or Diagrams*	Cleaning Glassware	Using Primary Air Standard - Bubble Meter	Using Volumetric Glassware (Pipets/Burets)	Collecting/Organizing Information	Applying Effective Communication Techniques*	Using a Personal Sampling Pump	Calibrating Electronic Meters	Using an Electric Single Pan Analytical Balance*	Using a Stereo Microscope*
ACOUSTICS/NOISE CONTROL															
Operating Sound-Measuring Equipment	●	●										●			
Obtaining Measurements of Stationary Environmental Noise Sources	●	●				●					●		●		
AIR POLLUTION															
Operating Gas-Absorbing Equipment	●	●	●				●	●	●			●			
Operating High-Volume Air Samplers	●	●		●	●	●									
Using Precision Rotameters	●	●		●	●			●				●			
OCCUPATIONAL HEALTH/VENTILATION															
Calibrating Personal Air Monitoring Devices	●	●		●	●		●	●	●			●		●	
Collecting Samples of Workplace Air	●	●		●				●		●	●	●			
Using Air-Purifying Respirators	●			●											
Calibrating a Respirable Dust Sampling Device	●	●		●	●		●	●	●		●	●		●	
Using Detector Tubes and Pumps	●	●	●	●	●	●	●	●	●						
Collecting Industrial Health Information	●		●			●				●	●				
Using a Swinging Vane Anemometer to Measure Airflow	●	●		●	●										
Obtaining Heat Stress Measurements	●	●			●					●					
Measuring Airflow in Local Ventilation Systems	●	●		●	●	●				●			●		
RADIATION															
Operating a Microwave Radiation Detection Monitor	●	●	●	●		●				●	●		●		
Using Ionizing Radiation Detectors	●	●	●										●		
SANITATION															
Collecting Pests for Identification	●		●							●	●				●
Performing Analyses for Waterborne Bacteria	●	●	●				●		●						●
Using a Stereo Microscope	●					●									●
WATER/WASTEWATER															
Collecting Stream Samples for Water Quality	●	●	●			●	●								
Performing Titration Analyses for Water Quality	●	●	●				●		●					●	

*Parts of General Modules

Figure 1. Summary of KSA's among modules.

Step 3. Look at the prerequisites in the module catalog for each of the modules you listed to determine if they are in a series and in what order they should be used. In the example, based on the nature of the prerequisites, the recommended order is:

A. Calibrating Personal Air Monitoring Devices or Calibrating a Respirable Sampling Device
B. Using Precision Rotameters
C. Collecting Samples of Workplace Air
D. Operating Gas-Absorbing Equipment

Step 4. Finally, read through the objectives in each module to determine how the module can be used to complement your program of instruction.

FOR ADDITIONAL INFORMATION

This pamphlet has provided information that can be considered subject oriented in that it describes the prospective student and the content of training materials developed in this project. Details about the format and other educationally oriented information are described in a companion pamphlet entitled "Training Vocational Education Students in Environmental Health."

After August 1981, copies of modules listed in this pamphlet may be obtained in any combination or number from:

National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road
Springfield, VA 22161

REFERENCES

1. "Conference Report on Two-Year Curriculum, Environmental Health Technicians," sponsored by the National Environmental Health Association and the U.S. Public Health Service.

2. National Environmental Health Association, Identification of the Role Performed by the Sanitarian as a Health Professional--Final Report, Denver, Colorado, June 1978.

3. National Environmental Health Association, Curriculum Guideline for Environmental Health, Denver, Colorado, November 1979.

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