UNIT III: BASIC LABORATORY SKILLS

Lesson 1: The Scientific Method

Competency/Objective: Describe the steps in the scientific method.

Study Questions

1. **What are the steps of the scientific method?**

2. **Why is it important to follow the scientific method?**

3. **What information should a laboratory notebook include?**

References

1. *Biotechnology: Applications in Agriculture (Student Reference)*. University of Missouri-Columbia: Instructional Materials Laboratory, 1998, Unit III.

2. Activity Sheet

   a) AS 1.1: Using the Scientific Method

UNIT III: BASIC LABORATORY SKILLS

Lesson 1: The Scientific Method

TEACHING PROCEDURES

A. Introduction

This unit will introduce some basic laboratory skills that are important in almost every type of biotechnology research. This lesson focuses on the scientific method and its application in biotechnology. The scientific method is an important and widely used research strategy. Scientific research is essentially a rational and logical search for answers to scientific questions. This search must be done in a calculated way to increase the chances of finding the desired answer.

B. Motivation

Trip the breaker for the classroom. Have students use the scientific method to analyze the problem. Guide them through the process using the steps below.

Step 1: Identify the problem. (Why are the lights in the classroom off?)

Step 2: Research the available information. (Is the switch on, are there light bulbs in the sockets, have the lights been on before, etc.?)

Step 3: Formulate a hypothesis. (The lights went off because the breaker was tripped.)

Step 4: Design the investigation/experiment. (The breaker will be turned back on.)

Step 5: Conduct the experiment and collect data. (The breaker is turned on and the lights are observed.)

Step 6: Draw conclusions. (The breaker being tripped caused the lights to go out.)

C. Assignment

D. Supervised Study

E. Discussion

1. Ask students to list the steps of the scientific method.

What are the steps of the scientific method?

a) Identify the problem in a statement that expresses the general purpose of the research.
b) Investigate earlier research to identify alternative explanations or solutions to the problem.
c) Formulate a hypothesis about the anticipated outcome of the research.
d) Design the experiment.
e) Conduct the experiment and collect data.
f) Analyze the data and draw conclusions about the success of the experiment in terms of the hypothesis.

2. Ask students why following the scientific method is important.

Why is it important to follow the scientific method?

a) The scientific method provides a logical approach to solving a problem.
b) The scientific method helps researchers look objectively at their research.
c) The scientific method allows experiments to be repeated by other researchers (replication), which is necessary to establish the validity of the experiment.

3. Ask students why it is important for businesses to keep a financial record book (to be able to analyze the business, to show weak areas, and to provide a credible record for the IRS). Laboratory notebooks are like financial record books; they are kept to analyze experiments, show weak areas, and provide a credible record for other professionals. Relate recording research to the activities of farmers or businesspeople who must keep an accurate record of his or her operation.

What information should a laboratory notebook include?

a) Cover that identifies the subject of the research
b) Table of contents
c) Laboratory sheets
    1) Title of the experiment, date, and name(s) of the investigator(s) of the experiment
    2) Brief description of the purpose of the experiment
    3) List of materials needed
    4) Procedures for the experiment
    5) A record of the results of the experiment, including data and observations
    6) Conclusions drawn from the research

F. Other Activities

G. Conclusion

The scientific method has been used to guide the research process for centuries. It provides a clear, logical method for investigating phenomena. The way a researcher approaches a problem is critical to the success of the investigation. The approach must be documented in a laboratory notebook. This documentation is important for many reasons, including the fact that it often is needed to prove ownership of research.

H. Answers to Activity Sheet

AS 1.1

1. (Answers will vary.) The use of an ultraviolet light is a better method of preventing culture media contamination than the use of either 70 percent alcohol or a 10 percent bleach solution.

2. (Answers will vary.) Exposure to the air, the procedure, the temperature, etc.

3. The sterile cotton swab or ball placed in the petri dish without being swabbed

I. Answers to the Evaluation

1. d
2. b
3. Problem statement
4. Hypothesis
5. a) 5 d) 1
    b) 6 e) 4
    c) 3 f) 2

UNIT III: BASIC LABORATORY SKILLS Name _____

Lesson 1: The Scientific Method Date _____

EVALUATION

Circle the letter that corresponds to the best answer.

1. The scientific method is important to biotechnology researchers because it:

   a. Guarantees that the research will be successful.
   b. Has always been used in scientific research.
   c. Provides a biased view of a research effort.
   d. Gives a logical structure to a research effort.

2. Which of the following is <u>not</u> necessarily a part of a laboratory sheet?

   a. Date of research and names of researchers
   b. Table of contents
   c. Description of experimental procedures
   d. Observations

Fill in the blanks with the most appropriate term(s).

3. A statement that describes the general purpose of the research is called the _____.

4. A focused and detailed statement that indicates the anticipated outcome of the research is called the _____.

Number the six steps of the scientific method in the order in which they occur.

5.
   a. _____ Conduct the experiment and collect data.

   b. _____ Draw conclusions.

   c. _____ Formulate a hypothesis.

   d. _____ Identify the problem.

   e. _____ Design the experiment.

   f. _____ Investigate earlier research.

Lesson 1: The Scientific Method Name _____

Using the Scientific Method

Objective: Perform a simple experiment following the principles of the scientific method and document the experiment in a laboratory notebook.

Materials and Equipment:

4 petri dishes or test tubes purchased with sterile culture media
4 sterile cotton swabs or balls
4 pairs of sterile latex gloves or regular latex gloves dipped in alcohol and allowed to dry
4 strips of Parafilm™ or clear tape
2 strips of sterile first aid gauze
1 bottle of a 10 percent bleach solution
1 ultraviolet light
Clean table or countertop divided into three sections by cardboard dividers taped to the surface

To successfully complete genetic manipulation techniques, a microbe-free or aseptic environment is necessary. This aseptic environment can be obtained in several ways, including wiping the surfaces with 70 percent alcohol, wiping the surfaces with a 10 percent bleach solution, or exposing the surfaces to an ultraviolet light. This experiment will determine which of these methods is most effective.

Procedure:

1. Your teacher will divide the class into groups. Before beginning the experiment, record the title of this experiment, the date, and the names of the members of your group on a lab sheet.

2. Write down a brief statement of the purpose of the experiment.

3. List the materials that will be used on your lab sheet.

4. Carry out the experiment. As you do, write down the steps of the procedure in the form of a descriptive paragraph.

5. Label each section of the table to match one of the treatment methods being used.

6. Using a piece of sterile gauze, wipe down one section of the table with 70 percent alcohol.

7. Using a new piece of sterile gauze, wipe down another section of the table with 10 percent bleach solution.

8. After these sections of the table have completely dried, put on sterile latex gloves and swab one section with a sterile cotton swab or ball.

9. Place the swab immediately into a petri dish or test tube containing sterile culture media. Seal the container with Parafilm™ or tape.

10. Label the petri dish or test tube with the name of the section of the table.

11. Repeat this process for the second section of the table using a new pair of sterile gloves.

12. Expose the third section of the table to an ultraviolet light overnight.

13. Immediately after the light is turned off, swab the table area using the same procedure as in steps 8 and 9.

14. Using a new pair of sterile gloves, open the fourth petri dish or test tube and place a sterile cotton swab or ball in it. Seal the lid in the same way as the others.

15. Keep the petri dishes or test tubes in a warm place for one to three weeks. Observe the results and record them daily on the laboratory sheet.

16. At the end of the period, write down the conclusions drawn from the experiment.

Key Questions:

1. What is a possible hypothesis for this experiment?

2. What factors were kept equal for all samples?

3. What is the control in this experiment?

Title:

Date:

Name(s):

Purpose:

Materials Needed:

Procedure:

Results:

Conclusions:

UNIT III: BASIC LABORATORY SKILLS

Lesson 2: Laboratory Equipment and Techniques

Competency/Objective: Demonstrate the proper use of laboratory equipment and techniques.

Study Questions

1. **What equipment is commonly used in a biotechnology laboratory?**
2. **What are the parts of a microscope, and how are they used?**
3. **What are the procedures for manipulating microscopic specimens?**
4. **What is meant by aseptic techniques?**
5. **Why is it important to follow aseptic techniques?**

References

1. *Biotechnology: Applications in Agriculture (Student Reference)*. University of Missouri-Columbia: Instructional Materials Laboratory, 1998, Unit III.

2. Activity Sheet

    a) AS 2.1: Parts of a Microscope

UNIT III - BASIC LABORATORY SKILLS

Lesson 2: Laboratory Equipment and Techniques

TEACHING PROCEDURES

A. Review

Researchers must be familiar with biotechnology laboratory equipment to select the proper experimental methods to use to accept or reject a hypothesis using the scientific method discussed in Lesson 1. This lesson reviews equipment commonly found in a laboratory, the parts and use of the microscope, and aseptic techniques.

B. Motivation

Swab a school drinking fountain or a tabletop with a sterile cotton ball or cotton swab. Place this swab in a petri dish containing autoclaved agar in an incubator or another warm space (such as in a greenhouse out of direct sun, in a 1' $\times$ 1' cardboard box heated by 10 watt bulb, or on a shelf a foot away from a warm radiator). The resulting bacterial growth will appear overnight, displaying the need for aseptic techniques. Use an autoclave or pressure cooker to kill the bacteria before disposal.

C. Assignment

D. Supervised Study

E. Discussion

1. Discuss the various pieces of equipment commonly used in a laboratory. Display any available laboratory equipment. Use pictures in catalogs from lab equipment suppliers (such as Fisher Scientific) to show equipment that is not available.

What equipment is commonly used in a biotechnology laboratory?

a) Pipettor - used to measure and transfer amounts of liquid smaller than one milliliter (ml)
b) Plastic ware and glassware
    1) Pipette tips
    2) Test tubes
    3) Centrifuge tubes
    4) Petri dishes
    5) Beakers
    6) Flasks
    7) Test tubes
c) Autoclave - used to sterilize glassware, plastic ware, etc.
d) Fume hood - vents air to the outside, getting rid of fumes
e) Incubator - used for tissue culture and the propagation of bacteria
f) Electrophoresis unit - uses an electric current to separate DNA fragments by size
g) Transilluminator - used to view an electrophoresis gel
h) PCR equipment - may be hot water baths or a thermocycler; used to cause the replication of DNA
i) Microcentrifuge - separates solids from liquids
j) Vortex - mixes a solid with a liquid in test tubes
k) Microscope - used to enlarge and view microorganisms or specimens not visible to the naked eye

2. Display an actual microscope and identify each part. Have students complete AS 2.1.

What are the parts of a microscope, and how are they used?

a) Ocular or eyepiece - initial point for viewing a specimen that contains the first lens system, usually magnifying 10 times
b) Objective - second lens system that magnifies the image and projects it up to the ocular
c) Nosepiece - rotating piece that holds the objectives
d) Body tube - holds the ocular and objective the correct distance apart
e) Arm - curved support connecting the body tube and base
f) Base - stand on which the microscope rests
g) Stage - place where the specimen is placed for observation
h) Disc diaphragm - contains a series of openings of different sizes that control the amount of light shining on the specimen
i) Light source - usually a mirror or electric lamp
j) Condenser - focuses light from the lamp on the specimen
k) Coarse adjustment - Large dial, used first to focus the low-power objective
l) Fine adjustment - Small dial, used to refine the focus or to focus the high power objective

3. Ask students who have used a microscope to recall how to view a specimen slide under a microscope. Demonstrate and explain the procedures used when viewing specimens.

What are the procedures for manipulating microscopic specimens?

a) The specimen must be mounted on a glass slide, with a drop of water added for a wet mount.
b) A cover slip is usually placed on top of the specimen.
c) Some specimens may need to be stained.
d) The slide is placed on the stage and secured by the clips.
e) The light source is turned on and adjusted.
f) The low-power objective is selected, and the coarse adjustment is used to focus the image.
g) If needed, the high-power objective is selected and the fine adjustment is used to focus the image by moving the objective up and away from the stage.

4. Ask students why hospital operating rooms are kept sterile. Compare biotechnology techniques such as tissue culture to surgery. Discuss the aseptic techniques used in research in biotechnology.

What is meant by aseptic techniques?

Aseptic techniques are procedures used to create and maintain a working area free of bacteria and other microorganisms that might contaminate delicate experiments.

a) Controlled air movement - The researcher works in an enclosed chamber, which allows the flow of air to be controlled.
b) Disinfection - The work area is disinfected with a 10 percent bleach solution. Then the instruments and work area are sprayed with a 70 percent ethanol solution and allowed to air dry.
c) Scrubbing up - The researcher scrubs his or her hands and arms thoroughly and allows them to air dry. He or she then sprays them with a 70 percent ethanol solution.
d) Sterilization - Researchers use an autoclave to sterilize all materials and instruments. An ultraviolet light kills microorganisms in the work area.

5. Ask students why aseptic techniques are important. Remind students about the motivation for this lesson.

Why is it important to follow aseptic techniques?

Experimental procedures like tissue culture and most DNA analysis techniques require proper aseptic techniques to be successful. Contaminants can disrupt many biotechnology experiments.

F. Other Activities

1. Using a microscope and a prepared slide, have students practice focusing it in the proper manner.

2. Watch a sterile and a non sterile test tube containing fruit for several days to observe bacterial growth.

G. Conclusion

Many different types of laboratory equipment used in biotechnology have been introduced in this lesson. The microscope has been examined in detail, since it is a common tool used in examining microorganisms. The importance of aseptic techniques has been described as well. These basic laboratory skills are important, and all researchers must master them.

H. Answers to Activity Sheet

AS 2.1

1. Ocular or eyepiece
2. Body tube
3. Nosepiece
4. Objective
5. Stage
6. Disc diaphragm
7. Condenser
8. Arm
9. Fine adjustment
10. Coarse adjustment
11. Light source
12. Base

I. Answers to Evaluation

1. a
2. c
3. c
4. b
5. d
6. a
7. d

8. Students may list any two of the following: controlled air movement, disinfection, scrubbing up, or sterilization.

9. Experimental procedures like tissue culture and most DNA analysis techniques require proper aseptic techniques to be successful. Contaminants can disrupt many biotechnology experiments.

UNIT III: BASIC LABORATORY SKILLS Name _____

Lesson 2: Laboratory Equipment and Techniques Date _____

EVALUATION

Circle the letter that corresponds to the best answer.

1. The lens system that is found at the top end of the body tube and normally magnifies 10 times is called the:

   a. Ocular.
   b. Objective.
   c. Disc diaphragm.
   d. Arm.

2. The part of a microscope that controls the amount of light placed on the specimen is called the:

   a. Ocular.
   b. Objective.
   c. Disc diaphragm.
   d. Coarse adjustment.

3. Which of the following should be used to adjust the high-power objective?

   a. Ocular
   b. Objective
   c. Fine adjustment
   d. Coarse adjustment

4. Which of the following is <u>not</u> a common piece of biotechnology equipment?

   a. Transilluminator
   b. Electrotransfectionator
   c. Electrophoresis unit
   d. PCR equipment

5. A microcentrifuge is used in the biotechnology laboratory to:

   a. Mix substances in a test tube.
   b. Separate DNA fragments of different sizes.
   c. Increase the quantity of a DNA sample.
   d. Separate solids from liquids.

6. Pipettors are used to:

   a. Measure and transfer amounts of liquid smaller than one milliliter.
   b. Measure and transfer amounts of liquid larger than one milliliter.
   c. Mix substances in a test tube.
   d. Maintain a suitable environment for the propagation of bacteria.

7. Which of the following is not a procedure for manipulating microscopic specimens?

   a. The specimen must be placed on a glass slide.
   b. A light source must be used so that light passes through the specimen.
   c. The low-power objective and the coarse adjustment are used to obtain the initial focus.
   d. The microscope should be refocused using the coarse adjustment and the high-power objective.

Complete the following short answer questions.

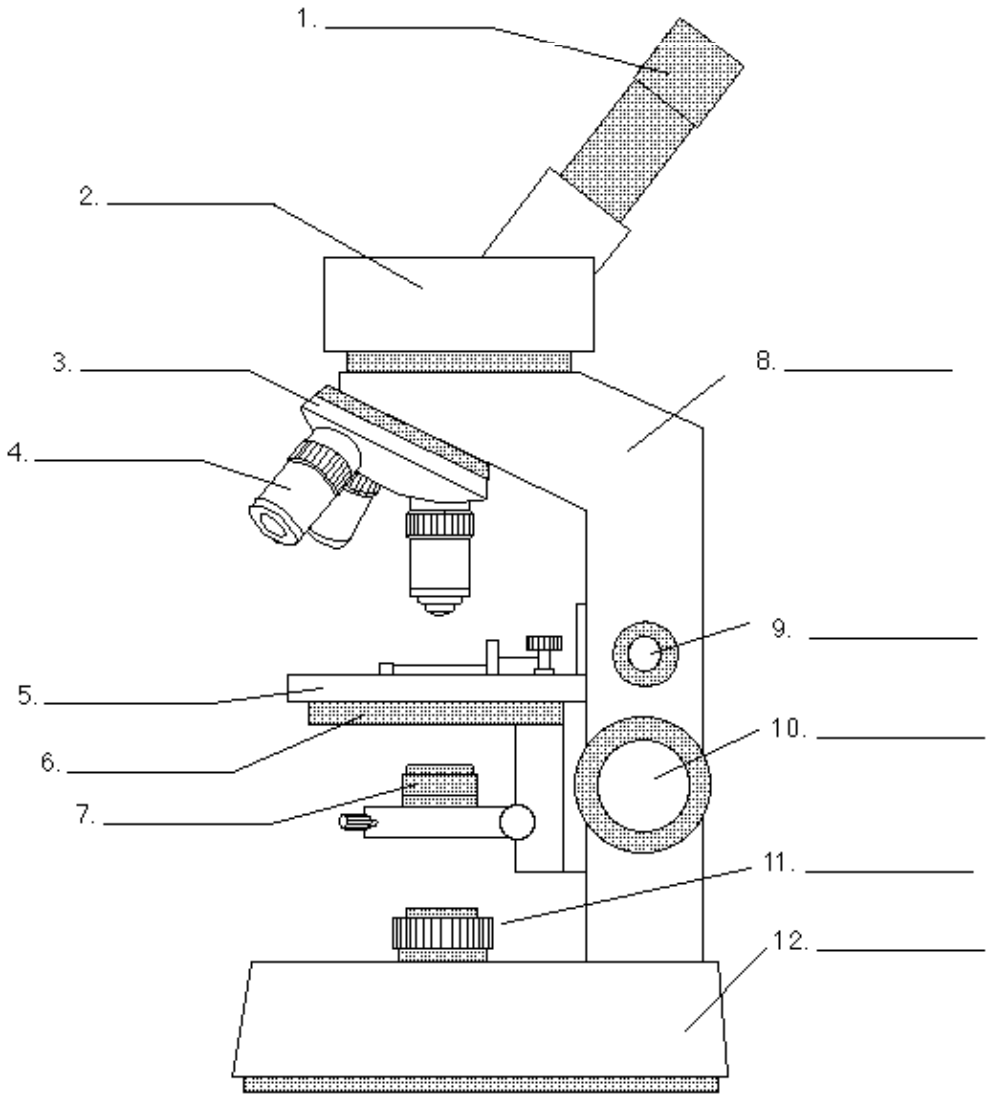
8. What are two aseptic techniques?

9. Why is it important to use aseptic techniques?

Parts of a Microscope

Objective: Identify the parts of a microscope.

Label the parts of the microscope in the spaces provided.



UNIT III - BASIC LABORATORY SKILLS

Lesson 3: Biotechnology Laboratory Safety

Competency/Objective: Explain why safety practices should be followed in the laboratory.

Study Questions

1. **What are some of the common biotechnology laboratory safety concerns?**
2. **How is a spill cleaned up?**
3. **What are the methods for disposing of materials used in biotechnology?**
4. **What procedures should be followed in case of fire?**
5. **What personal protective equipment should be worn in the laboratory?**
6. **What should be done if an injury occurs?**
7. **What ventilation is needed in a laboratory?**

References

1. *Biotechnology: Applications in Agriculture (Student Reference)*. University of Missouri-Columbia: Instructional Materials Laboratory, 1998, Unit III.
2. Activity Sheet
    a) AS 3.1: Using a Material Safety Data Sheet (MSDS)

UNIT III - BASIC LABORATORY SKILLS

Lesson 3: Biotechnology Laboratory Safety

TEACHING PROCEDURES

A. Review

Lesson 2 discussed some of the equipment used in biotechnology laboratories as well as aseptic techniques to reduce contamination of laboratory experiments. This lesson will examine the topic of laboratory safety. Laboratory safety is always important, especially in biotechnology laboratories. In the late 1970s and early 1980s, laboratories doing genetic manipulation were contained in a nearly sealed environment because of the fear of releasing pathogens, as well as other unknown risks. Today researchers have a much better understanding of the dangers of such research and take necessary precautions when needed. All laboratory research poses some risks that can be addressed by following a detailed safety plan. Laboratory safety is a top priority in every biotechnology laboratory.

B. Motivation

Before students arrive for class, create a "chemical spill" on a countertop in the laboratory that students will notice as they arrive. The chemical spill can simply be water mixed with a few tablespoons of baking soda and a teaspoon of lemon juice. Do not use an actual laboratory chemical or something that will stain the countertop. When students arrive, explain that the spill must be cleaned up, but the correct process must first be determined. Ask them how they would go about cleaning up the spill. Have students speculate as to what types of spills might occur in a biotechnology laboratory.

C. Assignment

D. Supervised Study

E. Discussion

1. Ask students to list the safety concerns that they would have if they were working in a biotechnology laboratory.

What are some of the common biotechnology laboratory safety concerns?

a) Microorganisms - Pathogenic microbes are dangerous because they can cause disease, and even nonpathogenic microorganisms can be harmful in certain cases.
b) Chemicals
c) Radioactivity - Researchers must be trained to handle and dispose of radioactive materials safely.
d) Electrical hazards - Electrophoresis equipment can cause electrical shock.
e) Physical hazards - Centrifuges can injure fingers, and the ultraviolet light from transilluminators can damage retinas and skin.

2. Ask students to list the types of substances that might be spilled in a biotechnology laboratory (acids, bases, stains, microbe cultures, buffer solutions, etc.). Discuss the clean up procedure and demonstrate the procedure by cleaning up the spill.

How is a spill cleaned up?

a) When the spilled chemical is known, the Material Safety Data Sheet (MSDS) outlines the proper clean up procedures.

b) When the substance is an unknown liquid, it should be absorbed using a special spill pillow; the spill pillow should then be disposed of as hazardous waste.
c) If the spill is an unknown solid or powder, it can be gently swept into a glass container and disposed of as hazardous waste.
d) Next, the spill area should be cleaned with a disinfectant and an ethanol solution.

3. Discuss with students the different types of waste generated in a biotechnology laboratory and how wastes should be discarded.

What are the methods for disposing of materials used in biotechnology?

a) All cultures and equipment that come in contact with microbes should be autoclaved or disinfected with hospital-type disinfectants before being thrown away.
b) The MSDS should be followed for chemicals.

4. Ask students to if they know the classroom fire plan. Discuss the procedures to be followed if a fire breaks out.

What procedures should be followed in case of fire?

a) The fire exit plan should be practiced during fire drills and followed when a fire occurs.
b) Everyone should know the location of the fire extinguisher, fire blanket, and fire alarm switch.

5. Ask students to describe the personal protective equipment (PPE) needed for handling pesticides. Compare this list with the PPE needed for most biotechnology laboratories.

What personal protective equipment should be worn in the laboratory?

a) Safety glasses or goggles
b) Disposable latex gloves
c) Lab coat or apron

6. Ask students if they know what to do for various types of injuries.

What should be done if an injury occurs?

a) Simple first-aid procedures, like applying pressure to stop blood loss or flushing skin or eyes with water if they come in contact with chemicals, should be done immediately.
b) In a classroom lab, the instructor should also be notified without delay so that he or she can follow the school procedure for emergencies.

7. Ask students to list some of the airborne hazards found in biotechnology laboratories (gases, fine powders, microbes, etc.).

What ventilation is needed in a laboratory?

a) Fume hoods are used to remove bad odors or harmful vapors from the laboratory and to maintain a sterile environment for certain laboratory procedures.
b) Ventilated lockable chemical storage cabinets prevent the build up of gases that could cause an explosion or a fire.

F. Other Activities

1. Show a video on laboratory safety, such as the video *Beginning Chemistry Laboratory* available from Carolina Biological Supply Company.

2. Use Glo-Germ to show the need for correct manipulation of bacteria and fungi. Glo-Germ is a substance that is visible only under a black light. Place Glo-Germ in a petri dish to represent a culture. Have students perform tasks such as culture transfers, adding nutrients or changing the culture media, or tissue culture procedures. The spread of Glo-Germ to other surfaces represents "contamination" of work areas. If the Glo-Germ is not present on any surfaces, then the students have been successful.

G. Conclusion

Safety in the biotechnology laboratory is critical. Careful, safe working habits help produce successful research results. If chemicals, cultures, or equipment are mishandled, the research is exposed to unnecessary hazards and may fail. Researchers can work safely and effectively if proper precautions are taken in the laboratory.

H. Answers to Activity Sheet

AS 3.1

1. Students may list any five of the following: chemical product and company identification; composition, information on ingredients; hazards identification; first aid measures; fire fighting measures; accidental release measures; handling and storage; exposure controls, personal protection; physical and chemical properties; stability and reactivity; toxicological information; ecological information; disposal considerations; transport information; regulatory information; and other information.

2. In a manner consistent with federal, state, and local regulations

3. Strong oxidizing agents; may form an explosive mixture with fluorine or potassium nitrate

4. It is not listed as a carcinogen.

5. Get medical aid. Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes.

6. Odorless to a slightly acetic-like odor

7. Safety glasses with side shields, gloves, protective clothing to prevent skin exposure, and a NIOSH/MSHA-approved air purifying dust or mist respirator

8. It may cause respiratory and digestive tract irritation. It may also cause eye and skin irritation.

I. Answers to Evaluation

1. b
2. d
3. a

4. The fire exit plan should be practiced during fire drills and followed when a fire occurs. Everyone should know the location of the fire extinguisher, fire blanket, and fire alarm switch.

5. Safety glasses or goggles, disposable latex gloves, and a lab coat or apron

6. Spill pillow

7. Flush the area with water and notify the instructor.

8. d
9. c
10. e
11. b
12. a

 Name _____

Lesson 3: Biotechnology Laboratory Safety Date _____

EVALUATION

Circle the letter that corresponds to the best answer.

1. What equipment is used in a laboratory for ventilation?

   a. None
   b. Fume hood
   c. Fume cabinet
   d. Open window

2. An MSDS contains important information about:

   a. Radioactive substances.
   b. Specialty laboratory equipment.
   c. Cultures of microorganisms.
   d. Chemical substances.

3. Before microbial cultures are disposed of they should be:

   a. Autoclaved.
   b. Sterilized.
   c. Sealed in an airtight container.
   d. Carefully scrubbed.

Complete the following short answer questions.

4. What procedures should be followed in a laboratory to safeguard against fires?

5. What personal protective equipment (PPE) should be worn in the laboratory?

6. What should be used to clean up an unknown liquid that has spilled?

7. What should be done if acid is spilled on a student's hand in the laboratory?

Match the following hazards with an action in the second column that will help to protect the biotechnology researcher from the hazard.

8.	_____ Physical hazards	a.	Aseptic techniques
9.	_____ Electrical hazards	b.	Following the MSDS
10.	_____ Radioactivity	c.	Careful use of electrophoresis equipment
11.	_____ Chemicals	d.	Careful use of centrifuges and transilluminators
12.	_____ Microorganisms	e.	Special training

Lesson 3: Biotechnology Laboratory Safety Name _____

Using a Material Safety Data Sheet (MSDS)

Objective: Identify important information from an MSDS.

Using the MSDS provided, answer the following questions.

1. What are five of the major sections common to an MSDS sheet?

2. How should the chemical be disposed of, according to the MSDS sheet?

3. With what materials is the chemical incompatible?

4. Is the chemical a known carcinogen?

5. What first aid measures should be taken if the chemical comes in contact with the skin?

6. Does the chemical have an odor?

7. What personal protective equipment should be worn when using the chemical?

8. What are the health effects of this chemical?

ACC# 20860

Fisher Scientific

Print Date: 10/23/97

Material Safety Data Sheet

Sodium acetate, anhydrous

Section 1 - Chemical Product and Company Identification

MSDS Name:
Sodium acetate, anhydrous

Catalog Numbers:
BP333 1, BP333 500, BP333-1, BP333-500, BP3331, BP333500, S207 10, S20710, S210 2, S210 500, S210-2, S210-3, S210-500, S2102, S2103, S210500, S78228, S782291

Synonyms:
Acetic acid,sodium salt, Sodium acetate

Company Identification:
Fisher Scientific - Fairlawn
Fairlawn, NJ 07410

Company Phone Number:
(201) 796-7100

Emergency Phone Number:
(201) 796-7100

CHEMTREC Phone Number, US:
(800) 424-9300

CHEMTREC Phone Number, Europe:
(202) 483-7616

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name:	Percent	EINECS/ELINCS
127-09-3	Sodium acetate	100	204-823-8

Hazard Symbols:
Risk Phrases:

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: white
Caution! Hygroscopic. May cause respiratory and digestive tract irritation. May cause eye and skin irritation.
Target Organs: None.

Potential Health Effects

Eye:
May cause mild eye irritation.

Skin:
May cause skin irritation.

Ingestion:
May cause irritation of the digestive tract.

Inhalation:
May cause respiratory tract irritation.

Chronic:
Prolonged or repeated skin contact may cause irritation.

Material Safety Data Sheet

Sodium acetate, anhydrous

Section 4 - First Aid Measures

Eyes:
Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids. Get medical aid.

Skin:
Get medical aid. Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes.

Ingestion:
If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid.

Inhalation:
Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid if cough or other symptoms appear.

Notes to Physician:
None

Antidote:
None reported

Section 5 - Fire Fighting Measures

General Information:
As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Dusts at sufficient concentrations can form explosive mixtures with air. Wear appropriate protective clothing to prevent contact with skin and eyes. Wear a self-contained breathing apparatus (SCBA) to prevent contact with thermal decomposition products.

Extinguishing Media:
For small fires, use water spray, dry chemical, carbon dioxide or chemical foam.

Autoignition Temperature:
607°C (1,124.60°F)

Flash Point:

NFPA Rating:
Not published.

Explosion Limits:
Lower: Upper:

Section 6 - Accidental Release Measures

General Information:
Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:
Vacuum or sweep up material and place into a suitable disposal container. Avoid generating dusty conditions.

Section 7 - Handling and Storage

Handling:
Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation.

Storage:
Store in a cool, dry, well-ventilated area away from incompatible substances.

Storage Code:
Gray

Material Safety Data Sheet
Sodium acetate, anhydrous

Section 8 - Exposure Controls, Personal Protection

Engineering Controls:
Good general ventilation should be sufficient to control airborne levels.

Exposure Limits

Chemical Name:	ACGIH	NIOSH	OSHA
Sodium acetate	None listed.	None listed.	None listed.

OSHA Vacated PELs

Personal Protective Equipment

Eyes:
Wear safety glasses with side shields.

Skin:
Wear appropriate gloves to prevent skin exposure.

Clothing:
Wear appropriate protective clothing to prevent skin exposure.

Respirators:
A NIOSH/MSHA approved air purifying dust or mist respirator.

Section 9 - Physical and Chemical Properties

Physical State:	Solid
Appearance:	white
Odor:	odorless to slight acetic-like odor
pH:	No information available.
Vapor Pressure:	No information available.
Vapor Density:	No information available.
Evaporation Rate:	No information available.
Viscosity:	No information available.
Boiling Point:	@ 760.00mm Hg
Freezing/Melting Point:	324.00°C
Decomposition Temperature:	No information available.
Solubility:	1190 g/l (20 c)
Specific Gravity/Density:	No information available.
Molecular Formula:	C2H3O2Na
Molecular Weight	82.03

Section 10 - Stability and Reactivity

Chemical Stability:
Stable.

Conditions to Avoid:
Incompatible materials.

Incompatibilities with Other Materials
Strong oxidizing agents. Explosive mixtures may be formed with fluorine or potassium nitrite.

Hazardous Decomposition Products
Carbon monoxide, carbon dioxide, toxic fumes of sodium oxide.

Hazardous Polymerization
Has not been reported.

Section 11 - Toxicological Information

RTECS:
CAS# 127-09-3: AJ4300010.

LD50/LC50:
CAS# 127-09-3:
Oral, mouse: LD50 = 6891 mg/kg
Oral, rat: LD50 = 3530 mg/kg.

Carcinogenicity:
CAS# 127-09-3: Not listed as a carcinogen by ACGIH, IARC, NIOSH, NTP, OSHA, or CA Prop 65.

Epidemiology:
No data

Teratogenicity:
No data

Reproductive:
No data

Mutagenicity
No data

Neurotoxicity
No information reported

Section 12 - Ecological Information

Ecotoxicity:
No information reported
Acute aquatic effects: 96-hour LC50 for fathead minnow: GT 100mg/L, 96-hour LC50 for water flea: GT 1000mg/L.
This chemical has a low potential to affect aquatic organisms.

Environmental:
This chemical is readily biodegradable and is not likely to bioconcentrate.

Physical:
None.

Other:
This chemical has a high biological oxygen demand, and it is expected to cause significant oxygen depletion in aquatic systems.

Section 13 - Disposal Considerations

Dispose of in a manner consistent with federal, state, and local regulations.

RCRA D-Maximum Concentration of Contaminants
None of the components are on this list.

RCRA D Series - Chronic Toxicity Reference Levels
None of the components are on this list.

RCRA F Series Wastes
None of the components are on this list.

RCRA P Series Wastes
None of the components are on this list.

RCRA U Series Wastes
None of the components are on this list.

RCRA Substances Banned from Land Disposal
None of the components are on this list.

Material Safety Data Sheet
Sodium acetate, anhydrous

Section 14 - Transport Information

	US DOT	IATA	IMO	RID/ADR	Canadian TDG
Shipping Name:	No information available.	No information available.	No information available.	No information available.	No information available.
Hazard Class:					
UN Number:					
Packing Group:					

Section 15 - Regulatory Information

US Federal

TSCA
CAS# 127-09-3 is listed on the TSCA Inventory.

Health and Safety Reporting List
None of the components are on this list.

Chemical Test Rules
None of the components are on this list.

TSCA Section 12b
None of the components are on this list.

TSCA Significant New Use Rule (SNUR)
None of the components are on this list.

CERCLA Reportable Quantities (RQ)
None of the components are on this list.

SARA Threshold Planning Quantities (TPQ)
None of the components are on this list.

SARA Hazard Categories
None of the components are on this list.

SARA Section 313
None of the components are on this list.

Clean Air Act - Hazardous Air Pollutants (HAPs)
None of the components are on this list.

Clean Air Act - Class 1 Ozone Depletors
None of the components are on this list.

Clean Air Act - Class 2 Ozone Depletors
None of the components are on this list.

Clean Water Act - Hazardous Substances
None of the components are on this list.

Clean Water Act - Priority Pollutants
None of the components are on this list.

Clean Water Act - Toxic Pollutants
None of the components are on this list.

OSHA - Highly Hazardous
None of the components are on this list.

US State

Material Safety Data Sheet
Sodium acetate, anhydrous

State Right to Know

California Prop 65

California No Significant Risk Level
No information available.

European/International Regulations

European Labelling in Accordance with EC Directives:
Hazard Symbols:
Risk Phrases:
Safety Phrases: S 24/25 Avoid contact with skin and eyes.

WGK (Water Danger/Protection)
No information available.

Canadian DSL/NDSL
CAS# 127-09-3 is listed on Canada's DSL/NDSL List.

Canadian WHMIS Classifications
This product has a WHMIS classification of D2B.

Canada Ingredient Disclosure List
CAS# 127-09-3 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

Section 16 - Other Information

Color information has been reworded.
MSDS Creation Date: December 13, 1994
Revision Date: October 23, 1997