

Focused Learning Lesson
Science
Grades 9-12
SI-H-A7

Overview:

Students analyze and assess scientific investigations to identify appropriate safety measures.

Approximate Duration: 45 minutes

Benchmark:

SI-H-A7 utilizing science safety procedures during scientific investigations

SI GLE: 10. Given a description of an experiment, identify appropriate safety measures.

Objective:

The student will analyze scientific investigations and identify appropriate safety measures.

Teacher Preparation:

Make copies of the safety symbols and laboratory investigations for each group of students. Be prepared to demonstrate safety procedures should it become necessary for student understanding.

Materials:

Laboratory safety symbol cards

Scenarios of laboratory investigations (You can substitute your own individual labs.)

Lesson Procedures:

Set or Opener:

Ask the students to describe everyday safety signs and their significance. They should describe reminders such as: wear your seatbelt, do not feed the animals, etc.

Body of the Lesson:

1. Teacher and students should review the handout detailing laboratory safety guidelines.
2. Students will read (or teacher may read aloud) the details of sample investigations, and identify the type of safety guidelines that are required by visually linking the symbols using a display board. Another option for student response would be to write their responses on paper.
3. This activity may be played as a competitive game with students accumulating points for their group for correct responses, or teacher may randomly call on groups to defend their choices.

Closure:

Ask the students to respond to the question orally or in journals, “Why is safety an important component of science lab and your everyday life?”

Attachments:

1. Lab Safety Guidelines
2. Lab Safety Symbols
3. Scenario of Experiment 1: Earthworm Dissection
4. Scenario of Experiment 2: pH of Household Substances
5. Scenario of Experiment 3: Flame Tests

Assessment:

Student responses to Example Experiments should be evaluated for accuracy.

Reference:

Miller, K. & Levine, J. (2002). *Biology*. Upper Saddle River, NJ: Prentice Hall.

Science Skills: Safety in the Classroom. Available online at
http://www.class.com/demo/hisd_science_level2/semesterA/1.1/engage.htm

Attachment 1

Laboratory Safety Guidelines

Glass

1. Glassware is easily broken, and should be handled with care. Never use broken glassware, and dispose of broken glass properly.
2. Glass surfaces should be dry before heating. Hot glassware should be handled only with heat-resistant gloves.
3. Clean all glassware thoroughly before putting it away.

Heat

1. Never heat anything – particularly chemicals – unless instructed to do so.
2. Never heat substances in a closed container.
3. Never handle heated objects with your bare hands; use proper safety equipment.

Fire

1. Always wear safety goggles when using open flames.
2. Never reach across an open flame.
3. Maintain a clear working area when using flames.
4. Tie back loose clothing and long hair.

Chemicals

1. Never smell chemicals directly, waft to detect odors.
2. Never mix chemicals unless instructed to do so by the teacher.
3. Never touch or taste chemicals unless instructed to do so by the teacher.
4. Keep all lids closed when not in use.
5. Dispose of chemicals as instructed by your teacher.
6. Rinse skin or clothing immediately with water when contacted by chemicals, and notify your teacher.

Sharp Instruments

1. Pass sharp instruments handle first.
2. Always cut in a direction away from yourself.
3. Carry sharp instruments in a tray or case.

Electricity

1. Keep electrical cords away from water and wet hands.
2. Never pull by the cord, hold the plug to disconnect the device.

Animals

1. Do not cause pain, discomfort, or injury to any animal.
2. Wash hands thoroughly after handling animals and their cages.

Attachment 2 Safety Symbols

Symbol	Description	Symbol	Description
 Disposal Alert	This symbol appears when care must be taken to dispose of materials properly.	 Clothing Protection Safety	This symbol appears when substances could stain or burn clothing
 Biological Hazard	This symbol appears when there is a danger from a microorganism such as bacteria, protist, or fungi.	 Fire safety	This symbol appears when you will be working with an open flame.
 Open Flame Alert	This symbol appears when an open flame could cause a fire or explosion	 Eye Safety	This symbol appears when an eye danger exists. Safety goggles should be worn during the experiment.
 Poison Safety	This symbol appears when poisonous substances are used	 Fume safety	This symbol appears when chemicals or chemical reactions could cause dangerous fumes
 Chemical Safety	This symbol appears when chemicals that you will be using can cause burns or can absorb through the skin and cause harm	 Sharp objects safety	This symbol appears when you will be working with sharp objects and your skin could get cut.
 Thermal Safety	This symbol appears when you should use caution handling hot objects.	 Animal Safety	This symbol appears whenever live animals are studied. The safety of the animals and the students must be taken into account.

Adapted from *Science Skills: Safety in the Classroom*. Accessed on May 17, 2004.
http://www.class.com/demo/hisd_science_level2/semesterA/1.1/engage.htm

Attachment 3: Scenario

Experiment One: Earthworm Dissection

Materials:

Dissecting pins, forceps, scissors, paper towel, scalpel, water, dissecting probe, preserved earthworm, hand lens, dissection pan.

Purpose:

In this lab, you will dissect an earthworm in order to observe the external and internal structures of earthworm anatomy and to observe behaviors in a living earthworm.

Procedure Overview:

Students will obtain a preserved earthworm that has been kept in decay-reducing chemicals. They will secure it to their dissecting pan with pins, and cut it open with a scalpel or scissors to observe interior structures. Tissues and organs will be probed to investigate their structure and orientation within the organism. Students will place a live earthworm in a tray and observe and record reactions to light using a flashlight.

Safety questions:

1. What additional materials should be included as safety devices?
2. What safety guidelines should be followed throughout the procedure?

Key:

1. *Goggles should be added for splash protection. Gloves should be worn as a precaution against the preservatives. An apron should be worn over clothing to protect against spills and stains.*
2. *Care should be taken with sharp instruments such as scalpels, scissors, and dissecting needles. Live animals should be treated with extreme care. Animals should not be harmed in the experiment. All materials and equipment should be cleaned and/or disposed of as directed by the teacher. Wash hands thoroughly after handling animals.*

Attachment 4: Scenario

Experiment Two: Comparing pH of Common Substances

Materials:

pH paper and chart, forceps, paper towels, micro-well tray, various household items such as: lemon juice, cola, ammonia, detergent, pond water, distilled water, salt water, tap water, or baking soda

Purpose:

In this lab, you will compare the pH levels of several common household substances and categorize them into acids, bases, and neutral substances.

Procedural Overview:

Small quantities of household substances will be placed in separate divisions of the well tray. Each substance will be tested with the pH paper by dipping the paper into the substance, and comparing the resulting color change to the pH chart.

Safety Questions:

1. What additional materials should be included as safety devices?
2. What safety guidelines should be followed throughout the procedure?

Key:

1. *Goggles should be worn to protect against chemicals. Aprons should be worn to protect clothing against spills and stains.*
2. *Care should be used in handling chemicals. Never smell a chemical directly, waft the odor with the cupped palm of the hand. All materials and equipment should be cleaned and/or disposed of as directed by the teacher. Wash hands thoroughly after handling chemicals.*

Attachment 5: Scenario

Experiment Three: Flame Tests

Materials:

sodium chloride (orange), potassium chloride (purple/blue), lithium chloride (red), barium chloride (green), water, glass rods with platinum wire loops, Bunsen burner or alcohol burner, and a flint striker or matches

Purpose:

When an element is burned, the electrons will become excited. As these electrons fall back from one energy level to another, they will emit photons of light. These photons will exhibit different colors, depending on the element and its discrete energy levels. That is, different wavelengths of light (colors) will be emitted when the electrons of different elements go down the step(s) between their energy level(s). Each element will have its own set of steps; therefore, each will have its own color or set of colors.

Procedural Overview:

Small amounts of different salts are burned in the flame of a Bunsen burner. Sodium burns orange, potassium - purple/blue, barium - green, and lithium - red. Dip the wire loop of a glass rod into the water. Use this wet loop to pick up some salt. Hold the salt in the flame and burn to show color. Repeat with each of the remaining salts.

Safety Questions:

1. What additional materials should be included as safety devices?
2. What safety guidelines should be followed throughout the procedure?

Key:

1. *Goggles should be worn as protection against chemicals. Aprons should be worn to protect clothing against spills and stains.*
2. *Bunsen burners should be used with caution. Never reach across a flame. Keep all papers and other materials away from the flame. Long hair and loose clothing should be tied back. Equipment should be thoroughly cleaned between tests to avoid reactions between chemicals. All materials and equipment should be cleaned and/or disposed of as directed by the teacher.*
3. *Never taste chemical in a science lab. Wash hands thoroughly after handling chemicals.*

