

Name: _____ Date: _____

Guided Learning: Handling Chemicals and Biological Materials

Learning goals

After completing this activity, you will be able to ...

- Label containers containing chemicals correctly.
- Use the proper technique to smell chemicals.
- Handle biological materials in a safe manner.
- Interpret a Material Safety Data Sheet.

Vocabulary: flammability, Material Safety Data Sheet, reactivity, waft

Warm-up questions:

1. Flour, powdered sugar, baking soda, and baking powder all have similar appearances. Suppose you had all of these substances in your pantry. How could you store them so that you could easily tell them apart?

2. Many household chemicals, such as ammonia and bleach, have warning labels on their packages. Why is it important to carefully read these labels?

3. Suppose you found a moldy sandwich in a sealed plastic bag in your refrigerator. Should you open the bag? Explain your answer.

Activity A: Handling Chemicals

Think About It: Suppose you were working on a lab investigation with a partner. The investigation involved three different chemicals. Before you got to class, your partner poured the samples of the three chemicals you would use and placed them on your lab table. The samples are shown at right.



What problems, if any, do you foresee occurring? _____

Because the chemicals on the right and left look very similar, they would be very hard to tell apart. For this reason, it is very important to label a container *before* you put a chemical into it.

The following information should be included on the label:

- The name of the chemical
- The chemical's concentration
- The chemical's formula
- The date you placed the chemical in the container

Because many chemicals look alike, never use a chemical in an unlabeled container. Also, do not attempt to dispose of the chemical. Instead, give the chemical to your teacher.

Some investigations may require you to smell a chemical. Do not place the chemical directly under your nose to smell it. Instead, use a technique called **wafting**. To waft, hold a chemical's container at least 15 cm (6 in.) away from your nose. Then, gently wave your hand over the opening of the container. This will direct some of the chemical's vapors towards your nose.



1. How could the label on the chemical at right be improved? _____

2. Why do you think it is dangerous to smell a chemical directly? _____



Activity B: Material Safety Data Sheets


Any chemicals ordered by your teacher will come with a **Material Safety Data Sheet** (MSDS) that summarizes the hazards presented by that chemical. The MSDS may also present information on disposing of the chemical and what to do if the chemical makes contact with the skin or eyes or is ingested.

Although there is no standard format for all safety data sheets, some elements are common. The hazards presented by a substance are summarized in the hazardous materials diamond, shown at right.

Each square in the diamond represents a different hazard. The blue square represents health hazards, the red square **flammability** (ability to catch on fire), the yellow square represents **reactivity** (tendency to react with other chemicals), and the white square represents special hazards.



The information in each square is decoded in the table below:

Health hazard		Flammability		Reactivity		Special hazards	
0	None	0	Will not burn	0	Stable at any temperature	ACID	Material is an acid
1	Minor skin irritant	1	Will burn if heated before ignition	1	Stable at normal temperatures and pressures	ALK	Material is a base
2	Could cause injury with long exposure	2	Can be ignited if hot or exposed to flame for a long time	2	Reacts violently at elevated pressures and temperatures or with water	COR	Material is corrosive
3	Could cause injury with short exposure	3	Can be ignited under almost any conditions	3	Capable of explosive reactions but needs an initiating source for reaction to start	W	Highly reactive with water
4	Could cause major injury or death with short exposure	4	Will burn rapidly and vaporize at normal pressure and temperature	4	Capable of explosive reactions at normal temperatures and pressures	OX	Material has oxidizing properties
							Material is radioactive

In some versions of the hazardous materials diamond, the white square describes recommended safety equipment rather than special hazards. It is not necessary to memorize all of the symbols used in the hazardous materials diamond. The hazards are explained in detail in the remainder of the Material Safety Data Sheet.

Most Material Safety Data Sheets contain the following sections:

- Material identification
- Manufacturer information and dates
- Hazardous ingredients
- Physical and chemical properties
- Fire and explosion hazards
- Reactivity data
- Health hazards
- Information on safe handling and use
- Control measures



1. The hazardous materials diamond for pure calcium is shown at right. What can you say about pure calcium?



2. What are some precautions you might take if you were handling pure calcium? _____

Activity C: Handling Biological Materials

Biological materials are anything that is or was once alive. Special care needs to be taken when handling such materials. One reason for this is that many biological materials can carry diseases or contain toxic substances.

Think About It: How do you think you can protect yourself from disease agents and toxic substances when handling biological materials?



The best way to protect yourself from any disease agents and toxic substances found in biological materials is to wear protective clothing, such as gloves, safety goggles, and a lab coat or apron. This will keep any disease agents and toxic substances away from your skin and eyes. If you are working with biological materials such as bacteria or mold you will also want to wear a mask over your mouth and nose like the scientist at left is doing.

Often, dangerous biological materials such as mold and bacteria are kept in sealed containers. Preserved biological specimens, such as the bat shown at right, might also be kept in sealed containers. Never open a sealed container holding a biological specimen unless specifically directed to do so by your teacher. The chemicals or specimens inside the container could make you sick. Instead, examine the specimens through the containers. You may safely use a magnifying glass or hand lens to do this.



When you complete your investigation, either return the biological materials to your teacher or dispose of them as instructed by your teacher. If the biological materials you were working with are living, do not release them into the environment. This could damage your local ecosystem by introducing invasive species.

If you are working with living organisms, treat them with care. Avoid harming the organism and be sure to provide the organism with an appropriate habitat and diet. If the organism will be kept in the laboratory over the weekend, make sure someone will be responsible for its care.



1. Why should you avoid opening a sealed dish containing bacteria? _____

2. Suppose your class was studying the behavior of a mouse. What are some things you could do to ensure the mouse was properly cared for while it was kept in the lab?
