Staying Safe Around Matter

Warm Up

- Assume each of the following pairs of equipment:
- Consider how the function of each pair relates to its function.
- Complete the list of equipment for each book.

Chemical equipment and its uses

The equipment used for mixing, storing, and measuring chemicals can be classified in a variety of ways.

One of the most common methods of classification is based on material it is made from.

Glassware - hardware

Most of the glassware found in the laboratory is made of borosilicate glass, which is resistant to heat and chemicals.

This is because glass absorbs very little heat, so it is unlikely to break.

Example: Two common glassware items are beakers and test tubes.

Ceramic - crucible

Ceramic crucibles are often used in laboratories to contain reactions that may involve high temperatures.

They may be heated to very high temperatures without cracking or breaking.

Metal - beaker

Beakers are often made of stainless steel and are used for mixing and storing chemicals.

They are durable and can withstand high temperatures.

Plastic - measuring cylinders

Measuring cylinders are often made of plastic and are used for transferring and measuring liquids.

They are lightweight and easy to handle.
People who work with chemicals are required to read WHMIS training on the proper handling of chemicals.

A material safety data sheet (MSDS) must be provided with every container of chemicals sold in Canada. This information includes chemical hazards and safety precautions associated with each chemical to be handled.

Quick Check

An excerpt from a MSDS for hydrochloric acid as follows. An actual MSDS will contain more information. Be sure to read all the data on the label.

1. What is HCL acid and why is it considered a hazardous compound? It is corrosive and highly toxic.

2. How should you store HCL acid? In corrosion-resistant, tightly sealed containers. It is a strong oxidizing agent and reacts with many substances.

3. What are the health effects of hydrogen chloride? It is highly corrosive and irritant. It can cause respiratory tract irritation, eye irritation, coughing, throat pain, and nausea.

4. What is the proper disposal of solutions containing HCL acid? Neutralize the solution by adding sodium bicarbonate, then dispose of it in a safe manner.
Understanding hazard symbols

Hazard symbols are on the labels of many products in and around your home and garage, like cooking spray, cleaning products, paint thinners, drain cleaners and windshield washer fluid.

Hazard symbols have three parts:
1. the picture
2. the words
3. the caution (signal) words underneath the image

1. Hazard symbol pictures

The picture tells you the type of danger:

- **EXPLOSIVE**
  - The container can explode if heated or punctured. Flying pieces of metal or plastic from the container can cause serious injury, especially to your eyes.

- **CORROSIVE**
  - The product can burn your skin or eyes. If swallowed, it can damage your throat and stomach.

- **FLAMMABLE**
  - The product or its fumes will catch fire easily if it is near heat, flames, or sparks. Reags used with this product may begin to burn on their own.

- **POISON**
  - If you swallow, lick, or in some cases, breathe in the chemical, you could become very sick or die.
If you swallow, lick, or in some cases, breathe in the chemical, you could become very sick or die.

2. Hazard symbol frames

The shape of the frame around the hazard symbol tells you what part of the product is dangerous:

- If it's a triangle, it means the container is dangerous.
- If it's an octagon, it means the contents are dangerous.

3. Signal words

The signal word(s) underneath the hazard symbol explain the degree of risk:

- Symbol -

  - **DANGER EXPLOSIVE**
  - **CAUTION** means temporary injury may result. Death may occur with extreme exposure.
  - **DANGER** means may cause temporary or permanent injury, or death.
  - **EXTREME DANGER** means exposure to very low amounts may cause death or serious injury.

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**Prepare For Lab**
- Always wear a lab coat in the lab.
- Handle chemicals carefully.
- Read and follow all directions.
- Learn and understand emergency procedures.
- Know where emergency equipment is stored.
- Push lab stools out of the way. Keep aisles clear.

**In Case of Accident**
- Always notify your teacher immediately.
- Dispose of broken glass as directed by your teacher. Do not touch.
- Clean up any spills immediately.
- Report any spills, accidents, or injury immediately.
- For a chemical spill on your skin, wash for 20 seconds. Rinse for 15 minutes.
- For a chemical splash in your eye, use a cotton ball to wipe away the spill. Rinse for 15 minutes.
- In case of a large area of spillage, use safety showers.
- In case of fire, use 4-lb dry powder that can be used depending on the size of the fire.
  - **Extinguish fire blankets, cover with wet cloth.**

**Lab Safety**
- Clean and put away all equipment at the end of the lab period.
- Dispose of waste products according to instructions.
- Always wash your hands after each lab.

**Dress For Lab**
- No shorts, skirts, or open-toed shoes.
- Roll up long sleeves.
- Long hair MUST be tied back.
- No rings, jewelry, or scarves.
- Wear safety glasses, lab coat, or apron.
- No books, notebooks, or purses in the lab area.

**The Lab Burner**
- Never leave a burner unattended.
- Use caution when handling heated glassware (vases).
- Do not place hot glassware directly on the lab desk or in cold water (vases will shatter).
- Never heat a closed container.
- Keep flames away from open containers.
- Do not place hot glassware on the end of a table. Keep from yourself and others.

**Handling Chemicals**
- Don’t use chemicals that aren’t labeled.
- Don’t taste anything in the lab unless instructed to.
- Smell by wafting with your hand.
- No unauthorized experiments.
- Always add acid to water. Never add water to acid.
- Never return spilled or unused chemicals to the stock bottle (contamination).
- Don’t touch your face or mouth while working in lab.
- No food, drink, gum allowed in lab.
Safety Using Glassware

Read the following passage to answer HW Assignment 2.

Background: Test tubes, flasks, and beakers are common laboratory equipment. When using glassware, it is important to be aware of the common laboratory accidents. Physical accidents occur when using glassware, and can be very dangerous. Always wear safety glasses and a lab apron when working with glassware. Be careful not to break glassware and do not touch broken glassware. When measuring the temperature of a liquid with a glass thermometer, do not use the thermometer to stir the liquid. Thermometers are made of glass and are not designed to be used as stirring rods. If you notice a drip or a streak in a piece of glassware, you should stop using it and tell your teacher. Broken glassware can be hazardous if it is not handled properly. Always use broken glass to clean up broken glass and do not allow broken glass to fall onto the floor.

Front: Below are seven pictures of common pieces of glassware. Read the scenarios inside each picture and write down the safety precautions you should take in each situation.

1. You have poured a chemical into your beaker and now need to add water to it.

   - Use a spatula to mix the chemical and water.
   - Wear safety glasses and a lab apron.

2. Using a traditional thermometer, you are measuring the temperature of a liquid.

   - Wear safety glasses and a lab apron.
   - Avoid touching the thermometer.

3. You are pouring a chemical into a graduated cylinder to measure it.

   - Use a spatula to mix the chemical and water.
   - Avoid touching the graduated cylinder.

4. You have mixed two chemicals in a beaker.

   - Use a spatula to mix the chemical and water.
   - Avoid touching the beaker.

5. In a test tube, you have used a stirrer.

   - Use a spatula to mix the chemical and water.
   - Avoid touching the test tube.

6. Your lab partner has used some chemical in a test tube.

   - Use a spatula to mix the chemical and water.
   - Avoid touching the test tube.

7. You made a wet mount.

   - Use a spatula to mix the chemical and water.
   - Avoid touching the microscope.
Safety in the Chemistry Lab

- **Safety Equipment**
  - Always wear safety glasses when working with chemicals.
  - SDS (Safety Data Sheets) are available for all chemicals used in the lab.
  - Keep flammable solvents in a cool, dry place.
  - Never leave chemicals unattended. Always lock the lab when not in use.

- **First Aid**
  - Keep a first aid kit and a fire blanket accessible.
  - If a chemical splash occurs, immediately wash the affected area with water.

- **Chemical Disposal**
  - Always dispose of chemical waste in the proper container.
  - Never pour chemicals down the drain. Always neutralize and dispose of waste in the proper manner.

- **Fire Blanket**
  - Keep a fire blanket accessible in the lab.
  - In case of fire, cover the fire with the fire blanket and call for help.

- **Emergency Eyewash**
  - Place an eyewash station close to the work area.
  - In case of chemical splash, immediately rinse the affected eye with water.

Table 1.1. Laboratory Safety Equipment

<table>
<thead>
<tr>
<th>Safety Equipment</th>
<th>Information Regarding Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fume Hood</strong></td>
<td>Enclosed area with fume to remove chemical vapors.</td>
</tr>
<tr>
<td><strong>Safety Shower</strong></td>
<td>Safety showers should be used after handling chemicals.</td>
</tr>
<tr>
<td><strong>Chemical Storage</strong></td>
<td>Chemical storage should be away from heat sources.</td>
</tr>
<tr>
<td><strong>Emergency Eyewash</strong></td>
<td>Eyewash stations should be accessible.</td>
</tr>
<tr>
<td><strong>Fire Blanket</strong></td>
<td>A fire blanket should be placed near the work area.</td>
</tr>
<tr>
<td><strong>Emergency Eyewash</strong></td>
<td>Eyewash stations should be accessible.</td>
</tr>
</tbody>
</table>

4. located at the sink in prep room.
Fire Safety - Using the Fire Extinguisher

The Fire Triangle
- Air (O2)
- Heat
- Fuel

To use a fire extinguisher (PASS):
- Pull the safety pin
- Aim at the base of fire
- Squeeze the extinguisher handle
- Sweep side to side

Remainder: learn about other types of fire extinguishers.

Types of Fires

<table>
<thead>
<tr>
<th>CLASS</th>
<th>COMMUNICATIONS</th>
<th>ELECTROS</th>
<th>COMBUSTIBLE LIQUIDS</th>
<th>COMBUSTIBLE SOLIDS</th>
<th>COMBUSTIBLE GASES</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Paper</td>
<td>Wire</td>
<td>Wood</td>
<td>Cotton</td>
<td>Rags</td>
</tr>
<tr>
<td>B</td>
<td>Combustible liquids</td>
<td>Electrical equipment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Combustible solids</td>
<td>Combustible gases</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Compressed gases</td>
<td>Corrosive materials</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fire Blanket & How to Use
1. Pull the cover
2. Pull the blanket
3. Smooth the fabric

Suggested Answers

Page 11, Quick Check
1. a. Smother with a cover (Ceramic pad)
   b. Ice. Cold water
   c. Notify teacher and neighbours
2. Neutralize acid with baking soda, wipe up with paper towel, sweep up glass - put in disposal marked “Glass”
3. 1) Heat with hot plate
   2) Being hand close
   3) Hold carefully, test tube holder
**Vocabulary of Lab Equipment Safety**

Directions: Match the vocabulary words in the left column with the definition in the second column.

<table>
<thead>
<tr>
<th>Vocabulary</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>protective eyewear</td>
<td>a. A tool that is useful for handling hot glassware, particularly beakers.</td>
</tr>
<tr>
<td>lab apron</td>
<td>b. A tool used instead of open flames in the classroom science lab.</td>
</tr>
<tr>
<td>safety device</td>
<td>c. The safety device in the science lab that you would use to rinse your eye if you get chemicals or drip in them.</td>
</tr>
<tr>
<td>lab glasses</td>
<td>d. Goggles that are important for a safe and fun experience in the science lab.</td>
</tr>
<tr>
<td>fire extinguisher</td>
<td>e. Safety clothing that protects your clothes from chemicals and stains.</td>
</tr>
<tr>
<td>protective gloves</td>
<td>f. A necessary safety device that is used to put out fires.</td>
</tr>
<tr>
<td>eyewash station</td>
<td>g. Safety clothing for the science lab that protects your hands.</td>
</tr>
<tr>
<td>glassware</td>
<td>h. Tools such as beakers, test tubes, flasks, and vials that are made of glass and are fragile.</td>
</tr>
<tr>
<td>hot plate</td>
<td>i. Lab apron. Wear to protect your clothes from chemicals or spills.</td>
</tr>
</tbody>
</table>

**Dress the Part**

Background: There are several pieces of clothing that have been developed especially for use in the science laboratory. You have probably already used protective eyewear, lab apron, and protective gloves while working in the classroom science lab. In this activity you will identify different pieces of protective equipment and think of situations in which you should use them.

Directions: Below are three pictures of protective equipment for the science lab.  
1. Write the name of each item.  
2. Write a scenario in which you would need that protective piece of clothing.

**PERSONAL PROTECTION PHOTOGRAPHS**

1. Safety goggles - Wear whenever you use chemicals, heat, or cuttings in the science lab.
2. Protective glasses - Wear to protect your eyes when working with harmful substances.
3. Lab apron - Wear to protect your clothes from chemicals or spills.
Safety Procedures
Any time you know you will be working in the lab, it is important to arrive fully prepared to perform all work as safely as possible. When this lab was prepared, the following are some things you should always do before you begin doing any lab.
- Review and practice proper equipment before class.
- Prepare any "start-up" tasks that may be required. Your teacher will often ask you to prepare a "start-up" task before you begin using lab equipment.
- Clear all lab benches, lab tables, book bags, etc. away from your lab print bench.
- Always wear protective eyewear during the laboratory period.
- Wear lab aprons and gloves if available.
- Tie back long hair to keep it away from flames or chemicals.
- Secure your apron or lab coat to keep it away from flames or chemicals.
- Consider wearing clothing made of natural fibers such as cotton and wool, at least under the most flammable materials.
- Boil water open-topped, because of the charring behavior of laboratory water.
- Be sure all equipment is functioning as desired. Do not use broken or damaged equipment.
- Never attempt laboratory procedures without your instructor’s permission and direct instructions/instructions.

Laboratory Etiquette
There are several things that all good chemists know about using equipment and chemicals in the lab. Here is a list of some things you should use during laboratory period.
- Always approach the work with responsibility and attitude and bring your own to a reasonable volume.
- Carry, eat, drink, touch, or taste chemicals.
- Never allow chemicals directly on your hands, or in your mouth.
- Bring equipment in metal or glass to the lab. Handle it with appropriate care. Ask your instructor or another student for help on handling and breaking.
- Never put equipment in flames or direct sunlight. This can be dangerous if not done properly.
- Never leave heat sources unattended. Turn them off when not in use.
- When working with chemicals, always start with water. It is particularly important to always use water to extinguish any fire otherwise.

Laboratory Cleanup
Some of these things may be related to accidents that occur in the lab. Others simply relate to keeping the lab in an upkeep condition. Always keep the lab well cleaned and tidy.
- Never leavechemicals on the lab bench. Always keep similar chemicals together.
- Clean-up spilled chemicals immediately with the spill kit. Be sure to label the spill.
- Never use aertex fabric or cloth to clean a spill. Use a paper towel instead.
- Always wash glassware well with soap and water. Rinse it and leave it to dry.
- Keep your hands warm. Follow the use of any chemicals.
- Travel lab benches with any other work equipment, etc. when you have completed your work.
- Clean-up area should be a measure of the amount of equipment to be removed and replaced in the area.
- All equipment that cannot be moved are period, charted, and kept in the appropriate area as directed by your teacher.

Homework
1. Identify at least 6 things going wrong in the "Phenomenally laboratory.
2. Correct the mistakes.
3. (Various answers)
SUGGESTED ANSWERS

1. prevent
2. agon
3. eat
4. glassware
5. thermometer
6. microscope
7. heavy
8. gogles
9. unplug
10. Points
11. false
12. false
13. true
14. false
15. true
16. true
17. true
18. false
19. true
20. false

Practice Test

1. When is the closest distance your chemistry lab is safe? (Answer: 10 feet)
2. Outline the value you should take in an article of the above property of a chemistry lab.
3. How were the properties of items in your laboratory? 
4. Knowing you have been in a particular room, identify the task you should do.
5. Give the name and use of each of the following pieces of equipment:
   - Test tube
   - Test tube holder
6. List the things you should do before beginning any chemistry experiment.
7. Give three ways for the time that is.

SUGGESTED ANSWERS

1. For example, by 1st staircase to the right.
2. For example, Right Down step, Out to Oval.
3. For example, One, ABC.
4. Closed toe shoes, natural fibers, no dangling or loose clothes, or jewelry.

5. Erlenmeyer Flask
6. Graduated Cylinder
7. Crucible
8. Heat
9. Water
10. Burette Clamp

Clamp Ball and Socket

6. Bead lab.
11. Wash with soap (if brush)
12. Avoid contact with flame and chemicals
13. Contamination or may drink the wrong thing
14. More safety equipment vs. more hazards

15.
- Beaker Tongs
- Pick up beaker
- Ring Stands
- Hold pad/ rings
- Ceramic Pad
- Sits on ring for heating
- Crucible tongs
- Pick up crucible

16. Under bench — out of the way
17. Metal Data Safety Sheet, Binder in store room
18. a. Sink (suit water before and after)
   b. Disposal Jar
   c. Glass Disposal
   d. Garbage Can
   e. Organic disposal in fume hood

19.
- Explosive contents
- Poison Level 2 Biohazard
- Flammable contents
- Poison Division 2
- Oxidizing material

20. Clamp near top of test tube, 65°C. Keep moving. Point away