Chemistry 11

Unit 1: Equipment + Lab Safety

Name: ____________________  Block: _____

Key
1.1 Staying Safe Around Matter

Warm Up
- Examine each of the following pairs of equipment.
- Consider how the structure of each piece relates to its function.
- Circle the better piece of equipment for each task.

(a) Boiling a solution
(b) Holding a hot test tube
(c) Measuring a volume of liquid
(d) Evaporation over a hot flame

Test tube holders are literally test tube shaped. The tongs below are crucible tongs, although the open section looks like it might fit a test tube, it would slip out and likely break. Crucible tongs are designed with grip to pinch the edges of a ceramic crucible dish.

c) When considering measurement tools it is imperative to think about accuracy and precision. The scale on most beakers is not detailed enough to provide an accurate measure (nor are many standard lab beakers calibrated with the same precision or quality as a measuring cylinder). Measuring cylinders provided a highly detailed scale which is vital for accurate measuring in the lab.

d) Top: watch glass, not always made of Kimax or Pyrex glass (i.e. cannot withstand heat). Bottom: ceramic evaporating dish. Ceramic material allows for direct heat from a source (say a bunsen burner), evenly distributes heat throughout the dish and has an open top to allow for liquid to evaporate and a solid product to be collected and viewed.

Chemistry Equipment and Its Uses

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

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

Most of the glassware found in the laboratory is made of a special type of glass with a low coefficient of expansion. This simply means the glass expands so little as it is heated that it is unlikely to break. Example: Two common brand names for this type of glassware are Pyrex and Kimax.

Other glassware is made of ceramic material. It may be heated to red-hot temperatures without expanding or breaking. Ceramic material includes wrought iron, stainless steel, aluminum, and brass.

Lab Safety + Equipment Page 2
<table>
<thead>
<tr>
<th>Glassware</th>
<th>Name</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beaker</td>
<td><strong>Holding</strong> for liquids</td>
<td>- may be graduated (sometimes in two directions)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- has a white spot for labeling</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- various sizes including 50, 150, 250, 450, 650, and 1000 ml.</td>
</tr>
<tr>
<td>Erlenmeyer (Conical)</td>
<td><strong>Holding</strong> for liquids</td>
<td>- a shape avoids loss due to spilling</td>
</tr>
<tr>
<td>Flask</td>
<td></td>
<td>- used for titration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- common sizes include 125, 250, and 500 mL.</td>
</tr>
<tr>
<td>Test Tubes</td>
<td><strong>Holding</strong> for liquids or solids</td>
<td>- can be heated directly or in a water bath</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- may be used to mix small quantities of chemicals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- large variety of sizes</td>
</tr>
<tr>
<td>Measuring (Graduated)</td>
<td><strong>Measuring</strong> for liquids</td>
<td>- sizes vary</td>
</tr>
<tr>
<td>Cylinder</td>
<td></td>
<td>- commonly 10, 25, 50, 100, and 250 mL</td>
</tr>
<tr>
<td>Funnel</td>
<td><strong>Funneling</strong></td>
<td>- useful for pouring liquids through small openings</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- can contain filter paper for separating solids from suspensions by filtration</td>
</tr>
<tr>
<td>Evaporating Dish</td>
<td><strong>Evaporating</strong></td>
<td>- evaporating solvent (solid) from a solution (dissolved) solvent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- can be used to dry a damp product</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- ceramic material allows to high temperatures</td>
</tr>
<tr>
<td>Watch glass</td>
<td><strong>Observing</strong></td>
<td>- useful for holding a sample of chemical</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- may cover a beaker or flask to prevent evaporation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- holds chemicals while drying</td>
</tr>
<tr>
<td>Crucible</td>
<td><strong>Heating</strong> to high temperatures</td>
<td>- heating covered or partially covered samples</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- ceramic material may be directly heated until red hot</td>
</tr>
<tr>
<td><strong>Clay pipe triangle</strong></td>
<td>Providing a base to hold a <strong>crucible</strong>.</td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td>------------------------------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>sits atop a wrought-iron ring</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>stems are made of ceramic material</em></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Pipette</strong></th>
<th>Measuring volumes of liquids</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>liquid is drawn up with a pipette bulb or suction device</em></td>
</tr>
<tr>
<td></td>
<td><em>may be graduated or volumetric (designed to deliver one specific volume)</em></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Thermometer</strong></th>
<th>Measuring temperatures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>bottle should be submerged in the fluid being measured</em></td>
</tr>
<tr>
<td></td>
<td><em>temperature ranges vary</em></td>
</tr>
<tr>
<td></td>
<td><em>most contain dyed alcohol</em></td>
</tr>
<tr>
<td></td>
<td><em>more precise thermometers contain mercury</em></td>
</tr>
<tr>
<td></td>
<td><em>commonly measure temperature in degrees <strong>C</strong> / <strong>F</strong> (K-Kelvin)</em></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Wash bottle</strong></th>
<th>a squeeze bottle with a nozzle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>used to rinse various pieces of laboratory glassware, such as test tubes</em></td>
</tr>
<tr>
<td></td>
<td><em>used in titrations to dispense droplets held on burette tips</em></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Burette</strong></th>
<th>Measuring <strong>known volumes dispensed</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>graduated glass tube with a stop valve at one end</em></td>
</tr>
<tr>
<td></td>
<td><em>for delivering known volumes of a liquid</em></td>
</tr>
<tr>
<td></td>
<td><em>used especially in titrations</em></td>
</tr>
</tbody>
</table>

**Quick Check**

Working with a partner, design a **classification scheme** and use it to put the glassware into groups according to common characteristics.

**ANSWERS:**

For Example:

<table>
<thead>
<tr>
<th>Uses</th>
<th>Other Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contains Chemicals</td>
<td>Other Uses</td>
</tr>
<tr>
<td>All Others</td>
<td>Funnel</td>
</tr>
<tr>
<td></td>
<td>Thermostat</td>
</tr>
<tr>
<td></td>
<td>Pipe Stem Triangle</td>
</tr>
</tbody>
</table>

For Example:

<table>
<thead>
<tr>
<th>Uses</th>
<th>Other Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Picks Things Up</td>
<td>Associated With Heating</td>
</tr>
<tr>
<td>Test Tube Holder</td>
<td>Flint Striker</td>
</tr>
<tr>
<td>Beaker Tongs</td>
<td>Bunsen Burner</td>
</tr>
<tr>
<td>Crucible Tongs</td>
<td>Ceramic Pad</td>
</tr>
<tr>
<td>Scoopula</td>
<td>Rings Stand</td>
</tr>
<tr>
<td></td>
<td>Ring Clamp</td>
</tr>
<tr>
<td></td>
<td>Burette Clamp</td>
</tr>
</tbody>
</table>
Safely Using Glassware

Background: Tools made of glass, called glassware, are very useful in the science lab. Glassware can be heated or cooled, and will not melt. However, glassware is also very fragile. In fact, breaking glassware is one of the most common laboratory accidents. You can take several important precautions when using glassware, to make the lab experience safer for everyone. First, be sure to always place glassware far from the edge of the table. This way it cannot easily be knocked off. Be sure to have dry hands when moving cool glassware; wet glass can be very slippery! Glassware does not change color or shape with temperature, therefore it can be hard to tell whether it is hot or cold. It is important to always assume that glassware is hot unless you are absolutely sure that it is cool. Always use beaker tongs or test tube tongs to touch hot 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 meant to be used as stirring rods. If you notice a chip or a crack in a piece of glassware, you should stop using it and tell your teacher. Broken glassware will only break more if used. And, if you should happen to accidentally break a piece of glassware, tell your teacher immediately. Do not attempt to clean up the broken glass until you have instructions for safe cleanup from your teacher.

If you follow these few safety precautions, your science lab experience will be safer and more fun for everyone.

Directions: Below and on the next page are seven pictures of common pieces of glassware. Read the scenarios beside each picture and write down the safety precautions you should use in each situation.

1. You have poured a chemical into your beaker and now need to carry it across the room to your lab station.

2. Using a traditional thermometer, you are measuring the temperature of a beaker of ice water. You need to stir some salt into the water to observe its affect on the temperature.

ANSWERS

Safety Using Glassware

1. Have dry hands. Be sure you have a clear space to set the beaker down at your lab station.
2. Wear safety goggles, protective gloves, and a lab apron.
3. Do not use the thermometer to stir the ice water - get a stirring rod to use instead. Wear a lab apron and protective goggles.
4. Wear safety goggles and a lab apron. Place the cylinder far from the edge of the table, and have your partner keep a safe distance.
5. Be careful not to hit the beaker too much to avoid breakage. Wear safety goggles and a lab apron.
6. Turn the mouth of the test tube away from you and others. Wear safety goggles and a lab apron. Use test tube tongs to move the test tube.
7. Make sure the flask is far from the edge of the table. Wear safety goggles and a lab apron.
8. Watch from the side when moving from the low power objective to the high power objective. Use the fine adjustment knob with the high power objective.

Safely Using Glassware cont.
Safely Using Glassware cont.

3. You are pouring a chemical into a graduated cylinder to measure it. Your lab partner is watching at eye level while you do this.

4. You have mixed two chemicals in a glass beaker. You now need to stir them vigorously with a stirring rod to begin the chemical reaction.

5. In a test tube you have mixed several chemicals. The test tube is placed in a hot water bath to accelerate a chemical reaction.

6. Your lab partner has stored some chemical in a flask and placed it at the end of your lab table.

7. You made a wet mount. You need to use a microscope to look at it using both the low and high power objectives.

Answers above
<table>
<thead>
<tr>
<th>Hardware</th>
<th>Name</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retort (ring) stand</td>
<td><strong>Ring clamp</strong></td>
<td>Attaching to a ring stand • supports a ceramic pad, a pipe stem triangle, or an evaporating dish • may surround a beaker as a safety ring</td>
</tr>
<tr>
<td>Burette clamp</td>
<td><strong>Burette clamp</strong></td>
<td>Attaching to a ring stand • holds a burette • may hold a test tube in a stationary position • may support the neck of a flask</td>
</tr>
<tr>
<td>Striker</td>
<td><strong>Striker</strong></td>
<td>Lighting a Bunsen burner • provides a spark by moving a flint across a file</td>
</tr>
<tr>
<td>Bunsen Burner</td>
<td><strong>Bunsen Burner</strong></td>
<td>Providing heat • adjusts flame temperature by addition of air through the barrel • adjusts flame height by turning the regulator valve</td>
</tr>
<tr>
<td>Test Tube Tongs</td>
<td><strong>Test Tube Tongs</strong></td>
<td>Holding HOT test tubes • used for heating test tubes over flame • used for removing test tubes from water baths</td>
</tr>
<tr>
<td>Test Tube Rack</td>
<td><strong>Test Tube Rack</strong></td>
<td>Holding test tubes • during experiments (without heat) • while observing substances inside test tubes</td>
</tr>
<tr>
<td>Beaker Tongs</td>
<td><strong>Beaker Tongs</strong></td>
<td>Lifting hot beakers • rubber cover allows tongs to firmly grasp and move beakers of all sizes</td>
</tr>
<tr>
<td>Crucible Tongs</td>
<td><strong>Crucible Tongs</strong></td>
<td>Holding hot crucibles • may remove or adjust crucible lid • holds hot evaporating dishes • NOT designed for lifting beakers or test tubes</td>
</tr>
<tr>
<td>Wire gauze (ceramised)</td>
<td><strong>Wire gauze (ceramised)</strong></td>
<td>Providing a base to hold glassware • sits atop a wrought-iron ring • provides a flat surface for beakers or flasks • sometimes called a wire gauze</td>
</tr>
<tr>
<td>Scoopula</td>
<td><strong>Scoopula</strong></td>
<td>Moving samples of solids • sometimes called a spatula • should NOT be used as a stirring rod (stirring rods should be glass)</td>
</tr>
</tbody>
</table>
The Workplace Hazardous Materials Information System (WHMIS) is the Canadian system for communicating information about the safety requirements for working with chemicals.

The main components of WHMIS are:
- a labelling system consisting of eight specialized safety icons (see below)
- training programs for people who work with chemicals
- Material Safety Data Sheets (MSDS) providing information about chemicals

- People who care around or work with chemicals are required to take WHMIS training with varying frequencies depending on their jobs.

![Chemical Hazards Icons](image-url)
SAFETY WITH MATERIALS

A Safety Data Sheet (SDS) must be provided with every chemical purchased in Canada.

These sheets contain hazard information and associated with each chemical (can also be found online).

This image shows an excerpt from an SDS for hydrochloric acid solution. This is only an excerpt.

An actual SDS may contain more than 15 sections, each of which may be quite detailed.

Quick Check-in

Task: Read over the SDS provided for your material and answer the questions below:

1. What are the purposes of a SDS?
2. What types of materials are required to have a SDS?
3. How is the information on an SDS categorized?
4. What is the name of your material?
5. What are the general hazard categories for this substance?
6. What are four of the chemical and physical properties of your material?
7. What first-aid measures are recommended if one of the following occurs:
   a. inhalation:
   b. skin contact:
   c. eye contact:
   d. ingestion:
8. What precautions are listed for safe handling and storage?

To provide safety procedures and chemicals, composition, reactivity, first aid, risks... etc.

Answers will vary depending on the material.
Quick Check

1. How would you deal with each of the following accidents should it occur during a lab you are performing this year?

   (a) While heating a small amount of alcohol in a beaker, it bursts into flame.

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

   (b) Your partner hands you a piece of hot glass they've just bent after heating over a Bunsen burner.

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

   (c) A test tube full of concentrated hydrochloric acid is dropped and broken on the floor.

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

2. How could you have prevented each accident from happening to begin with?

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

ANSWERS:

1. a. Smother with a cover (Ceramic pad)
   b. Ice, Cold water
   c. 1st: Notify teacher and neighbours, 2nd: Neutralize acid with baking soda, wipe up with paper towel, sweep up glass – put in disposal marked “Glass”

2. 1) Heat with hot plate
    2) Bring hand close
    3) Hold carefully, test tube holder
ASSIGNMENT 2: WHMIS Practice Worksheet

1. WHMIS is a:
   - ____ Workplace transportation guide
   - ____ Environmental system
   - [ ] Workplace hazardous materials information system
   - [ ] Workplace hazardous waste disposal system

2. WHMIS has 3 main communication components. They are:
   - [ ] Labels, MSDS, and training
   - ____ Reading, writing and labeling
   - ____ Heating, waste and storage
   - ____ Stickers, shipping and storage

3. How often do MSDS sheets need to be replaced?
   - ____ Every year
   - ____ Every 3 years
   - ____ Every 5 years
   - ____ When needed

4. If you see this symbol it means that the product:
   - ____ Is biohazardous
   - ____ Is corrosive
   - [ ] Produces toxic effects immediately upon exposure
   - ____ Produces toxic effects after prolonged exposure

5. Products displaying this symbol must be considered:
   - ____ Corrosive
   - ____ Flammable and combustible
   - [ ] Biohazardous
   - [ ] Oxidizing material

6. A Material Safety Data Sheet (MSDS) contains information on the following:
   - [ ] Hazardous ingredients
   - [ ] Toxicological information
   - [ ] Physical Properties
   - ____ All of the above

7. A chemical's characteristics (odor, appearance, etc) will be listed on the MSDS under:
   - [ ] Reactivity data
   - ____ Physical data
   - ____ Product identifier
   - ____ Toxicological properties

8. Personal protective equipment (PPE) that is recommended on a MSDS:
   - ____ Should be ignored
   - [ ] Does not have to be maintained
   - [ ] Must be available and used by employees when required
   - ____ Does not have to be available on the unit
9. Which of the following is a concern when using respirators:
   ___ It has to fit properly
   ___ It has to be cleaned regularly
   ___ The filter type must match the hazard
   ___ All of the above

10. The WHMIS symbol for compressed gas is:
    ___ “T” in a circle
    ___ “Cylinder in a circle
    ___ a flame in a triangle
    ___ “G” in a circle

11. The statement is FALSE regarding acute and chronic health effects:
    ___ Acute refers to sudden or brief effects
    ___ Chronic relates to long-term or prolonged effects
    ___ More information is known about acute effects than chronic effects
    ___ MSDS’s include information on how to treat chronic health effects

12. Supplier labels must be written in:
    ___ English
    ___ French
    ___ Both English and French
    ___ None of the above

13. By law, how many items of information are required on a workplace label?
    ___ 3
    ___ 8
    ___ 2
    ___ none

**True or False:**

14. The ultimate goal of WHMIS is to reduce injuries and illnesses associated with chemical exposures in the workplace.
    T/F

15. In the workplace, I don’t need to understand WHMIS.
    T/F

16. Suppliers are not responsible for providing a MSDS.
    T/F

17. This is the WHMIS symbol for flammable:
    T/F

18. The following symbol indicates immediate danger to health & life:
    T/F

19. ALL products & chemicals have a WHMIS label
    T/F

20. WHMIS labels show the suppliers name and address
    T/F
Household Hazardous Products Labels
The Consumer Chemicals and Containers Regulations (CCCR) require specific packaging and labeling of household products.

There are only 4 different household labels.

These labels may be bordered in 2 different ways.

The border indicates whether the label refers to the container or the contents within the container.

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.

Quick Check
What household labels would you expect to find on a container of Hydrochloric (muriatic) acid?
- Octagon
- Corrosive
- Poisonous

Hazard Classification
- The National Fire Protection Association (NFPA) developed a hazard identification system for emergency responders that is still in use today.
- In the past, some chemical manufacturers used NFPA diamonds on their products, but now labels are required to use Global Hazard System (GHS) labeling.
- The NFPA system was designed to convey safety information to emergency first responders, such as fire fighters. It was not designed to notify the user of the hazards of chemicals in the laboratory setting.

Hazard Identification System
- Low
- Medium
- High

Fire
- Health
- Reactivity
- Special cases

BLUE Diamond Health Hazard
- 4 Deadly
- 3 Hazardous
- 2 Hazardous
- 1 Highly Hazardous
- 0 Normal Material

RED Diamond Fire Hazard (Flash Point)
- 4 Below 73°F
- 3 Below 100°F
- 2 Above 100°F
- 1 Flash Point Below 40°F
- 0 Flash Point Above 205°F
- NG or LPG

YELLOW Diamond Reactivity
- 4 Highly Reactive
- 3 Shock and Heat May Decompose
- 2 Chemically Incompatible
- 1 Incompatible
- 0 Stable

WHITE Diamond Special Hazard
- 4 Explosive
- 3 Oxidizer
- 2 Corrosive
- 1 Radioactive
- 0 Non-hazardous
**Fire Safety - Using Fire Extinguishers**

**The Fire Triangle**

Take away any one of these components and you stop the fire.

To use a fire extinguisher (PASS):

- **P**ull the safety pin
- **A**im at the base
- **S**queeze the handle (until empty)
- **S**weep side to side

**Types of Fires**

<table>
<thead>
<tr>
<th>CLASSIFICATION</th>
<th>EXAMPLE MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Common Combustibles</td>
</tr>
<tr>
<td>B</td>
<td>Flammable liquids and gases</td>
</tr>
<tr>
<td>C</td>
<td>Live electrical equipment</td>
</tr>
<tr>
<td>D</td>
<td>Combustible metals</td>
</tr>
<tr>
<td>K</td>
<td>Cooking media</td>
</tr>
</tbody>
</table>

Fire classification is a term used to denote the type of fire, in relation to the combustion materials which have ignited.

This has very important impacts on the type of suppression or which can be used. Most are “ABC”

**Fire Blanket & How to Use**

1. **P**ull the clasp
2. **P**ull out the blanket
3. **S**mother the flames.
## SAFETY IN THE CHEMISTRY LAB

**Safety Equipment**

Every chemistry laboratory has a number of items “built in” to the facility for use in case of an accident or simply to ensure the safest laboratory operation possible. It is important to know the location and instructions for operation of each of these items.

- If you think you might need to use any of the equipment in this table for an emergency, don’t hesitate. Call out to inform others of the situation and immediately use the equipment as instructed.

### Table 1.1.3 Laboratory Safety Equipment

<table>
<thead>
<tr>
<th>Safety Equipment</th>
<th>Information Regarding Operation</th>
</tr>
</thead>
</table>
| Spill control station | - Located in the prep room.  
- Used to neutralize before clean up.  
  Acid Kit - baking soda (sodium bicarbonate)  
  Base Kit - vinegar (acetic acid) |
| First aid kit | - All labs should have access to a first aid kit.  
- Located in prep room  
- Such a kit should contain an antibiotic cream or ointment and plenty of bandages.  
- Burns are the most common injury in the chemistry lab. While ice followed by cold water is generally enough, the kit may contain a topical anesthetic cream. It is critical to ensure a student has no anesthetic allergies before using such a product.  
- Avoid burns from hot glass or metal by bringing your hand near the object first to test for heat.  
- Small cuts closely follow burns on the list of chemistry lab injuries. These may be treated with the antibiotic cream and a bandage. |
| Glass disposal container | - Never in the garbage  
- “Sharps” container ➔ side bench |
| Chemical waste disposal | - Containers clearly marked “Chemical Disposal” should be used for disposing solutions or precipitates containing heavy metals or any other toxic chemicals.  
- Some organic waste may release toxic fumes. Such waste often warrants its own container, which may be covered and/or placed in the fume hood.  
- Some chemicals such as dilute solutions of acids and bases and non-toxic salts may be flushed down the sink with plenty of water.  
- If you are unsure, ALWAYS ASK your lab instructor. |
| Fire alarm | - Though it may be in the hall outside of your lab, you must know where the fire alarm is located. |
### Safety Equipment

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Information Regarding Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fume Hood</td>
<td>- Enclosed area with fans and filters to remove chemical vapors.</td>
</tr>
<tr>
<td>Eyewash station</td>
<td>- If a chemical is splashed or spilled into the eyes, they should be held open and rinsed continuously for 15-15 min. Contact lenses should be removed.</td>
</tr>
<tr>
<td>Safety Shower</td>
<td>- Spills over a large portion of the body require removal of clothing and washing of the entire region for 10-15 min under the safety shower.</td>
</tr>
<tr>
<td>Fire Extinguisher</td>
<td>- Small fires such as those that occur in a beaker or crucible usually may be smothered by placing a ceramic pad or cover on top.</td>
</tr>
<tr>
<td>Fire Blanket</td>
<td>- A fire extinguisher should <strong>never</strong> be used on a person.</td>
</tr>
</tbody>
</table>

#### Fire Extinguisher

- **A fire extinguisher should **never** be used on a person.**
- **STOP. DROP. AND ROLL** is the best way to extinguish a fire involving a person.
  - A fire blanket may be used in combination with this process to smother the fire.
  - Fire blankets may be enclosed in a box or a cylindrical container attached to a wall, or they may be upright. An upright blanket may be wrapped around the victim while he or she is standing.

#### Emergency Gas Shut-off

- The emergency gas shut-off valve allows all gas outlets in the laboratory to be shut off at once.
- To use the shut off, turn a handle so it is perpendicular to the gas line or simply push a large red button.
- At the end of the day, this valve should always be left in the off position.

### Homework

**ASSIGNMENT #3:** "Dress the Part Practice Worksheet this assignment is to be completed in this workbook."
Dress the Part

**Background:** There are several pieces of clothing that have been developed specifically for use in the science laboratory. You have probably already used protective goggles, a 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.

a) write the name of each item
b) write a scenario in which you would need that protection.

```
Name: __________________________
When to Wear: ______________________
______________________________
______________________________
______________________________
______________________________

Answers:

- safety goggles - Wear whenever you use chemicals, heat, or cut things in the science lab.
- protective gloves - Wear to protect your hands when working with harmful substances.
- lab apron - Wear to protect your clothes from chemicals or stains.
```

Name: __________________________
When to Wear: ______________________
______________________________
______________________________
______________________________
______________________________
Safety Procedures

Any time you know you will be working in the laboratory, it is important to arrive fully prepared to perform all work as safely as possible. We call this lab preparedness. The following are some things you should always do before you begin doing a lab.

- Read the entire procedure before, paying close attention to any safety issues.
- Prepare any charts that may be required. Your teacher will often ask you to prepare a flow chart before you arrive for lab.
- Clear all binders, backpacks, book bags, coats, etc. away from your lab bench.
- Always wear eye protection during the laboratory period.
- Wear lab aprons or lab coats if available.
- Tie back long hair to keep it away from flames or chemicals.
- Secure loose sleeves or jewellery to keep them away from flames or chemicals.
- Consider wearing clothing made of natural fibres such as cotton and wool, as those are the most fire resistant fibres.
- Do not wear open toed shoes or shorts/skirts/etc. during laboratory work.
- Be sure all equipment is in good working order. Do not use cracked glassware or damaged electrical equipment.
- Never attempt laboratory procedures without your instructor’s permission and direct instruction/supervision.

Laboratory Technique

There are several things that all good chemists know about using equipment and chemicals in the lab. We refer to these things as proper laboratory technique.

- Always approach lab work with a responsible attitude and keep voices kept to a reasonable volume.
- Do not eat or drink or chew gum during laboratory period.
- Never touch or taste chemicals.
- Never inhale chemicals directly. Use your hand to odours toward you.
- Bring your hand near metal or glass to test for heat. Handle hot equipment with appropriate tongs, test tube holders, or mitts.
- Never use open flames around flammable materials. Use a hot plate or mantle.
- Clamp test tubes near the top and hold at a 45° angle with constant motion and the end pointed away from everyone during heating.
- Never leave heat sources unattended. Turn off Bunsen burners and hot plates when not in use.
- Safety Flame-orange, Heating Flame-small/blue, Acid to water always start with water. It is particularly important to add never the other way around.
Last, but not least, there are a number of things that relate to laboratory clean up. Some of these things may be related to accidents that occur in the lab. Others simply relate to leaving the lab in as good, or better, condition than you found it.

- Sweep any broken glass into a dustpan and place it in the proper disposal container. Always notify teacher & neighbors of any broken glass.
- Clean up spilled chemicals immediately with the spill kit. Be sure to notify neighbors of any chemical spill.
- Never return unused chemical to the original stock bottle. Either share it with another student or properly dispose of any excess.
- Always wash glassware well with soap and water, then rinse it, and leave it to air dry.
- Wash your hands well following the use of any chemicals.
- Wipe your lab bench with disinfectant when you have completed your lab.
- Clean up should begin with a reasonable amount of time to allow all equipment to be washed well and replaced in the appropriate spot.
- For experiments that run for more than one period, clearly label all materials and leave them in the appropriate place as instructed by your teacher.

 ASSIGNMENT #4: “Safety in the Laboratory”
This assignment is to be completed in this workbook.

Safety in the Laboratory

Question
Where is the safety equipment located in your chemistry laboratory?

Procedure
1. In the space below, draw an outline map of your chemistry laboratory, including every item in Table 1.1.3.
2. Add at least five more items that contribute to safety in your lab.

ANSWERS WILL VARY DEPENDING ON CLASSROOM

LABELLED DIAGRAM SHOULD INCLUDE:
- Fume Hood
- Eye Wash Station
- Safety Shower
- Fire Extinguisher (DON’T FORGET THE 1 IN THE PREP ROOM!)
- Fire Blanket
- Emergency Gas Shut Off
- First Aid Kit
- Spill Control
- Glass Disposal
- Chemical Waste Disposal
- Fire Alarm
1.1 Review Questions

1. Where is the closest fire alarm to your laboratory?
2. Outline the route you should follow in case of a fire
   1. For example, by 1st staircase to the right
   2. For example, Right, Down stairs, Out to Oval
   3. For example, One, ABC
   4. Closed toe shoes, natural fibers, no dangling or loose clothes, or jewellery

4. Knowing you have lab on a particular school day, describe how you should dress.

5. Give the pieces of:
   - Erlenmeyer Flask
   - Graduated Cylinder
   - Crucible
   - Test Tube
   - Clamp

6. List three things you should do before beginning any science experiment.

7. Give three uses for the fume hood.
   6. Read lab, Know safety procedures, Safety glasses
   7. Vent toxic fumes, Odours, Smoke, Store organics, Shield

8. What is the most common injury in the lab? How might you avoid this injury? How would you treat this injury?
   8. Burns. Bring hand near Ice
   9. a. 10 – 15 minutes in eyewash
      b. Stop, drop, roll
      c. Notify teacher and neutralize with acid
      d. Share, or proper disposal
      e. Notify, sweep up, place in glass disposal

9. How many of the following labels may be present in the lab?
   - Corrosive Product
   - Corrosive
   - Dangerously Reactive
   - Poisonous Product
   - Compressed Gas

10. What is the meaning of each of the following labels?
    - Health Hazard
    - Poisonous Product
    - Compressed Gas
    - Biohazardous Infectious
    - Corrosive Product
11. Outline a three-step procedure for cleaning glassware at the end of the period.

11. Wash with soap (+Brush)
12. Avoid contact with flame and chemicals

12. Why should long hair always be secured back during lab?

13. Why do you suppose food and drink are not allowed during lab?

13. Contamination or may drink the wrong thing
14. More safety equipment vs. more hazards

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

16. Under bench – out of the way
17. Metrical Data Safety Sheet, Binder in storeroom
18. a. Sink (run 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, 95°C, Keep moving, Point away
20. Give four things to keep in mind while heating a test tube half-filled with liquid.

Chemistry 11 Lab Safety PRACTICE TEST

Name: ___________________________ Date: ___________________________ Block: ___________________________

1. What safety device should be used if a student pours a chemical into a beaker and it splashes into their eyes?
   a. Fume Hood
   b. Fire Extinguisher

7. You see on your table an unlabeled beaker filled with a clear liquid. The contents
   a. must be water; go ahead and drink it.
   b. are probably water, drink it anyway, what’s the worst that could happen?
Chemistry 11 Lab Safety PRACTICE TEST

Name: ___________________________ Date: ___________________________

1. What safety device should be used if a student pours a chemical into a beaker and it splashes into their eyes?
   a. Fume Hood
   b. Fire Extinguisher
   c. Eye Wash Station ✗
   d. Fire Blanket

2. What safety equipment should the student have used to avoid the accident mentioned in question #1?
   a. Eye Wash station
   b. Safety Goggles
   c. Safety Shower
   d. Fire Blanket

3. Your lab partner just (accidentally) lit your notebook on fire. What piece of safety equipment should be used?
   a. Fume Hood
   b. Fire Extinguisher
   c. Eye Wash Station
   d. First Aid Kit

4. While trying to extinguish your notebook, your sweater catches on fire. What item should your partner use to save you?
   a. Eye wash station
   b. Safety Goggles
   c. Safety Shower
   d. Fire Blanket

5. You are safe now that the fire is out, but still in a slight state of shock. You knock an entire beaker of chemicals onto your lab partner’s pants. What item will be used to save the Levi’s?
   a. Eye wash station
   b. Safety Goggles
   c. Safety Shower
   d. Fire Blanket

6. Certain things are never allowed in a lab. Select which item below is allowed.
   a. Food ✗
   b. Goggles ✓
   c. Beverages ✗
   d. Horseplay ✗
   e. Candy ❌

7. You see on your table an unlabeled beaker filled with a clear liquid. The contents:
   a. must be water. Go ahead and drink it.
   b. are probably water. Drink it anyway, what’s the worst that could happen?
   c. are a really dangerous chemical. Pour it on your desk, and see if it burns through.
   d. are unknown. Leave it alone, and inform your instructor.

8. The most important tool(s) to have in a lab setting is:
   a. Beakers
   b. Bunsen Burners
   c. Hammers
   d. Common sense and maturity

9. If a piece of electrical equipment has a damaged wire:
   a. It is okay to use it if sparks are not shooting from the wire.
   b. It is okay to use it if you don’t touch the damaged part.
   c. It should be fixed before use.
   d. It should be given to your instructor right away.

10. Your laboratory procedure instructs you to pour six different solutions into separate beakers for use in a lab. You should:
    a. Pour all of the solutions into beakers and then label the beakers.
    b. Pour one solution at a time, and label each beaker after pouring the solution into it.
    c. Label all beakers first, and then pour the correct solution into each.
    d. Do not worry about labeling the beakers.

11. Which of the following is a common cause of laboratory accidents?
    a. Following directions
    b. Reading labels carefully
    c. Horseplay in the laboratory
    d. Following clean-up procedures

12. If the fire alarm sounds during a lab activity:
    a. Carefully put away all your materials and exit.
    b. Leave only if the fire is in the room where you are located.
    c. Turn off all heat sources and follow the evacuation procedures.
    d. Leave the room as quickly and quietly as possible without doing anything to your lab station.

13. You are finished with the lab activity when:
    a. The bell rings
    b. You have followed proper clean-up procedures ✗
    c. You have collected your data
    d. The group next to you is done

14. Most accidents:
    a. Can be prevented if you make safety a habit

17. Flammable means:
    a. Easily catch fire and capable of burning rapidly
    b. The opposite of "inflammable"
    c. Highly toxic

18. Which of the following is not an example of personal protective equipment?
    a.oggle and lone dates ✗

Lab Safety + Equipment Page 22
13. You are finished with the lab activity when:
   a. the bell rings
   b. you have followed proper clean-up procedures
   c. you have collected your data
   d. the group next to you is done

14. Most accidents
   a. can be prevented if you make safety a habit
   b. cannot be prevented
   c. are caused by your lab partner
   d. are caused by people who follow safety rules

15. Material Safety Data Sheets (MSDS) provide
   a. lab procedures, physical properties, and health considerations
   b. storage information, chemical properties, and cost of the chemical
   c. health considerations, disposal information, physical properties
   d. cost of the chemical, lab procedures, chemical formula

16. The label CORROSIVE on a chemical container indicates
   a. that the material can break down rapidly upon exposure to air
   b. that contact destroys living tissue as well as equipment
   c. that the material will catch fire upon exposure to air

17. FLAMMABLE means
   a. easily catch fire and capable of burning rapidly
   b. the opposite of "inflammable"
   c. highly toxic

18. Which of the following is not an example of personal protective equipment?
   a. goggles and long pants
   b. long-sleeve shirts
   c. contact lenses
   d. lab coats
   e. all of the above

19. The four routes by which toxic chemicals can enter the body include:
   a. inhalation, indigestion, transmission of bodily fluids, and interjection
   b. inhalation, constipation, instigation, and investigation
   c. inhalation, ingestion, absorption, and injection
   d. inhalation, congestion, inscription, and injection

20. You should stir solutions with
   a. a pencil or a pen
   b. a thermometer
   c. a stirring rod
   d. b or c

Identify the WHMIS symbols by choosing the letter of the symbol which corresponds with the description of the classification.

- A. 9. Compressed Gas
- B. 10. Biohazardous Waste
- C. 11. Toxic
- D. 12. Poisonous + Infectious

Note: The text is slightly unclear regarding the letter choices for the WHMIS symbols.
True/False Questions

1. Safety glasses must be worn whenever chemicals are used in an experiment.
   - T

2. At the end of an experiment, all remaining chemicals are to be poured down the sink.
   - F

3. Never handle chemicals with your bare hands.
   - T

4. In order to determine the odour of a chemical, always put your head/face directly over the container opening and inhale deeply to get the best sample.
   - F

5. Chemical spills should be left until the end of class before they are cleaned up.
   - F

6. Always return excess chemicals to the original container.
   - F

7. Tasting chemicals is an excellent way to determine a material’s physical properties.
   - F

8. When heating chemicals in a test tube, always direct the tube to the centre of the classroom so as not to splash walls and windows.
   - T

9. If clothing ignites, smother with a fire blanket or roll on the floor to smother flames.
   - T

10. For our purposes, safety symbols can be divided into two categories: hazardous household product symbols and WHMIS symbols.
    - T
Chemistry Lab Equipment

- Test Tube Rack
- Crucible with Cover
- Evaporating Dish
- Watch Glass
- Test Tubes
- Weigh Boat
- Wire Gauze
- Beaker
- Ring Stand
- Clay Triangle
- Bunsen Burner
- Micro-Pipets
- Graduated Cylinder
- Spatula
- Dropper
- Buret Clamp
- Electronic Balance
- Erlenmeyer Flask
- Buret
- Crucible Tongs
- Funnel
- Test Tube Holder
- Rubber Stoppers
- Iron Ring
- Test Tube Clamp (Utility Clamp)
- Thermometer
- Forceps
- Mortar and Pestle
- Scoopula
- Volumetric Flask
- Test Tube Brush
- Striker
- Beaker Tongs
- Glass Stirring Rod
- Safety Goggles

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