Chemistry 11

Unit 1: Equipment + Lab Safety

Name: Key Block: ____

①

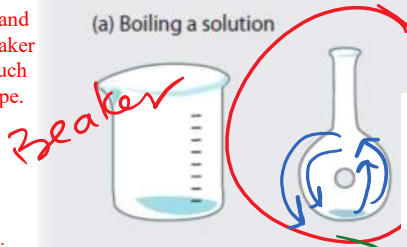
1.1 Staying Safe Around Matter

a) bad picture, there is no hole in a Florence Flask. the round shape and narrow neck facilitates circulation of convection currents (moving particles) and helps boiling. A beaker would allow too much heat energy to escape.

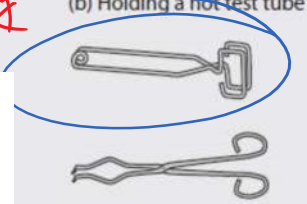
Warm Up

- 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



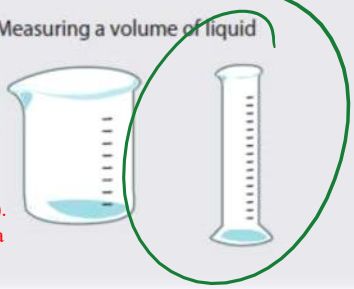
(b) Holding a hot test tube



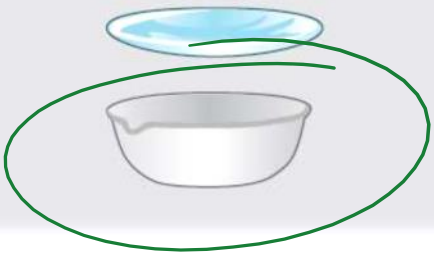
b) test tube holders are literally test tube shaped. the tongs below are **crucible tongs**. although the open section ***looks*** like it might fit a test tube, it would slip out and likely break. crucible tongs are designed with grip to pinch the edges of a ceramic crucible dish

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

(c) Measuring a volume of liquid



(d) Evaporation over a hot flame



d) top: watch glass, not always made of Kimax or Pyrex glass (ie: 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.

This classification divides equipment into 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.*

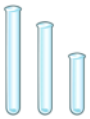
This simply means the glass expands so little as it is heated that it is unlikely to break.

example: Two common brand names for this type of glassware are Pyrex® and Kimax®.

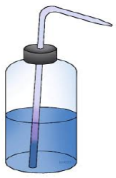
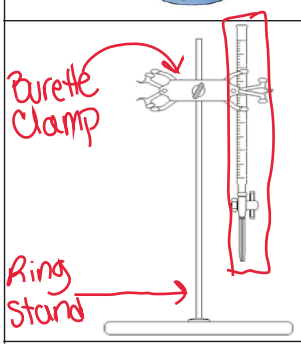
Other "glassware" is made of ceramic material. *(example* crucible, evaporating dish)
It may be heated to red-hot temperatures without expanding or breaking.
↳ 1400°C

Hardware is made of various types of metal including wrought iron, stainless steel, aluminum, and brass.

Table 1.1.1 *Commonly Used Glassware in the Chemistry Lab*

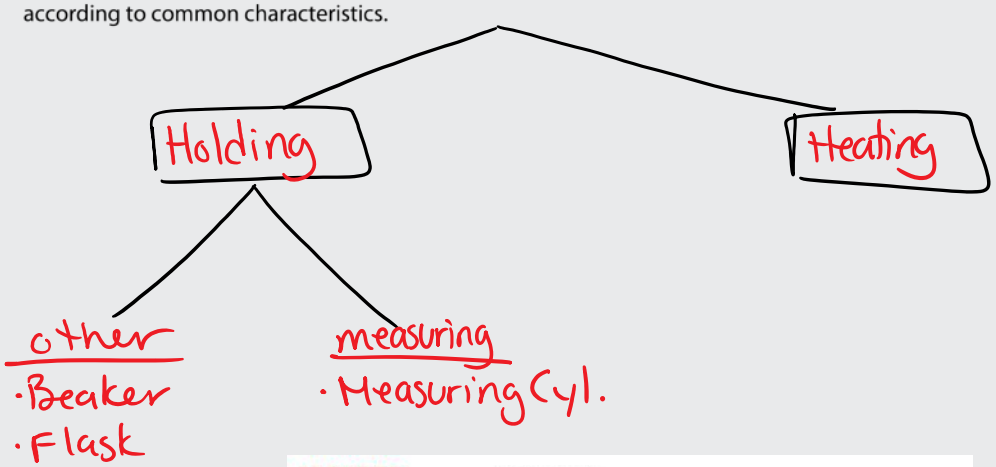
Glassware	Name	Use
	Beaker	Holding liquids • may be graduated (sometimes in two directions) • has a white spot for labeling • various sizes including 50, 150, 250, 450, 650, and 1000 mL
	Erlenmeyer (Conical) Flask	Holding liquids • shape avoids loss due to splashing • used for titration • common sizes include 125, 250, and 500 mL
	Test Tubes	Holding liquids or solids • can be heated directly or in a water bath • may be used to mix small quantities of chemicals • large variety of sizes
	Measuring (Graduated) Cylinder	measuring of liquids • sizes vary • commonly 10, 25, 50, 100, and 250 mL
	Fluted Funnel	Funneling liquids • useful for pouring liquids through small openings • can contain filter paper for separating solids from suspensions by filtration
	Evaporating Dish	Evaporating solvent (solid) • evaporation from a solution (solid dissolved) • can be used to dry a damp product • ceramic material allows heating to high temperatures
	watch glass	observing (holding) • useful for holding a sample of chemical • may cover a beaker or flask to prevent evaporation • holds chemicals while drying
	crucible	heating to high temperatures • heating covered or partially covered samples • ceramic material may be directly heated until red hot

	clay pipe triangle	Providing a base to hold a crucible • sits atop a wrought-iron ring • stems are made of ceramic material
	pipette	Measuring volumes of liquids • liquid is drawn up with a pipette bulb or suction device • may be graduated or volumetric *(designed to deliver one specific volume)* highly accurate
	thermometer	Measuring temperatures • bulb should be submerged in the fluid being measured • temperature ranges vary • most contain dyed alcohol • more precise thermometers contain mercury • commonly measure temperature in degrees °C / °F (K - Kelvin)

	wash bottle	• a squeeze bottle with a nozzle • used to rinse various pieces of laboratory glassware, such as test tubes • used in titrations to dispense droplets held on burette tips
	burette	Measuring known volumes dispensed • graduated glass tube with a stop valve at one end • for delivering known volumes of a liquid • used especially in titrations

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:

Uses	
Contains Chemicals	Other Uses
All Others	Funnel Thermostat Pipe Stem Triangle

For Example:

Uses		
Picks Things Up	Associated With Heating	Attach Together
Test Tube Holder Beaker Tongs Crucible Tongs Scoopula	Flint Striker Bunsen Burner Ceramic Pad	Ring Stand Ring Clamp Burette Clamp

Homework

ASSIGNMENT #1: *"Safely Using Glassware"* Practice Worksheet *this assignment is to be completed in this workbook.*

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. Wear safety goggles, protective gloves, and a lab apron.
2. Do not use the thermometer to stir the ice water - get a stirring rod to use instead. Wear a lab apron and protective goggles.
3. 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.
4. Be careful not to hit the beaker too much to avoid breakage. Wear safety goggles and a lab apron.
5. 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.
6. Make sure the flask is far from the edge of the table. Wear safety goggles and a lab apron.
7. 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.

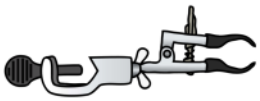
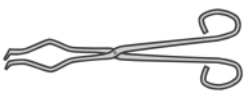
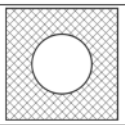
answers above

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.

Table 1.1.2 *Commonly Used Hardware in the Chemistry Lab*

Hardware	Name	Use
	Retort (ring) stand	Providing a post to attach • ring clamps, burette clamps, extension clamps, etc. • also called a utility stand
	Ring clamp	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
	Burette clamp	Attaching to a ring stand • holds a burette • may hold a test tube in a stationary position • may support the neck of a flask
	Striker	Lighting a Bunsen burner • provides a spark by moving a flint across a file
	Bunsen Burner	Providing heat • adjusts flame temperature by addition of air through the barrel • adjusts flame height by turning the regulator valve
	Test Tube Tongs	Holding HOT test tubes • used for heating test tubes over flame • used for removing test tubes from water baths
	Test Tube Rack	Holding test tubes • during experiments *(without heat)* • while observing substances inside test tubes
	Beaker Tongs	Lifting hot beakers • rubber cover allows tongs to firmly grasp and move beakers of all sizes
	Crucible Tongs	Holding hot crucibles • may remove or adjust crucible lid • holds hot evaporating dishes • NOT designed for lifting beakers or test tubes
	wire gauze (ceramic pad)	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
	scoopula	Moving samples of solids • sometimes called a spatula • should NOT be used as a stirring rod (stirring rods should be glass)

Labelling Chemicals

The **W** orkplace **H** azardous **M** aterials **I** nformation **S** ystem (**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

	Explosion Hazard		Flammable material		Oxidizing · fire/explosion risk
	Compressed Gas (explode under pressure)		Corrosive (severe skin burns)		Harmful (or Fatal)
	Heath Hazard		Harmful · skin, eyes, respiratory.		Harmful to Environment
	Biohazardous Infectious material.				

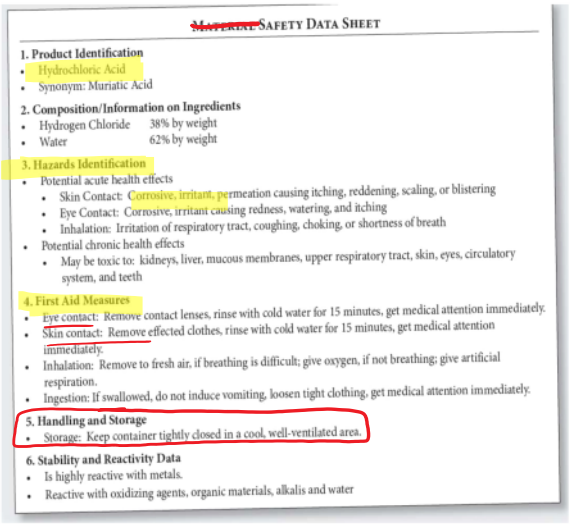
* The GHS system also defines an Environmental hazards group. This group (and its classes) was not adopted in WHMIS 2015. However, you may see the environmental classes listed on labels and Safety Data Sheets (SDSs). Including information about environmental hazards is allowed by WHMIS 2015.

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

SAFETY WITH MATERIALS

A S**afety** D**ata** S**heets** (SDS) must be provided with every chemical purchased in Canada.

These sheets contain hazard information and **safety procedures + first aid** associated with each and every chemical. (*can also be found online*)



~~Material~~ Safety Data Sheet

1. Product Identification
- Hydrochloric Acid
- Synonym: Muriatic Acid

2. Composition/Information on Ingredients
- Hydrogen Chloride 38% by weight
- Water 62% by weight

3. Hazards Identification
- Potential acute health effects
  - Skin Contact: Corrosive, irritant, permeation causing itching, reddening, scaling, or blistering
  - Eye Contact: Corrosive, irritant causing redness, watering, and itching
  - Inhalation: Irritation of respiratory tract, coughing, choking, or shortness of breath
- Potential chronic health effects
  - May be toxic to: kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, circulatory system, and teeth

4. First Aid Measures
- Eye contact: Remove contact lenses, rinse with cold water for 15 minutes, get medical attention immediately.
- Skin contact: Remove effected clothes, rinse with cold water for 15 minutes, get medical attention immediately.
- Inhalation: Remove to fresh air, if breathing is difficult; give oxygen, if not breathing; give artificial respiration.
- Ingestion: If swallowed, do not induce vomiting, loosen tight clothing, get medical attention immediately.

5. Handling and Storage
- Storage: Keep container tightly closed in a cool, well-ventilated area.

6. Stability and Reactivity Data
- Is highly reactive with metals.
- Reactive with oxidizing agents, organic materials, alkalis and water

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? To provide safety/procedures
2. What types of materials are required to have a SDS? all chemicals.
3. How is the information on an SDS categorized? composition, reactivity, first aid, risks...etc.
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:
   inhalation
   a. inhalation:
   b. skin contact:
   c. eye contact:
   d. ingestion:
8. What precautions are listed for safe handling and storage?

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 *this assignment is to be completed in this workbook.*

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
   _____ a 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 of 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

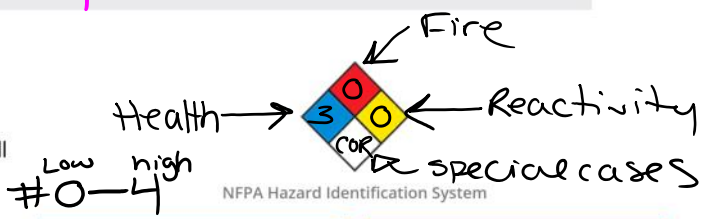
What household labels would you expect to find on a container of Hydrochloric *(muriatic)* acid?

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.



NFPA Hazard Identification System

BLUE Diamond Health Hazard
- 4 Deadly
- 3 Extreme Danger
- 2 Hazardous
- 1 Slightly Hazardous
- 0 Normal Material

RED Diamond Fire Hazard (Flash Point)
- 4 Below 73 °F
- 3 Below 100 °F
- 2 Above 100 °F Not Exceeding 200 °F
- 1 Above 200 °F
- 0 Will Not Burn

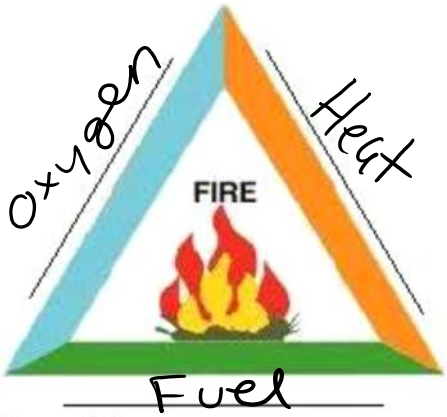
YELLOW Diamond Reactivity
- 4 May Detonate
- 3 Shock and Heat; May Detonate
- 2 Violent Chemical Change
- 1 Unstable if Heated
- 0 Stable

WHITE Diamond Special Hazard
- ACID – Acid
- ALK – Alkali
- COR – Corrosive
- OXY – Oxidizer
- ☢ – Radioactive
- W – Use No Water

9

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
- *Remember, too much is better than too little*

Types of Fires

CLASSIFICATION	EXAMPLE MATERIAL
A Common Combustibles	wood + paper
B Flammable liquids and gases	gas, chemicals
C Live electrical equipment	computers, phone
D Combustible metals	magnesium, lithium
K Cooking media	fats + oils (grease fire)

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"

Type of Extinguisher \ Fire	CLASS A Combustible materials (e.g. paper & wood)	CLASS B Flammable liquids (e.g. paint & petrol)	CLASS C Flammable gases (e.g. butane and methane)	CLASS D Flammable metals (e.g. lithium & potassium)
Water	✓	✗	✗	✗
Foam	✓	✓	✗	✗
Dry Powder	✓	✓	✓	✓
CO2	✗	✓	✗	✗
Wet Chemical	✓	✗	✗	✗

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.

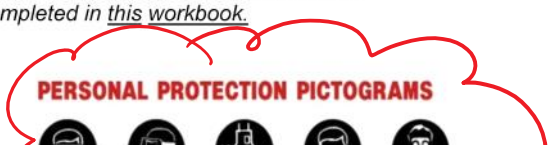
Table 1.1.3 *Laboratory Safety Equipment*

Safety Equipment	Information Regarding Operation
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	Information Regarding Operation
Fume Hood 	• enclosed area with fans + filters to remove chemical vapours. • May contain gas jets, sinks, lights, and electrical outlet • Enclosed by a sliding safety glass window • May store chemicals emitting toxic fumes • Useful for venting odours, smoke, and toxic fumes
Eyewash station 	• If a chemical is splashed or spilled into the eyes, they should be held open and rinsed continuously for ~~10 15~~ 15 min. Contact lenses should be removed. • Eyewash stations may be operated by pushing on a hand bar and/or a foot pedal. • Some labs may use a squeeze bottle apparatus or a piece of rubber tubing attached to a sink.
safety shower	• Spills over a large portion of the body require removal of clothing and washing of the entire region for 10 to 15 min under the safety shower. • Safety showers are operated by pulling on a ring that will begin the flow of some 200 L of water over a drained area of the lab.
	• Small fires such as those that occur in a beaker or a crucible usually may be smothered by placing a ceramic pad or cover on top. • If a larger fire occurs, pull the safety pin from the top of the extinguisher, point the hose at the base of the fire, and squeeze. Extinguishers operate by depriving the fire of oxygen and by lowering the temperature. • There are five classes of fires: • Type A: see above • Type B: • Type C: • Type D: • Type E: • Most extinguishers contain carbon dioxide and are good for class A, B, and C fires.
	• 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 90° 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.

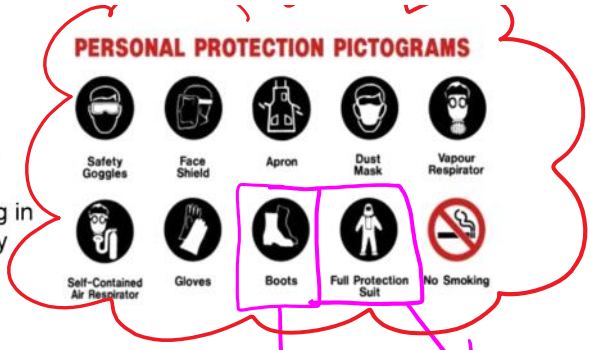
ASSIGNMENT #3: *"Dress the Part* Practice Worksheet *this assignment is to be completed in this workbook.*

Dress the Part



Dress the Part

Background: There are several pieces of clothing that have been developed specifi cally 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.



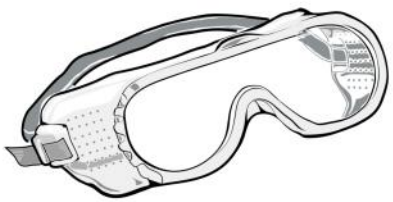
closed toe shoes

long pants

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 data tables 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
- When diluting chemicals, **always** start with water. It is particularly important to add acid to water never the other way around.

19

Laboratory Clean Up

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 & neighbours of any broken glass.
- Clean up spilled chemicals immediately with the spill kit. Be sure to notify neighbours 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.
- Rinse 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.

wash

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**

ASSIGNMENT #5a: "Complete ***Hebden Questions #1-8 on page 8***
This assignment is to be completed on a separate piece of paper.

Assignment #5b: Complete the Review Questions & Practice Test...*these may be answered in the space provided.*

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 n
pieces of

5.


Erlenmeyer Flask Holds Liquid


Graduated Cylinder Measure Liquids, Volume


Crucible Heat


Burette Clamp Clamp Burette


Test Tube Holder Holds Test tubes

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. Ho
fo
(a

(b

(c

(d

10.


Dangerously Reactive


Poisonous Product


Compressed Gas


Corrosive Product


Corrosive

(e) Partner has broken a test tube on the floor.

10. What is the meaning of each of the following labels?


health hazard


poisonous product


Compressed Gas


Biohazardous + Infectious


Corrosive


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

Ring Stands
Hold pad/ rings

Ceramic Pad
Sits on ring for heating

Ring Stands
Crucible tongs

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

17. What is an MSDS? Where might an MSDS be found in your school?

18. Where would you dispose of each of the following?
(a) a few milliliters of excess dilute acid

(b) a sample of heavy metal precipitate

(c) an excess piece of glass tubing

(d) used litmus paper

(e) a few milliliters of excess acetone (nail polish remover)

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: _____ 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
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 is 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. 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. goggles and long pants ✓

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 ← never! it will break.
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.

B 9. Compressed Gas

C 10. Biohazardous Waste

C 11. Toxic "other toxic effects"

D 12. Poisonous + infectious serious

Bad question (sorry)

A.

B.

C.

D.

C 13. Flammable

B 14. Oxidizing

D 15. Corrosive

A 16. Dangerously Reactive

A. 

B. 

C. 

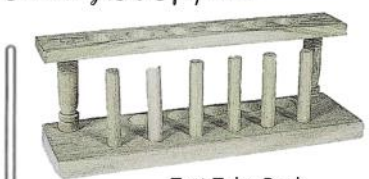
D. 

True/False Questions

1.	Safety glasses must be worn whenever chemicals are used in an experiment. (or heating)	T
2.	At the end of an experiment, all remaining chemicals are to be poured down the sink. = what if they are toxic?	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. never!	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. or your lab partners	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

Name _____

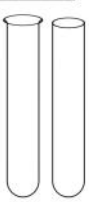


Test Tube Rack

Crucible with Cover

Evaporating Dish

Watch Glass



Chemistry Lab Equipment

Name _____