ACTIVITY 1

Laboratory Safety and Equipment

SAFETY REGULATIONS

To insure that a safe and healthful environment is maintained while taking your chemistry course, everyone should read the following safety regulations listed below.

1. You should prepare for each laboratory (after this first one) by reading all the instructions and completing the prelab assignment for the experiment before coming to class.

2. Wear approved eye goggles at all times while working in the laboratory with chemicals and equipment. If you wear your own frame eyeglasses, the goggles must be worn over them. The National Institute for Occupational Safety and Health (NIOSH) states that it is considered safe to wear contact lenses in lab, but only if eye goggles are worn over them.

3. Your apparel should be appropriate for laboratory work. Wear protective closed-toe shoes (neither sandals nor thongs), a lab coat, goggles, and gloves when working in the laboratory with chemicals and equipment. Tie back long hair, and do not wear long, dangling jewelry or clothes with loose and baggy sleeves. Cotton clothing is preferred over nylon, polyester, or wool.

4. Everyone should be alert and proceed with caution at all times in the laboratory. Take care not to bump another student, and remain in your lab station while performing an experiment. An unattended experiment can produce an accident.

5. Only the laboratory handout, pen, and calculator are permitted on the laboratory bench top. Other books, purses, and such items should be placed on the appropriate storage area shelves.

6. No food, beverage, or smoking is permitted in any science laboratory.

7. Never taste chemicals. Treat all chemicals as if they were poisonous unless you know them to be otherwise. Minimize their contact with your skin and clothing, and avoid breathing vapors and dust.

8. Extreme caution should be exercised when using a burner. Keep your head and clothing away from the flame and turn off the burner when not in use. Gas burners should be lighted only with a sparker. Check to see that all gas valves are turned off before leaving the laboratory.

9. Work areas and apparatus should be kept clean and neat. You should always clean, and wipe dry, all apparatus, desks, tables, or laboratory work areas at the conclusion of each laboratory experiment.

10. Hands should be washed thoroughly with soap at the conclusion of each laboratory.

11. You should know the locations and operations of all Safety Control Equipment listed on the following pages.

12. All accidents should be reported to the instructor immediately, no matter how minor.

13. Broken glassware and porcelain should be cleaned up immediately as disposed of in the broken glass box near the instructor’s desk.
14. If a chemical should splash on your skin or clothing, wash it off immediately with a large amount of water and then consult the instructor.

15. If a chemical should splash into your eye, immediately wash the eye with a large amount of water from the eye and face wash fountain. Continue washing and notify the instructor.

16. Flammable materials should only be used in small amounts, in closed containers whenever possible, and never around flames.

17. When diluting concentrated acids, always pour the concentrated acid into water to dissipate the heat produced and to prevent splattering.

18. Never work alone in the lab. You should only work in the laboratory during your scheduled laboratory period while under the supervision of your instructor.

SAFETY CONTROL EQUIPMENT

Instruments and tools play an important part in the safety program of your chemistry course. Throughout this course, references are made to equipment and devices used to prevent accidents from occurring in the laboratory. Before experimenting in the laboratory, you should become familiar with the safety equipment listed below, know their locations, and gain experience in actually using these items. All equipment should be easily accessible to everyone, and should be checked periodically to assure proper operation and cleanliness.

1. Eye and Face Wash Fountains
   Fountains prevent or reduce injuries from chemicals splashing in or near the eyes. The fountain is designed to provide a gentle flow of aerated water to cleanse the eye and surrounding areas of foreign substances for at least 15 minutes at a time. The eye and face wash fountain is found to the left of the whiteboard in the front of the lab room.

2. Safety Showers
   Showers prevent or reduce injuries from caustic chemicals or acid burns, from contact with toxic chemical reagents, or from clothing fires. The showerheads must be a nonclogging, deluge-type capable of covering a contaminated area of skin with a flood of water that is sufficient to dilute material to a safe level in 15 seconds. The safety shower is found to the left of the whiteboard in the front of the lab room.

3. Fire Extinguishers
   Extinguishers are used to put out fires. The instructor and students should be familiar with the operating instructions for all fire extinguishers. The fire extinguisher is found to the right of the whiteboard in the front of the lab room.

4. Fume hoods prevent the spreading of poisonous gases evolved in an experiment. Each laboratory station is equipped with a snorkel fume hood, and there are two large fume hoods found on the two sides of the lab room.
5. First Aid Kits
First Aid Kits are used to give emergency treatment for burns, cuts, and so on. Only the instructor or the stockroom technicians should administer treatment. The first aid kit is found in a drawer near the instructor’s desk.

6. Safety Goggles
Goggles protect your eyes from chemical and particle injuries. Students are not allowed to wear safety glasses with side shields. The most commonly used in school laboratories is a flexible soft-sided plastic model with a single large plastic lens. The goggles are available with baffled vents on the sides, so that air can flow through but liquids will not enter. Goggles should be worn over prescription glasses, and may be worn over contact lenses as well. Goggles will be provided by the instructor, should be washed frequently, and should be stored in a protected place, such as your laboratory locker.

7. Gloves
Gloves should be worn when working with chemicals and equipment. When wearing gloves, you must be careful not to contaminate your work area or other parts of the laboratory with any chemicals that might have spilled on your gloves. If there is any doubt, gloves should be removed and a new pair put on. Glove dispensors are found on both sides of the whiteboard in the front of the lab room.

8. Lab Coats
A lab coat protects clothing and skin from chemical spills. A lab coat will be provided by the instructor and should be stored in a protected place, such as your laboratory locker. If a spill occurs on the lab coat, the stockroom will wash it and a loaner lab coat will be issued.

9. Tongs
Tongs protect the hands from burns and chemical injuries. Always remember to use them when handling heated materials, especially in glass or porcelain containers. Crucible tongs and beaker tongs are found in drawer 030 at the back of the lab room.

10. Chemical Waste Containers
The chemical waste containers prevent fires, explosions, and pollution. Chemical waste containers will be found in the large fume hood labeled A on the side of the lab room near the Lab Support door.

**PROCEDURE**

1. Obtain from the instructor the **Locker Inventory Sheet**, which has printed on the back the **Safety Rules and General Laboratory Procedures** for the Chemistry Department at Saddleback College. Read the safety rules and procedures, including the final point where it states that when the course ends or if you drop the course, you will be charged $20 to have your locker checked in if you do not do it yourself. A copy of the **Safety Rules and General Laboratory Procedures** for the Chemistry Department at Saddleback College, or **Lab Safety Form (General)**, can be found on the Saddleback College Chemistry Department website:

   http://www.saddleback.edu/mse/chemistry/
2. On the *Locker Inventory Sheet*, print your last name then your first name at the top of the sheet, followed by the course, *Chem 1A*, the instructor, and finally your student number. Your locker number is on the top center of the Locker Inventory Sheet. Locate your locker and this working area will be your laboratory station for the semester. Your locker combination is on the top right of the sheet. *Take a picture of your locker combination with your phone, or write it down in your notebook.* Open your locker by turning the dial on the lock clockwise to the first number, counterclockwise 360º past the first number to the second number, and then clockwise to the third number. If your lock does not open, repeat exactly the directions from the previous sentence. If it still does not open, ask the instructor for assistance. If the instructor fails you, find the engraved number on the back side of the lock and write it down: the actual combination for your lock will have to looked up.

3. Before handling the locker equipment, you will need to put on gloves. Disposable gloves are found on both sides of the whiteboard in the front of the lab room. Gloves should be worn whenever handling equipment in the lab that is considered “dirty”. These include:
   (1) Student locker equipment  
   (2) Labeled drawer equipment (burners, clamps, iron rings, pipet rollers and bulbs, etc.)  
   (3) Ring Stands  
   (4) Glassware  
   (5) Sink handles  
   (6) Gas/Air valves  
   (7) Balances  
   (8) Stir plates  

A glove-free hand must be used whenever handling equipment in the lab that is considered “clean”. These include:
   (1) Backpacks, books, purses, etc., which will be placed in the appropriate storage area shelves  
   (2) Door handles  
   (3) Drawer or cupboard handles  
   (4) Calculators  
   (5) Computer keyboards  
   (6) Lab reports and pens  

Because you will be using laboratory equipment from your student locker, and often laboratory equipment from equipment drawers around the room, put on one glove, collect the necessary equipment, then put on your second glove.

Additional procedures for gloves usage are:
   (a) Do not wear gloves out of the lab, so remove both gloves when using a door handle to exit  
   (b) To use a drawer handle, calculator, or keyboard, remove one glove to touch these items  
   (c) Disposable gloves must be discarded once removed, and hands must be washed  
   (d) Wear disposable gloves no longer than one laboratory period, and do not save them for future use

4. The *Locker Inventory Sheet* lists each item in your laboratory locker, and how many of each item you should have. Pictures of each piece of laboratory equipment are found on page 6. Verify that you have all of the equipment, and that it is in good condition. Check that glassware is free from chips or jagged edges, crucibles have covers that fit. For your two watch glasses, make sure they will fit on top of your 250-mL beakers. After making a complete inventory, determine what items (if any) are missing from your locker, and what items (if any) are not in good condition. Your instructor will give you directions on how replace items that are missing or are not in good condition so that your locker will be completely stocked for the start of the semester. During the semester if a piece of equipment breaks, obtain a *Chemistry Glassware Request Form* from the instructor to replace the item. At the end of the semester you will receive a charge for the item from the Saddleback College Fiscal Office.
5. Once your locker is completely stocked, sign the **Locker Inventory Sheet** where it says that you have received the above equipment in good condition and you have read the **Rules and General Laboratory Procedures** for the Chemistry Department at Saddleback College.

6. Inspect your lab bench. Your sink should be clean and free of any debris. Available to you are several water faucets. The faucets with the red cap and the green cap are hot and cold tap water, respectively. The faucet labeled **DI** on a white cap is the deionized water. The wash bottle in your locker is for deionized water only. You may fill it with deionized water, and leave it filled in your locker. There are also nozzles labeled **GAS** on a blue cap, which is the source of natural gas for your burner; **AIR** on an orange cap, which is compressed air; and **VAC** on a yellow cap, which is a vacuum line.

7. At your lab station open the locker labeled **Hot Plate** to make sure that one is present. If not, find one that is not claimed and place it in the locker. Other common equipment that you will use throughout the semester are:

   (1) Bunsen burners
   (2) Fisher burners
   (3) strikers and striker flints
   (4) iron rings
   (5) ceramic-centered wire gauzes
   (6) clay triangles
   (7) test tube clamps or two-pronged clamps
   (8) universal clamps or three-pronged clamps
   (9) double buret clamps
   (10) beaker tongs
   (11) crucible tongs
   (12) hot pads

   These items are located in one of the many labeled drawers of equipment at the back of the lab room. Familiarize yourself with their locations. Pictures of these items, as well as other items that will be provided by the stockroom for specific experiments later in the semester, are found on page 7.

8. Complete the laboratory questions in the **Activity 1 Lab Report** section of Activity 1. The Activity 1 Lab Report asks for your name, the date, and your **Lab Station Number**. Your Lab Station Number is the numerical part of your locker number, found on on the face of your lab locker or the top center of your **Locker Inventory Sheet**. Remove the Activity 1 Lab Report (pages 9 thorough 12) from the rest of the experiment, and staple the m together.

9. If requested to do so, obtain from the instructor a **Student Information Sheet** and complete it.

10. When you have **completed** steps 1-9, write your **name and lab station number** on the board and the instructor will come to your lab station to check you out of lab. The instructor will inspect you laboratory locker, your Hot Plate Locker, and make sure your lab area is being left in a clean and orderly fashion. Have ready to turn in to the instructor (1) your **Locker Inventory Sheet**, (2) your Activity 1 Lab Report, and (3) your Student Information Sheet.

11. Before coming to lab to perform Experiment 2, you must complete the prelab assignment for Experiment 2, which can be found on the OWL web site:
    
    http://login.cengagebrain.com
STUDENT LOCKER EQUIPMENT

BEAKER

MEDICINE DROPPER

TEST TUBE

CRUCIBLE AND COVER

MICROSPATULA

TEST TUBE BRUSH

CUVET

RUBBER POLICEMAN (ON A GLASS STIRRING ROD)

TEST TUBE HOLDER

GRADUATED CYLINDER

SCOOPULA

TEST TUBE RACK

EVAPORATING DISH

SPONGE

THERMOMETER

ERLENMEYER FLASK

MAGNETIC STIRRING BAR

WASH BOTTLE

FUNNEL

GLASS STIRRING ROD

WATCH GLASS
COMMON LAB EQUIPMENT

STRIKER

CERAMIC-CENTERED WIRE GAUGE

HOT PLATE

FISHER BURNER

CLAY TRIANGLE OR PIPESTEM TRIANGLE

RING STAND

BUNSEN BURNER

UNIVERSAL CLAMP OR THREE-PRONGED CLAMP

BURET

CRUCIBLE TONGS

TEST TUBE CLAMP OR TWO-PRONGED CLAMP

PIPET

IRON RING

DOUBLE BURET CLAMP

VOUMETRIC FLASK

HOT PAD

BEAKER TONGS
ACTIVITY 1 LAB REPORT

Name: ___________________________________________ Student Lab Score: _______________
Date/Lab Start Time: ____________________________ Lab Station Number: _______________

EQUIPMENT IDENTIFICATION

1. Identify each item on the previous page.

   (a) __________________________________________
   (b) __________________________________________
   (c) __________________________________________
   (d) __________________________________________
   (e) __________________________________________
   (f) __________________________________________
   (g) __________________________________________
   (h) __________________________________________
   (i) __________________________________________
   (j) __________________________________________
   (k) __________________________________________
   (l) __________________________________________
   (m) __________________________________________
   (n) __________________________________________
   (o) __________________________________________
   (p) __________________________________________
2. Give the location of each of the following safety items:

(a) Fire Extinguisher:
______________________________________________________________________________
______________________________________________________________________________

(b) Eye and Face Wash Fountain:
______________________________________________________________________________
______________________________________________________________________________

(c) Safety Shower:
______________________________________________________________________________

3. Identify what each of the following designations mean:

(a) **DI**: _________________________________________________________________

(b) **GAS**: ______________________________________________________________

(c) **AIR**: _______________________________________________________________

(d) **VAC**: _______________________________________________________________

TRUE OR FALSE

1. ____ While working in the laboratory with chemicals and equipment, always wear safety goggles, gloves, a lab coat, and covered shoes.

2. ____ Backpacks and purses are allowed on the laboratory bench top during experiments.

3. ____ The laboratory work area and all apparatus should be cleaned and wiped dry at the conclusion of each laboratory experiment

4. ____ Food and drinks are allowed in the lab room.

5. ____ Chemicals splashed on your skin should be washed off immediately with a large amount of water.

6. ____ Use only low burner flames around flammable liquids such as acetone, alcohols, and ether.

7. ____ Clean up broken glassware immediately.

8. ____ Completing the prelab assignment before each experiment is optional.

9. ____ If you drop the course and do not perform a locker checkout, the stockroom will charge you $20 to do it for you.
1. Give the number of significant figures in each.
   
   ____  28
   ____  28.0
   ____  6.705
   ____  2.630
   ____  0.157
   ____  0.067
   ____  0.070
   ____  2,500
   ____  2,500.
   ____  4.8 x 10⁻³
   ____  4.80 x 10⁻³

2. Perform each of the following mathematical operations, and express the answer to the correct number of significant figures.

   (a)  (6.022 x 10²³)(1.25 x 10³)

   (b)  (6.626 x 10⁻³⁴)(2.9979 x 10⁸) / (4.17 x 10⁹)

   (c)  0.01285 + 0.0024 + 0.1879

   (d)  (987.5 – 979.5) / 979.5
3. Do the following conversions by dimensional analysis. Show all work and give units in the answers.

(a) How many grams are 258 milligrams?

(b) How many decimeters are 0.57 kilometers?

(c) How many seconds are 4.000 days?

(d) How many centiliters per second are 45.0 liters per hour