Name _____ Class _____ Date _____

Skills Practice Lab

DATASHEETS FOR IN-TEXT LAB

Laboratory Techniques

You have applied to work at a company that does research, development, and analysis work. The company does not require employees to have extensive chemical experience. However, all applicants are tested for their ability to follow directions, heed safety precautions, perform simple laboratory procedures, clearly and concisely communicate results, and make logical inferences.

The company will consider your performance on the test to decide whether to hire you and to determine your initial salary. Pay close attention to the procedures and safety precautions. If you are hired, you will need to know them and continue to use them. In addition, you will need to pay attention to what is happening around you, make careful observations, and keep a clear and legible record of these observations.

This laboratory orientation session will teach you some of the following techniques:

- how to use a Bunsen burner
- how to handle solids and liquids
- how to use a balance
- how to practice basic safety techniques in lab work

OBJECTIVES

Demonstrate proficiency in using a Bunsen burner, a balance, and a graduated cylinder.

Demonstrate proficiency in handling solid and liquid chemicals.

Develop proper safety techniques for all lab work.

Use neat and organized data-collecting techniques.

Use graphing techniques to plot data.

MATERIALS

- balance
- beakers, 250 mL (2)
- Bunsen burner and ~~related equipment~~ striker
- copper wire
- crucible tongs
- evaporating dish
- H_2O squirt bottle
- graduated cylinder, 100 mL
- ~~heat-resistant mat~~ wire gauze
- NaCl
- spatula
- test tube + rack
- ~~wax paper or~~ weighing paper

Always wear safety goggles and a lab apron to protect your eyes and clothing. If you get a chemical in your eyes, immediately flush the chemical out at the eyewash station while calling to your teacher. Know the location of the emergency lab shower and eyewash station and the procedures for using them.

Do not touch any chemicals. If you get a chemical on your skin or clothing, wash the chemical off at the sink while calling to your teacher. Make sure you carefully read the labels and follow the precautions on all containers of chemicals that you use. If there are no precautions stated on the label, ask your teacher what precautions to follow. Do not taste any chemicals or items used in the laboratory. Never return leftovers to their original container; take only small amounts to avoid wasting supplies.

Never put broken glass in a regular waste container. Broken glass should be disposed of separately according to your teacher's instructions.

Never stir with a thermometer because the glass around the bulb is fragile and might break.

When you insert glass tubing into stoppers, lubricate the glass with water or glycerin and protect your hands and fingers. Wear leather gloves or place folded cloth pads between both your hands and the glass tubing. Then ***gently*** push the tubing into the stopper hole. In the same way, protect your hands and fingers when removing glass tubing from stoppers and from rubber or plastic tubing.

Do not heat glassware that is broken, chipped, or cracked. Use tongs or a hot mitt to handle heated glassware and other equipment because hot glassware does not always look hot.

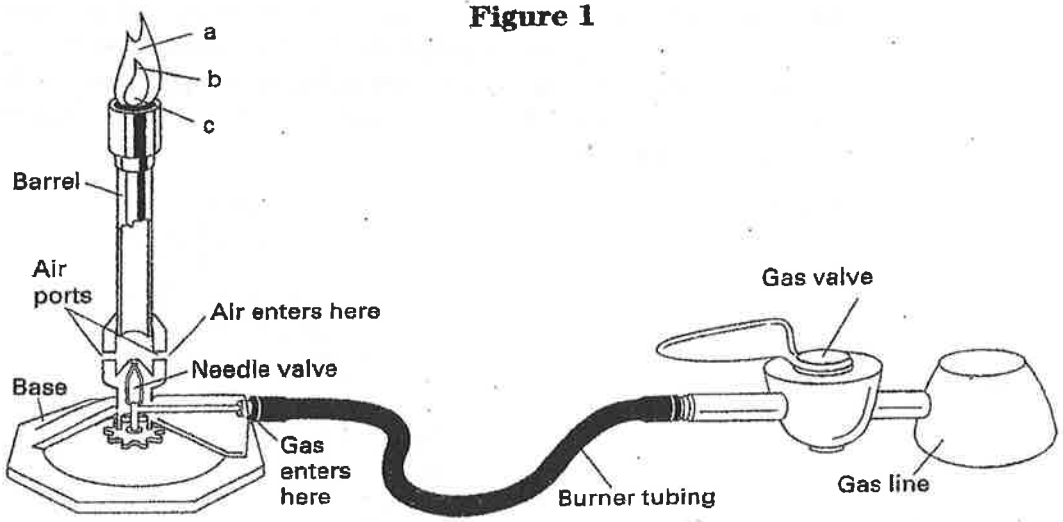
When using a Bunsen burner, confine long hair and loose clothing. If your clothing catches on fire, WALK to the emergency lab shower and use it to put out the fire. Do not heat glassware that is broken, chipped, or cracked. Use tongs or a hot mitt to handle heated glassware and other equipment because hot glassware does not always look hot.

When heating a substance in a test tube, the mouth of the test tube should point away from where you and others are standing. Watch the test tube at all times to prevent the contents from boiling over.

Procedure

1. Put on safety goggles and apron; make sure that loose clothing and hair are tied back.
2. Make note of where the following items are located and how each item is used: emergency lab shower, eyewash station, and emergency telephone numbers. Record this information in **Table 1.**
3. Check the gas valve at your lab station and at the neighboring lab stations to confirm that they are turned off. Notify your teacher immediately if a valve is on, because the fumes must be cleared before any work continues.
4. Compare the Bunsen burner in **Figure 1** with your burner. Construction may vary, but the air and methane gas, CH_4, always mix in the barrel, the vertical tube in the center of the burner. If you have any questions about the operation of your burner, ask your teacher before continuing to step 5.

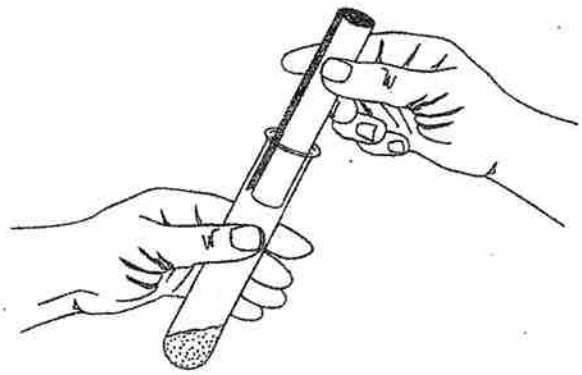
Figure 1



5. Partially close the air ports at the base of the barrel, turn the gas on full, hold the sparker about 5 cm above the top of the barrel, and proceed to light. Adjust the gas valve until the flame extends about 8 cm above the barrel. Adjust the air supply until you have a quiet, steady flame with a sharply defined, light-blue inner cone. If an internal flame develops, turn off the gas valve and let the burner cool. Otherwise, the metal of the burner can get hot enough to set fire to nearby flammable items. Before relighting the burner, partially close the air ports.
6. Using crucible tongs, hold a 10 cm piece of copper wire for 2–3 seconds in the part of the flame labeled "a" in **Figure 1.** Repeat this step for the parts of the flame labeled "b" and "c." Record your observations in **Table 1.**
7. Experiment with the flame by completely closing the air ports at the base of the burner. Observe and record the color of the flame and the sounds made by the burner. Using crucible tongs, hold an evaporating dish in the tip of the flame for about 3 minutes. Place the dish on a heat-resistant mat, and shut off the burner. After the dish cools, examine its underside. Record your observations in **Table 1.**
8. Before using the balance, make sure that it is level and showing a mass of zero. If necessary, adjust the calibration knob. Use the same balance for all measurements during a lab activity. Never put chemicals directly on the balance pan.
9. Place a piece of weighing paper on the balance pan. Determine the mass of the paper, and record this mass to the nearest 0.01 g in your data table. Put a small quantity of NaCl on a separate piece of weighing paper. Then, transfer 13 g of the NaCl to the weighing paper on the balance pan. Record the exact mass to the nearest 0.01 g in **Table 2.**

10. Remove the weighing paper and NaCl from the balance pan. Lay the test tube flat on the table, and transfer the NaCl into the tube by rolling the weighing paper and sliding it into the test tube. As you lift the test tube to a vertical position, tap the paper gently, and the solid will slip into the test tube, as shown in **Figure 2.**

Figure 2



11. Measure the mass of a dry 250 mL beaker, and record the mass in **Table 3.** Add water to the 50 mL mark, determine the new mass, and record the new mass in **Table 3.** Repeat the procedure by filling the beaker to the 100 mL mark and then to the 150 mL mark. Record the mass each time. Subtract the mass of the empty beaker from the other measurements to determine the masses of the water.

12. Repeat **step 11** with a second dry 250 mL beaker, but use a graduated cylinder to measure the volumes of water to the nearest 0.1 mL before pouring the water into the beaker. Read the volumes by using the bottom of the meniscus, the curve formed by the water's surface.

13. Clean all apparatus and your lab station. Put the wire, NaCl, and weighing paper in the containers designated by your teacher. Pour the water from the beakers into the sink. Scrub the cooled evaporating dish with soap, water, and a scrub brush. Be certain that the gas valves at your lab station and the nearest lab station are turned off. Be sure lab equipment is completely cool before storing it. Always wash your hands thoroughly after all lab work is finished and before you leave the lab.

TABLE 1 LABORATORY OBSERVATIONS

Step	Observation
Lab shower location	
Eyewash location	
Emergency numbers	
Copper wire in the flame	a) b) c)
Underside of the evaporating dish	

Flame Observations (1st part of Step #7)

TABLE 2 PAPER AND NaCl MASS DATA

Material	Mass (g)
weighing paper	
weighing paper and NaCl	

TABLE 3 BEAKER AND WATER DATA

Material	Mass (g) step 11	Mass (g) step 12
empty beaker		
beaker and 50 mL of water		
50 mL of water		
beaker and 100 mL of water		
100 mL of water		
beaker and 150 mL of water		
150 mL of water		

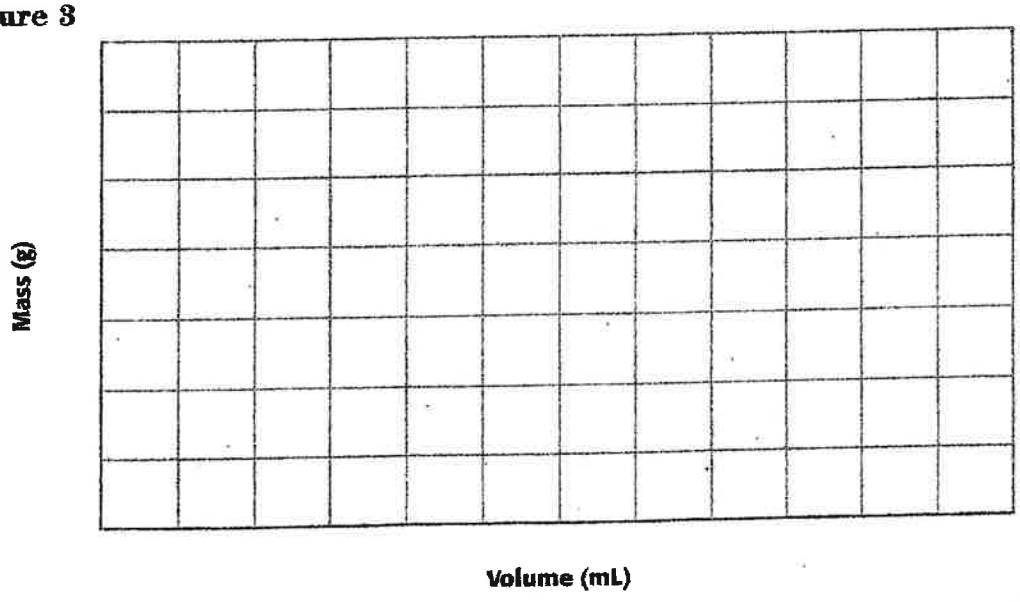
Analysis

1. **Analyzing data** Based on your observations, which type of flame is hotter: the flame formed when the air ports are open or the flame formed when they are closed? Based on your observations of the copper wire, what is the hottest part of the flame?

2. **Examining data** Which of the following measurements could have been made by your balance: 3.42 g of glass, 5.666 72 g of aspirin, or 0.000 017 g of paper? Explain your answer.

3. **Constructing graphs** Make a graph of mass versus volume for data from step 12. The mass of water (g) should be graphed along the *y*-axis as the dependent variable, and the volume of water (mL) should be graphed along the *x*-axis as the independent variable.

Figure 3



Conclusions

4. **Interpreting information** When methane is burned, it usually produces carbon dioxide and water. If there is a shortage of oxygen, the flame is not as hot and black carbon solid is formed. How did the experiments in the lab demonstrate these flames?

5. **Applying conclusions** Which is the most accurate method for measuring volumes of liquids, a beaker or a graduated cylinder? Explain your answer.

6. **Evaluating data** Jarrold got only partway through step 7 of this experiment when he had to put everything away. Soon after Jarrold left, his lab drawer caught on fire. How did this happen?

7. **Drawing conclusions** The density of water is equal to its mass divided by its volume. Calculate the density of water by using your data from step 11. Then, calculate the density of water by using your data from step 12.