BASIC LAB SKILLS: WEIGHING BALANCE AND BUNSEN BURNER

This lab is designed to familiarize students with various pieces of common lab equipment. The following are general procedures for how to use a weighing balance, set-up a filtration, and use a Bunsen burner. The experimental procedure begins with Part I.

Basic Weighing

1. Turn on a balance.
2. Fold a piece of weigh paper diagonally into quarters and open it back up (see Note 1).
3. Place the weighing paper on the balance.
4. Press "tare" or "zero" on the balance. Wait until the read-out shows 0.
5. Using a scoopula or spatula, transfer the sample to the container or weighing paper. Read-out shows the mass of the sample.

Notes

1. When using weighing paper as an intermediate container, fold the weighing paper diagonally to make a triangle. Unfold, then place on the pan. The fold makes it easier to transfer the sample especially to a container with narrow opening.
2. **Please DO NOT to take excess sample**. Excess chemicals **CANNOT** be returned to the bottles to avoid contamination.
3. Always put the cap back on the container when done weighing your sample.
4. You should aim to be within 5% of your target weight (i.e. 0.95 g to 1.05 g for 1.0 g)

Weighing by Difference

Weighing by difference is an accurate way to measure the weight of a substance. The weight of the substance is the difference between the weight of the container and the weight of the container and the substance.

1. Turn on a balance.
2. Press "tare" or "zero" on the balance. Wait until the read-out shows 0.
3. Place a container on the balance. Read-out shows the mass of the empty container.
4. Add the sample to the container. Read-out shows the total mass of the container and the sample.
5. The mass of the sample is equal to the mass of the container with sample minus the mass of the empty container.

Bunsen Burner

1. Figures 1 and 2 show a Bunsen burner and a bench gas valve, respectively. Connect the rubber tubing from the gas inlet of the Bunsen burner to the outlet of the bench gas valve. Make sure the gas valve is off, with the handle of the valve perpendicular to the outlet, as shown in the gas valve on the left in Figure 2. The gas valve should always be off when the burner is not lighted.

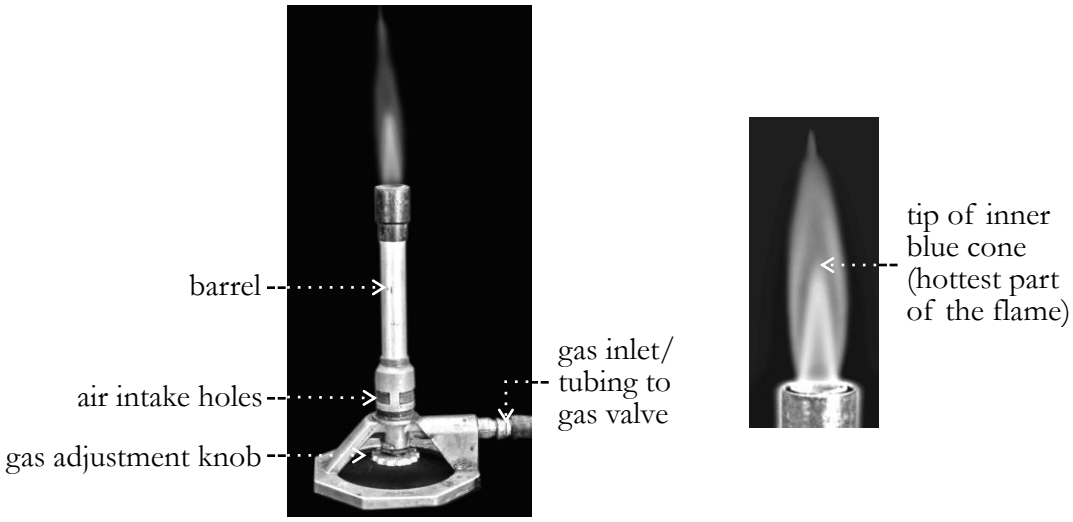

Figure 1. The Bunsen burner

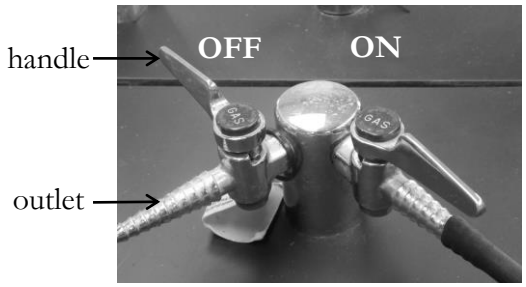

Figure 2. The gas valve

2. Controlling the gas and air supply is key to the operation of a Bunsen burner. Start with the gas adjustment knob closed or screwed all the way up and the air intake holes closed or the barrel screwed all the way down.
3. Turn the bench gas valve on by rotating the handle so it is parallel to the outlet as shown in the gas valve on the right in Figure 2.
4. Open the gas adjustment knob around one full turn. You will hear a gentle hiss.
5. Bring the flame of a lighter to the top of the barrel. The burner will be lighted up. The flame should be yellow.

6. Rotate the barrel to open the air intake holes to intensify the flame and change its color to blue. Continue to increase the air flow until you see a second blue cone appears at the center of the flame. The hottest part of the flame is the tip of the inner blue cone (see Figure 1).
7. Readjust the gas adjustment knob to change the size of the flame and the barrel to change the color of the flame, as needed. If the burner flows loudly, blows itself out, or has a detached flame, reduce the air flow and then readjust the gas.

> **Never leave a lit burner unattended**. Be careful around Bunsen burner as the flame could be nearly invisible.

8. To turn off the burner, screw the barrel down completely, screw the gas adjustment up completely, and turn the gas valve off.

Part I Weighing

A. Basic Weighing

1. Fold a weighing paper diagonally, unfold and place on a balance.
2. Press "tare" or "zero" on the balance. Wait until the read-out shows 0.
3. Add 0.75 g of NaCl. Record the weight of the NaCl (include all the decimal places and units).
4. Dispose of NaCl in the appropriate waste container and the weigh paper in the garbage.

> **Note:** You should aim to be within 5% of your target weight (i.e. 0.71 g to 0.79 g)

B. Weighing by Difference

1. Press "tare" or "zero" on the balance; wait until the read-out shows 0.
2. Place a small 50 mL beaker on the balance. Record the mass of the empty beaker.
3. Take the beaker off the balance and fill the beaker half way with tap water
4. Press "tare" or "zero" on the balance; wait until the read-out shows zero. Place the half full beaker on the balance. Record the mass of the beaker + water.
5. Discard the tap water down the drain and return the beaker to the shelf.
6. Calculate the accurate mass of the water in the beaker.

Part II Bunsen Burner

A. Lighting a Wood Splint

1. Light a Bunsen burner.
2. Place a wood splint across the base of the flame at the top of the barrel. Observe and record the phenomenon.
3. Now place the splint at the tip of the inner blue cone. Observe and record the phenomenon.
4. Dispose the wood splint in a waste container inside the fume hood.

B. Heating Substances in a Test Tube

1. Place 0.30 g of copper (II) sulfate pentahydrate ($CuSO_4 \cdot 5H_2O$) into a test tube. Record the colour.
2. Light the Bunsen burner and create a blue flame.
3. Hold the test tube with a test tube holder and heat the base of the test tube by moving it back and forth over the flame.
4. Heat the test tube for 2 minutes. Observe and record any changes.

> **Safety Note:** The test tube should be at a 45° angle and the open end is **not pointing at yourself or other people** as you bring it to the flame. Move the test tube back and forth to evenly heat the bottom of the test tube and prevent any one portion from being heated too strongly.

5. Allow the test tube to cool to room temperature.
6. Add 10 drops of distilled water to the test tube. Observe and record any changes.
7. Dispose of the sample in the appropriate waste container in the fume hood.

CLEAN-UP

- Dispose NaCl, $CuSO_4 \cdot 5H_2O$, and wood splint in the proper waste containers. Dispose weighing paper in trash can. Uncontaminated water goes down the drain.
- Wash glassware you used with the brushes beside the sink. Return them to the shelf/rack.
- Make sure the Bunsen burner and gas valve are off, disconnect the tubing from the gas valve.

Name (Please print): _____ **Date:** _____

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DATA AND OBSERVATIONS

Part I. Using a Weighing Balance

A. Basic Weighing

(Please record **all digits** shown on the balance and write the proper **unit** with it. This will be a **common requirement although the course**)

Mass of the NaCl on the weighing paper (NaCl only) = _____

B. Weighing by Difference

Mass of the empty beaker = _____

Mass of the beaker + water = _____

Mass of the water in the beaker (water only) = _____

Show your calculation for the above mass of the water in the beaker in the weighing by difference exercise:

Why might weighing by difference be useful over basic weighing in some cases?
(Hint: Think about what you just did)

Part II. The Bunsen Burner

A. Lighting a Wood Splint

1. How do you adjust the size of the Bunsen burner flame?

2. How do you adjust the color of the Bunsen burner flame?

3. Describe what happens to the wood splint
    a. when it was placed across the base of the flame:

    b. when it was placed at the tip of the inner blue cone:

    c. What is the reason to cause the difference of the two phenomena?

B. Heating Substances in a Test Tube

Colour of the $CuSO_4 \cdot 5H_2O$ _____

Colour after heating _____

Colour after adding water _____