**CHEMISTRY 2022-23 September 2, 2022**

**Today’s Agenda (Day 13)**

1. HOUSEKEEPING ITEMS

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1. Homework Check:

🡪 Practice Problems 2.1 – 2.2

🡪 Ch 2 Vocabulary

1. Class Activity:

🡪**LABS: Density / Effective Use of a Bunsen Burner**

🡪 **MONDAY: DAY 2: Chapter 2 PPT Review**

1. Section 2.3 – Uncertainty in Data
2. Section 2.4 – Representing Data

HOMEWORK:

* READ: Chapter 2 – Analyzing Data
* READ: Chapter 3 – Matter: Properties and Changes
* COMPLETE: Chapter 3 Vocabulary (abridged template)
* STUDY: Chapter 1 and 2 Vocabulary, Lab Safety, Chapter 2

CHAPTER 3

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| --- | --- | --- | --- | --- | --- |
| chemical change | chemical property | Chromatography | Compound | Crystallization | Distillation |
| Element | extensive property | Filtration | Gas | heterogeneous mixture | homogeneous mixture |
| intensive property | law of conservation of mass | law of definite proportions | law of multiple proportions | Liquid | Mixture |
| percent by mass | periodic table | phase change | physical change | physical property | Solid |
| Solution | states of matter | Sublimation | Vapor |  |  |

REMINDERS:

* TEST: **Ch 2 🡪 Sept. 6**
* Lab 1.1 AND Ch 2 Launch Lab – Sept. 5
* Lab 1.2 AND Ch 2 Mini-Lab – Sept. 6
* Chapter 3 Vocabulary – Sept. 10
* TEST: **Ch 3 🡪 Sept. 15**

**CHEMISTRY 2022-23 LAB ACTIVITY**

**LAB 1.1 – Laboratory Techniques & Lab Safety**

Chemistry has been developed largely through experimentation. Chemistry courses use laboratory experiences to demonstrate, clarify, and develop principles of chemistry. Behavior in the laboratory is more structured than in the classroom. Certain rules of conduct pertaining to safety and keeping a clean work environment must be followed at all times. You must also adopt correct procedures for using glassware and other pieces of equipment. General safety rules are summarized at the beginning of this lab manual. However, there often will be more specific safety rules or special procedures to follow when performing an experiment. Your teacher will provide these added instructions before you perform any lab activity. If you are unsure of any procedure, always ask your teacher before proceeding. In this activity, you will practice some laboratory techniques and apply laboratory safety rules. You will determine the mass of different solid materials, measure the volume of a liquid, and separate mixtures of chemicals. You will also review specific safety rules.

**Problem**

How can the mass of an object be measured? How can the volume of a liquid be measured? How can a mixture be separated?

**Objectives**

• Measure the mass of solid substances.

• Measure a volume of water.

• Separate components of a mixture through filtration.

**Materials**

table salt

sand

distilled water

100-mL graduated cylinder

250-mL beakers

(2) 50-mL beakers

(2) balance ring stand

Ring

funnel

scoops

(2) stirring rod

filter paper

weighing paper

water bottle

watch glass

**Safety Precautions **

• Always wear safety goggles and a lab apron.

 • Never eat or taste any substance used in the lab.

**Pre-Lab**

1. What is the safety rule concerning working alone in the laboratory?

2. What is the safety rule concerning the handling of excess chemicals?

3. What should you do if you spill a chemical?

4. Read the entire laboratory activity. Hypothesize what safety precautions will be needed to handle the different chemicals and lab equipment in this experiment. Record your hypothesis on page 3.

**Procedure**

1. Using a scoop, transfer a small amount of table salt to a 50-mL beaker.

2. Measure the mass of a piece of weighing paper to 0.1 g using a laboratory balance. Record this mass in Data Table 1.

3. Add about 5.0 g of table salt from the 50-mL beaker to the weighing paper. Record the mass of the weighing paper and table salt to 0.1 g in Data Table 1.

4. Transfer the table salt to the 250-mL beaker and place all excess table salt into an appropriate waste container, as indicated by your teacher.

5. Using another scoop, transfer a small amount of sand to the second 50-mL beaker. Using the techniques described in steps 2 and 3, measure out about 5.0 g of sand. Then transfer the sand to the 250-mL beaker containing the table salt.

6. Using a 100-mL graduated cylinder, measure out 80 mL of distilled water. Measure the volume of the water to 0.1 mL by reading at the bottom of the meniscus, as illustrated in Figure A. Record the volume of water measured in Data Table 1.

7. Pour the water into the 250-mL beaker containing the table salt and sand. Using the stirring rod, gently stir the mixture for 1 minute. Record your observations in Data Table 2.

8. Place a clean 250-mL beaker on the base of the ring stand. Attach the ring to the ring stand and set the funnel in the ring so that the stem of the funnel is in the beaker. Adjust the height of the ring so that the bottom of the funnel stem is approximately halfway up the beaker. Fold a piece of filter paper as illustrated in Figure B. Place the folded filter cone in the funnel.

 

9. To avoid splashing and to maintain control, you will pour the liquid down a stirring rod. Place the stirring rod across the top of the 250-mL beaker that contains the mixture, as shown in Figure B. The stirring rod should rest in the spout and extend several inches beyond the spout. Grasp the beaker with your hand and place your index finger over the stirring rod to keep it in place. Slowly pour the contents of the beaker into the filter cone, allowing the liquid to pass through the filter paper and collect in the beaker.

10. While holding the beaker at an angle, use the water bottle to rinse the beaker and wash any remaining solid from the beaker into the filter cone. Record your observations in Data Table 2.

11. Allow the filter cone to drain. Then remove the filter cone and carefully unfold the filter paper. Place the filter paper on a watch glass and record your observations in Data Table 2.

 

**Hypothesis**

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**Data and Observations**

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• To find the “Mass of table salt,” subtract the “Mass of weighing paper” from the “Mass of table salt + weighing paper.”

• To find the “Mass of sand,” subtract the “Mass of weighing paper” from the “Mass of sand + weighing paper.”

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**Cleanup and Disposal**

1. Place all chemicals in the appropriately labeled waste container.

2. Return all lab equipment to its proper place.

3. Clean up your work area

**Analyze and Conclude**

1. **Observing and Inferring** Why were the excess reagents not put back into the original reagent bottle?

2. **Comparing and Contrasting** What differences were observed between the mixture of salt and sand in the 250-mL beaker and the same materials after the water was added?

3. **Drawing a Conclusion** Why were the samples of table salt and sand placed into 50-mL beakers prior to weighing?

4. **Thinking Critically**

a. If one of the pieces of glassware is dropped and breaks, why is it necessary to clean up the broken glass immediately?

b. If one of the pieces of broken glass is dropped and breaks, why is it necessary to tell the teacher immediately?

5. **Thinking Critically** Why is it necessary to wear safety goggles and a lab apron while performing experiments in the lab?

6. **Error Analysis** What are some possible sources of error in this activity?

**Real-World Chemistry**

1. Why is eating, drinking, or chewing gum not allowed in a laboratory?

2. Why must you always wash your hands after working in a laboratory?

3. Why do you never work alone in a chemical laboratory?

**CHEMISTRY 2022-23 LAB ACTIVITY**

**CHAPTER 2 – Launch Lab**

**How can you form layers of liquids?**

You know that ice floats in water, whereas a rock sinks. Not surprisingly, water and other liquids sometimes form distinct layers when poured together.

 

**Procedure **

1. Read and complete the lab safety form.

2. Observe **5-mL samples of alcohol** (dyed red), **glycerol** (dyed blue), **corn oil**, and water. Plan the order in which to add the liquids to a **graduated cylinder** to form four layers. **WARNING**: Keep alcohol away from open flames.

3. Test your plan by adding the liquids, one at a time, to the graduated cylinder. When adding each liquid, tilt the graduated cylinder, and slowly pour the liquid so it runs down the inside. When adding the glycerol, allow it to settle before adding the next liquid.

4. Did the liquids form four distinct layers? If not, rinse out the graduated cylinder and repeat Steps 2 and 3 using a different order.

**Analysis**

1. Identify the order, from top to bottom, of the layers in the graduated cylinder.

2. Hypothesize what property of the liquids is responsible for the arrangement of the layers.

**Inquiry**

What do you think would happen if small pieces of metal, plastic, and wood were added to the layers of liquids in the graduated cylinder?

**CHEMISTRY 2022-23 LAB ACTIVITY**

**LAB 1.2 – Effective Use of a Bunsen Burner**

During chemical or physical changes, energy is often transferred in the form of heat. This transfer can be measured by a change in temperature. In this activity, you will test the effective use of a Bunsen burner. You will vary the height of the position of a beaker of water above the burner and observe how long it takes to boil the water. All other factors will be kept constant. The intensity of the flame and the height of the platform used to hold the beaker of water will not change. Because the intensity of the flame does not change, the amount of heat provided by the flame will be a constant. In addition, a given amount of water will always require the same amount of energy to boil.

**Problem**

How far from a flame should a beaker of water be positioned for heating to be most efficient?

**Objectives**

• **Heat** a beaker of water using a Bunsen burner.

• **Measure** distances using a ruler.

• **Measure** temperature using a thermometer.

**Materials**

100-mL graduated cylinder

250-mL beakers

(4) Bunsen burner striker or matches

thermometer

ring stand

ring

wire gauze

ruler

stopwatch or clock with a second hand

beaker tongs or hot mitts

hot pad

distilled water

**Safety Precautions **

• Always wear safety goggles and a lab apron.

• Never eat or taste any substance used in the lab.

• Assume all glassware is hot and handle with gloves.

• Boiling water can burn skin.

**Pre-Lab**

1. What are the constants in this experiment?

2. What are the variables in this experiment?

3. Which measurement in this experiment is the dependent variable?

4. Read over the entire laboratory activity. Hypothesize about what the most effective position above the flame will be. Record your hypothesis on page 6.

**Procedure**

1. Label four 250-mL beakers 1, 2, 3, and 4. Using a graduated cylinder, measure 100 mL of distilled water into Beaker 1. Measure and record the temperature of the water in Data Table 1. Repeat this process three more times for the remaining three beakers.

2. Set up a ring stand and attach the ring to the stand. Place the wire gauze on the ring to provide a platform on which to place the beaker of water.

3. Use burner connector safety tubing to connect the Bunsen burner to the gas inlet. Make sure the hose does not have any cracks or holes.

4. Light the burner by first turning on the gas flow and using the striker to ignite the gas. If you use a match, light the match first before turning on the gas. Hold the match close to the bottom side of the burner nozzle to light the gas.

5. When the flame is lit, adjust the gas flow and oxygen flow so that the flame is blue with an inner light-blue cone. A yellow flame is too cool and needs more oxygen. Your teacher may have additional directions on the operation of the Bunsen burner.

6. After you adjust the flame, move the burner to the ring stand and observe the height of the wire gauze above the flame. Adjust the height so the wire gauze is approximately halfway up the inner blue cone. Refer to Figure A, Test 1 height. Estimate the distance from the top of the burner to the wire gauze with a ruler and record this distance as Test 1 in Data Table 2. This will be your starting distance. Turn off the flame.

 

7. Place Beaker 1 on the wire gauze. Ignite the flame and measure the time (in s) it takes for the water to boil. Record this time in Data Table 2.

8. Turn off the flame and using beaker tongs and hot mitts, carefully remove the hot beaker of water from the wire gauze and place it on a hot pad on your lab bench.

9. Turn on the flame and adjust the height so the wire gauze is now at the top of the inner blue cone. Refer to Figure A, Test 2 height. Estimate the distance from the top of the burner to the wire gauze with the ruler and record this distance in Data Table 2. Turn off the flame.

10. Repeat steps 6–8 using Beaker 2.

11. Turn on the flame and adjust the height so the wire gauze is now positioned the same distance from the top of the inner blue cone as the top was positioned from the starting distance, halfway up the inner blue cone. Refer to Figure A, Test 3 height. For example, if the starting distance was 3 cm and the top of the inner blue cone is 6 cm, then the new position will be 9 cm above the burner top. Estimate the distance from the top of the burner to the wire gauze with the ruler and record this distance in Data Table 2. Turn off the flame.

12. Repeat steps 6–8 using Beaker 3.

13. Turn on the flame and adjust the height so the wire gauze is moved to a new position that is the same distance increment as before. Refer to Figure A, Test 4 height. For example, if the starting position was 3 cm, the height for test number 2 was 6 cm and the height for test number 3 was 9 cm, then the height for test 4 will be 12 cm. Estimate the distance from the top of the burner to the wire gauze with the ruler and record this distance in Data Table 2. This will be your starting distance. Turn off the flame.

14. Repeat steps 6–8 using Beaker 4.

15. When the beakers are cool, empty the water in the sink and dry the glassware.

**Hypothesis**

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**Cleanup and Disposal**

1. Clean and dry all glassware.

2. Return all lab equipment to its proper place.

3. Clean up your work area.

**Data and Observations** ****

**Analyze and Conclude**

1. **Observing and Inferring** Why did you turn off the burner between experiment setups?

2. **Thinking Critically** Why is the height of the wire gauze the independent variable?

3. **Thinking Critically** Why is the time to get the water to boil the dependent variable?

4. **Comparing and Contrasting** What observed differences did you note among the results of the four tests?

5. **Drawing a Conclusion** Why did it take less time for the water to boil when the wire gauze was placed at the tip of the inner blue cone?

6. **Thinking Critically** Why was it necessary to use beaker tongs or hot mitts to remove the beaker of water after the test but not before the test?

7. **Error Analysis** What are some sources of error in this activity?

**Real-World Chemistry**

1. Suppose you wanted to measure the heat produced by a Bunsen burner flame. Why would holding a thermometer in the flame be the wrong approach?

2. Why did you check to make sure that the hose to the burner did not have any holes or cracks?

**CHEMISTRY 2022-23 LAB ACTIVITY**

**CHAPTER 2 Mini Lab – Determine Density**

**What is the density of an unknown and irregularly shaped solid?** To calculate the density of an object, you need to know its mass and volume. The volume of an irregularly shaped solid can be determined by measuring the amount of water it displaces.

**Procedure **

1. Read and complete the lab safety form.

2. Obtain several **unknown objects** from your teacher. Note: Your teacher will identify each object as A, B, C, and so on.

3. Create a data table to record your observations.

4. Measure the mass of the object using a **balance**. Record the mass and the identity of the object in your data table.

5. Add about 15 mL of **water** to a **graduated cylinder**. Measure and record the initial volume in your data table. Because the surface of the water in the cylinder is curved, make volume readings at eye level and at the lowest point on the curve, as shown in the figure. The curved surface is called a meniscus.

6. Tilt the graduated cylinder, and carefully slide the object down the inside of the cylinder. Be sure not to cause a splash. Measure and record the final volume in your data table.

 

**Analysis**

1. **Calculate** Use the initial and final volume readings to calculate the volume of each mystery object.

2. **Calculate** Use the calculated volume and the measured mass to calculate the density of each unknown object. 3. **Explain** Why can’t you use the water displacement method to find the volume of a sugar cube?

4. **Describe** how you can determine a washer’s volume without using the water displacement method. Note, that a washer is similar to a short cylinder with a hole through it.