Introduction to the General Chemistry Laboratory

Lab Apparatus and Glassware

Review the first of two photographs at the end of the Data Documentation section, near the beginning of your lab manual. Inspect the pieces lab apparatus in the photo, along with their names in the caption above that photo. Review the lab apparatus in this illustration as well. Physically inspect each of these items in the laboratory.

Chemical Waste and Spills

For this and every other lab experiment, obtain a 250-ml beaker and label it as waste. Place all of your chemicals in this beaker after you have used them. After you have completed the entire lab, empty the contents of your waste beaker into the labeled waste container for this experiment. Read the label on the waste container and verify that it is the correct container before you pour anything into it. Refer to your lab manual, as well, if you do not see the names of your waste substances on the waste container's label. If you are still in doubt, ask your instructor to explain any discrepancies involving the waste disposal.

If you spill chemicals during your lab experiment, they will need to be cleaned up. If you are sure that the substances do not contain concentrated acids or bases, or any other toxic or reactive chemicals, then you may clean it yourself with gloves, water, and paper towels. If there may be a potential hazard involved with the spill, then notify your instructor or a lab technician immediately.

Questions

1. What do you do to determine how to dispose of the chemicals in your waste beaker?

2. What chemical(s) can be safely poured down the laboratory sink?

3. How and when can you clean up spilled chemicals by yourself?

4. How do you handle a chemical spill that is not known to you to be nonhazardous?

Weighing a Solid

Weigh a clean, empty 50-mL beaker and record its mass to the nearest 0.001 g.
Place approximately 0.5 g of sodium sulfate (Na_2SO_4) in the beaker and record the new total mass to the nearest 0.001 g using the same balance. Find the exact mass of your sample by taking the difference between the two measurements. Label the beaker, and save the beaker and solid. If you spill any of the powder on the balance or other surface, clean it up using gloves, along with a small broom or dry paper towels. Do not use water or any liquids to clean the weighing surface of the balance. If a nonhazardous liquid is spilled on the balance, clean it up immediately using gloves and paper towels. Show your calculations below.

Calculations:

Questions

5. What happens to anhydrous sodium sulfate when it absorbs water?

6. Why is it important to weigh the beaker even when you are using the tare button on the balance?

7. Why is it important to use same balance only for the entire experiment?

8. How do you handle a small spill of nonhazardous solid powder on an analytical balance?

Determining Density

Weigh a clean, empty 10-ml graduated cylinder to the nearest 0.001 g. Place approximately 9 ml of 95% ethanol (C_2H_5OH) in the cylinder. Record the exact volume to the nearest 0.05 ml. Weigh the cylinder with the ethanol to the nearest 0.001 g. Find the exact mass of your sample by taking the difference between the two mass measurements. Calculate the density of your ethanol sample in g/ml using the equation $d = m/V$. Save the cylinder and liquid.

Calculations:

Dispensing a Liquid with a Graduated Cylinder

Add ethanol to the label on the sodium sulfate beaker. Pour approximately 7.5 ml of ethanol from the cylinder into the beaker. Record the final volume on the cylinder to the nearest 0.05 ml. Determine the amount of ethanol dispensed to the nearest 0.05 ml by taking the difference between the two volume measurements. Show your calculations below. Anhydrous sodium sulfate is a drying agent and it absorbs any water that may be in the ethanol sample. The sample now contains dry ethanol.

Calculations:

Questions

9. What are the smallest graduation intervals and the uncertainty in the volume measurement for a 10-ml graduated cylinder?

10. What are the smallest graduation intervals for 25-ml and 50-ml graduated cylinders?

11. What is the uncertainty (+/-) in the volume measurement that is printed on a 50-ml beaker? Explain whether or not that uncertainty is acceptable for analytical volume measurements.

12. Why can't you pour the residual ethanol in the graduated cylinder back into the source bottle? If that ethanol cannot be used in the experiment, where does need to be placed?

Dispensing a Liquid with a Buret

Place a buret vertically on a buret stand and fill approximately halfway or more with DI water. Open the stopcock and let water flow into a clean beaker until there is no air remaining in the buret tip. Record the buret volume to the nearest 0.05 ml. Dispense approximately 10 ml into the beaker. Record the new buret volume to the nearest 0.05 ml. Determine the volume of water dispensed to the nearest 0.05 ml as the difference between the two measurements. Show your calculations below. Dispose of the water in the sink.

Calculations:

Dispensing a Liquid with Pipets

Place 50 ml of DI water into a small, clean beaker. Fill a 5-ml volumetric pipet up to its calibration line from the water in the beaker. When you fill the pipet, keep the pipet tip from resting on the bottom of the glass in the beaker. Transfer the water from the pipet back to the beaker by gravity flow only and do not force the remainder of the water out of the pipet. Fill a 10-ml graduated pipet approximately up to the 4 ml graduation from the water in the beaker. Record the volume to the nearest 0.05 ml. Transfer approximately 5 ml back to the beaker. Record the final volume to the nearest 0.05 ml and determine the exact volume transferred. Show your calculations below. Dispose of the water in the sink.

Calculations:

Stirring, Heating, and Cooling

Place a stir bar in a 150-ml beaker and then add 100 ml of tap water. Place the beaker on a stirring hot plate. Slowly and gradually turn on the stirring function without turning on the heat function. Once the water is stirring, turn the heat function on and heat the water until it is boiling. Measure the temperature of the boiling water to the nearest 0.1 ^oC.
Use a digital thermometer and keep the tip from touching the bottom of the beaker.

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Make an ice-water bath with both ice and tap water in a 250-ml beaker.
Fill the beaker completely with ice before adding the tap water.
Measure the temperature of the ice water to the nearest 0.1 ^oC.
Use a digital thermometer and keep the tip from touching the bottom of the beaker.

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Questions

13. Why is the stir bar added before the liquid is added?

14. Why should the stir function be turned on carefully?

Cleanup and Disposal

Pour the water down the sink. Empty your waste beaker and any other waste chemicals into the labeled waste container. Rinse all of your glassware and remove all of the labels. Ensure that there are no visible traces of chemicals remaining in your glassware, and then place your glassware on the used glassware cart.

Questions

15. What two criteria must be met before your used glassware is placed on the cart?

16. Who is responsible for ensuring that no chemicals or labels remain in or on the glassware when they are placed on the cart?

17. Can you place glassware that is cracked or broken on the cart? Broken glassware must be placed where?