Experiment 1 – Basic Laboratory Operations (10e)

Pre-Lab Hints

1. Review the Bunsen Burner section in the Introduction for the experiment.
2. Review the Bunsen Burner section again.
   Note that a *luminous* flame has an *insufficient* supply of oxygen.
3. Review Technique 16A (Measuring Volume) in the Laboratory Techniques section near the front of your lab manual. Inspect Figures T.16a and T.16b also.
4. Review Technique 6 (Measuring Mass) in the Laboratory Techniques.
   Inspect Figures T.6a, b, and c also
5. Review the Bunsen Burner section again, along with your answers for problems 1 and 2.
6. Review Technique 16B (Pipetting a Liquid), Read 2. Filling of the Pipette for 6a and 6b, and read 3. Delivery of the Liquid for 6c and 6d.
7. Review the Density section in the Introduction for the experiment.
   Calculate volume for 1 g of *each* solid using volume = mass ÷ density.
8. Find the sample mass as the difference between the final and initial masses.
   Substitute this mass, along with the volume given, in the equation for density (d = m/V).

Procedure Notes

Part A2. Skip this step. Use Figure 1.3 for the sketch in part A2a of the report sheet.

Part B1. Use same balance throughout experiment, this will minimize errors because the balances may not all be calibrated identically. Also, record the mass of each item before you press the tare button to avoid issues with determining its mass. Weigh a small (3") test tube, a 50-ml beaker, a metal spatula, and a 10-ml graduated cylinder. For "other", use combined mass of same test tube and same beaker. Retain the beaker and cylinder for parts B2, C1, and C2.

Part B2. Use 7 ml of water in each trial. The mass of the water will then be approximately 7 g. For the comment, report your precision as a range, which is the average ± error.

Part C1. Be sure to record the three-digit unknown number on your report sheet for your solid. Use approximately 10 g sample of same solid for each of the two trials. Place the samples in a weighing tray or a small beaker to weigh them on the balance. Record volumes to nearest 0.05 ml (graduations are at 0.10 ml for a 10-ml cylinder). Calculate the density with the proper number of significant digits. Clean and dry the solid, then put it back in the vial after completing the measurements. Put weighing trays on the used glassware cart after use. Write all calculations down on a separate sheet of paper.

Part C2. Be sure to record the three-digit unknown number on your report sheet for your liquid. Use 5 ml volumetric pipettes for both the water and the unknown. The pipette volume is calibrated as TD 5.00 ml, but by gravity flow only, so do not force the last drop out of the pipette. Calculate the density with the proper number of significant digits. Dispose of used unknown liquid in the waste jar. Omit Class Data portion. Write all calculations down on a separate sheet of paper.

Lab Questions

Answer these questions instead of the questions following the report sheet in the lab manual. Attach your answers to your lab report sheet and calculations.

1. Suppose your Bunsen burner has a nonluminous flame. Describe the color zones. Where is the hottest point? What is the highest temperature possible?

2. Suppose that you close the airflow valve on your Bunsen burner. What happens to the temperature and color of the flame? Describe the phenomenon that causes the new color.

3. Suppose you tare the balance (to zero) after weighing a glass cylinder (25.00 g). Then, without pressing the tare button again, you measure the mass of a water sample (7.00 g) placed in the cylinder. What does the balance read? Now suppose the power failed so that you lost your tare setting after you filled the cylinder with water. How would you now obtain the correct mass of the water?

4. Suppose your solid in part C1 is not completely submerged. How does this change the final volume reading and the calculated solid volume? How does this change the experimental density (d = m/V)?

5. The pipets in parts C2 and C3 were calibrated to deliver 5.00 ml of liquid. Suppose the pipet was dirty and, as a result, retained some liquid droplets so that less liquid is delivered. Does anything happen to your recorded volume? (See line d in your report sheet.) What happens to the mass measurement for the dispensed liquid? What is the overall effect on your density calculation (d = m/V)?