Chem 130: Chemistry for Funeral Services
Problem Set 1: Answer Key

Name: ______________________________ Date: ______________

Each question is worth one point. Show your work wherever calculations are required.

1. Distinguish between a physical and a chemical property. Give an example of each.

   Physical – no change in composition eg. Boiling water
   Chemical – change in composition eg. Baking bread

2. Why is it important to put temperature in degrees Kelvin before doing calculations of properties associated with temperature?

   Kelvin is an absolute scale starting at zero. In Kelvin, when a temperature doubles, it really is twice as hot. That's not true on a relative scale like Celsius.

3. Fill in the following chart and answer the question:

   1000 mg = ____**1**____ g

   3.1 L = ____**3100**____ mL

   Which is bigger, 61 m or 0.061 km? Explain
   They are the same size. Neither is bigger.

4. What is vapor pressure? Why might it be important to know about vapor pressure when working with embalming fluids?

Vapor pressure is the pressure of the gas that's from the liquid in a closed container. The vapor pressure is in equilibrium when the amount of gas formed from liquid evaporation exactly balances the amount of liquid formed from vapor condensation. As temperature increases, vapor pressure increases. Any liquid in a closed container with a high vapor pressure should be stored in a cool environment. (Other embalming examples possible.)

5. You want to find the density of a metal. The cylinder and the water shows 40 mL. When the metal is added, the water level goes up to 74 ml. The metal has a mass of 268 g. What is its density? (HINT: draw a picture of the experiment and think about what the changes in water level mean.)

Be sure to include a drawing to help you answer these kinds of questions. Without a drawing, though, the answer is like this:

1. Find the volume of the metal

Water + metal = 74 mL
Water alone = 40 mL

Metal alone = 34 mL
(by subtraction)

2. Find the mass of the metal

268 g of metal
(given in the problem)

3. Find the density of the metal

$$\frac{\text{mass}}{\text{volume}} = \frac{268\text{ g}}{34\text{ mL}} = 7.9\text{ g/mL density}$$

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6. The pressure on 500 ml of a gas changes from 1.5 atm to 3.5 atm. What is the final volume? The temperature is kept constant throughout. (HINT: draw a picture of the experiment and think about what the change in pressure will do to the gas.)

Be sure to draw a picture to help with your analysis of the problem. The picture should include the gas before (in some volume) with the pressure at 1.5 atm. The gas after has a smaller volume (it was squished by the increased pressure…) with a final pressure of 3.5 atm. The picture helps you to see that the volume gets smaller so the pressure ratio should have the smaller pressure on top and the larger one on the bottom. This will make the final volume smaller. So…

$$500 \text{ mL gas} \times \frac{1.5 \text{ atm}}{3.5 \text{ atm}} = 214 \text{ mL gas as the final volume}$$

7. Give two characteristics of liquids that are different from gases. How are the characteristics explained by the atomic theory of matter?

   Liquids fill the bottom of a closed container and diffuse slowly. Gases fill a closed container and diffuse quickly. On an atomic level, liquids are loosely bound particles not that slide around but don't fly away from each other, except occasionally at the surface. Gases are not bound and move freely and rapidly.

8. How are elements different from mixtures?

   An element is a substance made up of one particular type of atom.
   A mixture is made up of two or more substances in varying proportions.

All substances are made of atoms. Mixtures contain many different atoms combined into many different compounds which are then mixed together in varying proportions.

9. Give a common example of Charles' Law or Boyle's Law and explain how it illustrates the law.

   When you heat air in a balloon, the volume increases. The law says that volume increases with temperature.

10. Explain the difference between an endothermic reaction and an exothermic reaction. For each, what happens to the reaction? What happens to the surroundings? Give an example.

    Exothermic – puts out heat (from reaction to surroundings) Example: "instant" heat packs
    Endothermic – takes in heat (from the surroundings to the reaction) Example: "instant" cold packs