Assignment #4

Due on Wednesday, September 18, 2013

Read Section 1.3 on *Real World Measurements: Dealing with Units,* on pages 41–57 in the text.

Background and Definitions

Solutions and Concentration. A **chemical solution** is made by dissolving some **solute** in a **solvent**; for example, salt in water. The **concentration** of the solution refers to the proportion of solute that is dissolved in the solvent. This proportion can be expressed in terms of mass of solute per volume of solution (e.g., grams per liter, or grams per cubic centimeter), percent volume of solute per volume of entire solution, percent mass of solute per mass of entire solution, or the number of moles of solute per liter of solution (a mole is 6.02×10^{23} atoms or molecules of a given element or compound, respectively). The latter form of determining concentration is usually referred to as **molarity**.

Do the following problems

1. Suppose you need to mix some pure acid with some water to produce 16 liters of a solution that is 30% acid. How much pure acid and how much water should be mixed?

2. Determine the percent composition by mass of a 250–grams salt solution which contains 117.5 grams of salt.

3. Determine the concentration of a solution (in number of moles per liter of solution) made by dissolving 20.0 grams of caustic soda (NaOH) in sufficient water to yield 482 cm^3 of solution. One mole of NaOH weighs about 40.0 grams.

4. Explain how to prepare 25 liters of a solution of barium chloride (BaCl$_2$) which has a concentration of 0.10 moles per liter, starting with solid BaCl$_2$. One mole of barium chloride weighs about 208 grams.

5. Specify the volume of the solution in Problem 4 needed to get 0.020 moles of BaCl$_2$.