NAME: **HONORS CHEMISTRY**

SECTION: Percent Solutions

One simple method of expressing the concentration of a solution is to state the percentage by mass of the solution that is solute. Unless otherwise specified, a solution concentration expressed in percent is interpreted by chemists to mean grams of solute per 100 g of solution. For example, a 10% solution of dextrose contains 10 g of dextrose in a total 100 g of solution. These concentration units are frequently used in pharmacies and hospitals.

1. What mass of NaCl would be found in 100. g of 3.50% solution?
2. What mass of K2SO4 should be dissolved in sufficient water to make 200. g of 5.32% solution?
3. A pharmacist needs to prepare a medicinal ointment. She mixes 3.7 g of solid D with 43.6 g of ointment base Q. What is the percentage of D by mass in the ointment?

The concentrations of solutions containing organic compounds are sometimes presented as mass percents. These concentration figures are followed by (m/m), which is sometimes written (w/w) in an older convention. The expressions (m/v), (v/m) and (v/v), meaning “mass over volume,” “volume over mass,” and “volume over volume,” are also used. The masses are measured in grams, and the volumes in cubic centimeters (1 cm3 = 1 mL). For example, 1/10 m/v KCl in H2O would mean 1 g KCl dissolved in 10 cm3 H2O.

1. Describe what is meant by the following solution concentrations.
   1. 5/50 m/v C12H22O22 in H2O
   2. 10/100 v/m CH3CH2OH in H2O
   3. 50/50 v/v CH3OH in H2O
   4. 1/4/5 v/v/v CH3COOH/CH3(CH2)3OH/H2O

Solution expressions involving volume proportions can be changed to a percentage basis if the liquid densities are known. For example, suppose we have a solution of methanol (a.k.a formaldehyde, CH2O) in 2-propanone (acetone, CH3COCH3) that is 30/70 m/v and we want to write the m/m percent. The volume of the solvent is first converted to mass, using the definition of density (D = mass/volume). The density of 2-propanone is 0.790 g/cm3.

1. Given the following densities, convert the solution concentrations from PROBLEM 4 to (m/m) percentages.

H2O = 1.00 g/cm3 CH3OH = 0.791 g/cm3 CH3(CH2)3OH = .810 g/cm3

CH3CH2OH = 0.789 g/cm3 CH3COOH = 1.05 g/cm3

* 1. 5/50 m/v C12H22O22 in H2O
  2. 10/100 v/m CH3CH2OH in H2O
  3. 50/50 v/v CH3OH in H2O
  4. 1/4/5 v/v/v CH3COOH/CH3(CH2)3OH/H2O