Concentration Worksheet

Concentration – A measure of the amount of solute in a given amount of solution. There are many different ways of expressing concentration, some are more appropriate than others depending on the purpose.

Important concepts to remember
- **Solution = solute + solvent**
- **1 mL of water = 1 gram**

Grams per liter: (this measure is often used when discussing the solubility of a solid in solution)

Problems:

1. You have 125 g of potassium sulfate and 325.6 L of solution. What is the concentration of your solution?

2. If 162.35 g aluminum hydroxide are dissolved in 6750 mL of solution, what is the concentration of the solution?

3. Calculate the concentration in grams per liter of a 450.0 mL solution containing 0.0762 moles of iodine.

Percent Composition: (frequently used with commercial products)
Percent by mass:

Percent by volume:

Mass to volume percent:

Problems:

Percent-by-Mass concentration of a solution

1. What is the percent-by-mass, %(m/m), concentration of sucrose in a solution made by dissolving 7.6 g of sucrose in 83.4 g of water?

Percent-by-volume concentration of a solution

2. Calculate the volume percent, %(v/v), of solute in the following solution: 20.0 mL of methyl alcohol in enough water to give 475 mL of solution.

Mass-volume percent concentration

3. Normal saline solution that is used to dissolve drugs for intravenous use is 0.92%(m/v) NaCl in water. How many grams of NaCl are required to prepare 35.0mL of normal saline solution?

Parts per million (ppm): (used with very dilute solutions)

Problems:

1. What is the concentration, in ppm of a solution made with 18.5 g of salt in 12,5000.0 g of water?

2. What is the concentration, in ppm if the solubility of NaCl at 25°C is 36.2 g/100 g solution?

3. What mass of NaCl can be dissolved in 50.0 g of H_2O at the same concentration as the last problem?

Molarity: (most widely used unit for concentration when preparing solutions in lab)

Problems:

1. Determine the molarity of the following solution: 4.35 moles of $KMnO_4$ are dissolved in enough water to give 750 mL of solution.

2. What is the molarity of a solution made with 126.32 g of sodium hydroxide (NaOH) dissolved to make 874.2 mL of a solution?

3. How many moles of HNO_3 are needed to prepare 5.0 liters of a 2.0 M solution of HNO_3?