CHEM 130 **Name**_____

Quiz 1 - "Mathish" problems **Due by 4:00 PM, Friday Sept 2.**

These are typical problems involving unit conversion, the metric system, percentage calculations, etc. You may use your book, **but you may not seek help from anyone other than Dr. Lamp**. As you work these problems remember to keep track of units and be sure that every answer has the correct units and significant figures. Clearly mark your answers.

Percent (%) = (parts component)/(100 parts sample) e.g. % by mass = (g component)/(100g sample)

1. A mass of 17 micrograms (μg) is equal to _____ kilograms.

   To do this conversion, we need to know that 1 μg = 10^{-6} g, and 1 kg = 10^{3} g

   $$17\ \cancel{\mu g} \times \frac{10^{-6}\ \cancel{g}}{1\ \cancel{\mu g}} \times \frac{1\ kg}{10^{3}\ \cancel{g}} = 1.7 \times 10^{-8}\ kg$$

2. Of the volumes 86.30 mL, 0.0863 L and 8.630 x 10^{5} μL, which (if any) is the largest?

   It is probably easiest to get things in terms of a common unit, like mL:

   $$0.0863\ \cancel{L} \times \frac{1\ mL}{10^{-3}\ \cancel{L}} = 86.3\ mL \quad \text{while} \quad 8.630 \times 10^{5}\ \cancel{\mu L} \times \frac{10^{-6}\ L}{1\ \cancel{\mu L}} \times \frac{1\ mL}{10^{-3}\ \cancel{L}} = 863\ mL$$

   Therefore 8.630 x 10^{5} μL is largest.

3. If a 4.50 g sample of a Zn-Al-Cu alloy contains 2.45 g Zn and 1.34 g Al, what is the % composition of Cu?

   The sample contains only Zn, Al, and Cu. Since you are given the mass of Zn and Al, the remainder must be Cu: 4.50g – (2.45g + 1.34g) = 0.71 g Cu

   Therefore, the percent Cu is:

   $$\frac{0.71\cancel{g}\ Cu}{4.50\cancel{g}\ Alloy} \times 100\% = 15.77\%\ Cu = \mathbf{16\%\ Cu}$$

4. Car batteries are filled with sulfuric acid. What is the mass of the acid (in grams) in 500.0 mL of the battery acid solution if the density of the solution is 1.285 g/cm^{3} and if the solution is 38.1 % sulfuric acid by mass?

   A density of 1.285 g/cm^{3} implies that 1 mL of solution has a mass of 1.285 g, and we have 500.0 mL of this solution, so we can calculate the mass of the solution:

   $$\frac{1.285\ g\ solution}{1.00\ \cancel{mL\ solution}} \times \frac{500.0\ \cancel{mL\ solution}}{} = 642.5\ g\ solution$$

   But only 38.1% of this solution is sulfuric acid:

   $$642.5\ \cancel{g\ solution} \times \frac{38.1\ g\ sulfuric\ acid}{100\ \cancel{g\ solution}} = \mathbf{244.793\ g = 245\ g\ sulfuric\ acid}$$