U7LM2B Percent by Mass & Density of Solutions Wksht **Name: _____KEY_____**

1. What is the percent by mass of a solution made by dissolving 5.25 g of calcium nitrate in 675 g of water?
   $\frac{5.25g\ Ca(NO_3)_2}{(675g+5.25g\ total)}$ x 100% = 0.771775… 3 sig figs ... **0.772% $Ca(NO_3)_2$**

2. How many grams of NaCl are present in 1250. g of solution that is 12.00% NaCl by mass?
   (12.00%/100%) x 1250g NaCl = 150.0g… 4 sig figs ... **150.0g NaCl**
   Note: 12.00% can simply be written as 0.1200.

3. What mass of water is contained in 600. g of 12.0 % NaCl solution?
   0.120(600g) = 72.0g NaCl... the rest must be water, so 600g – 72.0g = **528g water**

4. What mass of water must we add to 35.0 g NaCl to make a 12.0 % NaCl solution?
   0.120 = 35.0g NaCl / (35.0g NaCl + Xg H_2O) X = 256.6666g… 3 sig figs… **257g water**

5. What mass of 12.0 % NaCl solution contains 35.0 g of NaCl?
   The denominator above represents this situation. 35.0g NaCl + 257g H_2O = **292g solution**

6. What mass of 25 % calcium chloride solution contains 350. g of water?
   0.25 = Xg NaCl / (Xg NaCl + 350g H_2O)
   0.25X + 87.5g = X
   87.5g = (1 - 0.25)X
   87.5g = (0.75)X
   X = 116.666
   Total mass of solution = 117g NaCl + 350g H_2O = 466.66g…. 2 sig figs… **470g solution**

7. What mass of each calcium chloride and water are required to prepare 350. g of 22.0 % calcium chloride solution?
   0.220 = Xg NaCl / (350g solution)
   X = **77.0g NaCl**
   350g solution = 77.0g NaCl + Yg H_2O
   Y = **273g H_2O**

8. A solution is 12 % calcium hydroxide. How many moles of calcium hydroxide are dissolved in 250 g of this solution?
   0.12 = Xg $Ca(OH)_2$ / (250g solution)
   X = 30g (1mol/74.10g) = 0.40485… 2 sig figs = **0.40mol $Ca(OH)_2$**

9. The density of a 15.00 % NaCl solution is 1.108 g/mL. How many mL of this solution must we use to obtain 75.00 g NaCl?
   Assume 1g soln…
   0.15 = Xg NaCl / (1g solution)…. X = 0.15g NaCl in 1g soln
   $\frac{0.15g\ NaCl}{1\cancel{g\ soln}}$ x $\frac{1.108\cancel{g\ soln}}{1mL\ soln}$ = 0.1662g NaCl per mL soln
   75.00g = 0.1662g/mL (YmL)
   YmL = 451.2635… 4 sig figs… **451.3mL solution**
   Check: Convert this volume by density to get mass of solution. Multiply this by 0.15, to get 75.00 g Na in this mass.

10. What is the molarity of a 20.00 % solution of $NaNO_3$? The density of the solution is 1.143 g/mL.
    $\frac{0.2000g\ \cancel{NaNO_3}}{1\cancel{g\ soln}}$ x $\frac{1.143\cancel{g\ soln}}{1\cancel{mL}\ soln}$ x $\frac{1mol\ NaNO_3}{85.00\cancel{g\ NaNO_3}}$ x $\frac{1000\cancel{mL}}{1L}$ = 2.6894… 4 sig figs… **2.689M $NaNO_3$**

11. What is the density of a 35.0 % hydrochloric acid solution, HCl, if it's11.3 molar?

$$\frac{11.3\ \text{mol HCl}}{1\ \text{L soln}} \times \frac{36.46\ \text{g HCl}}{1\ \text{mol HCl}} \times \frac{1\ \text{L}}{1000\ \text{mL}} \times \frac{1\ \text{g soln}}{0.350\ \text{g HCl}} = 1.177137\ldots \text{ 3 sig figs…}$$ **1.18 g/mL HCl**

12. The density of a 16.4 M NaOH solution is 1.43 g/mL. What is the percent by mass of this solution?

You can probably convert 1L to 1000mL on your own at this point.

$$\frac{16.4\ \text{mol NaOH}}{1000\ \text{mL soln}} \times \frac{40.00\ \text{g NaOH}}{1\ \text{mol NaOH}} \times \frac{1\ \text{mL soln}}{1.43\ \text{g soln}} \times 100\% = 45.8741\ldots \text{ 3 sig figs…}$$ **45.9% NaOH**