Name Key Date _____

Solutions Review Sheet
Quantitative Chemistry

For the problems, be sure to show your work, and use significant figures!

1. Define the following in your own words:

   a. Solution –

   b. Solute –

   c. Solvent –

   d. Soluble –

   e. Saturated –

   f. Unsaturated –

   g. Concentrated –

   h. Dilute –

2. Complete the chart below related to the compounds and their solubility in water.

Na: 0.9
Cl: 3.0
C: 2.5
H: 2.1
O: 3.5

Compound	Type of Bond (Ionic, PC, NPC)	Is it soluble in water?
NaCl Na-Cl	$\Delta EN = \lvert 0.9 - 3.0 \rvert = 2.1$ Ionic	Yes
C_8H_{18} C-H	$\Delta EN = \lvert 2.5 - 2.1 \rvert = 0.4$ NPC	No
CH_2O C-O	$\Delta EN = \lvert 2.5 - 3.5 \rvert = 1.0$ PC	Yes
*C-H	$\Delta EN = \lvert 2.5 - 2.1 \rvert = 0.4$	

* Doesn't matter b/c C-O is polar

3. Complete the table with the following equations. Know these!

Percent by Mass	Percent by Volume
Molarity	Dilution

4. ~~Drugstores sell 3.00% hydrogen peroxide solutions. If you purchase a bottle with a mass of 250.~~ grams, how many grams of hydrogen peroxide are in the bottle?

$$250.\text{ g soln} \times \frac{3.00\text{ g } H_2O_2}{100.\text{ g soln}} = 750.\text{ g } H_2O_2$$

5. What is the molarity of a 2.00 L solution containing 0.15 moles of solute?

$$M = \frac{0.15\ \text{mol}}{2.00\ \text{L}} = 0.075\ \text{M}$$

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6. How many grams of $FeCl_3$ are needed to make 100. mL of a 1.00 M solution?

$$100.\text{mL} \times \frac{1\ \text{L}}{1000\text{mL}} \times \frac{1.00\ \text{mol}\ FeCl_3}{1\ \text{L}} \times \frac{162.2\ \text{g}\ FeCl_3}{1\ \text{mol}\ FeCl_3} = 16.2\ \text{g}\ FeCl_3$$

Briefly describe how you would prepare the above solution using a 100-mL volumetric flask.

1) Add 16.2 g $FeCl_3$ to a volumetric flask
2) Add water to dissolve it
3) Fill with water to the calibration mark

7. A stock solution contains 1.0 M silver nitrate. If you wanted to prepare 300. mL of 0.10 M silver nitrate, how many milliliters of the stock solution would you use?

$$M_c V_c = M_d V_d$$

$$(1.0\ \text{M})V_c = (0.10\ \text{M})(300\text{mL})$$

$$V_c = 30.\text{mL}$$

8. How many milliliters of 0.500 M KI are needed to react with 25.0 mL of 0.100 $Pb(NO_3)_2$?

$$2KI + Pb(NO_3)_2 \rightarrow PbI_2 + 2KNO_3$$

$$25.0\text{mL} \times \frac{1\ \text{L}}{1000\text{mL}} \times \frac{0.100\ \text{mol}\ Pb(NO_3)_2}{1\ \text{L}} \times \frac{2\ \text{mol KI}}{1\ \text{mol}\ Pb(NO_3)_2} \times \frac{1\ \text{L}}{0.500\ \text{mol KI}} \times \frac{1000\text{mL}}{1\ \text{L}} = 10.0\ \text{mL}$$

9. Copper reacts with silver nitrate according to the following reaction:

$$Cu + 2AgNO_3 \rightarrow 2Ag + Cu(NO_3)_2$$

a. If 1.7 grams of copper are added to 100. mL of 0.10 M (2 s.f.) silver nitrate, what is the limiting reactant?

$$1.7\ \text{g}\ Cu \times \frac{1\ \text{mol}\ Cu}{63.55\text{g}\ Cu} \times \frac{2\ \text{mol}\ Ag}{1\ \text{mol}\ Cu} = 0.0535\text{mol}\ Ag$$

$$100.\text{mL} \times \frac{1\ \text{L}}{1000\text{mL}} \times \frac{0.10\ \text{mol}\ AgNO_3}{1\ \text{L}} \times \frac{2\ \text{mol}\ Ag}{2\ \text{mol}\ AgNO_3} = 0.0100\ \text{mol}\ Ag$$

$AgNO_3$ is the limiting reactant

b. How many grams of silver would be produced?

$$0.0100\ \text{mol}\ Ag \times \frac{107.9\ \text{g}\ Ag}{1\ \text{mol}\ Ag} = 1.1\ \text{g}\ Ag$$

should only have 2 s.f.