AP Chemistry Homework – Summer Assignment

Name: _____

Due Date: Wednesday, September 4, 2019 (first day of class)

NOTE: You must show your mathematical calculations for all of the following calculations – you can't just write down your answers to these problems. CIRCLE YOUR FINAL ANSWERS!!!!!

Please use the official AP Chemistry Periodic Table of The Elements for use in your calculations.

1. You react 25.4 g of potassium carbonate aqueous with 34.7 g of aqueous strontium bromide. After the reaction reaches completion, you recover 10.3 g of a light grey solid. What is the name and chemical formula of this solid?

2. What is the limiting reagent in this reaction? And what is the excess reagent?

3. What is the percent yield of this reaction?

4. Find the molecular formula for a compound that has a molar mass of 60.10 g/mol, and has a percent by mass composition of 39.97% carbon, 46.62 % nitrogen, and 13.41 % hydrogen.

5. Complete the following table (note: all compounds from acetic acid on down are acids):

Compound name	Molecular Formula	Cation (with charge)	Anion (with charge)
Calcium thiocyanate			
	$CuCl_2$		
		Hg_2^{2+}	N^{3-}
Ammonium hypochlorite			
	$Al_2(HPO_4)_3$		
		K^+	$Cr_2O_7^{2-}$
Silver (I) Permanganate			
	$Mo_2(S_2O_3)_3$		

		Bi^{+}	S_{2-}
Compound name	Molecular Formula	Cation (with charge)	Anion (with charge)
Acetic Acid			
	HCN		
		H^{+}	Cl^{-}
Chloric acid			
	H_2SO_3		
		H^{+}	C_2O_{42-}

6. Name the following binary molecules

A. H_3O

B. P_2O_8

C. C_4H_{10}

D. N_2F_6

E. BrF

F. PCl_5

G. N_5O_7

H. SO_2

Write down the 6 rules for solubility of compounds in water, as recorded in Table 4.1 on page 156.

1.

2.

3.

4.

5.

6.

Define the term molarity, and state how to calculate it.

Define the term molality, and state how to calculate it.

Define the term normality with respect to acids, and state how to calculate it.

Perform the following solutions calculations. For more information, please see the chapters that discuss solutions.

1. What is the molarity of NaCl found in a 100.0 mL aqueous solution that contains 13.5 g NaCl?

2. What is the molarity of $Al_2(SO_3)_3$ found in a 225.0 mL aqueous solution that contains 82.1 g $Al_2(SO_3)_3$?

3. What is the molarity of Al^{3+} ions found in a 225.0 mL aqueous solution that contains 82.1 g $Al_2(SO_3)_3$?

4. How many moles of molybdenum (II) hydroxide would be needed in order to make a 1.25 M aqueous solution?

5. What is the molality of 150.0 mL of a 3.0 M Na_2CO_3 solution?

6. What is the molality of a solution that conations 244.8 g of $AgNO_3$ dissolved in 845.0 mL of H_2O?

7. What is molarity of 24.0 g of sulfuric acid dissolved in 125.0 mL of water? And what is the normality of this solution?

8. How many grams of phosphoric acid are needed to produce 100.0 mL of a 3.50 N solution? And how many moles of phosphoric acid particles are needed to accomplish this?

Write down the 5 rules for assigning oxidation states to atoms found in Table 4.2 on page 171.

1.

2.

3.

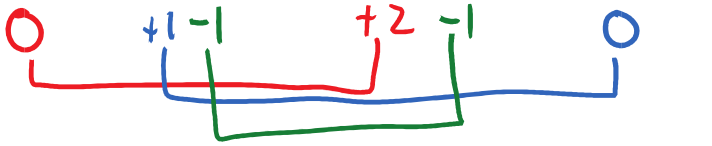
4.

5.

Perform calculations on the balanced and unbalanced redox reactions listed below. Identify the starting and ending charge of each element. State whether the atoms of each type of element were oxidized, reduced, or remained unchanged. Finally, for all atoms that changed their charge in the reaction (i.e. NOT the spectator ions), write balanced redox half reactions below.

<u>Sample balanced reaction:</u>

$$Mg_{(s)} + HBr_{(aq)} \square MgBr_{2(aq)} + H_{2(g)}$$



List the charge of each atom below its position in the reaction above. Connect elements on both sides of

Balanced redox half reactions:

$Mg_{(s)} \longrightarrow Mg^{2+}_{(aq)} + 2e^-$

$2e^- + 2H^+_{(aq)} \longrightarrow H_{2(g)}$

Final balanced chemical reaction:

$Mg_{(s)} + 2H^+_{(aq)} \longrightarrow Mg^{2+}_{(aq)} + H_{2(g)}$

By writing the reactions this way, we see that in this reaction, Mg transfers 2 electrons to H^+, allowing it to form $H_{2(g)}$. Br^- is a spectator ion, and is omitted in the final balanced reaction.

the equation with lines that show how the oxidations states changed before and after the reaction took place.

<u>Starting unbalanced reaction #1:</u>

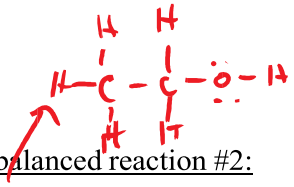
$$H^+_{(aq)} + Cu_{(s)} + HNO_{3(aq)} \rightarrow Cu(NO_3)_{2(aq)} + NO_{(g)} + H_2O_{(l)}$$

List the charge of each atom below its position in the reaction above. Connect elements on both sides of the equation with lines that show how the oxidations states changed before and after the reaction took place.

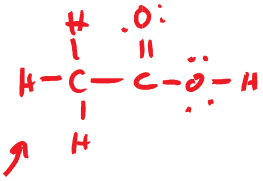
Balanced redox half reactions:

Final balanced chemical reaction:

Starting balanced reaction #2:



$$3\ CH_3CH_2OH_{(g)} + 2\ Cr_2O_{7}^{2-}{}_{(aq)} + 16\ H^{+}{}_{(aq)}$$



$$\longrightarrow 3\ CH_3CO_2H_{(aq)} + 4\ Cr^{3+}{}_{(aq)} + 11\ H_2O_{(l)}$$

List the charge of each atom below its position in the reaction above. Connect elements on both sides of the equation with lines that show how the oxidations states changed before and after the reaction took place.

Balanced redox half reactions:

Final balanced chemical reaction:

Starting unbalanced reaction #3:

$$Cu_{(s)} + AgNO_{3(aq)} \square\ Cu(NO_3)_{2(aq)} + Ag_{(s)}$$

List the charge of each atom below its position in the reaction above. Connect elements on both sides of the equation with lines that show how the oxidations states changed before and after the reaction took place.

Balanced redox half reactions:

Final balanced chemical reaction:

Write down the following definitions of the acids and bases below:

1. Arrhenius Acid:

2. Arrhenius Base:

3. Bronsted-Lowry Acid:

4. Bronsted-Lowry Base:

5. Lewis Acid:

6. Lewis Base: