AP Chemistry Summer Assignment

I know, I know....no one REALLY wants a summer assignment. But I DO know that you kids want to pass your AP exam and get college credit for all your hard work! So to make that happen, I need you to review what you learned in Honors/Regular Chemistry this summer and be ready to jump into new material when school starts in August! ☺

AP Chemistry Tentative Schedule:

Wednesday, August 16	First class day. Issue books and begin reviewing summer assignment
Thursday, August 17	Summer Assignment Due
Monday, August 21	Test over the Polyatomic Ions and review CH 1-3
Tuesday, August 22	Review chapters 1-3
Wednesday, August 23	Test - Chapters 1-3 (from summer assignment and review)

Here is your assignment:

1. *Memorize the Polyatomic Ions List* (symbol and charge) for the ions on the page attached. There will be a test over this material in the first week of school! Make a Quizlet, make note cards, make lists...whatever it takes for you to succeed! Don't wait until August 20th! Slow and steady wins the race! ☺ Test on 8/21

2. **Complete the attached questions** which includes simple chemistry terminology, as well as naming compounds and a review of some basic chemistry. You may write the answers on this paper or a separate paper. This assignment will be due 8/17 (Thursday)

If you need a solid resource, try Rice University's Open Stax (found here:
https://openstax.org/books/chemistry-2e/pages/1-introduction

That's it!! You can do this. I'm here for you, as well!

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1. Describe the differences between these 3 ways to separate mixtures:
   Distillation separates mixtures by differences in _____
   Filtration separates mixtures by differences in _____ &
   Chromatography separates mixtures by differences in _____.

2. Name the SI units for the following:
   Mass—
   Length—
   Time—
   Temperature—
   Amount of substance—

3. How does one convert between K and Celsius temperature scales?

4. What is density and what are TWO possible units?

5. Differentiate between precision and accuracy.

6. How many significant figures are in the following numbers?
   2.002 _____   0.0040 _____ 5.04×10^{23} _____

   200,000 _____   200,001 _____ 6×10^{200} _____

7. What is the rule for adding and subtracting in relation to significant figures?

8. According to the rules of adding and subtracting SF's, what are the following?

   2.002 + 4 = _____   6.9999 – 4.2 = _____

   4.000 + 7.01 + 9 = _____   15-7.4329 = _____

9. What is the rule for multiplying and dividing, in relation to significant figures?

10. According to the rules for multiplying and dividing SF's, what are the following?
    2.00 x 4.00 = _____   16/2.0 = _____

11. Where are protons found? _____ What charge do they have? _____

12. Where are neutrons found? _____ What charge do they have? _____

13. Where are electrons found? _____ What charge do they have? _____

14. How is the neutron number found using the mass number and the atomic number? Why?

15. Why are the atomic mass numbers on the periodic table numbers with decimal places?

16. Naturally occurring chlorine is 75.78% Cl-35 (atomic mass 34.969 amu) and 24.22% Cl-37 (atomic mass 36.966 amu). Calculate (MUST SHOW WORK) the average atomic mass of chlorine.

17. What are the 7 diatomic elements? List them in their diatomic form.

18. Differentiate between a cation and an anion.

19. What is an ionic compound?

20. How are ionic compounds named?

21. Name the following ionic compounds.   Write the following formulas.

    NaCl   sodium fluoride

    K_2S lithium nitride

    Li_2NO_3 strontium oxide

    MgO   magnesium chloride

    Al_2O_3 sodium bromide

22. What is special about naming ionic compounds that include transition metals?

23. Name the following ionic compounds that contain transition metals; write formulas.

Fe_2O_3 nickel (II) oxide

$CuSO_4$ silver(I) carbonate

Ag_2S cadmium (II) chlorate

CrO_2 manganese (II) chlorite

24. What are covalent compounds made of?

25. How are covalent compounds named?

26. Name the following covalent compounds.   Write formulas for covalent cmpds.

N_2O_5 tetracarbon pentasulfide

CO_2 octaphosphorus monochloride

CO disulfur monoxide

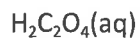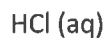P_3F_3 hexanitrogen septafluoride

27. How are binary acids named?

28. How are ternary acids (oxyacids) named? What polyatomic ion endings are changed?

29. What does (aq) mean?

30. Name the following acids.   Write formulas for acids.

    HCl (aq)   sulfuric acid

    $H_2C_2O_4$(aq)   carbonic acid

    HI (aq)   hydrofluoric acid

    $HClO_4$(aq)   acetic acid

Molecular Masses

1. Determine the molar mass of each of the following compounds.
    a. N_2O_5

    b. $FeCO_3$

    c. silicon hexabromide

2. Calculate the percentage by mass of oxygen in the following compounds.
    a. NO_2

    b. $Cr(NO_3)_3$

    c. H_2CO_3

3. The empirical formula of a compound is CH. If the molar mass of this compound is about 78g, what is the molecular formula?

4. Find empirical formulas of the following compounds with the following compositions:
    a. 40.1 % C, 6.6% H, 53.3% O
    b. 18.4% C, 21.5 % N, 60.1 % K

AP Chemistry—Polyatomic Ions

*You must know the name, formula and charge ☺

-1 Charge		-2 Charge		-3 Charge	
Formula	**Name**	**Formula**	**Name**	**Formula**	**Name**
CH_3COO^-	acetate	$C_2O_4^{-2}$	oxalate	PO_4^{-3}	phosphate
HCO_3^-	hydrogen carbonate or bicarbonate	CO_3^{-2}	carbonate	PO_3^{-3}	phosphite
HSO_4^-	hydrogen sulfate or bisulfate	CrO_4^{-2}	chromate	AsO_4^{-3}	arsenate
HSO_3^-	hydrogen sulfite	SO_4^{-2}	sulfate	AsO_3^{-3}	arsenite
ClO^-	hypochlorite	SO_3^{-2}	sulfite		
SCN^-	thiocyanate	$Cr_2O_7^{-2}$	dichromate		
OCN^-	cyanate	SiO_3^{-2}	silicate		
NH_2^-	amide	$S_2O_3^{-2}$	thiosulfate		
N_3^-	azide	HPO_4^{-2}	hydrogen phosphate		
ClO_2^-	chlorite				
ClO_3^-	chlorate				
ClO_4^-	perchlorate				
BrO_3^-	bromate				
OH^-	hydroxide				
NO_3^-	nitrate				
NO_2^-	nitrite				
CN^-	cyanide				
MnO_4^-	permanganate				
$H_2PO_4^-$	dihydrogen phosphate				
IO_3^-	iodate				

+1 Charge

NH_4^+	ammonium

Balancing Equations

5. Balance the following equations:

a. $NaH_2PO_4 \rightarrow NaPO_3 + H_2O$

b. $Ca(OH)_2 + CO_2 \rightarrow Ca(HCO_3)_2$

c. $SrBr_2 + (NH_4)_2CO_3 \rightarrow SrCO_3 + NH_4Br$

d. $Mn_2O_3 + Al \rightarrow Al_2O_3 + Mn$

e. $S + N_2O \rightarrow SO_2 + N_2$

f. $N_2 + H_2 \rightarrow NH_3$

g. $AgNO_3 + FeCl_3 \rightarrow Fe(NO_3)_3 + AgCl$

h. $Fe_2(SO_4)_3 + KOH \rightarrow K_2SO_4 + Fe(OH)_3$

i. $Al_2(SO_4)_3 + KOH \rightarrow Al(OH)_3 + \rightarrow K_2SO_4$

j. $C_7H_{16} + O_2 \rightarrow CO_2 + H_2O$

Stoichiometry

Show your work and box or circle your final answer please. Keep in mind that your first step with stoichiometry is ALWAYS to make sure your equation is balanced (if there is an equation)!!

1. **How many molecules of ethane (C_2H_6) are present in 0.334 g ethane?**

2. **How many moles of cobalt (Co) atoms are there in 6.00 X 10^9 cobalt atoms?**

3. **How many moles of calcium (Ca) atoms are in 77.4 g of calcium?**

4. **How many atoms are present in 3.14 g copper (Cu)?**

5. How many moles of oxygen are necessary to react completely with four moles of propane (C_3H_8)?

$$C_3H_8 + O_2 \rightarrow CO_2 + H_2O$$

6. The fermentation of glucose, $C_6H_{12}O_6$, produces ethyl alcohol, C_2H_5OH and CO_2 as shown here:

$$C_6H_{12}O_6 \rightarrow 2\ C_2H_5OH\ (aq) + 2CO_2\ (g)$$

a. How many moles of CO_2 are produced when 0.300 mol of $C_6H_{12}O_6$ fully reacts?

B. How many grams of $C_6H_{12}O_6$ are needed to form 2.00 g of C_2H_5OH?

C. How many molecules of CO_2 form when 2.00 g of C_2H_5OH are produced?

12. How many grams of $Al(OH)_3$ (molar mass 78.0 g/mol) can be produced from the reaction of 48.6 mL of 0.15 M KOH with excess $Al_2(SO_4)_3$?

$$Al_2(SO_4)_3 + 6KOH \rightarrow 2Al(OH)_3 + K_2(SO_4)$$

13. If 20 L of oxygen are consumed in this reaction, how many liters of carbon dioxide are produced?

$$C_3H_8 + 5O_2 \rightarrow 3\ CO_2 + 4H_2O$$