Welcome to AP Chemistry **Mrs. Scott**

The Course:

AP Chemistry is a two-semester college level course. It is a time-consuming and challenging, yet extremely rewarding course! It moves at a fast pace and will require a large amount of independent study outside of the class. Your study skills will improve and you will learn to do college level work. To have success on the AP exam, students will need to spend on average five to ten additional hours per week outside of class working on AP chemistry. This time will be spent on homework assignments, pre-labs, lab reports, problem sets, etc. There will be times that students will be able to complete things during class if they use their time efficiently. These statements are not meant to discourage, but to point out and state the truth to avoid any misconceptions about the high expectations for this course. As your teacher, I will do my very best to provide a college level course/experience which not only prepares you for the AP exam, but provides a solid foundation in chemistry. It is also intended for it to be fun! You are fortunate to be able to take this type of college level course in the high school setting as part of a small class.

Summer Assignment:

1. Read the Data Analysis Power Point. It has information that you will need throughout the course.
2. Do the worksheets below.

   This will be graded as homework assignment and for correctness. It is due on the FIRST day of class. This is an AP class and all work must be completed independently. You are on the honor system. The material on these pages is NOT new, you learned them last year. But they are skills you will need that I won't be teaching again. You can use your notes from Honors Chemistry to help you or the AP text book.

<u>This form must be signed and returned with Summer Assignment:</u>

I, _____, worked on this assignment by myself. (student signature)

I know that everything that I take credit for in this class is a reflection of both myself and my character. I promise to take full responsibility for all my actions and strive to give my best at all times.

For the fall, similar to Honors Chemistry, you will be given a worksheet packet along with a power point for each chapter/unit. I would recommend a binder for this class. I am really excited to work with you all again this fall!!!

Monatomic Cations	**Monatomic Anions**	**Polyatomic Cations**	**Polyatomic Anions**
Group 1 (including H) H^{+1}, hydrogen Li^{+1}, lithium Na^{+1}, sodium K^{+1}, potassium Cs^{+1}, cesium Group 2 Be^{+2}, beryllium Mg^{+2}, magnesium Ca^{+2}, calcium Sr^{+2}, strontium Ba^{+2}, barium Group 13 Al^{+3}, aluminum Transition and Heavier Metals Cr^{+2}, chromium (II) Cr^{+3}, chromium (III) Mn^{+2}, manganese (II) Mn^{+4}, manganese (IV) Mn^{+7}, manganese (VII) Cu^{+1}, copper (I) Cu^{+2}, copper (II) Fe^{+2}, iron (II) Fe^{+3}, iron (III) Pb^{+2}, lead (II) Pb^{+4}, lead (IV) Hg^{+2}, mercury (II) Ni^{+2}, nickel (II) Ni^{+3}, nickel (III) Sn^{+2}, tin (II) Sn^{+4}, tin (IV) Ag^{+1}, silver Zn^{+2}, zinc	Group 17 and H H^{-1}, hydride F^{-1}, fluoride Cl^{-1}, chloride Br^{-1}, bromide I^{-1}, iodide Group 16 O^{-2}, oxide S^{-2}, sulfide Group 15 N^{-3}, nitride P^{-3}, phosphide	Ammonium, NH_4^{+1} Mercury (I), Hg_2^{+2}	Acetate, $C_2H_3O_2^{-1}$ Bicarbonate (hydrogen carbonate), HCO_3^{-1} Carbonate, CO_3^{-2} Perchlorate, ClO_4^{-1} Chlorate, ClO_3^{-1} Chlorite, ClO_2^{-1} Hypochlorite, ClO^{-1} Permanganate, MnO_4^{-1} Cyanide, CN^{-1} Hydroxide, OH^{-1} Peroxide, O_2^{-2} Nitrate, NO_3^{-1} Nitrite, NO_2^{-1} Chromate, CrO_4^{-2} Dichromate, $Cr_2O_7^{-2}$ Sulfate, SO_4^{-2} Sulfite, SO_3^{-2} Phosphate, PO_4^{-3} Phosphite, PO_3^{-3}

***Note: Transition metals are named with Roman numerals to indicate their oxidation state (charge) if they have multiple oxidation states. Silver and zinc are the only transition metals on this list that have a single oxidation state and therefore are not named with roman numerals. As long as you know which transition metals need Roman numerals, individual charges of these metals do not need to be memorized.

INFORMATION IN THE TABLE BELOW AND IN THE TABLES ON PAGES 3-5 MAY BE USEFUL IN ANSWERING THE QUESTIONS IN THIS SECTION OF THE EXAMINATION.

DO NOT DETACH FROM BOOK.

PERIODIC TABLE OF THE ELEMENTS

1 H 1.0079																	2 He 4.0026
3 Li 6.941	4 Be 9.012											5 B 10.811	6 C 12.011	7 N 14.007	8 O 16.00	9 F 19.00	10 Ne 20.179
11 Na 22.99	12 Mg 24.30											13 Al 26.98	14 Si 28.09	15 P 30.974	16 S 32.06	17 Cl 35.453	18 Ar 39.948
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.90	23 V 50.94	24 Cr 52.00	25 Mn 54.938	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.59	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.1	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.75	52 Te 127.60	53 I 126.91	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	57 *La 138.91	72 Hf 178.49	73 Ta 180.95	74 W 183.85	75 Re 186.21	76 Os 190.2	77 Ir 192.2	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra 226.02	89 †Ac 227.03	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110 § (269)	111 § (272)	112 § (277)						

§Not yet named

*Lanthanide Series	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.4	63 Eu 151.97	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97
†Actinide Series	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np 237.05	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)

GO ON TO THE NEXT PAGE.

Metric Conversions

Unit	Symbol	*Equivalent Expressions*	
mega	M	**1 Mg** = 1,000,000 g = 10^6 g	**1 Mg** = 1,000,000 g = 10^6 g
kilo	k	**1 kg** = 1,000 g = 10^3 g	**1 kg** = 1,000 g = 10^3 g
hecta	h	**1 hg** = 100 g = 10^2 g	**1 hg** = 100 g = 10^2 g
deca	da	**1 dag** = 10 g = 10^1 g	**1 dag** = 10 g = 10^1 g
o		1g = 10^0g	1g = 10^0g
deci	d	**1 g** = 10 dg = 10^1 dg	**1 dg** = 0.1 g = 10^{-1} g
centi	c	**1 g** = 100 cg = 10^2 cg	**1 cg** = 0.01 g = 10^{-2} g
milli	m	**1 g** = 1,000 mg = 10^3 mg	**1 mg** = 0.001 g = 10^{-3} g
micro	µ	**1 g** = 1,000,000 µg = 10^6 µg	**1 µg** = 0.000001 g = 10^{-6} g
nano	n	**1 g** = 1,000,000,000 ng = 10^9 ng	**1 ng** = 0.000000001 g = 10^{-9} g
pico	p	**1 g** = 1,000,000,000,000 pg = 10^{12} pg	**1 pg** = 0.000000000001 g = 10^{-12} g

* Any quantity can be substituted for g; ie. 1 L = 1000 mL just as 1 g = 1000 mg

A helpful pnemonic for memorizing prefixes (you need to know these):

Many **k**ids **h**ave **d**ropped **o**ver **d**ead **c**onverting **m**etric **m**easurements **i**n **p**roblems.

Advanced Placement Chemistry Review Assignment

Topic 1: Significant Figures & Scientific Notation

1. Count the number of significant figures in the following measurements.

   a. 2.71 g _____ b. 0.00047 kg _____ c. 7.0×10^5 m _____ d. 1,030 L _____

   e. 150 pencils _____ f. 37500 µg _____ g. 0.1010 cm _____

2. Express each of the following in proper scientific notation (Pay attention to sig figs and units).

   a. 0.000125 m _____ b. 155.0 mL _____

   c. 123,030,000 ng _____ d. 481.9×10^{-9} cm _____

3. Calculate the correct answer with proper units and significant figures for each of the following:

   a. 12 g + 0.677 g + 86.33 g = _____

   b. (355.78 g) / (0.056 g) = _____

   c. 97.34 mL – 34.1 mL = _____

   d. 14.68 x 5 = _____

4. Perform the following calculations with scientific notation and report your answer with the correct number of significant figures.

   a. $0.14 \times (6.02 \times 10^{23})$ = _____

   b. $\dfrac{(9.875 \times 10^4) - (9.795 \times 10^4)}{9.875 \times 10^4} \times 100\ \%$ = _____ (assume 100 is exact)

   c. $\dfrac{(3.8 \times 10^{-12} \times 4.0 \times 10^{-13})}{(4 \times 10^{12} \times 6.3 \times 10^{13})}$ = _____

Topic 2: Dimensional Analysis

Show work using dimensional analysis. No work = no credit even if answer is correct. Follow significant figures and rounding rules unless the number of significant figures is specified. Include units where appropriate.

5. How many hours are in a week? Report your answer to three significant figures.

6. Find the number of centimeters in 1.00×10^2 yards. (1 yd = 3 ft, 1 ft = 12 in, 2.54 cm = 1 in)

7. If Jules Verne expressed the title of his famous book, Twenty Thousand Leagues under the Sea in basic SI units, what would the title be? Round your answer to three significant figures.
   (1 league = 3.45 mi, 1 mi = 1609 m)

8. How many µL are present in 250 mL of H_2O?

9. Wavelengths are often represented in nm. What is the diameter of a helium (He) atom in nm if it is equivalent to 1.0×10^{-13} km?

10. The area of a rectangular room has a length of 10.5 m and a width of 4.50 m. What is this area in m^2? In cm^2?

11. The acceleration of a sphere is determined to be 9.52 m/s^2. What is the acceleration in km/min^2?

Topic 3: Density and Temperature

Show all work. No work = no credit even if answer is correct. Follow significant figures and rounding rules. Include units where appropriate.

12. A rectangular block has dimensions of 2.9 cm x 3.5 cm x 10.0 cm. The mass of the block is 615.0 grams. What are the volume and the density of the block?

13. The density of pure silver is 10.5 g/mL at 20°C. If 5.25 grams of pure silver pellets are added to a graduated cylinder containing 11.2 mL of water, to what volume will the water in the cylinder rise?

14. You can figure out whether a substance floats or sinks if you know its density and the density of the liquid. In which of the liquids listed below will high-density polyethylene, HDPE, float? HDPE, a common plastic, has a density of 0.97 g/cm^3. It does not dissolve in any of the following liquids.

Substance	Density (g/cm^3)
ethylene glycol	1.1088
water	0.9997
ethanol	0.7893
methanol	0.7914
acetic acid	1.0492
glycerol	1.2613

15. Mercury is found as a liquid at room temperature. If it has a boiling point of 630. K, what is this boiling point in degrees Celsius?

Topic 4: Precision and Accuracy

16. The density of ethanol was determined experimentally at 25°C in a series of trials to be 0.608 g/mL, 0.705 g/mL, and 0.689 g/mL. The accepted density of ethanol is reported to be 0.789 g/mL.
    a. Are the experimental densities precise? Why/Why not?

    b. Calculate % error for this experiment. Use the average experimental density in your calculation and report your answer to 0.1%. Show your work.

    c. Are the experimental densities accurate? Why/Why not?

Topic 5: Properties and Changes

17. Categorize each of the following as an element, a compound, or a mixture:
    a. carbonated water _____
    b. tungsten _____
    c. aspirin (acetylsalicylic acid) _____
    d. air _____
    e. lye (sodium hydroxide) _____
    f. fluorine _____

18. Iron pyrite, also known as fool's gold, has a shiny golden metallic appearance. Crystals are often in the form of perfect cubes. A cube of iron pyrite measuring 0.40 cm on each side has a mass of 0.064 g.

    a. Which of these observations are qualitative and which are quantitative?

    b. Which of these observations are extensive (dependent on the amount of substance present) and which are intensive (independent of the amount of substance present)?

19. Identify the following as a physical property, physical change, chemical property, or chemical change:

    a. Ethanol has a density of 0.697 g/mL. _____

    b. The solution turns blue upon mixing water and food coloring. _____

    c. Wood burns in an oven. _____

    d. Methyl alcohol is highly flammable. _____

    e. Ice melts in a beaker. _____

    f. Methyl ethanoate smells like apples. _____

    g. Iron rusts on a car. _____

    h. Alkali metals react strongly in hydrochloric acid. _____

Topic 6: Atom Structure & History

20. How many protons and neutrons are contained in the nucleus of each of the following atoms? How many electrons are present in each of these neutral atoms?

    a. $^{13}_{6}C$ ____ protons ____ neutrons ____ electrons

    b. $^{208}_{82}Pb$ ____ protons ____ neutrons ____ electrons

21. Complete the following table:

Name	Mass #	Atomic #	# of Protons	# of Neutrons	# of Electrons	Symbol
Gallium-70					31	
						$^{31}_{15}P^{-3}$
Strontium-80					36	
						$^{55}_{25}Mn^{+2}$

22. The natural abundance for boron isotopes is 19.9% boron-10 (exact mass 10.013 amu) and 80.1% boron-11 (exact mass 11.009 amu). Calculate the average atomic mass of boron using the exact masses instead of mass numbers in your calculations. Show your work. Follow significant figures and rounding rules. Include appropriate units.

23. Europium has two stable isotopes, ^{151}Eu and ^{153}Eu, with masses of 150.9197 u and 152.9212 u, respectively. Calculate the percent abundances of these isotopes of europium to 0.1%. Hint: The percent abundances of these two isotopes must add to 100%. Show your work. Follow significant figures and rounding rules. Include appropriate units.

_____

Topic 7: Periodic Table Structure

Identify by name the group or section of the periodic table noted for the following features.

26. a. group containing the most reactive nonmetals; all are diatomics; form -1 ions _____

b. group containing metals that only form +2 ions _____

c. set of metals that often form colored ions in solution; the majority have multiple charges as ions

_____

d. group containing the most reactive metals; form +1 ions _____

e. group containing least reactive elements on periodic table, typically inert _____

27. These elements start with the letter B: B, Ba, Bk, Bi, and Br. Identify which of these elements match the following descriptions. You may use elements once, more than once, or not at all.

a. Which are metals? _____

b. Which are liquids? _____

c. Which are actinides? _____

d. Which are main block elements? _____

Topic 8: Compound Nomenclature

28. Name or give the formula for the following compounds. All ions included in the summer letter are required to be memorized by name and by formula.

	Name	Formula
a.	lithium fluoride	_____
b.	_____	K_2O
c.	calcium phosphate	_____
d.	_____	$MnCl_2$
e.	silver sulfide	_____
f.	_____	Cu_2O
g.	aluminum sulfate	_____
h.	_____	$ZnCO_3$
i.	chromium (III) phosphide	_____
j.	_____	SO_3
k.	lead (IV) hydroxide	_____
l.	_____	N_2O_5

m. ammonium sulfite _____

n. _____ $BaCr_2O_7$

o. sodium peroxide _____

p. _____ NH_3 (use common names; see ppt/videos if necessary)

q. nickel (II) hypochlorite _____

r. _____ $Fe(CN)_3$

s. rubidium chromate _____

t. _____ $Mg_3(PO_4)_2$

Topic 9: Equations

29. Balance the following equations using the lowest whole-number coefficients.

a. __Fe + __P_4 → __Fe_3P_2

b. __Ca + __H_2O → __$Ca(OH)_2$ + __H_2

c. __$Ba(OH)_2$ + __H_3PO_4 → __$Ba_3(PO_4)_2$ + __H_2O

d. __$(NH_4)_2CO_3$ + __$Al(ClO_3)_3$ → __$Al_2(CO_3)_3$ + __NH_4ClO_3

30. Write balanced chemical equations for the following word equations. Use the lowest possible whole-number coefficients to balance the equations.
    a. Aqueous solutions of ammonium sulfate and barium nitrate form a precipitate of barium sulfate and aqueous ammonium nitrate.

    b. Elemental magnesium and oxygen gas combine to form solid magnesium oxide.

    c. Chlorine gas and aqueous potassium bromide react to form bromine liquid and aqueous potassium chloride.

    d. Solid copper (II) carbonate decomposes to form crystals of copper (II) oxide and carbon dioxide gas.

    e. Sulfuric acid is neutralized by lithium hydroxide to form water and aqueous lithium sulfate.

    f. Liquid benzene, C_6H_6, undergoes combustion in oxygen gas, making carbon dioxide gas and steam.

Topic 10: Mole Conversions & Stoichiometry

Show your work. No work = no credit. Follow significant figures and rounding rules. Include appropriate units.

31. a. Calculate the number of moles in 500. atoms of iron (Fe).

    b. What is the molar mass of lead (IV) carbonate, $Pb(CO_3)_2$?

    c. How many formula units are present in 87.2 grams of lead (IV) carbonate?

    d. What percentage of oxygen is found in lead (IV) carbonate? Round your answer to 0.1%.

32. The reusable booster rockets of the U.S. space shuttle employed a mixture of aluminum and ammonium perchlorate for fuel. A possible reaction for this is:

__Al(s) + __ NH_4ClO_4(s) → __ Al_2O_3(s) + __ $AlCl_3$(s) + _ NO(g) + __H_2O(g)

a. Balance the above reaction using the lowest possible whole-number coefficients.

b. If 4.00 g of aluminum reacted completely, how many grams of aluminum oxide would be made?

c. If 4.18 g of aluminum chloride was produced, how many moles of ammonium perchlorate would be consumed?

d. How many molecules of nitrogen monoxide would form if $6.3x10^{25}$ formula units of aluminum oxide were also produced?

33. The decomposition of ammonia is shown in the following equation: $2NH_3(g) \rightarrow N_2(g) + 3H_2(g)$.

a. 42.0 g of nitrogen has what volume in liters at STP?

b. 150 L of NH_3 undergoes decomposition to form how many liters of hydrogen gas at STP?

c. How many liters of ammonia were decomposed at STP if $3.0x10^{23}$ nitrogen molecules were made?