AP Chemistry Summer Assignment **May 2018**

Future AP Chemistry Student,
Welcome to AP Chemistry! I am eagerly anticipating a great year of Chemistry. In order to ensure the best start for everyone next fall, I have prepared a **summer assignment** that reviews **basic chemistry concepts**. There is a multitude of tremendous chemistry resources are available via the Internet. With the ready access to hundreds of websites either in your home or at the local library, I am confident that you will have sufficient resources to prepare adequately for the fall semester. There are few old chemistry textbooks which can be picked up for your reference. The reference text book as part of AP course is "Chemistry- The central science" by LeMay, Brown, Burstein.

You may contact me by **email: (sswindall@henry.k12.ga.us)** this summer. I will do my best to answer your questions **ASAP**.
I hope you are looking forward to an **exciting year** of chemistry. You are all certainly **fine** students, and with **plenty** of motivation and hard work you should find AP Chemistry a successful and rewarding experience.

Finally, I recommend that you spread out the summer assignment. Please do not try to complete it all in the final week of the summer. Chemistry takes time to **process** and **grasp** at a level necessary for success in AP Chemistry. Remember, AP Chemistry is an **equivalent course to Introductory Chemistry** in college. Taking a college level course **in high school is difficult**, **requires dedication**, and is a **great investment** in your education so prepare yourself and arrive ready to learn.
Have a **great summer** and **enjoy** learning chemistry.

Ms. Swindall

USE SIGNIFICANT DIGITS in problems.

1. What does it mean by "significant numbers"? Why is important to consider significant numbers / digits in calculations. How does it help the scientist?

2. Write the **most common guidelines** to determine significant figures (digits) with an example? How does it differ in math operations like multiplication/division/ addition/subtractions?

3. Use **factor labeling** method **to convert** the following: Use significant digits to express the final answer.
   a. 4000 meters = ___ miles.
   b. 3450 cm = ____ Km
   c. 10.0 years= _____ seconds.

4. Classify each of the following as units of mass, volume, length, density, energy, or pressure.
   a. $Kg.m^2/s^2$ b. Liter c. cm^3 d. mm e. kg/m^3 f. pascal
   g. atm h. cal.

5. Convert the following temperature 45℃ into kelvin and Fahrenheit. What does temperature of an object mainly signify?
   a. ℉ B. Kelvin

6. A cylinder rod formed from an element X is 50.0 cm long and has a mass of 4.00 kg. The density of element X is 4.234 g/cm^3. What is the radius of the cylinder?

7. Record the following in correct **scientific notation**:
   a. 3.0002 mol b. 0.00045 Å c.85640000 atoms d. 0.00340 rams

8. Calculate the following to the **correct number** of significant figures.
   a. 4.45 g / 5.296 cm^3
   b. 22 g + 0.457 g
   c. 6.5478 x 8.173 x 3.4
   d. 101- 2.35- 0.4 – 1.23 =
9. Give the **chemical symbols** for the following elements:
   a. Carbon b. sulfur c. Krypton d. Fluorine e. lead f.Arsenic g.Potassium h. chloride i. Iron

10. Write **the latin** names for each of the elements symbols:
    a. Na b. Au c. Ag d. Sn e. Fe f. Hg g. K h. Pb

11. Define a physics change and chemical change. Label each of the following as either a **physical process** or a **chemical process**.
    a. Cutting a piece of aluminum metal.
    b. Melting of wax.
    c. Pulverizing ice.
    d. Frying a samosa or (potato).
    e. Explosion of nitroglycerin.
    f. Electrolysis of water.

12. What is the main difference between element, compound, and mixture? Draw a particle diagram to show the difference.
13. Name some of the common separation methods for pure **substances and mixtures**? Use examples to show how they work.

14. State the postulates of Dalton's atomic theory. What were the drawbacks and explain why.

15. Write the formula of the following compounds?
    a. Calcium Acetate. b. Ammonium Phosphate c. Lithium Nitrite

    d. Barium perchlorate. e. Barium Oxide f. Zinc (II)sulfate.

    g. Sodium Per bromate I. Calcium Iodide J. Gallium(III) Carbonate.

17.Define the words: **atomic number, atomic mass, mass number, molecular formula, structural formula, empirical formula, isotopes, cation, anion, metalloid, and allotrope**, **isoelectronic** .

18.Determine **number of protons and neutrons** in each of the following.

a. K_{19}^{39} b. $^{23}_{11}Na$. c. $^{208}_{82}Pb^{2+}$ d. $^{33}_{15}P^{3-}$

22. Classify the following into diatomic molecule, molecular compound, ionic compound, Atomic element.

a. F_2 b. Cl_2 c. C d. NaCl e. KF f. CO_2 g. H_2 h. Ag
i. Rust (Fe_2O_3) j. MgO k. O_2 l. I_2 m.CO n. K_2CO_3

23. **State the contribution of the following chemist in one line.**

a. Democritus b. Mendeleev c. Henry Becquerel d. Roentgen e. J.J Thompson plum pudding model f. Rutherford gold foil experiment g. Chadwick h. Millikan oil drop method

24. What is the difference between a. Nitogen and Nitride ion b. Phosphorus atom and Phosphate ion.

25. Why do we call $Mg(NO_3)_2$ magnesium nitrate, but we call $Ni(NO_3)_2$ Nickel(II) nitrate?

26. How many grams of methane (CH_4) are present in 50 grams of methane gas?
(USE factor labeling method)

27. Calculate the mass of O_2 produced if 10.00g sodium chlorate is completely decomposed by heating.

28. Calculate the **mass in grams** of each of the following:
a. 2.01×10^{10} atoms of Bromine gas b. 3.01×10^{23} formula units of BaI_2.

29.In an experiment, a student gently heated a hydrated copper compound to remove the water of hydration. The following data was recorded:

1. Mass of crucible, cover, and contents before heating 23.4 g.
2. mass of empty crucible and cover 18.82 g.
3. mass of crucible, cover, and contents after heating to constant mass 20.94 g.

Calculate the experimental percent of water in the compound.

29. An **extensive property** is one that depends on the amount of the sample. Which of the following properties are extensive?
a. volume b. density c. temperature d. energy e. melting point. F. pressure

30.A hydrated compound has an analysis of 18.29% Ca, 32.37% Cl, and 49.34% water. What is its Empirical formula?

31. Name the types of **general inorganic reactions** with example of each?

32. Define an Arrhenius Acid, Arrhenius base and salt? Give some examples of each.

33. What mass of Iron is required to replace silver from 8.00g of silver nitrate dissolved in water?

$$Fe(s) + AgNO_3 \rightarrow Fe(NO_3)_2 + Ag.$$

34. Define and give examples a. Law of conservation of mass. b. Law of multiple proportion.

35.Strontium consists of four isotopes with masses and their percent abundance of 83.9134 amu (0.5%), 85.9094 amu (9.9%) , 86.9089 amu (7.0 %) , and 87.9056 amu (82.6 %). Calculate the atomic mass of Sr ?

36.Nitrogen has two isotopes, N-14 and N-15, with atomic masses of 14.00031 amu and 15.001 amu, respectively. What is the percent abundance of N-15?

37.The molecular formula of morphine, a pain-killing narcotic, is $C_{17}H_{19}NO_3$.

a.What is the molar mass?
b.What fraction of atoms in morphine is accounted for by carbon?
c.Which element contributes least to the molar mass?

38.The hormone, thyroxine is secreted by the thyroid gland, and has the formula: $C_{15}H_{17}NO_4I_4$. How many milligrams of Iodine can be extracted from 15.0 Grams of thyroxine?

39. Calculate the percentage by mass of the following compounds:
a. sulfur in sulfuric acid b. Carbon in acetone.

40.Arsenic reacts with chlorine to form a chloride. If 1.587 g of arsenic reacts with 3.755 g of chlorine, what is the simplest formula of the chloride?

41.Washing soda is a hydrate of sodium carbonate. Its formula is $Na_2CO_3 . x H_2O$. A 2.714 g Sample of washing soda is heated until a constant mass of 1.006 g of Na_2CO_3 is reached. What is x ?

42. Explain the difference between heat and temperature. Use an example .

43.Determine the empirical and molecular formula of each of the following substances:

a.Ibuprofin, a headache remedy contains 75.6 % C, 8.80 % H , and 15.5 % O by mass and has a molar mass about 206 g/mol.

44. What are the types of inorganic reactions. Write a **balanced equation** for the following:

a.Reaction of boron trifluoride gas with water to give liquid hydrogen fluoride and solid boric acid,(H_3BO_3).

b.Reaction of magnesium Oxide with Iron to form Iron (III) Oxide and Magnesium.

c.The decomposition of dinitrogen Oxide gas to its elements.

d.The reaction of Calcium Carbide solid with water to form calcium hydroxide and acetylene (C_2H_2) gas.

e.The reaction of solid calcium cyan amide ($CaCN_2$) with water to from calcium carbonate and ammonia gas.

f.Ethane burns in air (Oxygen).

g.Hydrogen reacts with oxygen to from Water.

h.Nitrogen gas reacts with Hydrogen to form Ammonia.
i.Hydrogen reacts with Iodine gas to form Hydrogen Iodide.

j. Sodium reacts with Iodine gas to form Sodium Iodide.

k.Carbon dioxide combines with water to form carbonic acid.

l.Magnesium and nitrogen gas combine to form magnesium nitride.

m.Conc. Hydrochloric acid reacts with Conc. Sodium hydroxide to form sodium chloride and water.

45. **DEFINE limiting reagent, theoretical yield , and actual yield?**

46.Sodium hydroxide reacts with carbondioxide as follows:

$2\ NaOH(s) + CO_2(g) \rightarrow Na_2CO_3(s) + H_2O(l)$

Which reagent is the limiting reactant when 1.85 mol of sodium hydroxide and 1.00 mol carbondixide are allowed to react? How many moles of sodium carbonate can be produced? How many moles of the excess reactant remain after the completion of the reaction?

47. WHEN benzene (C_6H_6) reacts with bromine (Br_2) bromobenzene(C_6H_5Br) is obtained:
$C_6H_6 + Br_2 \rightarrow C_6H_5Br + HBr$

a.What is the theoretical yield of bromobenzene in this reaction when 30.0g of benzene reacts with 65.0 g of bromine?
b. If the actual yield of bromobenzene was 56.7 g what was the percentage yield?

48.Define exothermic and endothermic reactions. What happens to the temperature of the surrounding during endo and exothermic reactions.

49.To prevent a condition called the "bends", deep sea divers breathe a mixture containing, in mole percent, 10.0% O_2, 10.0% N_2 , and 80.0% He.

a.Calculate the molar mass of this mixture.

b.What is the ratio of the density of this gas to that of pure Oxygen?

50.When Hydrogen sulfide gas, H_2S, reacts with oxygen, Sulfur dioxide gas and steam are produced.

a.Write the balanced chemical equation for this reaction.

b.How many liters of sulfur dioxide would be produced from 10.0 l of Oxygen? Assume 100% yield and that all gases are measured at the same temperature and pressure.

AP CHEMISTRY (Common mono, di & polyatomic ions.) You must **MEMORIZE** the formula and charges of all of the polyatomic ions.

I)	Name (Ion)	Symbol(Ion)
a)	Sodium	
b)	Potassium	
c)	Cesium	
d)	Beryllium	
e)	Calcium	
f)	Strontium	
g)	Barium	
h)	Gallium	
i)	Aluminum	
j)	Nitrogen	
k)	Arsenic	
l)	Bismuth	
m)	Oxygen	
n)	Fluorine	
o)	Chlorine	
p)	Bromine	
q)	Iodine	

Common ions of transition elements

Ion Name	Ion
a) Chromium(III)	
b) Manganese(II)	
c) Iron(II) or Ferrous	
d) Iron(III) or Ferric	
e) Cobalt(II)	
f) Nickel(II) or nickel	

g) Copper(II) or Cupric
h) Zinc
i) Silver
j) Cadmium
k) Mercury(II) or mercuric

Common Polyatomic Ions

Name	Formula	Name	Formula
a) Acetate		b) Ammonium	
c) Carbonate		d) Chlorate	
e) Chlorite		f) Chromate	
g) Cyanide		h) Dichromate	
i) Dihydrogen Phosphate		j) Dihydrogen Phosphate	
k) Hydrogen Carbonate		l) Hydrogen Sulfate	
m) Hydrogen Sulfite		n) Hypochlorite	
o) Hydroxide		p) Nitrate	
q) Nitrite		r) Oxalate	
s) Perchlorate		t) Permanganate	
u) Perioxide		v) Phosphate	
w) Sulfate		x) Sulfite	
y) Thiosulfate			

Common Acids	Formula	Common Acids	Formula
Hydrochloric Acid		Phosphoric acid	
Perchloric acid			
Carbonic acid		Sulfurous Acid	
Nitrous acid		Sulfuric Acid	
Nitric Acid		Hypochlorous Acid	
Chlorous Acid		Chloric Acid	