AP Chemistry Summer Assignment

Hello and welcome to AP Chemistry.

The following assignment will be a helpful review for a few topics learned in chem 1.

You ***Must*** learn the common polyatomic ions and solubility rules provided on the next page.

The attached assignment covers chapter 1, 2 and part of chapter 3.

On my school website look in the folder labelled **Summer Review Material Webpage**.
It contains screencasts that will help with the summer assignment. Other helpful sites;

- http://www.mychemistrytutor.com
- http://www.chemmybear.com/groves/apchem.html
- http://www.bozemanscience.com/ap-chemistry/

When you return in September there will be an exam on: ***Mole Conversion*** (excluding gas volume)
Polyatomic ions
Solubility Rules
Naming Chemical Formulas

Email me if any questions arise.

Dr. C

Selected Polyatomic Ions

Formula	Name
H_3O^+	hydronium
Hg_2^{2+}	mercury(I)
NH_4^+	ammonium
$C_2H_3O_2^-$ } CH_3COO^- }	acetate
CN^-	cyanide
CO_3^{2-}	carbonate
HCO_3^-	hydrogen carbonate
$C_2O_4^{2-}$	oxalate
ClO^-	hypochlorite
ClO_2^-	chlorite
ClO_3^-	chlorate
ClO_4^-	perchlorate

Formula	Name
CrO_4^{2-}	chromate
$Cr_2O_7^{2-}$	dichromate
MnO_4^-	permanganate
NO_2^-	nitrite
NO_3^-	nitrate
O_2^{2-}	peroxide
OH^-	hydroxide
PO_4^{3-}	phosphate
SCN^-	thiocyanate
SO_3^{2-}	sulfite
SO_4^{2-}	sulfate
HSO_4^-	hydrogen sulfate
$S_2O_3^{2-}$	thiosulfate

Solubility Rules

The following are always soluble with anything

Group I metals
Ammonium NH_4^+
Nitrate NO_3^-
Acetate $C_2H_3O_2^-$
Hydrogen carbonate HCO_3^-
Chlorate ClO_3^-

Partial solubility- the following are soluble with everything except

Halides (Cl^-, Br^-, I^-)
Ag^+, Pb^{2+}, Hg_2^{2+}

Sulfates (SO_4^{2-}) - Hungry seniors always bake peanut butter cakes
Hg_2^{2+} Sr^{2+} Ag^+ Pb^{2+} Ca^{2+}

The folloing are solube with Group I metals, NH_4^+ and...

Hydroxides (OH^-) - Seniors bake cakes
Sr^{2+} Ba^{2+} Ca^{2+}

Chromate(CrO_4^{2-}) - Make cakes
Mg^{2+} Ca^{2+}

Mole Conversions

1 Mole = Formula Mass (g) = 6.02×10^{23} molecules, atoms, particles = 22.4 L of gas @ STP
(AKA Molar Mass)

Please Define the Following (primarily chapter 1)

Pure substance

Element

Compound

Law of Constant Composition

Law of Definite Proportions

Physical Property

Chemical Property

Physical Change

Chemical Change`

1. Use **factor labeling** method to convert the following:

a. 50.0mL = ___ liters.

$$? \text{ L} = 50.0 \text{ mL} \times \frac{1 \text{ L}}{1000 \text{ mL}} = 0.0500 \text{ L (to 3 significant figures)}$$

b. 650 in = ____ meters

c. 4 years= _____ seconds.

d. 200 liters = _____ ml

2. Classify each of the following as units of mass, volume, length, density, energy, or pressure.

a.Kg b. Liter c. m^3 d. mm e. kg/m^3

f. Joule g. atm h. cal i.Torr J. g/ml

3. Most laboratory experiments are performed at room temperature at 25°C. Express this temperature in:

a. °F

b. K

4. How many **significant figures** are in each of the following?

a. 1.9200 mm b. 0.0301001 kJ c. 6.022×10^{23} atoms

d. 460.000 L e. 0.000036 cm^3 f. 10000

g. 1001 h. 0.001345 i. i.0.0101

J. 3.02×10^{4} k. 3.21×10^{-2}

5. Write the number 1200 three ways: to 2, 3, and 4 significant figures

6. Record the following in correct **scientific notation:**
   a. 4,050,000,000 cal 4.05×10^9 cal
   b. 0.000123 mol
   c. 0.00345 Å
   d. 700,000,000 atoms

7. Calculate the following to the **correct number** of significant figures.
   a. 1.270 g / 5.296 cm^3
   b. 12.235 g / 1.010 L
   c. 12 g + 0.38 g
   d. 170g + 2.785 g
   e. 2.1 x 3.2102
   f. 200.1 x 120
   g. 17.6 + 2.838 + 2.3 + 200.

8. A cylinder rod formed from silicon is 46.0 cm long and has a mass of 3.00 kg. The density of silicon is 2.33 g/cm^3. What is the diameter of the cylinder? (the volume of cylinder is given by $V=\pi r^2h$, where r is the radius and h is the length)

9. Give the **chemical symbols** for the following elements:
   a. Carbon b. sulfur c. Titanium d. Nitrogen e. Helium

   f. Krypton g. Fluorine h. Scandium I. Arsenic J. Potassium

   k. Sodium l. chloride m. Iron n. Zinc

10. A container has a volume of 1.05×10^3 cm^3. When filled with gas, the mass of the container + gas is 837.6 g. The mass of the container alone is 836.2 g. To the correct number of significant figures, what is the density of the gas? D=m/v

11. Classify each of the following as to pure substances or mixtures. If an item is a mixture, specify if it is heterogeneous or homogeneous.

(a) concrete

(b) seawater

(c) magnesium

(d) gasoline

(e) air

(f) tomato juice

(g) iodine crystals

(h) a nickel

12. How would you separate a mixture of granulated sugar and beach sand of comparable grain size?

13. Label each of the following as either a **physical process** or a **chemical process.**

a. Corrosion of aluminum metal.

b. Melting of ice.

c. Pulverizing an aspirin.

d. Digesting a candy bar.

e. Explosion of nitroglycerin.

f. Milk turning sour.

g. Burning of paper.

h. Forming of frost on a cold night.

i. Bleaching of hair with H_2O_2.

j. A copper wire is hammered flat.

14. A solid white substance A is heated strongly in the absence of air. It decomposes to form a new white solid substance B and a gas C. The gas has exactly the same properties as the product obtained when carbon is burned with excess oxygen. What can you say about whether solids A and B and the gas C are elements or compounds?

15. In the process of attempting to characterize a substance, a chemist makes the following observation: The substance is a silvery white, lustrous metal. It burns in air, producing an intense white light. It reacts with chlorine to give a brittle white solid. The substance can be pounded into thin sheets or down into wires. It is a good conductor of electricity. Which of these characteristics are physical and which are chemical properties?

16. Why do we call $Ba(NO_3)_2$ barium nitrate, but we call $Fe(NO_3)_2$ iron(II) nitrate?

17. Write the formula of the following compounds? (google → "formula writing")
a. Calcium sulfate. b. Ammonium Phosphate c. Lithium Nitrite

d. potassium perchlorate. e. Barium Oxide f. Zinc sulfide.

g. Sodium Perbromate I. Calcium Iodide J. Aluminum Carbonate

18. Convert **6.75 atm** to: (Using **factor-labeling** method) (google →"pressure conversions ")
a.torr

b. kilopascals

c. mm of Hg

Define the following (primarily Chap 2)

Dalton

Thomson

Millikan

Becquerel

Curie

Chadwick

Atomic number

Atomic mass

Average atomic (isotopic) mass

Mass spectrometer

Structural formula

How many grams of methane (CH_4) are present in 5.6 moles of methane gas?
(*Using the factor labeling method)*

What is the difference between?

a. Chlorine and Chloride

b. Sodium atom and Sodium ion

How many grams of methane (CH_4) are present in 5.6 moles of methane gas?
(Use the factor labeling method)

19. Nitrogen (atomic mass=14.00674) 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?
(google→ "atomic mass isotope abundance ")

20. Write the number of protons and electrons?

	Protons	Neutrons	Electrons
a P_4 molecule			
b. a PCl_5 molecule			
c. a P^{3-} Ion			
d. P^{5+} ion			

21. Mercury has an atomic mass of 200.59 amu. Calculate the
a. Mass of 3.0×10^{10} atoms

b. Number of atoms in one nanogram of Mercury

22. Calculate the molar masses (g/mol) of
a.Ammonia (NH_3)

b. Baking soda ($NaHCO_3$)

c. Osmium Metal (Os)

23. List the following has diatomic molecule, molecular compound, ionic compound, atomic element.

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

24. White gold is an alloy that typically contains 45.0% by mass gold and the remainder is platinum. If **154 g** of gold are available, how many grams of platinum are required to combine with the gold to form this alloy?

25. What is the empirical formula of a compound that contains 53.73% Fe and 46.27% of S ? (Google ➔"empirical formula percent ")

26. Determine the number of molecules present in 4.56 mol of nitrogen (N_2). (Google➔"mole conversions ")

Atoms?

27. A hydrated compound has an analysis of 18.29% Ca, 32.37% Cl, and 49.34% water. What is its formula? (Google➔ "percent empirical formula ")

28. Name the 4 types of **general inorganic reactions** with example of each?

29. Define Acid, base and salt? Give two examples of each.

Acid-

Base-

Salt-

30. 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? (hint...mass% I)

31. Determine the **formula weight** (aka molar mass) for the following:

a. N_2O_5

b. $CuSO_4$

c. $Ca(HCO_3)_2$

d. $CaSO_4 \bullet 2H_2O$

32. Determine the empirical formula of the compounds with the following compositions by mass:

a. 10.4 % C, 27.8% S , 61.7 % Cl

b. 21.7 % C, 9.6 % O, and 68.7 % F

33. **Common Polyatomic Ions** ***(Please provide in the following)***

Name	Formula with charge	Name	Formula with charge
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			

34.

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

35. Ion Name Symbol with charge

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

36. **Common ions of transition elements**

Ion Name Ion

a) Chromium(III)

b) Manganese(II)

c) Iron(II)

d) Iron(III)

e) Cobalt(II)

f) Nickel(II)

g) Copper(II)

h) Zinc

i) Silver

j) Cadmium

k) Mercury(II)

37. One way to remove Nitrogen Oxide (NO) from smokestack emissions is to react it with ammonia:

$4\ NH_3\ (g) + 6\ NO\ (g) \text{ --------> } 5\ N_2\ (g) + 6\ H_2O\ (l)$

a. 12.3 mol of NO reacts with _____ mol of ammonia

b. 5.87 mol NO yields _____ mol nitrogen.

38. Name the following covalent compounds:

a. CO_2

b. P_4S_{10}

c. NI_3

d. PCl_5

e. CCl_4

f. SF_6

g. CH_4

h. C_2H_6

i. C_3H_8

39. Define **Oxidation number**.

Find the **Oxidation number** of

a. Carbon in CO_2

b. Sulfur in H_2SO_4

c. Phosphorus in PO_4^{3-}

d. Manganese in MnO_4^{2-}

40. What mass of copper is required to replace silver from 4.00g of silver nitrate dissolved in water?

(Google➔"stoichiometry ")

___Cu(s) + ___$AgNO_3$ → ___$Cu(NO_3)_2$ + ___Ag

41. Write the chemical formulas for the following compounds:

a. Calcium Carbonate

b. Ammonium Phosphate

c. Sodium Chloride

d. Sodium Oxide

e. Calcium Sulfate

f. Sodium Nitrite

g. Magnesium Acetate

h. Potassium cyanide

i. Zinc(II) Nitrate

j. Iron(III) Phosphate

k. Nickel (II) Fluoride

b. Law of multiple proportion

42. 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 ? (Google➔ "atomic mass calculation ")