Honors Chemistry Mid-Year Review

- **Density**

What is the formula for density? D=Mass/Volume

A cube of gold-colored metal with a volume of 54cm^3 has a mass of 980g. The denisty of the gold is 19.3g/cm^3. Is the metal pure gold? NO 18.15g/cm^3

What is the volume of 70.0g of ether if the density of ether is 0.70 g/cm^3? 100 cm^3

- **Chemical and Physical Changes**

Identify the following as a chemical or physical change:

burning wood chem	melting ice physical
photosynthesis chem	heating copper wire physical
iodine subliming physical	composting garbage chem

- **Oxidation numbers**

What are the symbols and oxidation numbers of the following:

Lithium Li^{+1}	Nitrogen N^{-3}
Fluorine F^{-1}	Boron B^{+3}
Calcium Ca^{+2}	sulfate SO_4^{-2}
carbonate CO_3^{-2}	nitrate NO_3^{-1}
phosphate PO_4^{-3}	ammonium NH_4^{+1}

- **Writing formulas for compounds**

Write the correct fromulas for the following compounds:

aluminum chloride $AlCl_3$	magnesium oxide MgO
sodium acetate $NaC_2H_3O_2$	ammonium sulfate $(NH_4)_2SO_4$
aluminum sulfide Al_2S_3	calcium phosphate $Ca_3(PO_4)_2$

- **Name the following compounds**

$FeCl_3$ iron (III) chloride	Ag_2S silver (I) sulfide
NH_4NO_3 ammonium nitrate	N_2O_5 dinitrogen pentoxide
SO_3 sulfur trioxide	H_2O dihydrogen monoxide

- **Molar Mass of Compounds**

Calculate the molar mass of the following:

NaCl 58g/mol	$MgCO_3$ 84g/mol
$C_{12}H_{22}O_{11}$ 342g/mol	$CuSO_4$ 160g/mol
$(NH_4)_2S$ 68g/mol	

- **Percent Composition**

Calculate the percent compostion of Fe_2O_3 70% Fe, 30% O

What is the percentage of carbon in $C_6H_{12}O_6$? 40% C

What is the percent composition of NiO, is a sample of NiO with a mass of 10.3 grams contains 8.1 grams Ni and 2.2 grams O? 78.6% Ni, 21.4% O

- **Empirical formulas**

What is the empirical formula of a compound that is 40.7% carbon, 54.2% oxygen, and 5.1% hydrogen? $C_2H_3O_2$

The empirical formula of a compound is C_2H_3O. The molar mass of the compound is 172 g. What is its molecular formula? $C_8H_{12}O_4$

The percentage composition of Teflon, a polymer used for nonstick surface of cooking utensils, is 24% C and 76% F. What is the empirical formula? CF_2

- **Chemical Reactions**

Write out, balance and identify which type of chemical reaction is represented by each of the following.

zinc and lead (II) nitrate yield

$$Zn + Pb(NO_3)_2 \text{ -------> } Zn(NO_3)_2 + Pb$$

iron and sulfur yield

$$Fe + S \text{ -------> } FeS$$

the combustion of $C_{10}H_{22}$

$$2\ C_{10}H_{22} + 31\ O_2 \text{ -------> } 20\ CO_2 + 22\ H_2O$$

$$H_2C_2O_4 + NaOH \text{ -------> } Na_2C_2O_4 + 2H_2O$$

- **Moles**

How many molecules of methane are there in 2.50 moles of methane? 15.05×10^{23}

Calculate the mass of 3.78 moles of sulfur dioxide, SO_2 242g

How many moles are there in 6.32×10^{24} molecules of chloroform? 10.5 mol

A chemist plans to use 435 g ammonium nitrate (NH_4NO_3) in a reaction.
How many moles of NH_4NO_3 is this? 5.4 mol

- **Stoichiometry**

a) Given an equation

$2C_2H_6(g) + 7O_2(g) \S\UP9(\Delta)\D\BA8()\rightarrow 4CO_2(g) + 6H_2O(g)$

How many mol of CO_2 will be formed by the complete combustion of 6.6 mol C_2H_6? 13.2 mol CO_2 0.0410 mol C_2H_6? 0.082 mol CO_2

b)Determine the amount of iodine produced when 145 g of KI react with excess copper (II) chloride.

$2CuCl_2(s) + 4KI(s) \rightarrow 2CuI(s) + 4KCl(s) + I_2(s)$

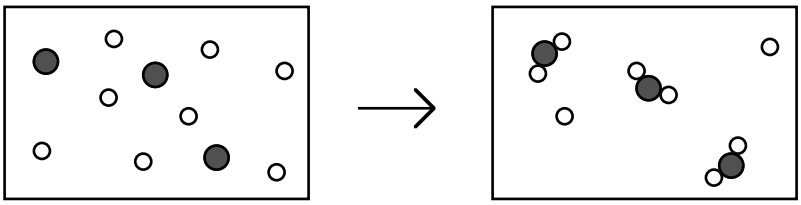
55.47 g

c) The reaction of element X with element Y

● = X

○ = Y

is represented in the following diagram



Write a balanced chemical equation describing the reaction.

Identify the limiting reagent.

$X + 2Y \text{ -------> } XY_2$

limiting reagent: X

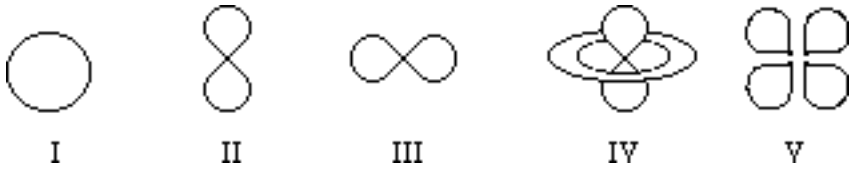
d) Calculate the moles of water which can be produced when 0.35 moles of hydrogen gas burn in air. .35 mol H_2O

e) How many moles of chlorine gas will be required to react with iron to produce 14 moles of iron (III) chloride? 21 mol Cl_2

f) Calculate the percent yield when 24.8 g of propane (C_3H_8) are burned in air to produce 15.0 g water vapor 37% percent yield

Additional Problems:

Which of the following sketches represent orbitals which can have quantum numbers $n = 3$ and $l = 1$?



A. V only
B. II and III
C. IV and V
D. I, II and III
E. I, II, III, IV and V

Which of the following is the correct ground state electron configuration for Mn^{2+}?

A) $[Ar]4s^23d^3$
B) $[Ar]4s^23d^5$
C) $[Ar]4s^13d^4$
D) $[Ar]4s^03d^5$

The electron in a hydrogen atom falls from a higher excited energy level down to the $n = 6$ level, emitting radiation having a wavelength of 4379 nm. What was the original n-level of the electron?

A) 7
B) 10
C) 12
D) 14

The ability of an atom to compete for electrons with another atom to which it is bonded is defined as:

A) ionization potential
B) electronegativity
C) electron affinity
D) magnetism

Write the appropriate formulas to show the reactants and products for the following. All solution are aqueous. For each reactant and product indicate the phase as (s)olid, (l)iquid, (g)as or (aq)eous. Balance the equation.

(e) A solution of hydrogen peroxide is heated.

$$2HO_{2(l)} \text{ -------> } 2H_2O_{(g)} + O_{2(g)}$$

(f) A piece of potassium metal is dropped into a beaker of water.

$$K_{(s)} + 2H_2O_{(l)} \text{ -------> } 2KOH_{(aq)} + H_{2(g)}$$

(g) Pentane (C_5H_{12}) is burned completely in air.

$$C_5H_{12(l)} + 8O_{2(g)} \text{ -------> } 5CO_{2(g)} + 6H_2O_{(g)}$$

Complete the following table:

Name of the compound	Formula of the compound
nitrogen dioxide	NO_2
Potassium Dichromate	$K_2Cr_2O_7$
lead nitrate	$Pb(NO_3)_2$
Sulfuric Acid	H_2SO_4
Nickel (II) hydroxide	$Ni(OH)_2$

Using the following equation, how many grams of $KMnO_4$, assuming excess potassium iodide and sulfuric acid, are required to produce 1.0 mole I_2?

$$2\ KMnO_4 + 10\ KI + 8\ H_2SO_4 \rightarrow 6\ K_2SO_4 + 2\ MnSO_4 + 5\ I_2 + 8\ H_2O$$

63.20g $KMnO_4$

How did Bohr's model of the hydrogen atom explain the emission spectrum of the hydrogen atom?

Answers will vary

If 7.00 g of the hydrocarbon C_5H_{12} are combusted in excess oxygen, calculate the moles of $CO_{2(g)}$ and $H_2O_{(l)}$ formed.

.486mol CO_2, .582mol H_20

Indicate the direction of increasing ionization energy and increasing electronegativity, going across a period and going down a group.

------->Draw the outline of the periodic table and use arrows to indicate the direction of increasing ionization energy and electronegativity