- Molecular geometry
- Activity Series
- periodic table

- Gas Formulas

KEY

Exam Review- Honors

Turn in for extra credit points due the day of your exam

Lewis Structures, Molecular Geometry, Hybridization ch 6

1. Draw the Lewis Structures for the following, be able to determine the geometry, bond angle and hybridization
   a. H_2O 2+6=8 H-Ö-H Tetrahedral/bent <109.5 sp^3
   b. NH_3 5+3=8 H-N-H (H) Tetrehedral Trigonal pyramidal <109.5 sp^3
   c. CH_4 4+4=8 H-C-H (H) Tetrahedal/tetrahedral 109.5 sp^3
   d. CO_2 4+12=16 Ö=C=Ö Linear sp +1

Empirical Formula

2. Calculate Empirical and molecular formula and percent composition
   a. Calculate the percent composition of $CaCO_3$ Ca% 40.08/100.09 x100 = 40.0%
      40.08 + 12.01 + 3x16 = 100.09 g/mol C% 12.01/100.09 x100 = 12.0%
   BAD EX. → b. What is the empirical formula of citric acid if it is 37.51% C, 4.20% H and 58.29% O?
      37.51g C x 1mol/12.01g = 3.123 / 3.123 = 1 x6 f6
      4.20g H x 1mol/1.01g = 4.158 / 3.12 = 1.33 x6 f8
      58.29g O x 1mol/16.00g = 3.64 / 3.12 = 1.16 x6 f7
      O 48.00 / 100.05 = 48%
      All times 6
   c. What is the molecular formula of the molecule that has an empirical formula of CH_2O and a molar mass of 120.12g/mol?
      Empirical Formula mass = 30.03
      120.12/30.03 = 4
      $C_4H_8O_4$
      $C_6H_8O_7$

Review your polyatomic Ions

3. List them below

CO_3^{2-} CrO_4^{2-}

NO_3^- PO_4^{3-}

SO_4^{2-} ClO_3^-

$C_2H_3O_2^-$ NH_4^+

OH^-

CN^-

Oxidation numbers

Assign oxidation numbers to each of the atoms in the following compounds:

Na_2CrO_4 Na = +1 O = −2 Cr = +6

(+2 −8)

$K_2Cr_2O_7$ K = +1 O = −2 Cr = +6

(+12 −14 = +2)

CO_2 O = −2 C = +4

(−4)

CH_4 H = +1 C = −4

(+4)

$HClO_4$ O = −2 H = +1 Cl = +7

(+1 −8)

MnO_2 O = −2 Mn = +4

(−4)

SO_3^{2-} O = −2 S = +4

(−6)

SF_4 F = −1 S = +4

(−4)

Naming Ionic and Covalent Compounds

Ionic compounds are made up of metal and nonmetal. They transfer their electrons.

Covalent compounds are made up of at least two nonmetal. They share their electrons

1) NaBr Sodium bromide

2) CaO Calcium oxide

3) Li_2S lithium sulfide

4) $MgBr_2$ magnesium bromide

5) $Be(OH)_2$ beryllium hydroxide

6.) $FeCl_3$ Iron (III) chloride

Write the formulas for the following *ionic* compounds:

6) potassium iodide KI

7) magnesium oxide MgO

8) aluminum chloride $AlCl_3$

9) sodium nitrate $NaNO_3$

10) calcium carbonate $CaCO_3$

Write the names of the following *covalent* compounds: use prefixes

11) SO_3 sulfur trioxide

12) N_2S dinitrogen sulfide

13) PH_3 phosphorus trihydride

14) BF_3 boron trifluoride

15) P_2Br_4 diphosphorus tetrabromide

16) nitrogen trichloride NCl_3

17) boron carbide BC

18) dinitrogen trioxide N_2O_3

19) phosphorus pentafluoride PF_5

Balancing and Type of Reaction – Balance and tell the type of reaction for each equation

1) 1 N_2 + 3 H_2 -> 2 NH_3 synthesis

2) 2 $KClO_3$ -> 2 KCl + 3 O_2 decomposition

3) 2 NaCl + ___ F_2 -> 2 NaF + ___ Cl_2 single replacement

4) 2 H_2 + 1 O_2 -> 2 H_2O synthesis

5) 1 $Pb(OH)_2$ + 2 HCl -> 2 H_2O + 1 $PbCl_2$ double replacement

6) 2 $AlBr_3$ + 3 K_2SO4 -> 6 KBr + ___ $Al_2(SO_4)_3$ double replacement

7) ___ CH_4 + 2 O_2 -> 1 CO_2 + 2 H_2O combustion

Activity Series

4. Predicting the products of single replacement reactions using the Activity series

a. 3 Li + $Fe(NO_3)_3$ -> $3LiNO_3$ + Fe

b. Au + HCl -> no rxn

c. Cl_2 + 2 KBr -> Br_2 + 2KCl

d. Cu + $Al(NO_3)_3$ -> no rxn

Stoichiometry

5. Using the following equation: $2\ NaOH + H_2SO_4 \rightarrow 2\ H_2O + Na_2SO_4$

How many grams of sodium sulfate will be formed if you start with 200. grams of sodium hydroxide and you have an excess of sulfuric acid?

$200.g\ NaOH \times \frac{1mol}{40\ g} \times \frac{1\ Na_2SO_4}{2NaOH} \times \frac{142.05\ g}{1mol} = 355\ g$

6. $2\ C_6H_{10} + 17\ O_2 \rightarrow 12\ CO_2 + 10\ H_2O$

$35.0g\ C_6H_{10} \times \frac{1mol}{82.16g} \times \frac{12\ CO_2}{2\ C_6H_{10}} \times \frac{44.0g}{1mol} = 112.49$

112g

If I do this reaction with 35.0 grams of C_6H_{10} and 45.0 grams of oxygen, how many grams of carbon dioxide will be formed?

$* 45.0g\ O_2 \times \frac{1mol}{32.00\ g} \times \frac{12\ CO_2}{17\ O_2} \times \frac{44.0g}{1mol} = 43.7g$

What is the limiting reagent for problem 6? ~~O_2~~

43.7g of CO_2 will be produced

How much of the excess reagent is left over after the reaction from problem 6 is finished?

$45.0g\ O_2 \times \frac{1mol}{32.00g} \times \frac{2\ C_6H_{10}}{17\ O_2} \times \frac{82.16g}{1mol} = 13.6g$ used

$35.0 - 13.6 = 21.4g$

If 35.0 grams of carbon dioxide are actually formed from the reaction in problem 6, what is the percent yield of this reaction?

$\frac{35.0g\ CO_2}{43.7g} \times 100 =$ 80.1% yield

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

Gases

7. Combined Gas Law – Boyle's, Charles' and Gay Lussac's Laws (T must be in Kelvin; other units must just be the same on both sides of the equation)

A gas with a volume of 4.0L at a pressure of 205kPa is allowed to expand to a volume of 12.0L. What is the pressure in the container if the temperature remains constant?

$(205\ kPa)(4.0L) = (P_2)(12.0L)$

$P_2 = 68.3\ kPa$

A gas balloon has a volume of 106.0 liters when the temperature is 45.0 °C and the pressure is 740.0 mm of mercury. What will its volume be at 20.0 °C and 780 .0 mm of mercury pressure?

$\frac{(740.0\ mm\ Hg)(106.0L)}{318K} = \frac{(780.0\ mm\ Hg)V_2}{293K}$

$V_2 = 92.7L$

8. Ideal Gas Law $PV = nRT$

a. If I have 72 liters of gas held at a pressure of 344.4kPa and a temperature of 225 K, how many moles of gas do I have?

$344.4 \rightarrow 3.399\ atm$ (101.325)

$(3.399)(72L) = n(.0821)(225K)$

$n = 13\ moles$

b. 22.00 g of CO_2 has a volume of 50.00 L and a pressure of 0.8210 atm. What must be the temperature of the gas? $44.01 = .4999\ mol$

$(.8210)(50.00L) = (.4999\ mol)(.0821)T$ $\quad T = 1000.K$

c. If the gas present in 5.64 L at STP is changed to a temperature of 18 °C and a pressure of 787 Torr, what will be the new volume?

NOT $PV=nRT$

$\frac{(760\ torr)(5.64L)}{273K} = \frac{(787\ torr)(V)}{291K}$

$V = 5.81L$

9. Dalton's Law $P_T = P_1 + P_2 + P_3 \ldots$

a. Blast furnaces give off many unpleasant and unhealthy gases. If the total air pressure is 0.99 atm, the partial pressure of carbon dioxide is 0.05 atm, and the partial pressure of hydrogen sulfide is 0.02 atm, what is the partial pressure of the remaining air?

10.

$0.99 = \underset{CO_2}{0.05} + \underset{H_2S}{0.02} + P_{air}$

$P_{air} = 0.92\ atm$

11. Stoichiometry of Gases

a. Ethylene burns in oxygen to form carbon dioxide and water vapor:

$$C_2H_{4(g)} + 3\ O_{2(g)} \rightarrow 2\ CO_{2(g)} + 2\ H_2O_{(g)}$$

How many liters of water can be formed if 1.25 liters of ethylene are consumed in this reaction?

?

b. $2\ C_8H_{18}(l) + 25\ O_2(g) \text{----} > 16\ CO_2(g) + 18\ H_2O(g)$

The above reaction is the reaction between gasoline (octane) and oxygen that occurs inside automobile engines.
If 4.00 moles of gasoline are burned, what volume of oxygen is needed if the pressure is 0.953 atm, and the temperature is 35.0°C?

Molarity $M = \frac{mol}{L}$

1. Calculate the number of moles of $KClO_3$ which would be needed to prepare 20.0 mL of a 0.010 M solution.

$0.010M = \frac{moles}{.020L}$ moles = 0.00020

2. Calculate the number of grams of sucrose, molar mass 342 g/mol, needed to prepare 10.0 L of a 0.50 M solution. {1710 g}

2SF $0.50\ M = \frac{moles}{10.0L}$ $5 moles \times \frac{342g}{1mol} = 1710\ g$ 1700g

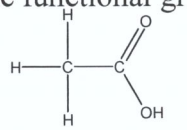
3. Calculate the molarity of a solution in which there are 34.2 g sucrose dissolved in enough water to make 6.0 Litres of solution. {0.017 M}

wrong SF

$342.g \times \frac{1mol}{342g} = 0.100\ mol$ $\frac{0.100\ mol}{6.0L} = 0.0167$ 0.017M

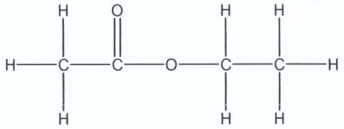
Organic Chemistry

1. Identify the functional groups on the following organic molecules.

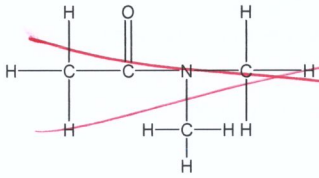
a. 

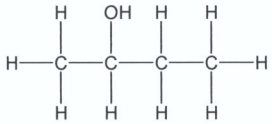
carboxylic acid

not 1st → not 2nd

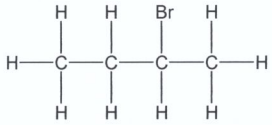
b. 

ester

c. 

d. 

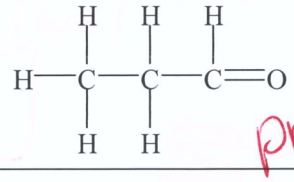
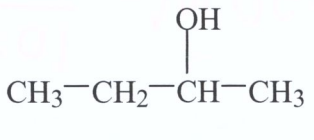
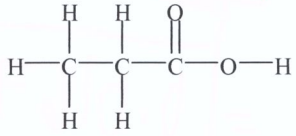
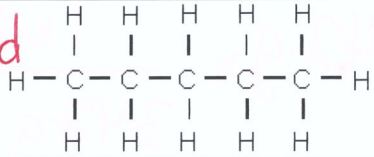
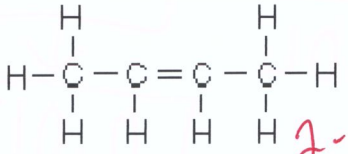
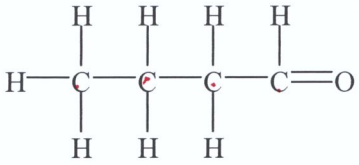
alcohol

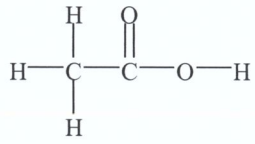
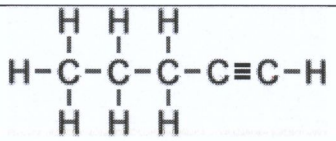
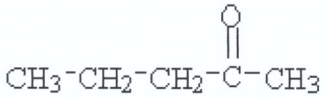
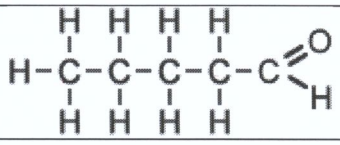
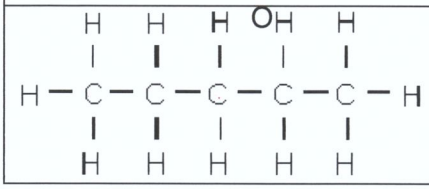
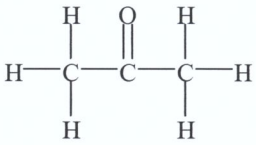
e. 

alkyl halide

Organic Chemistry – Naming Worksheet

1. Name the following organic compounds. Circle the functional group if one is present.

 aldehyde propanal	 alcohol 2-butanol
 carboxylic propanoic acid	 alkane pentane
 alkene 2-butene	 aldehyde butanal

 ethanoic acid	 1-pentyne
 2-pentanone	 pentanal
 2pentanol	 2-propanone