**THE MOLE**

1. What is the molar mass of each of the following?

a. Al(C2H3O2)3? 204.13 g/mol b. Ammonium chloride 53.50 g/mol

c. Potassium bromate 167.00 g/mol

2. I know that 8.401 x 1024 atoms of a certain element has a mass of 391.8 g.

What element is this? Silicon

3. How many Sulfide ions are present in 12.24 mg of potassium sulfide? 6.683 x 1019 ions

4. How many carbon atoms are in 1.00 mole of dicarbon hexahydride? 1.20 x 1024 carbon atoms

5. How many grams are 2.34 x 1023 molecules of C6H10OS2? 63.1 grams

6. How many molecules can be found in a sample of .847 grams of carbon dioxide?

1.16x 1022 molecules

7. Determine the percent composition of all of the elements found in the following compounds:

a. Sodium chlorate NaClO3 45.10% O; 33.30% Cl; 21.60% Na b. Cuprous sulfide Cu2S 20.15% S; 79.15% Cu

8. What is the difference between an empirical and molecular formula? The empirical formula shows the most simplified ratio of the elements in a compound. The molecular formula shows the actual ratio of the elements in the compound.

9. Determine the empirical formula for a compound using the following information:

a. 58.00% Rb; 9.50% N; 32.50% O RbNO3

b. 49.62% C; 10.82% H; 39.56% O C5H13O

10. What is the molecular formula of a compound with an empirical formula of CHOCl (chlorine) and a molecular weight of 129 grams? C2H2O2Cl2

11. What are the 7 diatomic elements? Br2, I2, N2, Cl2, H2, O2, F2

12. Determine the molecular formula for a compound containing 7.70% carbon, 1.30% hydrogen, and 81.90% iodine. Its molar mass is 281 g/mol. C2H4I2

14. 1.00 mol of Al2S3 consists of how many total mol of ions? 5.00 mol (2.00 mol Al and 3.00 mol S)

**CHEMICAL REACTIONS**

1. For each of the following:

a. Indicate the type of the reaction

b. Predict the products by name

c. Write the equation for the complete reaction. If the reaction does not occur, write NR.

d. For DD reactions include the states

e. Balance the reaction only if it occurs

a. silver nitrate + cupric chloride 🡪 DD (precipitate) – silver chloride and cupric nitrate

2AgNO3(aq) + CuCl2(aq) 🡪 2AgCl(s) + Cu(NO3)2(aq)

b. copper (II) + aluminum sulfate 🡪 NO REACTION

c. sodium nitrite + ammonium sulfate 🡪 NO REACTION

d. iodic acid 🡪 D4 - diiodine pentoxide and water

2HIO3 🡪 I2O5 + H2O

e. hydrochloric acid +barium hydroxide 🡪DD (neutralization)-water and barium chloride

2HCl(aq) + Ba(OH)2(aq) 🡪 BaCl2(aq) + H2­O(l)

f. sodium + chromium (II) chlorate 🡪 SD – sodium chlorate and chromium

2Na + Cr(ClO3)2 🡪 2 NaClO3 + Cr

g. cupric oxide 🡪 D2 – copper (II) and oxygen

2CuO 🡪 2Cu + O2

h. C4H8 + oxygen (complete) 🡪C – carbon dioxide and water

C4H8 + 6O2 🡪 4CO2 + 4H2O

1. dibromine pentoxide + water 🡪 S4 – bromic acid

Br2O5 + H2O🡪 2HBrO3

1. iron (II) oxide + carbon dioxide 🡪 S5 – iron (II) carbonate

FeO + CO2 🡪 FeCO3

k. chlorous acid + magnesium hydroxide 🡪

DD (neutralization) – water and magnesium chlorite

2HClO2(aq) + Mg(OH)2(s) 🡪 Mg(ClO)2(aq) + 2H­­2O(l)

1. aluminum carbonate 🡪 D5 – aluminum oxide and carbon dioxide

Al2(CO3­­)3 🡪 Al2O3 + 3CO2

m. Sodium sulfide + hydrochloric acid 🡪

DD (gaseous) – sodium chloride and hydrogen sulfide gas

Na2S + 2HCl(aq)  🡪 2NaCl (aq) + H2S(g)

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n. hydrobromic acid + calcium carbonate 🡪

DD (gaseous) -calcium bromide, carbon dioxide, and water (carbonic acid breaks down)

HBr(aq) + CaCO3(s)  🡪 CaBr­2(aq)­  + CO2(g)  + H2O(l)

2. What is the difference between oxidation and reduction? Oxidation is a loss of electrons by one reactant. Reduction is a gain of electrons by one reactant.

4. What are the four main signs that a chemical reaction has occurred? Evolution of a gas; temperature change; precipitate; color change

**STOICHIOMETRY**

1. How many grams of potassium sulfate are produced if 10.0 g of sulfuric acid and 7000.0 mg of potassium hydroxide are mixed together? What is the limiting reactant? LR = KOH; 10.872 g
2. How many moles of chloric acid are required to react completely with 2.05 g of sodium carbonate?

.0387 mol

1. The reusable booster rockets of the U.S. space shuttle employ a mixture of aluminum and ammonium perchlorate for fuel. The balanced equation is

3Al(s) + 3NH4ClO4 🡪 Al2O3(s) + 3NO(g) + 6H2O(l) NH3(g)

What mass of ammonium perchlorate should be used in a fuel mixture for every 1.00 kg of aluminum used? 4.36 kg

1. How many grams of magnesium chloride are produced if 420 cm3 of chlorine gas reacts with 14.8 g of Magnesium at STP? 1.8 g MgCl2
2. If the following reaction produces 6840 J of energy, how many grams of CrO3 is used? 127 g

CrO3 + H2O🡪 H2CrO4 + 5.4 kJ

1. How much heat is absorbed/released when 193 g of ammonium bromide react according to the following equation?

NH­3 + HBr 🡪 NH4Br ΔH = 188.32 kJ

371 kJ released (enthalpy is reversed because reaction is reversed

**SOLUTIONS**

1. If 960 g of sodium hydroxide are used to prepare 16000 mL solution. What is the molarity of the solution? 1.5 M

2. If we add .15 L of a 6.02M HCl solution and some water to a beaker, creating a 2.42 M HCl solution, what is the volume of the new solution? .37L

3. A 2.34 M solution contains 10. g of acetic acid. What is the volume of the solution in mL? 71 mL

4. What mass of sodium oxide is consumed if it reacts with 12.3 mL of a 3.45 M HCl solution? 1.32g

5. How many grams of .67 M KClO3 are needed to prepare 1.00 Liters of solution? 82 g

6. Describe how 100 ml of a .10 M solution of sodium hydroxide would be made. Fill a volumetric flask approximate 2/3 full of water. Add .4 grams of sodium hydroxide to the flask. Swirl the flask. Add remaining 1/3 of water to the solution until meniscus is at the line on the flask. Mix.

7. Using the pH scale, define an acid and a base. An acid is a substance with a pH value of 0 – 6.99 and a base is a substance with a pH value of 7.01 - 14

**CHEMICAL BONDING**

1. What is the difference between an ionic and a covalent bond?

An ionic bond is a bond commonly formed between a metal and a nonmetal. A covalent bond is a bond commonly formed between two nonmetals.

1. Would the following pairs most likely form an ionic or molecular compound?
   1. Mg and Cl - ionic b. I and F - molecular c. P and Cl - molecular
   2. d. Sn and O - ionic e. Ag and S - ionic
2. Draw a Lewis dot diagram for each of the following:
   1.  b.  c.  d.  e. 