Review Sheet—Quarterly 2

**Definitions**

 Reactant—elements or compounds that chemical change to form new substances in a reaction. Always found on the left side of a chemical reaction

 Product—elements and compounds that are formed from a chemical reaction. Always found on the right side of a chemical reaction.

 Theoretical Yield—How much of a product should have been created in a reaction.

 Actual Yield—How much product was actually produced in a chemical reaction

 Percent Yield—the percent of the total product that was actually formed in the reaction.



**Types of Chemical Reactions**

 1. Synthesis/Composition

 2 or more elements/compounds combine to form 1 compound

 **2**Na + Cl2 🡪 **2** NaCl

 Predict the product for the following reactions:

**2**Mg + O2 🡪**2MgO**

 Calcium metal is heated in the presence of nitrogen gas

 **3Ca + N2 🡪 Ca3N2**

 2. Decomposition

 One substance breaks down into more than one substance

H2O2 🡪 H2 + O2

 Predict the product for the following reaction:

Solid Magnesium chloride is strongly heated.

**MgCl2 🡪 Mg + Cl2**

 3. Single Replacement

 1 element replaces another element within a compound

 **2**Zn + **3**FeCl3 🡪 **2**ZnCl2 + **3**Fe

 **2**NaI + Br2 🡪 **2**NaBr + I2

 Predict the products for the following reaction:

Ca + **2**HCl 🡪**CaCl2 + H2S**

 Pieces of zinc are added to a solution of sodium phosphate

 **3Zn + 2Na3PO4 🡪 6Na + Zn3(PO4)2**

 4. Double Replacement

 The positive ions from each of 2 compounds switch places forming 2 new compounds

Pb(NO3)2 + **2**KI 🡪 PbI2 + **2**KNO3

Predict the products for the following reaction:

CaS + **2**HCl 🡪**CaCl2 + H2S**

 Solutions of silver nitrate and sodium chromate are mixed

 **2AgNO3 + K2CrO4 🡪 2KNO3 + Ag2CrO4**

 5. Combustion

 All combustions reactions involve O2 as a reactant. HEATED does not mean BURNED!

 Regular combustion (may look like a composition reaction)

 **2**H2 + O2 🡪 **2**H2O

 **2**Mg + O2 🡪 **2**MgO

 Hydrocarbon combustion (compound containing hydrogen and carbon as primary components) 🡪 always produces CO2 and H2O.

 CH4 + **2** O2 🡪 CO2 + 2H2O

 Predict the products for the following reactions:

**4**Li + O2 🡪**2LiO2**

Propanol (C3H7OH) is burned completely in air.

 **2C3H7OH + 9O2 🡪 6CO2 + 8H2O**

**Balancing Reactions**

 Balance the following reactions. All coefficients should be reduced to the lowest, whole number

 1. \_**4**\_\_Fe + \_\_**3**\_O2 🡪 \_\_**2**\_Fe2O3

 2. \_\_\_\_Zn + \_**2**\_\_HCl 🡪 \_\_\_\_ZnCl2 + \_\_\_\_H2

 3. \_\_**4**\_Si2H3 + **11**\_\_O2 🡪 \_**8** SiO2 + \_**6**\_\_H2O

 4. \_**2**\_\_C2H2 + \_**5**\_\_O2 → \_**4**\_\_CO2 + \_**2**\_\_H2O

 5. \_**2**\_\_Al + \_**2**\_\_NaOH + \_**6**\_\_H2O → \_**2**\_\_NaAl(OH)4 + \_**3**\_\_H2

 6. \_\_\_\_Fe2O3 + \_**3**\_\_H2 → \_**2**\_\_Fe + \_**3**\_\_H2O

 7. \_\_\_\_\_N2O4 + \_**2**\_\_N2H4 → \_**3**\_\_N2 + \_**4**\_\_H2O

 8. \_\_\_\_\_MnO2 + \_\_**4**\_\_HCl → \_\_\_\_MnCl2 + \_**2**\_\_H2O + \_\_\_\_Cl2

 9. \_**4**\_\_CH3NH2 + \_**9**\_\_O2 ➝ \_**4**\_\_CO2 + \_**10**\_\_H2O + \_**2**\_\_N2

**Mole Conversions**

 Mole finding tool



Convert the following to moles

1. 26.0 gram Ca(ClO4)2



1. 5.08 gram XeF4



1. 32.0 gram O2



1. 10.0 gram V2O5



 Convert the following to grams

1. 2.55 mole Cu2CrO4



1. 1.95 mole HNO3



1. 2.00 mole HC2H3O2



1. 10.0 mole NaCl



 Gram to Molecules/Atoms

 Convert the following to molecules/atoms

1. 50.00 gram KBr



1. 1.00 gram O2



1. 32.58 gram CuS



1. 5.00 gram Ca



 Perform the following conversions

1. 1.000g of CaCl2 to moles



1. 18.0g of dextrose, C6H12O6, to moles



1. 2.55 mole Cu2CrO4 to grams



1. 0.251 mol of K2CrO4 to grams



1. 6.37 mol of carbon monoxide to molecules



**Empirical and Molecular Formulas**

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 1. Determine the empirical and molecular formulas of each of the following substances

 A) epinephrine, 59.0% C. 7.16% H, 26.2% O, 7.64% N by mass, MW = 183 g/mol



 B) nicotine, 74.1% C, 8.6% H, 17.3% N by mass, MW = 160 g/mol.



 2. Determine the empirical and molecular formulas of each of the following substances:

 A) ethylene glycol, 38.7% C, 9.7% H, and 51.6% O by mass, MW = 62.1 g/mol



 B) caffeine, 49.5% C, 5.15% H, 28.9% N and 16.5% O by mass, MW = 195 g/mol



**Stoichiometry**

 1. Aspirin (C9H8O4) is synthesized by reacting salicylic acid (C7H6O3) with acetic anhydride (C4H6O3). The balanced equation is:

C7H6O3 + C4H6O3 → C9H8O4 + HC2H3O2

1. What mass of acetic anhydride is needed to completely consume 1.00x102 g salicylic acid?



 B. What is the maximum mass of aspirin (the theoretical yield) that could be produced in this reaction?



 2. Aluminum burns in bromine, producing aluminum bromide,

2Al(s) + 3Br2(l) → 2AlBr3(s)

 In a certain experiment, 6.0g of aluminum was reacted with an excess of bromine to yield 50.3g aluminum bromide. Calculate the theoretical and percent yields for this experiment.



 3. Given the following reaction:

CaCO3(s) → CaO(s) + CO2(g)

 If 50.8g of CaCO3 react to produce 26.4g of CaO, what is the percent yield of CaO?

 

4. 4 FeCr2O7 + 8 K2CO3 + O2 🡪 2Fe2O3 + 8K2CrO4 + 8CO2

 (a) How many grams of FeCr2O7 are required to produce 44.0 g of CO2?



 (b) How many grams of O2 are required to produce 100.0 g of Fe2O3?



 (c) If 300.0 g of FeCr2O7 react, how many g of O2 will be consumed?



 (d) How many g of Fe2O3 will be produced from 300.0 g of FeCr2O7?

