UMB- FSG – CHEM 115 – Fall 2012

10/01/2012

CHAPTER 3

If you have any questions, concerns, or suggestions about the FSG, please email me at dan.nguyen0929@gmail.com

I. Please balance the following reactions.

1. $CaCN_2 + H_2O \Rightarrow CaCO_3 + NH_3$
2. $Na_2O_2 + H_2O \Rightarrow NaOH + O_2$
3. $Na_2SO_4 + C \Rightarrow Na_2S + CO_2$
4. $ZnS + O_2 \Rightarrow ZnO + SO_2$
5. $CH_5N + O_2 \Rightarrow CO + H_2O + NO_2$
6. $C_3H_6O_2S + O_2 \Rightarrow CO_2 + H_2O + SO_3$
7. $C_6H_6O + O_2 \Rightarrow CO + H_2O$
8. $C_3H_8O_2S + O_2 \Rightarrow CO_2 + H_2O + SO_3$
9. $C_6H_6 + O_2 \Rightarrow CO_2 + H_2O$
10. $C_5H_5N + O_2 \Rightarrow CO_2 + H_2O + NO_2$

II. The following reactions are either combination reactions, decomposition reactions, or combustion reactions. Please write the complete reaction, and name the reaction.

1. $C_4H_8O_2 + O_2 \rightarrow$ _____
2. $Al\ (s) + N_2\ (g) \rightarrow$ _____
3. $CaCO_3(s) \rightarrow$ _____
4. $C + O_2 \rightarrow$ _____
5. $H_2CO_3 \rightarrow$ _____
6. $H_2O_2 \rightarrow$ _____
7. $CaO(s) + H_2O \rightarrow$ _____
8. $PbCO_3(s) \rightarrow$ _____
9. $Cu(OH)_2(s) \rightarrow$ _____
10. $Al(s) + HCl(aq) \rightarrow$ _____

III. Working with chemical formulas

$n = \frac{m}{M}$, number of particle = n x 6.022×10^{23} (Avogadro's number = 6.022×10^{23})

1. Helium (He) is a valuable gas used in industry, low-temp research, deep-sea diving tanks, and balloons. How many moles of He atoms are in 6.46 g of He?

2. Zinc (Zn) is a silvery metal that is used in making brass (with copper) and in plating iron to prevent corrosion. How many grams of Zn are in 0.356 mole of Zn?

3. Sulfur (S) is a nonmetallic element that is present in coal. How many atoms are in 16.3 g of S?

4. Methane (CH_4) is the principal component of natural gas. How many moles and how many molecules of CH_4 are present in 6.07 g of CH_4?

5. How many hydrogen atoms are present in 25.6 g of urea, $(NH_2)_2CO$.

IV. Percent composition of compounds

$$\text{Percent composition of an element} = \frac{n \times M_{element}}{M_{compound}} \times 100\%$$

1. Calculate the percent composition by mass of H, P, and O in phosphoric acid.

2. Ascorbic acid (vitamin C) is composed of 40.92 percent carbon, 4.58 percent hydrogen, and 54.50 percent oxygen by mass. Determine its empirical formula.

3. What are the empirical formulas of the compounds with the following compositions?
a) 40.1% C, 6.6% H, and 53.3% O

b) 18.4%C, 21.5%N, and 60.1%K

4. Chalcopyrite ($CuFeS_2$) is a principal mineral of copper. Calculate the number of kilograms of Cu in 3.71×10^3 kg of chalcopyrite.

5. A sample of a compound contains 1.52 g of nitrogen and 3.47 g of oxygen. The molar mass of this compound is between 90 g and 95 g. Determine the molecular formula and the accurate molar mass of the compound.