CHM 111   Chapter 4   Worksheet and Study Guide

Purpose: This is a guide for your as you work through the chapter. The major topics are provided so that you can write notes on each topic and work the corresponding problems.

This should serve a s a study guide as you go on to do the problems in Sapling and take the quizzes and exams.

The Problems are embedded in the Topics and Space for Notes

$N_A = 6.022 \times 10^{23}$

Topic 1:   Writing and Balancing Chemical Equations.

Be able to derive chemical equations from narrative descriptions of chemical reactions.
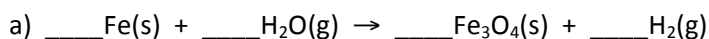
Be able to define three common types of chemical reactions (precipitation, acid-base, and oxidation-reductions.)
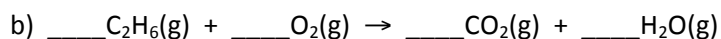
Notes:

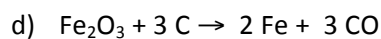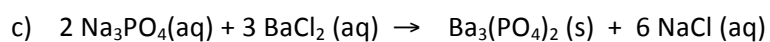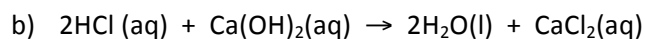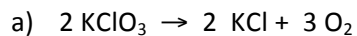(A) Write and balance the equation.
     Aqueous calcium hydroxide reacts with aqueous sodium carbonate to produce solid calcium carbonate and aqueous sodium hydroxide.

(B) Balance the equations:

a) ____Fe(s) + ____H_2O(g) $\rightarrow$ ____Fe_3O_4(s) + ____H_2(g)

b) ____C_2H_6(g) + ____O_2(g) → ____CO_2(g) + ____H_2O(g)

(C) Identify each reaction as precipitation, redox or acid base.

a) 2 $KClO_3$ → 2 KCl + 3 O_2

b) 2HCl (aq) + $Ca(OH)_2$(aq) → 2H_2O(l) + $CaCl_2$(aq)

c) 2 Na_3PO_4(aq) + 3 $BaCl_2$ (aq) → $Ba_3(PO_4)_2$ (s) + 6 NaCl (aq)

d) Fe_2O_3 + 3 C → 2 Fe + 3 CO

Topic 2: Reaction Stoichiometry

     (A) Be able to use balanced chemical equations to derive stoichiometric factors relating amounts of reactants and products
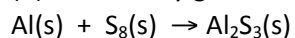
     (B) Be able to perform stoichiometric calculations involving mass, moles, and solution molarity.

Notes:

(A) How many moles of Al_2S_3 will be produced from the reaction of 4.5 moles of Al?

    Al(s) + S_8(s) → Al_2S_3(s)
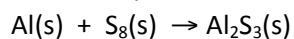
(B) How many grams of sulfur are needed to react with 125 grams of Al?

$Al(s) + S_8(s) \rightarrow Al_2S_3(s)$

Topic 3:　　　**Be able to perform stoichiometric calculations involving mass, moles, and solution molarity.**

　Notes:

(A) What mass of Al is needed to react with 8.5 grams of Fe_2O_3 according to the reaction?

　　$Al(s) + Fe_2O_3(s) \rightarrow Al_2O_3 (s) + Fe(s)$
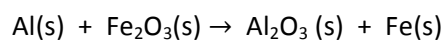
(B)   What mass of Iron (III) carbonate can be precipitated from the reaction of 755.0 mL of .150 M aqueous potassium carbonate with excess aqueous iron (III) chloride? The products are solid iron (III) carbonate and aqueous potassium chloride.

Topic 4: Reaction Yields: Be able to explain the concepts of theoretical yield and limiting reactants/reagents and be able to calculate the percent yield.

Notes:

(A) If a student goes to the lab and makes 8.80 grams of aluminum bromide from the reaction of 8.30 grams of bromine with excess aluminum, what is the percent yield for the reaction? (Calculate the theoretical yield first!)

$Al\ (s)\ +\ Br_2\ (l)\ \rightarrow\ AlBr_3\ (s)$
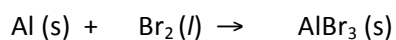
(B) What is the limiting reagent in the reaction of 12.0 g of SO_2 with 8.0 g of H_2S in the reaction? What mass of sulfur will be produced?

$SO_2\ (g)\ +\ 2\ H_2S\ (g)\ \rightarrow\ 3S\ (s)\ +\ 2\ H_2O\ (l)$
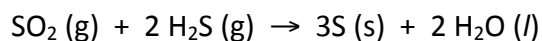
(C) Determine the theoretical yield of HCl if 60.0 g of BCl_3 and 37.5 g of H_2O are reacted according to the following balanced reaction. $BCl_3(g) + 3\ H_2O(l)\ \rightarrow\ H_3BO_3(s) + 3\ HCl(g)$
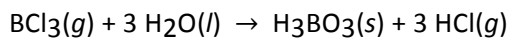
(D) According to the following reaction, what amount of Al_2S_3 remains when 20.00 g of Al_2S_3 and 2.00 g of H_2O are reacted? $Al_2S_3(s) + 6\ H_2O(l) \rightarrow 2\ Al(OH)_3(s) + 3\ H_2S(g)$
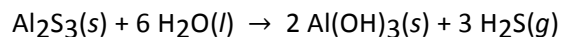
(E) Determine the number of grams of aluminum oxide that will be produced when 50.00 g of Fe_2O_3 react with excess Al and the percent yield for the reaction is 75.0 %. The reaction is:

$Fe_2O_3(s) + 2\ Al(s) \rightarrow Al_2O_3(s) + 2\ Fe(s)$
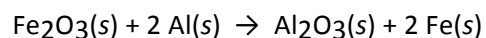
Topic 5:   **Be able to write and balance chemical equations in molecular, total ionic, and net ionic formats. Be able to predict the solubility of common inorganic compounds by using solubility rules**

Notes:

(A) Circle the compounds that are **STRONG** electrolytes. If the compound is a strong electrolyte, write the dissociation reaction that occurs when the compound is put in water.
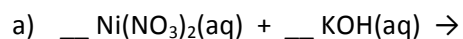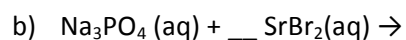
a) NH_4NO_3

b) $C_{12}H_{22}O_{11}$

c) $PbCl_2$

d) $CaCl_2$

(B) Complete and balance the following equations and <u>write the net ionic equations</u> for each of them.

   a) __ $Ni(NO_3)_2(aq)$ + __ $KOH(aq)$ →

Complete Ionic equation:

Net ionic equation:

   b) Na_3PO_4 (aq) + __ $SrBr_2(aq)$ →

Complete Ionic equation:

Net ionic equation:

Topic 6: Identify common strong acids and strong bases and write acid/base neutralization reactions.

Define acid

Define Base

Define Strong:

List of strong acids

List of strong bases

(A) Write acid base neutralization reactions:

Write the reaction of sulfuric acid with sodium hydroxide.

Write the reaction of calcium hydroxide with hydrochloric acid.

What volume of 0.25 M sulfuric acid is needed to completely neutralize 100. mL of 0.35 M sodium hydroxide?