Chemistry CP

Name:

Review Sheet—Chapter 9

Date:

After studying Chapter 9, you should be able to:

- Interpret balanced chemical equations in terms of interacting moles, representative particles, masses, and volumes (at STP).
- Construct mole ratios from balanced chemical equations and apply these ratios in calculating mole-mole stoichiometric quantities.
- Calculate stoichiometric quantities from balanced chemical equations using units of mass.
- Calculate stoichiometric quantities from balanced chemical equations using units of moles, mass, representative particles, and volume (gases at STP).
- Identify the limiting reagent in a reaction and use it to calculate stoichiometric quantities and the amount of excess reagent(s).
- Calculate the theoretical yield, actual yield, and/or percent yield for a chemical reaction.

Essential skills from previous chapters:

- Polyatomic ions (you will be given a list of the –ates)
- Correct formula writing
- Writing formulas from names
- Writing names from formulas
- Balancing equations

Useful conversion factors:
1 mol = 6.02×10^{23} particles
1 kg = 1000 g
1 mol gas = 22.4 L (at STP)

Problems for you to try:

Remember to always start with a balanced equation!

1. How many moles of carbon dioxide gas can be produced if 25.0 g of $Cr_2(CO_3)_3$ are reacted with excess nitric acid, HNO_3, according to the following chemical equation? *(.264 mol CO_2)*

$$Cr_2(CO_3)_3\,(s) + 6\,HNO_3\,(aq) \rightarrow 2\,Cr(NO_3)_3\,(aq) + 3H_2O\,(l) + 3\,CO_2\,(g)$$

Moles					
g = moles x gfm					

2. What mass in grams of carbon dioxide is produced if 85.0 mol of magnesium carbonate, $MgCO_3$, are heated allowed to decompose according to the following equation?

$$MgCO_3\,(s) \rightarrow MgO\,(s) + CO_2(g)$$ *(3.74×10^3 g CO_2)*

Moles			
g = moles x gfm			

3. Iron reacts with oxygen to produce iron (III) oxide, or rust. Write a balanced equation for this reaction. If an iron nail with a mass of 4.3 g reacts completely with oxygen, how many grams of rust would be produced? *(6.1 g rust)*

____Fe + ____ O_2 → ____Fe_2O_3

Moles			
g = moles x gfm			

4. One method of producing copper metal is to heat a mixture of copper (I) oxide with copper (I) sulfide. The other product is SO_2. How many kilograms of copper (I) oxide must be reacted with 10.0 kg of copper (I) sulfide to achieve a complete reaction for both reactants?

(18.0 kg copper (I) oxide)

balanced equation: ___Cu_2O + ___Cu_2S → ___Cu + ___SO_2

Moles				
g = moles x gfm				

5. Phosphorus and bromine react vigorously together to form PBr_3.
   a) If 5.00 g of phosphorus and 35.0 g of bromine react, which is the limiting reactant?
   b) How many grams of PBr_3 will be produced?
   c) If the actual yield of PBr_3 is 30.0 g, what is the percent yield?

(bromine, 40.0 g PBr_3, 76% yield)

BONUS: How many molecules of PBr_3 will be produced?

____ P + ____Br_2 → _____PBr_3

Moles			
g = moles x gfm			

6. When 84.8 g of iron (III) oxide reacts with an excess of carbon monoxide, 54.3 g of iron is produced. What is the percent yield of this reaction?

Fe_2O_3 + 3 CO → 2 Fe + 3 CO_2 *(91.6% yield)*

Moles				
g = moles x gfm				

7. Aluminum chloride is made by reacting scrap aluminum with chlorine gas.
   a) Which is the limiting reactant when 3.5 g Al and 5.6 g Cl_2 react?
   b) How many grams of aluminum chloride are produced?
   c) What is the mass of the remaining excess reactant when the reaction is complete?

(chlorine, 7.0 g aluminum chloride, 2.1g Al excess)

_____*Al* + _____*Cl_2* → ____*$AlCl_3$*

Moles			
g = moles x gfm			