Chapter 9 Chemical Quantities

Section 1.   Information in chemical equations

Chemical equations can be evaluated by several terms.

C_3H_8 (g) + 5 O_2(g) → 3CO_2(g) + 4 H_2O(g)

Describes:

Review:

Aqueous solutions of silver nitrate and copper (II) sulfate react to produce what?

Make sure all ____________ are balanced before doing ________________

Section 2: Mole to Mole relationships

This tells us __ moles of water __________ to __ moles of ___________ and __ mole of oxygen.

What if we had ____ mole of ______?

__ mole of __________ is produced

__ mole of _________ is produced

________________ can be written from balanced equations.

$$\frac{2 \text{ moles } H_2O}{2 \text{ moles } H_2} \qquad \frac{2 \text{ moles } H_2O}{1 \text{ mole } O_2} \qquad \frac{2 \text{ moles } H_2}{1 \text{ mole } O_2}$$

Use these as _____________________ to do calculations between ______________.

If you have _____ moles of _________, how many moles of ________ will it produce?

Section 3 Mass Calculations

How much iodine would be needed to completely react with 35.0 g of aluminum?

You should know:

1 mol Al = ___________ g Al

1 mol I = _________ g I

__ mol Al = __ mol I_2

We can change 35.0 g of Al→ moles Al→ moles I_2 → grams I_2

Self Check 9.3 pg. 258

The ______________ of using ______________ equations to __________ problems is called ______________________.

How many water molecules were formed in self check 9.3?

When 9.2 moles of ammonia are decomposed at STP, what volume of hydrogen is produced?

What is the mass of the hydrogen produced?

Section 4 Concepts of Limiting Reagent

8 slices of bread, 1 full jar of peanut butter and 1 full jar of jam. Which will you run out of first when you make pb and j's?
___________= limiting reagent
Which will you have left over?
__________________= excess reagents

The _____________in the balanced equation indicate the __________ ______________ required to completely consume all the ___________ with no reactants remaining _________________. This ratio is called a ___________ ________________. When a mixture is found to contain these _________, it is said to be a *stoichiometric* _______________. There would be no limiting ________________ in this scenario.

Most mixtures of reactants are _______ stoichiometric so the limiting reagent/reactant needs to be ________________.

This is done when the quantities of _______________________ are given in the problem.

Limiting reactant/reagent determines the ________________________ produced and is the reactant that runs out ______________.

Section 5 Calculations Involving a Limiting Reactant

Step 1= using stoichiometry, convert the _______ of the _________ reactant to the _______ of the ______________ in question.
Step 2 = using stoichiometry, convert the _______ of the second ____________ to the mass of the _______________________.
Step 3 = the _____________ that ____________ the _____________ amount of ___________ is the limiting reagent.

Example:
2.50×10^4 grams of nitrogen and 5.00×10^3 grams of hydrogen react. First determine the limiting reagent, then identify the mass of ammonia produced.
Step 1 –

Step 2 –

Step 3 –

The amount of product produced is ___________ of NH_3. This is called the ________________.

Ex. 9.8 pg. 271

$2NH_3(g) + 3CuO(s) \rightarrow N_2(g) + 3Cu(s) + 3H_2O(g)$

The limiting reagent is _________, the amount of ____ produced is ____________.

Section 6 Percent Yield

______________ and _______________ are concerned with ______________ of production. Oftentimes _______________ is used to determine ___________________.

Theoretical yield is the _____________ amount of product ____________________ formed from a ___________ equation and given ___________ of ________________. This is a ____________ quantity.
Actual yield is the ______________ of product ___________ when the process is ____________ carried out.

<u>Percent yield</u> is the ______________ of the _____ yields based on ________.
Ex. During an experiment you obtain 14.6 grams of water and the theoretical yield is 15.4 grams. What is the percent yield?

This next example combines limiting reagent and percent yield.

Using the following reaction, calculate the mass of xenon tetrafluoride that is formed from 130. grams of xenon reacts with 100. grams of F_2. Also determine the percent yield if only 145 g of XeF_4 is actually isolated.

$$Xe(g) + 2F_2(g) \rightarrow XeF_4(s)$$

Limiting reagent is ______, the theoretical yield is ___________________________.
Percent yield is