Name: ____________________________ Date: ___________________________

Equations

Homework Unit 9 - Topic 1

Types of Reactions

The heart of chemistry is chemical changes. They occur when one substance is converted to another substance by changing the electron arrangements of the substances. Elements can be combined to make a compound. A compound can be broken down into its elements. Also, two or more compounds may react to make more compounds.

The whole key to understanding chemical change is to understand the change involves ***valence electrons***.

Synthesis	$A + B \rightarrow C$
Decomposition	$C \rightarrow A + B$
Single Replacement	$A + BC \rightarrow AC + B$
Double Replacement	$AB + CD \rightarrow AD + CB$
Combustion	$C_xH_y + O_2 \rightarrow CO_2 + H_2O$

Mole-Mole Problems

Examine the following reaction: $\mathbf{2}NH_3 \rightarrow \mathbf{3}H_2 + 1N_2$

If you start with 5.3 moles of NH_3, how many moles of H_2 will be produced?

$$\frac{\mathbf{3}\text{ mol } H_2}{\mathbf{2}\text{ mol } NH_3} \times \frac{5.3\text{ mol } NH_3}{1} = \textit{7.95 mol } H_2$$

Notice that we start with the mole ratio from the equation. Start with your ASKED FOR UNIT (in this case mol H_2) and then add in the quantity that you're given in the word problem. Remember to cancel your units when you complete the equation to make sure you're left only with your asked for unit.

Name: ____________________________ Date: __________________________

1. Given the reaction:
$2Al + 3H_2SO_4 \rightarrow 3H_2 + Al_2(SO_2)_3$
The total number of moles of H_2SO_4 needed to react completely with 5.0 moles of Al is
   (1) 2.5 moles
   (2) 5.0 moles
   (3) 7.5 moles
   (4) 9.0 moles

2. Given the reaction:
$CH_{4(g)} + 2O_{2(g)} \rightarrow CO_{2(g)} + 2H_2O_{(g)}$
What type of reaction is this?
   (1) decomposition (combustion)
   (2) double replacement
   (3) single replacement
   (4) synthesis

3. Given the reaction:
$Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$
How many moles of H_2O are needed to react completely with 2.0 moles of Ca?
   (1) 1.0 mole
   (2) 2.0 moles
   (3) 0.50 moles
   (4) 4.0 moles

4. Given the reaction:
$CH_4 + 2O_2 \rightarrow CO_2 + H_2O$
What mass of products are formed by the complete reaction if 1 mole of CH_4 and 2 moles of O_2?
   (1) 1 gram of CO_2 and 2 grams of water
   (2) 3 grams of CO_2 and 6 grams of water
   (3) 44 grams of CO_2 and 18 grams of water
   (4) 44 grams of CO_2 and 36 grams of water

5. Given the reaction:
$4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$
What is the total number of moles of H_2O produced when 1.0 mole of NH_3 is completely consumed?
   (1) 0.67 moles
   (2) 1.00 moles
   (3) 1.33 moles
   (4) 1.50 moles

6. Given the reaction:
$PbCl_2 + Na_2CrO_4 \rightarrow PbCrO_4 + 2NaCl$
What type of reaction is this?
   (1) decomposition
   (2) double replacement
   (3) single replacement
   (4) combustion

7. How many grams is equal to 7.5 moles of H_2SO_4?

8. How many moles is 0.44 grams of CO_2?

9. Given the incomplete equation:
   $2N_2O_5 \rightarrow ? + ?$
Which set of products could complete and balance the incomplete reaction?
   (1) $2N_2 + 3H_2$
   (2) $2N_2 + 2O_2$
   (3) $4NO_2 + O_2$
   (4) $4NO + 5O_2$

10. When the equation
__ C_8H_{16} + __ O_2 → __ CO_2 + __ H_2O
is correctly balanced using the smallest whole number coefficient, the coefficient of O_2 is
   (1) 1
   (2) 8
   (3) 12
   (4) 16

11. Which is a correctly balanced equation for a reaction between hydrogen gas and oxygen gas?
   (1) $H_2 + O_2 \rightarrow H_2O$ + heat
   (2) $H_2 + O_2 \rightarrow 2H_2O$ + heat
   (3) $2H_2 + 2O_2 \rightarrow H_2O$
   (4) $2H_2 + O_2 \rightarrow 2H_2O$

Balance the equations below then classify them as *decomposition (D), double replacement (DR), single replacement (SR), or combustion (C).*

Reaction - Balance it!	**Classification**
____ N_2 + ____ H_2 → ____ NH_3	
____ NaCl + ____ F_2 → ____ NaF + ____ Cl_2	
____ $KClO_3$ → ____ KCl + ____ O_2	
____ $FeCl_3$ + ____ NaOH → ____ $Fe(OH)_3$ + ____ NaCl	
____ C_5H_{12} + ____ O_2 → ____ H_2O + ____ CO_2	