Chemistry		
Chapter 11	– Chemical Re	eactions

Chemical Equations

- Word Equations Write the names of the ______ to the _____ of the arrow (separated by a + sign) and write the _____ in a similar manner to the _____ of the arrow.
- Chemical Equations Write the formulas of the reactants to the ______ of the yields sign (arrow) and the formulas of the products to the ______.
- Examples:
 - o Solid magnesium reacts with oxygen gas to produce magnesium oxide.
 - $\circ \quad \text{Fe (s)} + \text{O}_2 \text{ (g)} \quad \rightarrow \quad \text{Fe}_2 \text{O}_3 \text{ (s)}$
 - When heated, solid mercury(II) sulfide reacts with oxygen gas to produce liquid mercury and sulfur dioxide gas.
 - \circ CaCO₃ (s) \rightarrow CaO(s) + CO₂ (g)

Balancing Equations

- Use ______ to balance an equation so it obeys the
- Examples:
 - o hydrogen + oxygen → water

o zinc (II) + hydrochloric acid → zinc (II) chloride + hydrogen

o nitric acid + magnesium hydroxide → magnesium nitrate + water

Double Replacement Reactions • A reaction in which _____ in ____ ionic compounds ____ to form two ______ ionic compounds. • These types of reactions will only occur if the following 1 of the following criteria is met (*Use reference sheet*) o An insoluble product (precipitate) forms o Gas is given off o Liquid water is formed **Examples:** \circ lead (II) nitrate + potassium iodide \rightarrow \circ iron (II) chloride + potassium sulfide \rightarrow o calcium hydroxide + hydrochloric acid → \circ sodium acetate + potassium bromide \rightarrow o potassium phosphate + magnesium chloride →

o potassium sulfate + calcium nitrate →

 \circ sodium hydroxide + phosphoric acid \rightarrow

	o Shows only those particles in the reaction.		
	, or those ions not directly involved in the reaction, are		
	o, or those ions not directly involved in the reaction, of these equations.		
o Solids (s), Liquids (l) and Gases (g) don't split.			
	 Only Aqueous (aq) splits. 		
	Examples:		
	■ BaCl ₂ (aq) + Na ₂ SO ₄ (aq) \rightarrow BaSO ₄ (s) + 2NaCl (aq)		
	■ $HCl(aq) + ZnS(aq)$ \rightarrow $H_2S(g) + ZnCl_2(aq)$		
	 Complete the reaction & balance first; then write a net ionic equation for Silver (I) nitrate + sodium chloride → 		
Single F	Replacement Reactions		
• A	reaction in which takes the place of another element as part of an		
_	compound.		
	 Metals always replace another metal (use reference sheet) 		
	Hydrogen at times behaves like a metal!		
	 Halogen nonmetals always replace another halogen nonmetal 		
	Fluorine is the most reactive, iodine the least reactive!		
• E	xamples:		
	o If solid zinc metal is placed in an aqueous solution of copper (III) sulfate will a reaction		

occur?

 \circ Al + H₂SO₄ \rightarrow

 If solid silver metal is placed in an aqueous solution of potassium nitrate will a reaction occur?

$$\circ$$
 Cl₂ + KI \rightarrow

Decomposition Reactions

- A reaction that occurs when _____ reactant breaks down into _____ products.
- Examples:

$$\circ$$
 2Ag₂O \rightarrow 4Ag + 2O₂

$$\circ$$
 PCl₅ \rightarrow PCl₃ + Cl₂

$$\bigcirc \quad H_2O_2 \quad \rightarrow \quad H_2O \quad + \quad O_2$$

$$\circ$$
 2CuO \rightarrow 2Cu + O₂

• Specific Decomposition Reactions (HONORS only)

$$\circ \quad MCO_3 \quad \rightarrow \quad MO \quad + \quad CO_2$$

- Where M is any metal
- Example:
 - CaCO₃ \rightarrow

$$\circ \quad MOH \ \rightarrow \ MO \ + \ H_2O$$

- Where M is any metal
- Example:
 - LiOH →

$$\circ \quad MClO_3 \ \rightarrow \ MCl \ + \ O_2$$

- Where M is any metal
- Example:
 - NaClO₃ \rightarrow

- \circ Acid \rightarrow H₂O + remainder of elements
 - Examples:
 - $H_2CO_3 \rightarrow$
 - $H_2SO_4 \rightarrow$
 - $H_2SO_3 \rightarrow$
- $\circ \quad NH_4OH \ \rightarrow \ NH_3 \ + \ H_2O$

Synthesis (Combination) Reactions

- A reaction that occurs when _____ reactants combine to form _____ product.
- Examples:

$$\circ$$
 2H₂ + O₂ \rightarrow 2H₂O

$$\circ \quad 2Ag \ + \quad S \quad \rightarrow \quad Ag_2S$$

$$\circ$$
 2Al + 3Cl₂ \rightarrow 2AgCl₃

$$\circ$$
 NH₃ + HCl \rightarrow NH₄Cl

• Specific Synthesis Reactions (HONORS only) – Opposite of Decomposition!

$$\circ$$
 MO + CO₂ \rightarrow MCO₃

- Where M is any metal
- Example:

•
$$K_2O + CO_2 \rightarrow$$

$$\circ$$
 MO + H₂O \rightarrow MOH

- Where M is any metal
- Example:

• CaO +
$$H_2O \rightarrow$$

$$\circ$$
 MCl + O₂ \rightarrow MClO₃

- Where M is any metal
- Example:
 - KCl + $O_2 \rightarrow$

$$\circ$$
 NO + H₂O \rightarrow Acid

- Where N is any nonmetal
- Examples:
 - $N_2O_3 + H_2O \rightarrow \text{nitrous acid}$
 - $N_2O_5 + H_2O \rightarrow \text{nitric acid}$
 - $P_2O_3 + H_2O \rightarrow phosphorous$ acid
 - $P_2O_5 + H_2O \rightarrow phosphoric acid$
 - $SO_2 + H_2O \rightarrow sulfurous acid$
 - $SO_3 + H_2O \rightarrow sulfuric acid$

Combustion Reactions

- A reaction that occurs when a _____ reacts with _____ to form ____ and _____.
 - Steps to Balance
 - 1. Balance C first
 - 2. Balance H next
 - 3. Balance O last
 - 4. If you would have to put ½ of O to balance, double all coefficients to fix!
- Examples:

$$\circ$$
 CH₄ + O₂ \rightarrow CO₂ + H₂O

$$\bigcirc \quad C_4H_8 \ + \ O_2 \quad \rightarrow \quad CO_2 \ + \ H_2O$$

$$\bigcirc \quad C_2H_6 \ + \ O_2 \quad \rightarrow \quad CO_2 \ + \ H_2O$$

Chapter 11 Mixed Practice

- State the reaction type and predict the products for the following reactions:
 - \circ potassium chloride + silver (I) nitrate \rightarrow

 \circ sodium chloride \rightarrow

 \circ iron (III) metal + copper (II) sulfate \rightarrow

 \circ methyl alcohol, CH₃OH + oxygen gas \rightarrow

 \circ zinc (II) metal + oxygen gas \rightarrow