Review Sheet: Unit 6 **Name** *KEY*

I. Fill in the blanks with the most appropriate term:

Common names of substances like "milk of magnesia" or "lime" usually give no information about the chemical composition of a compound. Consequently, chemists rely on a chemical *formula* when representing a chemical compound. *Ionic* compounds are composed of a metal and a nonmetal while *molecular* compounds are formed between nonmetals. In formulas for binary ionic compounds, the *positive* ion (or *cation*) is always written first and named first. The *negative* ion (or *anion*) is then written and named, with the ending changed to *"-ide"*. *Subscripts* are used to show the number of each ion in the formula. The *stock* system of nomenclature is used for compounds of metals that have more than one charge. Ions made up of more than one element are called *polyatomic* ions, and the ending is NOT changed when naming the compound! *Prefixes* are used to show the number of atoms of each element when naming a molecular compound. Carbon compounds are a special type of molecular compound with the prefix denoting the number of *carbon* atoms and the suffix denoting the type of *bonds*.

A chemical reaction can be represented by a chemical *equation*. The starting substances that undergo a chemical change are called the *reactants*. The new substances formed are called the *products*. Following the Law of Conservation of *Mass /Matter*, a chemical equation must be balanced. When balancing an equation, *coefficients* are placed in front of the reactants and products so that the same number of atoms of each *element* is on each side of the equation. An equation must never be balanced by changing the *subscripts* in the chemical formula of a substance.

Special abbreviations are used to show the physical state of a substance in a reaction. The symbol for a liquid is _____(l)_____; for a solid, _____(s)_____; for a gas, _____(g)_____ or _____↑_____; and for a precipitate (an _____insoluble_____ solid), a _____(s)_____ or _____↓_____. A substance that is dissolved in water is designated _____(aq)_____.

We recognize five general types of reactions. In a _____synthesis_____ reaction, the reactants are two or more _____elements_____ and/or compounds and a more _____complex_____ product is formed. A _____decomposition_____ reaction is just the opposite; a single compound is broken down into two or more simpler substances. In a _____single_____ _____replacement_____ reaction, the reactants and products take the general form of A + BY → AY + B. An _____activity_____ series must be used to determine if this type reaction will actually take place. An element in the _____activity_____ series can replace any element _____below_____ it on the list, but cannot replace any element _____above_____ it on the list. A _____double_____ _____replacement_____ reaction involves the exchange of cations (_____positive_____ ions) between two compounds generally in an _____aqueous_____ solution. One of the reactants in a _____combustion_____ reaction is atmospheric _____oxygen_____; the products of the complete combustion of a hydrocarbon are _____CO_2_____ and _____H_2O_____. If the combustion is incomplete (which means not enough _____oxygen_____ is present), the poisonous, colorless, odorless gas _____carbon_____ _____monoxide (CO)_____ is also formed.

II. Writing and naming formulas

Write either the name or formula for the following compounds, whichever is appropriate.

1. phosphorus pentachloride _____PCl_5_____
2. CH_4 _____methane_____
3. zinc phosphate _____$Zn_3(PO_4)_2$_____

4. C_4H_8 _____*butene*_____

5. CCl_4 _____*carbon tetrachloride*_____

6. ammonium thiosulfate _____$(NH_4)_2S_2O_3$_____

7. aluminum citrate _____$AlC_6H_5O_7$_____

8. tin (II) oxide _____SnO_____

9. Fe_2O_3 _____*iron (III) oxide*_____

10. copper (II) iodate _____$Cu(IO_3)_2$_____

III. Balancing Equations

Balance the following equations. Tell which type of reaction each represents.

1. $Zn + 2HCl \rightarrow H_2 + ZnCl_2$

type: *single replacement*

2. $3AgNO_3 + AlI_3 \rightarrow 3AgI + Al(NO_3)_3$

type: *double replacement*

3. $2Al_2O_3 \rightarrow 4Al + 3O_2$

type: *decomposition*

4. $2C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O$

type: *combustion*

5. $2Fe + 3Br_2 \rightarrow 2FeBr_3$

type: ____*synthesis*____

IV. Activity Series

Use the activity series to write balanced chemical equations for each of these single replacement reactions. If no reaction will occur, write "NR".

1. $Sn(s) + NaNO_3(aq) \rightarrow NR$

2. $Cl_2(g) + 2\,NaBr(aq) \rightarrow 2\,NaCl\,(aq) + Br_2\,(l)$

3. $Cu(s) + FeSO_4(aq) \rightarrow NR$

V. Word Equations

Substitute symbols and formulas for words and then balance the following equations. Be sure to use abbreviations to denote physical states.

1. When solid potassium nitrate is heated, it decomposes to solid potassium nitrite, and oxygen gas is evolved.

$2\,KNO_3\,(s) \rightarrow 2\,KNO_2\,(s) + O_2\,[(g)\ or\ \uparrow]$

2. Solid lithium hydroxide reacts with carbon dioxide to form solid lithium carbonate and liquid water.

$2\,LiOH\,(s) + CO_2\,(g) \rightarrow Li_2CO_3\,(s) + H_2O\,(l)$

VI. Predicting Products

1. In a common synthesis reaction, sodium metal is lowered into a bottle of chlorine gas. Predict the product, substitute symbols and formulas for names, and then balance the equation. Be sure to use abbreviations to denote physical states.

$$2\ Na\ (s)\ +\ Cl_2\ (g)\ \rightarrow\ 2\ NaCl\ (s)$$

2. Aluminum sulfate and calcium hydroxide are used in a water purification process. When each is dissolved in water, they react to produce two insoluble products. Predict the products, substitute symbols and formulas for names, and then balance the equation. Be sure to use abbreviations to denote physical states.

$$Al_2(SO_4)_3\ (aq)\ +\ 3\ Ca(OH)_2\ (aq)\ \rightarrow\ 3\ CaSO_4\ [(s)\ or\ \downarrow]\ +\ 2\ Al(OH)_3\ [(s)\ or\ \downarrow]$$