

## I BALANCING CHEMICAL EQUATIONS

Name \_\_\_\_\_

Rewrite and balance the equations below.

- $N_2 + H_2 \rightarrow NH_3$  \_\_\_\_\_
- $KClO_3 \rightarrow KCl + O_2$  \_\_\_\_\_
- $NaCl + F_2 \rightarrow NaF + Cl_2$  \_\_\_\_\_
- $H_2 + O_2 \rightarrow H_2O$  \_\_\_\_\_
- $AgNO_3 + MgCl_2 \rightarrow AgCl + Mg(NO_3)_2$  \_\_\_\_\_
- $AlBr_3 + K_2SO_4 \rightarrow KBr + Al_2(SO_4)_3$  \_\_\_\_\_
- $CH_4 + O_2 \rightarrow CO_2 + H_2O$  \_\_\_\_\_
- $C_3H_8 + O_2 \rightarrow CO_2 + H_2O$  \_\_\_\_\_
- $C_8H_{18} + O_2 \rightarrow CO_2 + H_2O$  \_\_\_\_\_
- $FeCl_3 + NaOH \rightarrow Fe(OH)_3 + NaCl$  \_\_\_\_\_
- $P + O_2 \rightarrow P_2O_5$  \_\_\_\_\_
- $Na + H_2O \rightarrow NaOH + H_2$  \_\_\_\_\_
- $Ag_2O \rightarrow Ag + O_2$  \_\_\_\_\_
- $S_8 + O_2 \rightarrow SO_3$  \_\_\_\_\_
- $CO_2 + H_2O \rightarrow C_6H_{12}O_6 + O_2$  \_\_\_\_\_
- $K + MgBr_2 \rightarrow KBr + Mg$  \_\_\_\_\_
- $HCl + CaCO_3 \rightarrow CaCl_2 + H_2O + CO_2$  \_\_\_\_\_

## II BALANCING EQUATIONS

Name \_\_\_\_\_

Balance the following chemical equations.

- $CH_4 + O_2 \rightarrow CO_2 + H_2O$  \_\_\_\_\_
- $Na + I_2 \rightarrow NaI$  \_\_\_\_\_
- $N_2 + O_2 \rightarrow N_2O$  \_\_\_\_\_
- $N_2 + H_2 \rightarrow NH_3$  \_\_\_\_\_
- $KI + Cl_2 \rightarrow KCl + I_2$  \_\_\_\_\_
- $HCl + Ca(OH)_2 \rightarrow CaCl_2 + H_2O$  \_\_\_\_\_
- $KClO_3 \rightarrow KCl + O_2$  \_\_\_\_\_
- $K_3PO_4 + HCl \rightarrow KCl + H_3PO_4$  \_\_\_\_\_
- $S + O_2 \rightarrow SO_3$  \_\_\_\_\_
- $KI + Pb(NO_3)_2 \rightarrow KNO_3 + PbI_2$  \_\_\_\_\_
- $CaSO_4 + AlBr_3 \rightarrow CaBr_2 + Al_2(SO_4)_3$  \_\_\_\_\_
- $H_2O_2 \rightarrow H_2O + O_2$  \_\_\_\_\_
- $Na + H_2O \rightarrow NaOH + H_2$  \_\_\_\_\_
- $C_2H_6 + O_2 \rightarrow CO_2 + H_2O$  \_\_\_\_\_
- $Mg(NO_3)_2 + K_3PO_4 \rightarrow Mg_3(PO_4)_2 + KNO_3$  \_\_\_\_\_

# WORD EQUATIONS

Name \_\_\_\_\_

Write the word equations below as chemical equations and balance.

1. zinc + lead (II) nitrate yield zinc nitrate + lead

2. aluminum bromide + chlorine yield aluminum chloride + bromine

3. sodium phosphate + calcium chloride yield calcium phosphate + sodium chloride

4. potassium chlorate when heated yields potassium chloride + oxygen gas

5. aluminum + hydrochloric acid yield aluminum chloride + hydrogen gas

6. calcium hydroxide + phosphoric acid yield calcium phosphate + water

7. copper + sulfuric acid yield copper (II) sulfate + water + sulfur dioxide

8. hydrogen + nitrogen monoxide yield water + nitrogen

# WORD EQUATIONS

Name \_\_\_\_\_

Write and balance the following chemical equations.

1. Hydrogen plus oxygen yield water.

2. Nitrogen plus hydrogen yield ammonia.

3. Aluminum bromide plus chlorine yield aluminum chloride and bromine.

4. Hydrochloric acid plus sodium hydroxide yield sodium chloride plus water.

5. Iron plus lead (II) sulfate react forming iron (II) sulfate plus lead.

6. Potassium chlorate when heated produces potassium chloride plus oxygen gas.

7. Sulfuric acid decomposes to form sulfur trioxide gas plus water.

8. Sodium oxide combines with water to make sodium hydroxide.

9. Potassium iodide reacts with bromine forming potassium bromide plus iodine.

10. Sodium phosphate reacts with calcium nitrate to produce sodium nitrate plus calcium phosphate.

11. Zinc reacts with iron (III) chloride yielding zinc chloride plus iron precipitate.

12. Ammonium carbonate and magnesium sulfate react to yield ammonium sulfate plus magnesium carbonate.

13. Phosphoric acid plus calcium hydroxide react forming solid calcium phosphate plus water.

14. Aluminum plus oxygen gas form aluminum oxide under certain conditions.

15. Nitrogen gas plus oxygen gas react and form dinitrogen pentoxide.

# PREDICTING PRODUCTS OF CHEMICAL REACTIONS

Name \_\_\_\_\_

Predict the products of the reactions below. Then, write the balanced equation and classify the reaction.

1. magnesium bromide + chlorine

2. aluminum + iron (III) oxide

3. silver nitrate + zinc chloride

4. hydrogen peroxide (catalyzed by manganese dioxide)

5. zinc + hydrochloric acid

6. sulfuric acid + sodium hydroxide

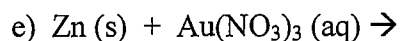
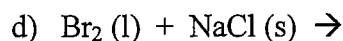
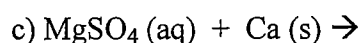
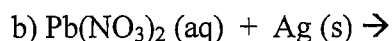
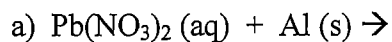
7. sodium + hydrogen

8. acetic acid + copper

### Single Replacement Reactions and the Activity Series

*A cation will replace any less reactive cation in a cationic single replacement reaction.  
An anion will replace any less reactive anion in an anionic single replacement reaction*

Use the chart to predict **if** the following will occur. If it does, predict the products and complete the balanced equation.



### Precipitation Reactions

*A low solubility compound will not dissolve in water, and will form a solid called a precipitate if it is created in a reaction. A soluble compound will dissolve in water and will be in the aqueous phase if in the presence of water in a reaction.*

A) Using the chart provided in the data book, decide if each of the following compounds will dissolve in water:

a) calcium chloride    b) calcium sulphide    c) calcium sulphate    d) cesium hydroxide

e) copper (I) phosphate    f) copper (II) phosphate    g) ammonium carbonate

B) Assume that the following solid compounds are mixed together in the presence of water (so the reactants could be dissolved). Complete the chemical equations, including phases and balancing:

a) copper (II) nitrate and sodium sulphite

b) Barium sulphide and zinc sulphate

c) silver acetate and magnesium bromide

## Types of Chemical Reactions

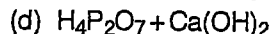
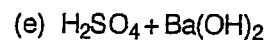
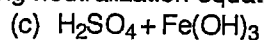
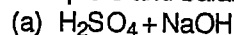
Answer on a separate sheet of paper.

### SUMMARY OF REACTION TYPES

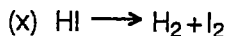
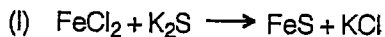
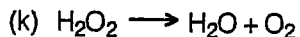
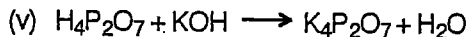
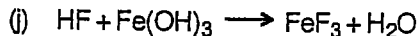
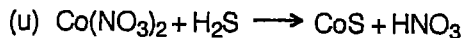
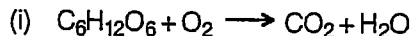
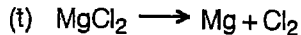
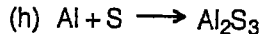
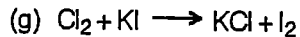
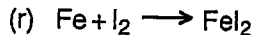
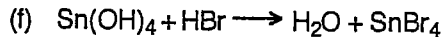
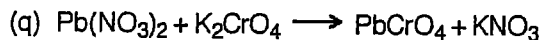
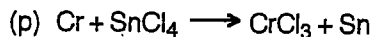
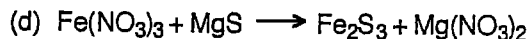
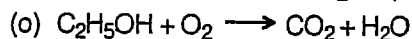
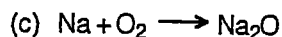
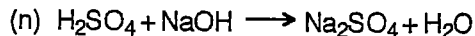
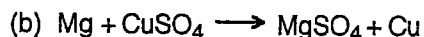
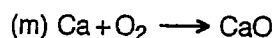
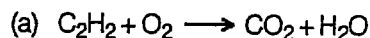
TYPE	HOW TO RECOGNIZE REACTANTS	HOW TO PREDICT PRODUCTS
Synthesis or Combination	2 Elements	Combine elements into one compound
Decomposition	One compound	Break compound into its elements
Single Replacement	Element + Compound	Interchange metals (or nonmetals) present
Double Replacement	Compound + Compound	Interchange positive ions in compounds
Neutralization (special case of double replacement)	Acid + Base	Water is one product; remaining ions combine to form a salt
Combustion of Hydrocarbon	(A substance whose formula starts with "C") + O <sub>2</sub>	CO <sub>2</sub> + H <sub>2</sub> O (if H present) + SO <sub>2</sub> (if S present)

### EXERCISES:

1. Complete and balance the following neutralization equations.



2. Balance the following equations and classify each reaction as one of: synthesis, decomposition, single replacement, double replacement, neutralization or combustion.



3. Complete and balance the following reactions and classify each equation as one of: synthesis, decomposition, single replacement, double replacement, neutralization or combustion.

