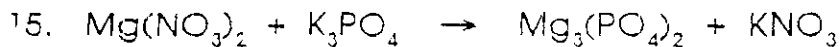
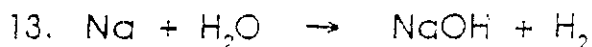
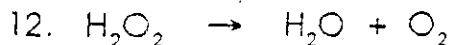
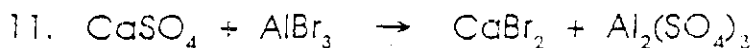
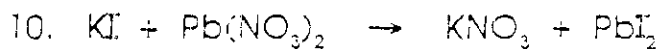
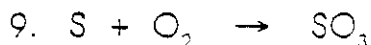
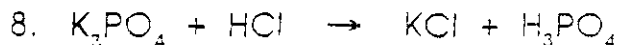
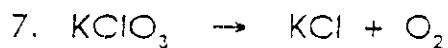
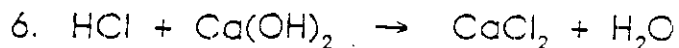
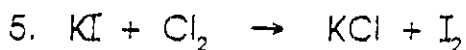
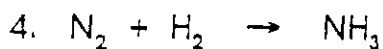
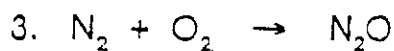
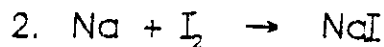
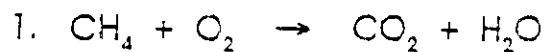


# BALANCING EQUATIONS

Name \_\_\_\_\_

Balance the following chemical equations. **I**

129



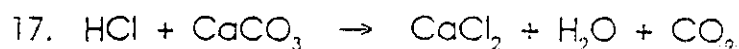
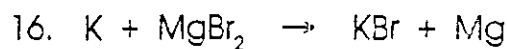
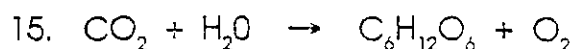
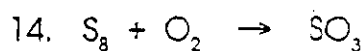
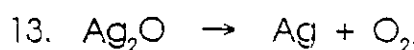
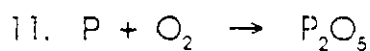
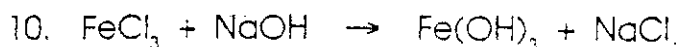
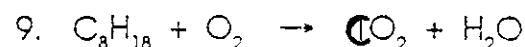
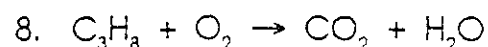
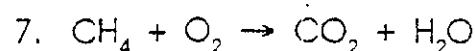
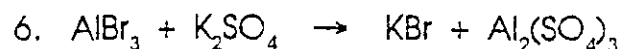
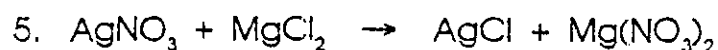
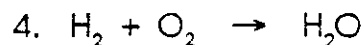
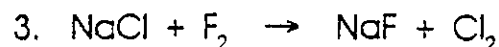
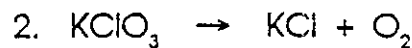
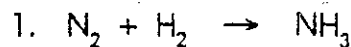
# BALANCING CHEMICAL EQUATIONS

Name \_\_\_\_\_

Rewrite and balance the equations below.

II

130



## Balancing Equations Worksheet

131

- 1)  $\underline{\quad} \text{N}_2 (\text{g}) + \underline{\quad} \text{H}_2 (\text{g}) \longrightarrow \underline{\quad} \text{NH}_3 (\text{g})$
- 2)  $\underline{\quad} \text{KClO}_3 (\text{s}) \longrightarrow \underline{\quad} \text{KCl} (\text{s}) + \underline{\quad} \text{O}_2 (\text{g})$
- 3)  $\underline{\quad} \text{C}_3 \text{H}_8 \text{O} (\text{l}) + \underline{\quad} \text{O}_2 (\text{g}) \longrightarrow \underline{\quad} \text{CO}_2 (\text{g}) + \underline{\quad} \text{H}_2 \text{O} (\text{l})$
- 4)  $\underline{\quad} \text{Sn} (\text{s}) + \underline{\quad} \text{HCl} (\text{aq}) \longrightarrow \underline{\quad} \text{SnCl}_2 + \underline{\quad} \text{H}_2 (\text{g})$
- 5)  $\underline{\quad} \text{NaBr} + \underline{\quad} \text{Cl}_2 \longrightarrow \underline{\quad} \text{NaCl} + \underline{\quad} \text{Br}_2$
- 6)  $\underline{\quad} \text{K} + \underline{\quad} \text{H}_2 \text{O} \longrightarrow \underline{\quad} \text{H}_2 + \underline{\quad} \text{KOH}$
- 7)  $\underline{\quad} \text{Ca}(\text{OH})_2 + \underline{\quad} \text{HC}_2 \text{H}_3 \text{O}_2 \longrightarrow \underline{\quad} \text{Ca}(\text{C}_2 \text{H}_3 \text{O}_2)_2 + \underline{\quad} \text{H}_2 \text{O}$
- 8)  $\underline{\quad} \text{Pb}(\text{NO}_3)_2 + \underline{\quad} \text{NaI} \longrightarrow \underline{\quad} \text{PbI}_2 + \underline{\quad} \text{NaNO}_3$
- 9)  $\underline{\quad} \text{C}_8 \text{H}_{18} + \underline{\quad} \text{O}_2 \longrightarrow \underline{\quad} \text{CO}_2 + \underline{\quad} \text{H}_2 \text{O}$
- 10)  $\underline{\quad} \text{C}_3 \text{H}_8 + \underline{\quad} \text{O}_2 \longrightarrow \underline{\quad} \text{CO}_2 + \underline{\quad} \text{H}_2 \text{O}$
- 11)  $\underline{\quad} \text{Cu} + \underline{\quad} \text{O}_2 \longrightarrow \underline{\quad} \text{Cu}_2 \text{O}$
- 12)  $\underline{\quad} \text{C} + \underline{\quad} \text{O}_2 \longrightarrow \underline{\quad} \text{CO}_2$
- 13)  $\underline{\quad} \text{C}_6 \text{H}_{10} \text{O}_5 + \underline{\quad} \text{O}_2 \longrightarrow \underline{\quad} \text{CO}_2 + \underline{\quad} \text{H}_2 \text{O}$
- 14)  $\underline{\quad} \text{C}_3 \text{H}_5(\text{NO}_3)_3 \longrightarrow \underline{\quad} \text{N}_2 + \underline{\quad} \text{O}_2 + \underline{\quad} \text{CO}_2 + \underline{\quad} \text{H}_2 \text{O}$
- 15)  $\underline{\quad} \text{Ag} + \underline{\quad} \text{H}_2 \text{S} + \underline{\quad} \text{O}_2 \longrightarrow \underline{\quad} \text{Ag}_2 \text{S} + \underline{\quad} \text{H}_2 \text{O}$
- 16)  $\underline{\quad} \text{SiO}_2 + \underline{\quad} \text{C} \longrightarrow \underline{\quad} \text{SiC} + \underline{\quad} \text{CO}$
- 17)  $\underline{\quad} \text{Al}(\text{OH})_3 + \underline{\quad} \text{HCl} \longrightarrow \underline{\quad} \text{AlCl}_3 + \underline{\quad} \text{H}_2 \text{O}$



# WORD EQUATIONS I

Name \_\_\_\_\_

133

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 II

Name \_\_\_\_\_

134

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.

## Types of Reactions

Please use the textbook pages 256-267 to help you with the following.

### OUTLINE

What are the five basic types of chemical reactions covered in this textbook?

- 1
- 2
- 3
- 4
- 5

How can we use the information in regards to patterns classically exhibited by the reaction types?

### Synthesis Reactions

Definition-

General Equation-

Example Equations-

What is the classical pattern of a synthesis reaction that will give you clues regarding predicting products given only the reactants?

Specific Information relevant to synthesis reactions-

### Decomposition Reactions

Definition-

General Equation-

Example Equations-

What is the classical pattern of a decomposition reaction that will give you clues regarding predicting products given only the reactants?

Specific Information relevant to decomposition reactions-

### Single Replacement Reactions

Definition-

General Equation-

Example Equations-

What is the classical pattern of a single replacement reaction that will give you clues regarding predicting products given only the reactants?

Specific Information relevant to single replacement reactions-

## Double Replacement Reactions

Definition-

General Equation-

Example Equations-

What is the classical pattern of a double replacement reaction that will give you clues regarding predicting products given only the reactants?

Specific Information relevant to double replacement reactions-

## Combustion Reactions

Definition-

General Equation-

Example Equations-

What is the classical pattern of a combustion reaction that will give you clues regarding predicting products given only the reactants?

Specific Information relevant to combustion reactions-

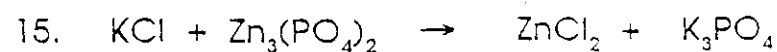
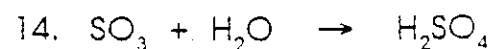
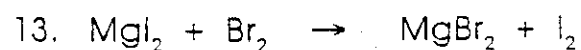
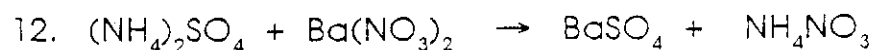
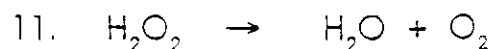
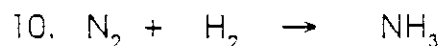
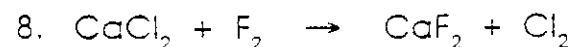
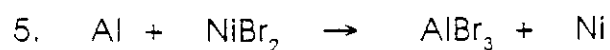
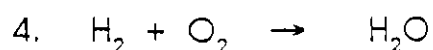
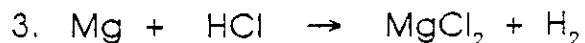
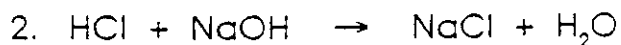
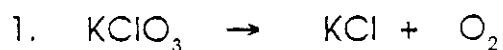


# CLASSIFYING CHEMICAL REACTIONS

Name \_\_\_\_\_

139

Balance the reactions below and classify them as synthesis, decomposition, single replacement or double replacement.

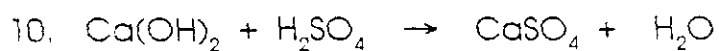
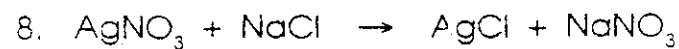
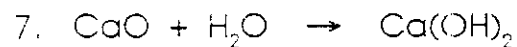
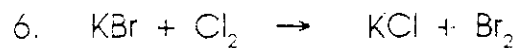
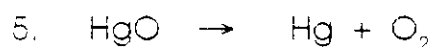
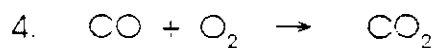
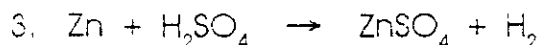


# CLASSIFICATION OF CHEMICAL REACTIONS

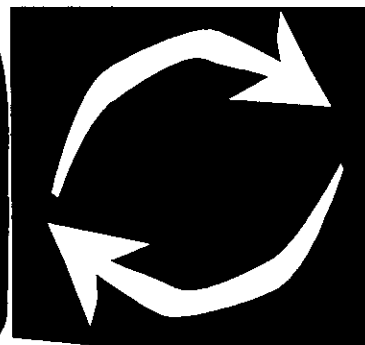
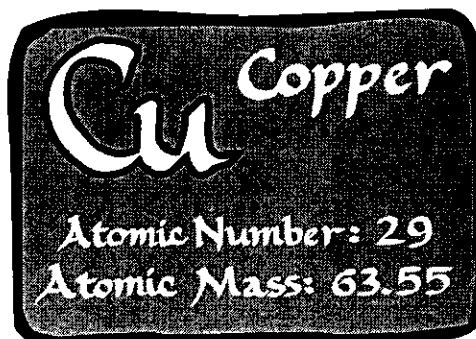
Name \_\_\_\_\_

140

Balance the reactions below and classify them as synthesis, decomposition, single replacement or double replacement.



## Copper Circle Project



### Purpose:

The group will be taking solid copper and running it through five various reactions. When all of the reactions are complete the final product will be solid copper, thus coming full circle with the copper. The student's goal is to report out the project discussing the chemistry behind each reaction in the following format below. Students may use any visual media to report out this information. The project will be assessed on the following criteria:

1. Word equation (1 point for each correct reaction)
2. Balanced chemical equation including state of matter (1 point for each correct reaction)
3. Type of reaction (1 point for each correct reaction)
4. Drawings of reaction on a submicroscopic level (1 point for each correct reaction)
5. What evidence indicates a reaction occurred? (1 point for each correct reaction)
6. Quality Grade: neatness, color, creativity, user friendly and spelling (5 points total)

### REACTION 1:

Wrap a 5 cm piece of copper metal around the end of your pencil. Place it in a test tube with 3 mL of 6M nitric acid. Let stand for 20 minutes. Record observations of the newly formed products: copper (II) nitrate, water and nitrogen dioxide gas.

### REACTION 2:

Place the test tube in a cold water bath. While stirring, SLOWLY add 4 mL of a 6M sodium hydroxide to the copper (II) nitrate solution. Record observations of the newly formed products: solid copper (II) hydroxide and aqueous sodium nitrate.

### REACTION 3:

Add 2 mL of water to dilute the contents. Place the test tube in a hot water bath. As the copper (II) hydroxide is heated, observe the formation of the precipitate, copper (II) oxide and water as a product.

### REACTION 4:

Place test tube in a cold water bath to help the precipitate settle faster. Using a pipette, remove the liquid layer on top. Add a clean dropper full of water to the test tube. Let settle and remove the top liquid layer again. Add 5 mL of 6M sulfuric acid ( $H_2SO_4$ ) to the test tube containing copper (II) oxide and stir. Record observations of the newly formed products: copper (II) sulfate and water.

### REACTION 5:

Add one large piece of zinc metal to the copper (II) sulfate solution and stir. BE CAREFUL! Test tube gets hot! Record observations of the newly formed products: zinc sulfate and copper metal.

142.

## Equations

Write a balanced chemical equation to represent each of the following chemical reactions:

1. iron + sulfur  $\rightarrow$  iron (II) sulfide
2. zinc + cupric sulfate  $\rightarrow$  zinc sulfate + copper
3. silver nitrate + sodium bromide  $\rightarrow$  sodium nitrate + silver bromide
4. potassium chlorate (heated)  $\rightarrow$  potassium chloride + oxygen
5. water (electricity)  $\rightarrow$  hydrogen + oxygen
6. mercury (II) oxide (heated)  $\rightarrow$  mercury + oxygen
7. potassium iodide + lead (II) nitrate  $\rightarrow$  lead (II) iodide + potassium nitrate
8. aluminum + oxygen  $\rightarrow$  aluminum oxide
9. magnesium chloride + ammonium nitrate  $\rightarrow$  magnesium nitrate + ammonium chloride
10. iron (III) chloride + ammonium hydroxide  $\rightarrow$  iron (III) hydroxide + ammonium chloride
11. sodium peroxide + water  $\rightarrow$  sodium hydroxide + oxygen
12. iron (III) oxide + carbon  $\rightarrow$  iron + carbon monoxide
13. iron + water  $\rightarrow$  hydrogen + iron (III) oxide
14. iron (III) chloride + potassium hydroxide  $\rightarrow$  potassium chloride + iron (III) hydroxide
15. aluminum + sulfuric acid  $\rightarrow$  aluminum sulfate + hydrogen

(continued)

## EQUATIONS

16. sodium carbonate + calcium hydroxide  $\rightarrow$  sodium hydroxide + calcium carbonate
17. carbon dioxide + water  $\rightarrow$  carbonic acid
18. phosphorus + oxygen  $\rightarrow$  phosphorus pentoxide
19. sodium + water  $\rightarrow$  sodium hydroxide + hydrogen
20. zinc + sulfuric acid  $\rightarrow$  zinc sulfate + hydrogen
21. aluminum sulfate + calcium hydroxide  $\rightarrow$  aluminum hydroxide + calcium sulfate
22. calcium oxide + water  $\rightarrow$  calcium hydroxide
23. iron + copper (I) nitrate  $\rightarrow$  iron (II) nitrate + copper
24. iron (II) sulfide + hydrochloric acid  $\rightarrow$  hydrogen sulfide + iron (II) chloride
25. potassium oxide + water  $\rightarrow$  potassium hydroxide
26. ammonium sulfide + lead (II) nitrate  $\rightarrow$  ammonium nitrate + lead (II) sulfide
27. mercury (II) hydroxide + phosphoric acid  $\rightarrow$  mercury (II) phosphate + water
28. potassium hydroxide + phosphoric acid  $\rightarrow$  potassium phosphate + water
29. calcium chloride + nitric acid  $\rightarrow$  calcium nitrate + hydrochloric acid
30. potassium carbonate + barium chloride  $\rightarrow$  potassium chloride + barium carbonate
31. magnesium hydroxide + sulfuric acid  $\rightarrow$  magnesium sulfate + water
32. sulfur dioxide + water  $\rightarrow$  sulfurous acid

*(continued)*

**Predicting Products Worksheet**

Name: \_\_\_\_\_

*For each of the following reactions, identify the type of reaction and predict the products.*

1. Type: \_\_\_\_\_  $\text{N}_2 + \text{H}_2 \rightarrow$
2. Type: \_\_\_\_\_  $\text{MgBr}_2 + \text{Cl}_2 \rightarrow$
3. Type: \_\_\_\_\_  $\text{C}_3\text{H}_8 + \text{O}_2 \rightarrow$
4. Type: \_\_\_\_\_  $\text{Zn} + \text{HCl} \rightarrow$
5. Type: \_\_\_\_\_  $\text{MgO} \rightarrow$
6. Type: \_\_\_\_\_  $\text{K}_2\text{S} + \text{Fe}(\text{NO}_3)_2 \rightarrow$
7. Type: \_\_\_\_\_  $\text{Al}(\text{OH})_3 + \text{HCl} \rightarrow$
8. Type: \_\_\_\_\_  $\text{Li} + \text{H}_2\text{O} \rightarrow$
9. Type: \_\_\_\_\_  $\text{NaBr} + \text{AgNO}_3 \rightarrow$
10. Type: \_\_\_\_\_  $\text{C}_6\text{H}_{10}\text{O}_5 + \text{O}_2 \rightarrow$
11. Type: \_\_\_\_\_  $\text{Na} + \text{O}_2 \rightarrow$
12. Type: \_\_\_\_\_  $\text{Mg} + \text{Zn}(\text{NO}_3)_2 \rightarrow$
13. Type: \_\_\_\_\_  $\text{NH}_4\text{NO}_3 + \text{CaCl}_2 \rightarrow$
14. Type: \_\_\_\_\_  $\text{H}_2\text{O} + \text{electricity} \rightarrow$
15. Type: \_\_\_\_\_  $\text{Na}_2\text{CO}_3 + \text{KNO}_3 \rightarrow$
16. Type: \_\_\_\_\_  $\text{AgNO}_3 + \text{Na}_2\text{CO}_3 \rightarrow$

## Predicting Products

Name \_\_\_\_\_

Period \_\_\_\_

For each of the problems:

1. Write the chemical formula for the reactant(s).
2. In the margin, state the type of reaction that is predicted.
3. Predict the products.

*\*Note: For single replacement reactions, use the activity series to make sure the reaction occurs.*

1. aluminum plus hydrochloric acid
2. calcium hydroxide plus nitric acid
3. mercury plus oxygen
4. sodium bromide plus silver nitrate
5. lithium iodide plus fluorine
6. potassium iodide plus iron
7. zinc plus cupric sulfate
8. lithium plus bromine
9. sodium chloride plus electricity
10. calcium chloride plus bromine