

Key



KEY

## Chemistry: Balancing Chemical Equations

Directions: First, balance each of the chemical equations below. Then, classify each reaction as **synthesis**, **decomposition**, **single-replacement**, or **double-replacement**. To earn full credit, write the words out when classifying.

Balance the equation...

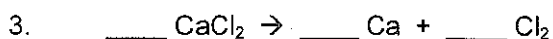
...and classify it.



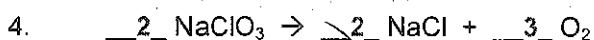
synthesis



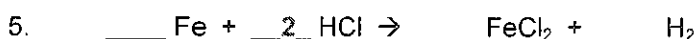
synthesis



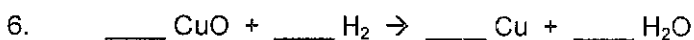
decomposition



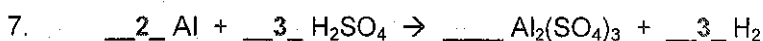
decomposition



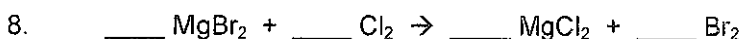
single replacement



single replacement



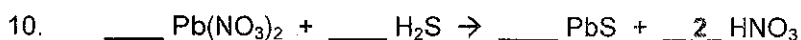
single replacement



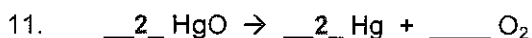
single replacement



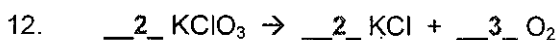
single replacement



double replacement



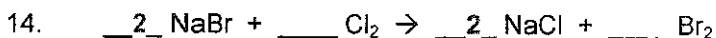
decomposition



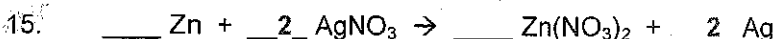
decomposition



synthesis



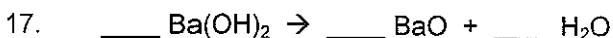
single replacement



single replacement



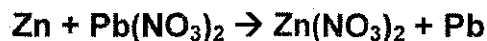
synthesis



decomposition

## Word Equations – Answer Key

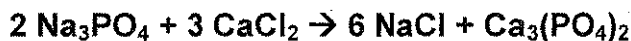
- 1) Zinc and lead (II) nitrate react to form zinc nitrate and lead.



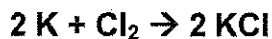
- 2) Aluminum bromide and chlorine gas react to form aluminum chloride and bromine gas.



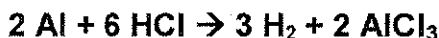
- 3) Sodium phosphate and calcium chloride react to form calcium phosphate and sodium chloride.



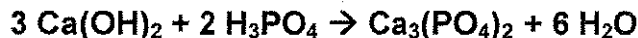
- 4) Potassium metal and chlorine gas combine to form potassium chloride.



- 5) Aluminum and hydrochloric acid react to form aluminum chloride and hydrogen gas.



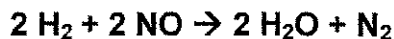
- 6) Calcium hydroxide and phosphoric acid react to form calcium phosphate and water.



- 7) Copper and sulfuric acid react to form copper (II) sulfate and water and sulfur dioxide.



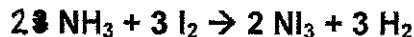
- 8) Hydrogen gas and nitrogen monoxide react to form water and nitrogen gas.



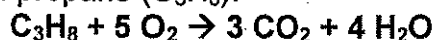
## Worksheet: Writing Equations

Write equations for the following reactions:

- 1) The reaction of ammonia with iodine to form nitrogen triiodide (NI<sub>3</sub>) and hydrogen gas.



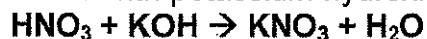
- 2) The combustion of propane (C<sub>3</sub>H<sub>8</sub>).



- 3) The incomplete combustion of propane to form CO and water.



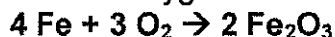
- 4) The reaction of nitric acid with potassium hydroxide.



- 5) The reaction of copper (II) oxide with hydrogen to form copper metal and water.



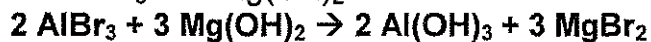
- 6) The reaction of iron metal with oxygen to form iron (III) oxide.



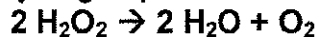
- 7) The complete combustion of 2,2-dimethylpropane (C<sub>4</sub>H<sub>10</sub>) in oxygen.



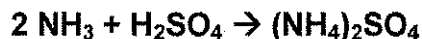
- 8) The reaction of AlBr<sub>3</sub> with Mg(OH)<sub>2</sub>



- 9) The decomposition of hydrogen peroxide to form water and oxygen.



- 10) The reaction of ammonia with sulfuric acid.



KEY

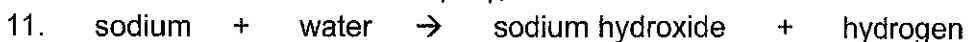
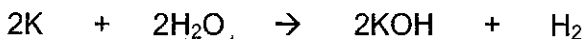
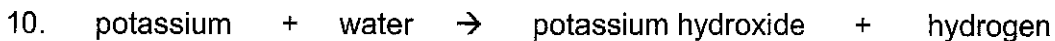
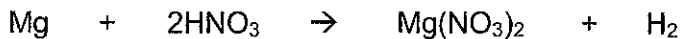
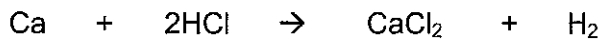
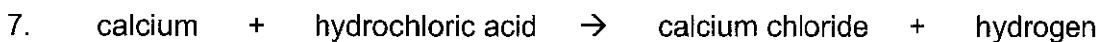
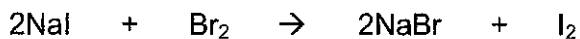
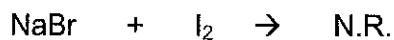
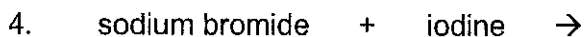
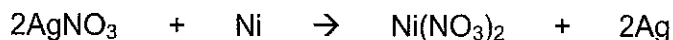
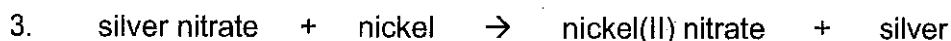
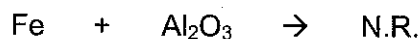
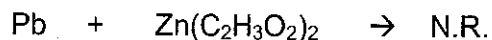
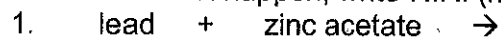
#4

**Worksheet #4: Single-Replacement Reactions**

Step 1 - Write the formulas of the reactants on the left of the yield sign

Step 2 - Look at the Activity Series on page 266 to determine if the replacement can happen

Step 3 - If the replacement can occur, complete the reaction and balance it. If the reaction cannot happen, write N.R. (no rxn) on the product side.



KEY

#5

**Worksheet #5: Double-Replacement Reactions**

In these reactions, all you do is look at the names of the reactants, and "switch partners". Just be sure that the new pairs come out with the positive ion named first, and paired with a negative ion.

1. aluminum iodide + mercury(II) chloride → aluminum chloride + mercury(II) iodide



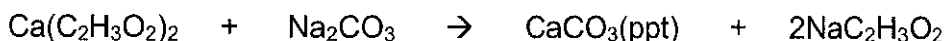
2. silver nitrate + potassium phosphate → silver phosphate + potassium nitrate



3. copper(II) bromide + aluminum chloride → copper(II) chloride + aluminum bromide



4. calcium acetate + sodium carbonate → calcium carbonate + sodium acetate



5. ammonium chloride + mercury(I) acetate → ammonium acetate + mercury(I) chloride



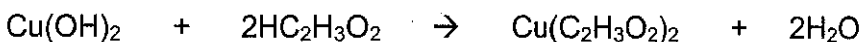
6. calcium nitrate + hydrochloric acid → calcium chloride + nitric acid



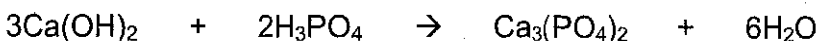
7. iron(II) sulfide + hydrochloric acid → iron(II) chloride + hydrogen sulfide (g)



8. copper(II) hydroxide + acetic acid → copper(II) acetate + water



9. calcium hydroxide + phosphoric acid → calcium phosphate + water



10. calcium bromide + potassium hydroxide → calcium hydroxide + potassium bromide



Examine the products of the reactions on this page, and determine in each whether a gas, water, or a precipitate is formed. Use the solubility table in Appendix A of your textbook to determine the solubilities of the reaction products. If there is no gas, water, or precipitate produced, put an "X" through the yield sign, because no reaction occurs.

## Predicting the products of chemical reactions

~~4/2~~  
#7

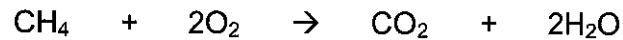
- 1)  $2 \text{Ag} + 1 \text{CuSO}_4 \rightarrow 1 \text{Ag}_2\text{SO}_4 + 1 \text{Cu}$  *NO RXN*  
Type: Single Displacement
- 2)  $2 \text{NaI} + 1 \text{CaCl}_2 \rightarrow 2 \text{NaCl} + 1 \text{CaI}_2$   
Type: Double Displacement
- 3)  $1 \text{O}_2 + 2 \text{H}_2 \rightarrow 2 \text{H}_2\text{O}$   
Type: Synthesis
- 4)  $2 \text{HNO}_3 + 1 \text{Mn(OH)}_2 \rightarrow 2 \text{H}_2\text{O} + 1 \text{Mn(NO}_3)_2$   
Type: ~~Acid-Base~~ *DR*
- 5)  $2 \text{AgNO}_2 + 1 \text{BaSO}_4 \rightarrow 1 \text{Ag}_2\text{SO}_4 + 1 \text{Ba(NO}_2)_2$   
Type: Double Displacement
- 6)  $2 \text{HCN} + 1 \text{CuSO}_4 \rightarrow 1 \text{H}_2\text{SO}_4 + 1 \text{Cu(CN)}_2$   
Type: Double Displacement
- 7)  $1 \text{H}_2\text{O} + 1 \text{AgI} \rightarrow 1 \text{HI} + 1 \text{AgOH}$   
Type: Double Displacement
- 8)  $3 \text{HNO}_3 + 1 \text{Fe(OH)}_3 \rightarrow 3 \text{H}_2\text{O} + 1 \text{Fe(NO}_3)_3$   
Type: Acid-Base *DR*
- 9)  $4 \text{LiBr} + 1 \text{Co(SO}_3)_2 \rightarrow 2 \text{Li}_2\text{SO}_3 + 1 \text{CoBr}_4$   
Type: Double Displacement
- 10)  $1 \text{LiNO}_3 + 1 \text{Ag} \rightarrow 1 \text{AgNO}_3 + 1 \text{Li}$  *NO RXN*  
Type: Single Displacement
- 11)  $1 \text{N}_2 + 2 \text{O}_2 \rightarrow 2 \text{NO}_2$   
Type: Synthesis
- 12)  $1 \text{H}_2\text{CO}_3 \rightarrow 1 \text{CO}_2 + 1 \text{H}_2\text{O}$   
Type: Decomposition
- 13)  $1 \text{AlCl}_3 + 3 \text{Cs} \rightarrow 3 \text{CsCl} + 1 \text{Al}$   
Type: Single Displacement
- 14)  $1 \text{Al(NO}_3)_3 + 1 \text{Ga} \rightarrow 1 \text{Ga(NO}_3)_3 + 1 \text{Al}$   
Type: Single Displacement
- 15)  $1 \text{H}_2\text{SO}_4 + 2 \text{NH}_4\text{OH} \rightarrow 2 \text{H}_2\text{O} + 1 \text{(NH}_4)_2\text{SO}_4$   
Type: ~~Acid-Base~~ *DR*
- 16)  $1 \text{CH}_3\text{COOH} + 1 \text{O}_2 \rightarrow 1 \text{CO}_2 + 2 \text{H}_2\text{O}$   
Type: Combustion
- 17)  $1 \text{C}_4\text{H}_8 + 6 \text{O}_2 \rightarrow 4 \text{CO}_2 + 4 \text{H}_2\text{O}$   
Type: Combustion
- 18)  $2 \text{KCl} + 1 \text{Mg(OH)}_2 \rightarrow 2 \text{KOH} + 1 \text{MgCl}_2$   
Type: Double Displacement
- 19)  $1 \text{Zn} + 1 \text{Au(NO}_2)_2 \rightarrow 1 \text{Zn(NO}_2)_2 + 1 \text{Au}$   
Type: Single Displacement
- 20)  $2 \text{KOH} + 1 \text{H}_2\text{SO}_4 \rightarrow 1 \text{K}_2\text{SO}_4 + 2 \text{H}_2\text{O}$   
Type: ~~Acid-Base~~ *DR*
- 21)  $1 \text{BaS} + 1 \text{PtCl}_2 \rightarrow 1 \text{BaCl}_2 + 1 \text{PtS}$   
Type: Double Displacement
- 22)  $2 \text{Na}_2\text{O} \rightarrow 4 \text{Na} + 1 \text{O}_2$   
Type: Decomposition

#10

**Worksheet #6: Combustion Reactions**

We will focus on the combustion of hydrocarbons. Hydrocarbons react with oxygen to form carbon dioxide and water.

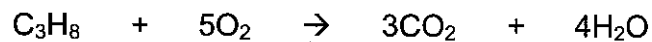
1. methane (CH<sub>4</sub>) + oxygen → carbon dioxide + water



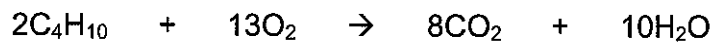
2. ethane (C<sub>2</sub>H<sub>6</sub>) + oxygen → carbon dioxide + water



3. propane (C<sub>3</sub>H<sub>8</sub>) + oxygen → carbon dioxide + water



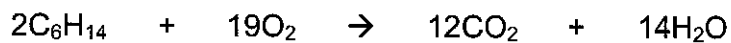
4. butane (C<sub>4</sub>H<sub>10</sub>) + oxygen → carbon dioxide + water



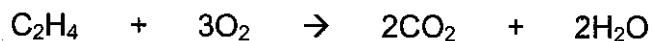
5. pentane (C<sub>5</sub>H<sub>12</sub>) + oxygen → carbon dioxide + water



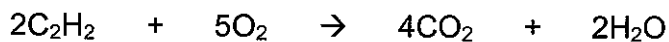
6. hexane (C<sub>6</sub>H<sub>14</sub>) + oxygen → carbon dioxide + water



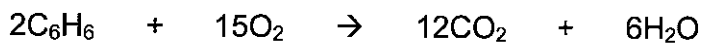
7. ethene (C<sub>2</sub>H<sub>4</sub>) + oxygen → carbon dioxide + water



8. ethyne (C<sub>2</sub>H<sub>2</sub>) + oxygen → carbon dioxide + water



9. benzene (C<sub>6</sub>H<sub>6</sub>) + oxygen → carbon dioxide + water

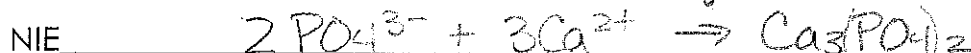
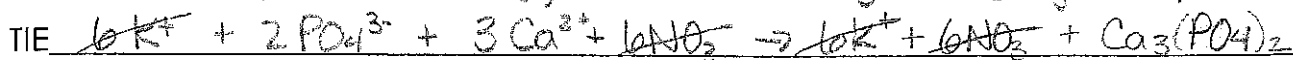
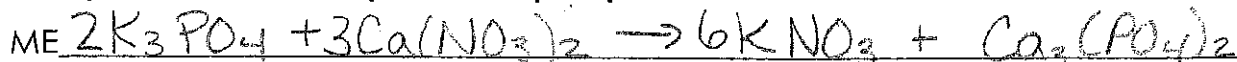


## NET IONIC EQUATIONS

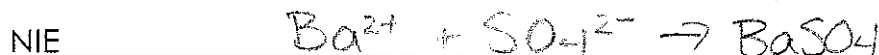
Key

Write the molecular, total ionic, and net ionic equations for the following reactions:

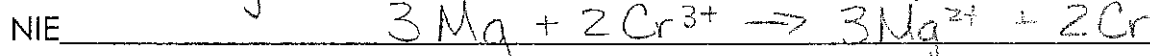
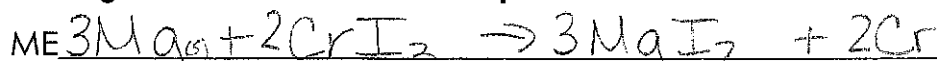
1. Aqueous solutions of potassium phosphate and calcium nitrate are mixed.



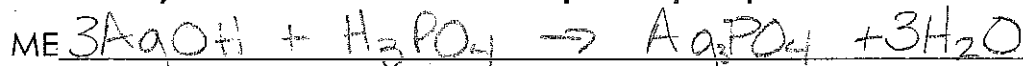
2. Aqueous solutions of barium chloride and sodium sulfate are mixed.



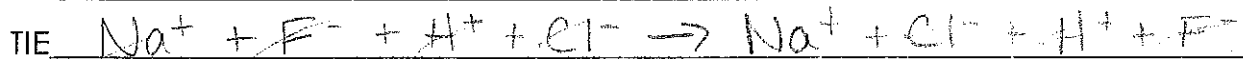
3. Magnesium is added to an aqueous solution of chromium (III) iodide.



4. Silver hydroxide is added to an aqueous phosphoric acid solution.

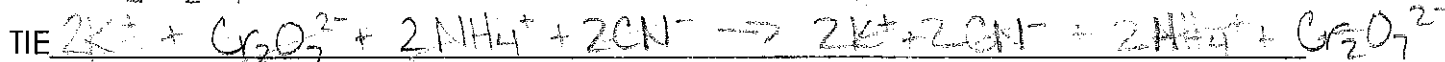
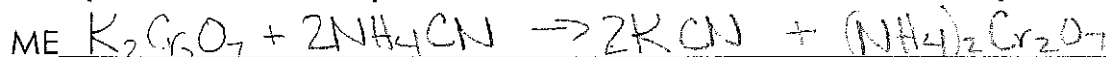


5. Aqueous solutions of sodium fluoride and hydrochloric acid are mixed.



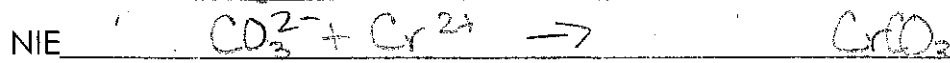
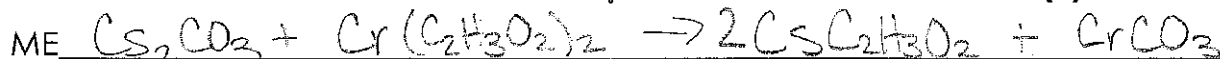
NIE

6. Aqueous solutions of potassium dichromate and ammonium cyanide are mixed.

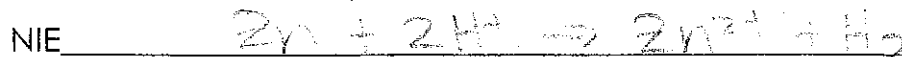
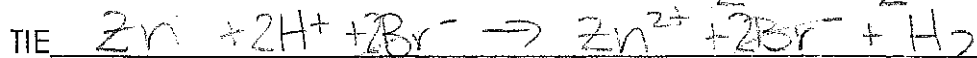
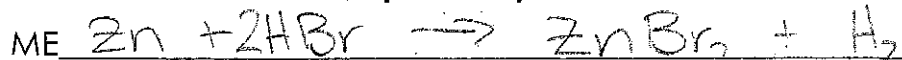


NIE

7. Cesium carbonate is added to an aqueous solution of chromium (II) acetate.



8. Zinc is added to an aqueous hydrobromic acid solution.





## Net Ionic Equations Worksheet

Name Key

BALANCE the following equations, then write the NET IONIC EQUATION for each one. Identify the spectator ions. Remember that solids, liquids (such as plain H<sub>2</sub>O), and gases do not become ions.

