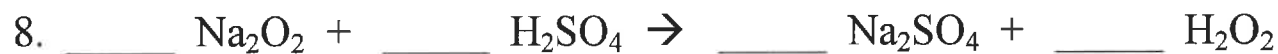
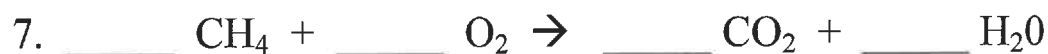


# **Chemistry**

## **Unit 6**

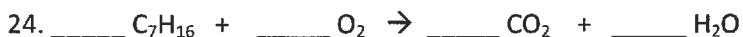
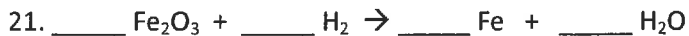
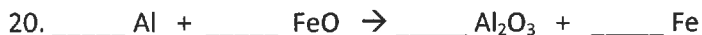
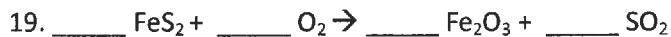
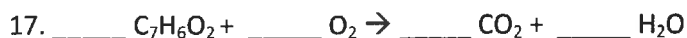
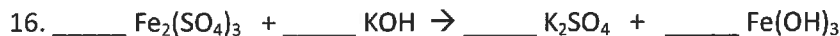
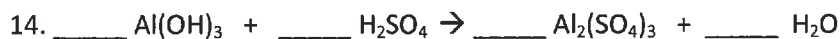
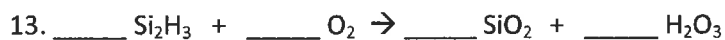
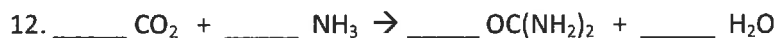
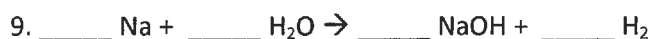
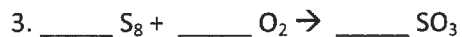
### **Chemical Reactions**

## Balancing Equations - Notes



## Balancing Chemical Equations Worksheet

**Directions:** Write a balanced equation on a separate piece of paper.

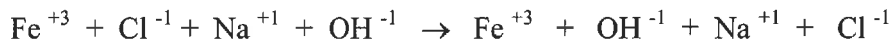


## WORD EQUATIONS:

Write the word equations below as chemical equations and balance. Be sure to **balance the charges** on each molecule.

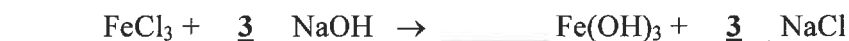
**Example:** iron(III)chloride and sodium hydroxide → iron(III)hydroxide and sodium chloride

First, Identify each symbol and charge:



Second, balance the charges on each molecule:  $\text{Fe Cl}_3 + \text{Na OH} \rightarrow \text{Fe (OH)}_3 + \text{Na Cl}$

Lastly, balance the equations for both reactants and products:



I. magnesium metal reacts with nickel(III) nitrate to form magnesium nitrate and nickel metal.

---

1) zinc metal reacts lead(II) nitrate to yield zinc nitrate and lead metal.

2) aluminum bromide and chlorine gas yields aluminum chloride and liquid bromine

3) sodium phosphate and calcium chloride yields calcium phosphate and sodium chloride

- 4) potassium chlorate when heated yields potassium chloride and oxygen gas
  
- 5) aluminum metal and hydrochloric acid forms aluminum chloride and hydrogen gas.
  
- 6) calcium hydroxide and phosphoric acid react to form calcium phosphate and water.
  
- 7) copper metal and sulfuric acid yields copper(I) sulfate and water and sulfur dioxide
  
- 8) hydrogen gas and nitrogen monoxide react to form gaseous water and nitrogen gas
  
- 9) sodium phosphate reacts with lead(II) acetate to produce lead(II) phosphate and sodium acetate.

# Notes

## Combustion, Synthesis, and Decomposition Reactions Worksheet

Complete each of the following equations, write formulas for and balance the chemical reaction equation.

Combustion Reaction:  $C_xH_y + O_2 \rightarrow CO_2 + H_2O$

1) Methane \_\_\_\_\_

2) Ethene \_\_\_\_\_

3) Methanol \_\_\_\_\_

4) Heptane \_\_\_\_\_

5) Propyne \_\_\_\_\_

Synthesis Reaction:  $A + B \rightarrow AB$

1) Barium + Sulfur \_\_\_\_\_

2) Silver + oxygen \_\_\_\_\_

3) Aluminum + Oxygen \_\_\_\_\_

4) Hydrogen + Oxygen \_\_\_\_\_

5) Hydrogen + Nitrogen \_\_\_\_\_

**Decomposition Reaction:  $AB \rightarrow A + B$**

1) Potassium chloride \_\_\_\_\_

2) Calcium oxide \_\_\_\_\_

3) Mercury (II) oxide \_\_\_\_\_

4) Sodium chloride \_\_\_\_\_

5) Copper (I) bromide \_\_\_\_\_

## Combustion, Decomposition, & Synthesis Reactions Worksheet

- Instructions: 1) Identify the reaction type as a synthesis, decomposition, or combustion  
2) Write the chemical formula's for the reactants and predict the products  
3) Balance the reactions

	Type	Balanced Reaction
1) Sodium + Oxygen	_____	_____
2) Butane	_____	_____
3) Iron (III) Chloride	_____	_____
4) Copper (II) + Oxygen	_____	_____
5) Propene	_____	_____
6) Silver + Chlorine	_____	_____
7) Aluminum oxide	_____	_____
8) Tin (VI) + Chloride	_____	_____
9) 2 - Propanol	_____	_____
10) Barium Oxide	_____	_____
11) Glucose (C <sub>6</sub> H <sub>12</sub> O <sub>6</sub> )	_____	_____
12) Potassium+Chlorine	_____	_____
13) Lead (II) Oxide	_____	_____
14) Ethyne	_____	_____
15) Iron (III) + Sulfur	_____	_____
16) Octane	_____	_____
17) Silver + Oxygen	_____	_____
18) Hydrogen+ Nitrogen	_____	_____
19) 3 - Hexene	_____	_____
20) Copper (I) Bromide	_____	_____
21) Mercury (II) Oxide	_____	_____
22) 1 - Pentanol	_____	_____
23) Magnesium+Oxygen	_____	_____
24) Sodium Chloride	_____	_____
25) Calcium + Sulfur	_____	_____



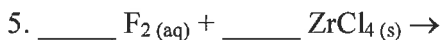
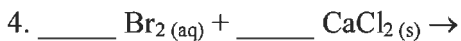
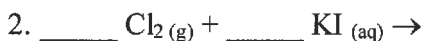
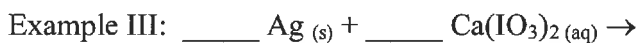
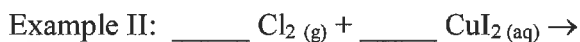
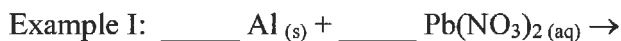
# Single / Double Replacement

**SHOW ALL WORK, ALL EQUATIONS, and ALL UNITS**

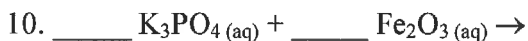
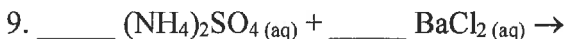
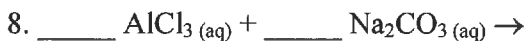
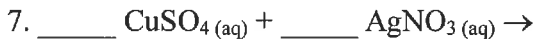
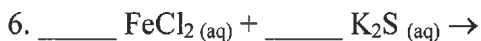
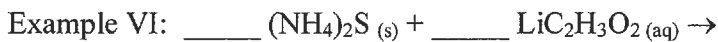
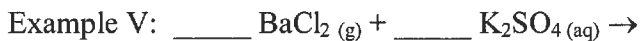
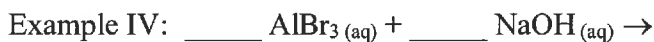
Chemical Equations & Reaction Types:

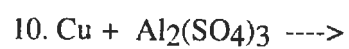
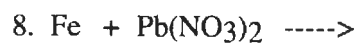
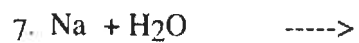
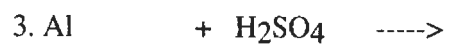
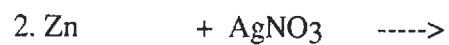
PREDICT the products and write the BALANCED EQUATION for each for each of these reactions.

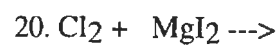
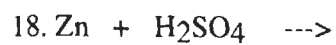
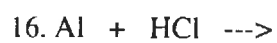
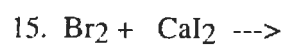
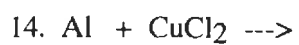
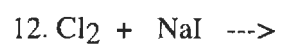
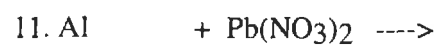
SINGLE REPLACEMENT:



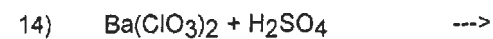
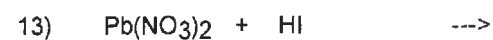
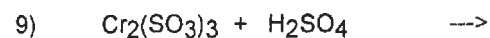
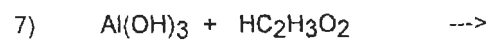
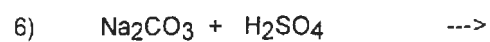
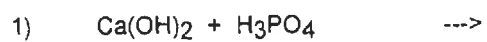
DOUBLE REPLACEMENT:



**Practice Reactions:**

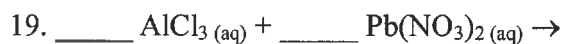
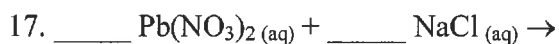
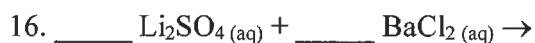
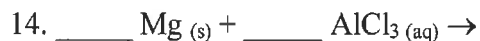
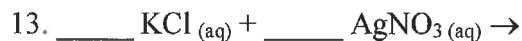
**CHEMISTRY****SINGLE REPLACEMENT REACTION WORKSHEET**

## PRACTICE REACTIONS



For PreAp - Must use Activity Series @ end of packet

Predict the product and write a balanced equation for each of the following. Write N.R. if no reaction occurs.



## OIL RIG

### Balancing Redox Equations

Early in the year you learned to classify chemical reactions in order to help you predict the products that would occur. You learned about composition (synthesis), decomposition, single replacement, double displacement, and combustion reactions. There is another classification method that involves determining whether electrons have been transferred from one chemical to another. These reactions are called oxidation reduction reactions, or REDOX if you are talking “chemist’s slang”. Many of the reactions that we have studied, and classified in another way, are also redox reactions.

In this lesson you will learn to classify reactions as “redox”, and learn a new method of balancing some of the more difficult reactions.

We identify which substance is oxidized and which is reduced by using the mnemonic “OIL RIG”. We are talking about electrons, so just remember:

Oxidation  
Is  
Losing electrons

Reduction  
Is  
Gaining electrons

Of course it might not seem logical to you that when you reduce something you gain electrons. However, remember that the electrons are negative, so when you gain a negative particle, the oxidation state goes down, or is reduced in value.

#### PURPOSE

In this activity you will learn to recognize redox reactions and will learn the half-reaction method of balancing these equations.

#### MATERIALS

paper	pencil
white board	dry erase marker
paper towel	

#### PROCEDURE

1. The first exercise on your student page asks you to mark the oxidation states on each atom, determine whether any of those states change from reactants to products, and indicate which chemical is oxidized and which is reduced. Complete this exercise now. The rules for determining oxidation states are below, just in case you have forgotten them.

## RULES FOR DETERMINING OXIDATION STATES

**Definition:** An oxidation state is the charge that an atom would have IF all of its bonds were ionic. That means that sometimes oxidation states are real, and sometimes they are just an accounting method that we have for keeping track of electrons in a chemical reaction.

1. The oxidation state of a free element is zero.
2. The oxidation state for a monatomic ion is equal to its charge.
3. The algebraic sum of the oxidation states of all of the atoms in a compound must be zero.
4. The oxidation state for alkali metals in compounds is +1; the oxidation state for alkaline earth metals in compounds is +2.
5. In compounds, the more electronegative element is always negative.
6. In compounds, hydrogen is usually +1 unless it is more electronegative than the element that it is bonded with. In that case, it is a hydride and has a charge of -1.
7. In compounds, oxygen is usually -2.
8. Oxidation states do not have to be the ones found on the periodic table. They do not even have to be whole numbers. **Rule three may not be violated!** Remember, oxidation states are the charge that an atom would have IF all of its bonds were ionic. Many compounds are covalent.

Name \_\_\_\_\_

Period \_\_\_\_\_

## OIL RIG

### Balancing Redox Equations

#### EXERCISE 1: IS THIS A REDOX REACTION OR NOT?

In this exercise, you need to mark the oxidation states of each atom in every compound in the equation. If any of these oxidation states change from the reactants to the products, then the reaction is a redox and you should write the word “redox” in the blank that is found at the left of the reaction. If it is not a redox reaction, write “no” beside the reaction. If the reaction is redox, determine which atoms are reduced and which are oxidized, and write those atoms in the proper blanks. If the reaction is not redox, leave the blanks for “oxidized” and “reduced” blank.



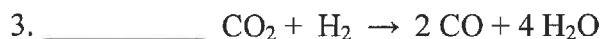
Oxidized \_\_\_\_\_

Reduced \_\_\_\_\_



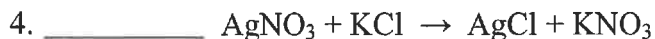
Oxidized \_\_\_\_\_

Reduced \_\_\_\_\_



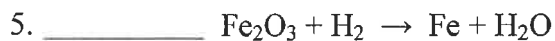
Oxidized \_\_\_\_\_

Reduced \_\_\_\_\_



Oxidized \_\_\_\_\_

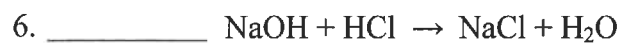
Reduced \_\_\_\_\_



Oxidized \_\_\_\_\_

Reduced \_\_\_\_\_





Oxidized \_\_\_\_\_

Reduced \_\_\_\_\_



Oxidized \_\_\_\_\_

Reduced \_\_\_\_\_



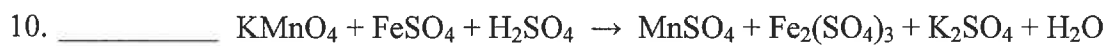
Oxidized \_\_\_\_\_

Reduced \_\_\_\_\_



Oxidized \_\_\_\_\_

Reduced \_\_\_\_\_



Oxidized \_\_\_\_\_

Reduced \_\_\_\_\_

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

## Physical and Chemical Change Worksheet

*True or False. If false, correct the underlined portion of the statement so that it is true.*

1. A physical change is a change of matter from one form to another without a change in chemical properties.
2. A physical change is a change that occurs when a substance changes composition by forming one or more new substances.
3. Color change is evidence that a chemical change may have occurred.
4. Fizzing or foaming is evidence that a chemical change may have occurred.
5. Production of light is evidence that a physical change may have occurred.
6. Production of heat or light is evidence that a chemical change may have occurred.
7. A change in odor is evidence that a physical change may have occurred.
8. Chemical changes can be reversed by physical changes.

**Identify each of the following as either a Physical change (P) or a chemical change (C).**

1. You cut your hair. \_\_\_\_\_
2. Making a peanut, pretzel and cereal mixture. \_\_\_\_\_
3. Baking soda reacts with vinegar and forms a gas. \_\_\_\_\_
4. A piece of metal is bent in half. \_\_\_\_\_
5. An aspirin is crushed into fine powder. \_\_\_\_\_
6. Copper turns green when exposed to the environment. \_\_\_\_\_
7. Two clear liquids are mixed and a yellow color forms. \_\_\_\_\_
8. Baking cookies. \_\_\_\_\_
9. Diamonds are used to scratch glass. \_\_\_\_\_
10. A tree burns to form ashes. \_\_\_\_\_
11. A piece of paper is crumpled up. \_\_\_\_\_
12. Water freezes to form ice. \_\_\_\_\_
13. Food spoiling. \_\_\_\_\_
14. A candle burning. \_\_\_\_\_
15. A candle melting. \_\_\_\_\_



# Study Guide

## A Voyage through Equations

After working on this worksheet, you should be able to do the following:

- 1) Given an equation, you should be able to tell what kind of reaction it is.
- 2) Predict the products of a reaction when given the reactants.

### **Section 1: Identify the type of reaction**

For the following reactions, indicate whether the following are examples of synthesis, decomposition, combustion, single replacement, or double replacement:

- 1)  $\text{Na}_3\text{PO}_4 + 3 \text{KOH} \rightarrow 3 \text{NaOH} + \text{K}_3\text{PO}_4$  \_\_\_\_\_
- 2)  $\text{MgCl}_2 + \text{Li}_2\text{CO}_3 \rightarrow \text{MgCO}_3 + 2 \text{LiCl}$  \_\_\_\_\_
- 3)  $\text{C}_6\text{H}_{12} + 9 \text{O}_2 \rightarrow 6 \text{CO}_2 + 6 \text{H}_2\text{O}$  \_\_\_\_\_
- 4)  $\text{Pb} + \text{FeSO}_4 \rightarrow \text{PbSO}_4 + \text{Fe}$  \_\_\_\_\_
- 5)  $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$  \_\_\_\_\_
- 6)  $\text{P}_4 + 3 \text{O}_2 \rightarrow 2 \text{P}_2\text{O}_3$  \_\_\_\_\_
- 7)  $2 \text{RbNO}_3 + \text{BeF}_2 \rightarrow \text{Be}(\text{NO}_3)_2 + 2 \text{RbF}$  \_\_\_\_\_
- 8)  $2 \text{AgNO}_3 + \text{Cu} \rightarrow \text{Cu}(\text{NO}_3)_2 + 2 \text{Ag}$  \_\_\_\_\_
- 9)  $\text{C}_3\text{H}_6\text{O} + 4 \text{O}_2 \rightarrow 3 \text{CO}_2 + 3 \text{H}_2\text{O}$  \_\_\_\_\_
- 10)  $2 \text{C}_5\text{H}_5 + \text{Fe} \rightarrow \text{Fe}(\text{C}_5\text{H}_5)_2$  \_\_\_\_\_
- 11)  $\text{SeCl}_6 + \text{O}_2 \rightarrow \text{SeO}_2 + 3\text{Cl}_2$  \_\_\_\_\_
- 12)  $2 \text{MgI}_2 + \text{Mn}(\text{SO}_3)_2 \rightarrow 2 \text{MgSO}_3 + \text{MnI}_4$  \_\_\_\_\_
- 13)  $\text{O}_3 \rightarrow \text{O} \cdot + \text{O}_2$  \_\_\_\_\_
- 14)  $2 \text{NO}_2 \rightarrow 2 \text{O}_2 + \text{N}_2$  \_\_\_\_\_

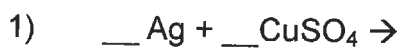
## Section 2: Practicing equation balancing

Before you can write a balanced equation for a problem which asks you to predict the products of a reaction, you need to know how to balance an equation. Because some of you may not fully remember how to balance an equation, here are some practice problems:

- 1)  $\_\_ \text{C}_6\text{H}_6 + \_\_ \text{O}_2 \rightarrow \_\_ \text{H}_2\text{O} + \_\_ \text{CO}_2$
- 2)  $\_\_ \text{NaI} + \_\_ \text{Pb}(\text{SO}_4)_2 \rightarrow \_\_ \text{PbI}_4 + \_\_ \text{Na}_2\text{SO}_4$
- 3)  $\_\_ \text{NH}_3 + \_\_ \text{O}_2 \rightarrow \_\_ \text{NO} + \_\_ \text{H}_2\text{O}$
- 4)  $\_\_ \text{Fe}(\text{OH})_3 \rightarrow \_\_ \text{Fe}_2\text{O}_3 + \_\_ \text{H}_2\text{O}$
- 5)  $\_\_ \text{HNO}_3 + \_\_ \text{Mg}(\text{OH})_2 \rightarrow \_\_ \text{H}_2\text{O} + \_\_ \text{Mg}(\text{NO}_3)_2$
- 6)  $\_\_ \text{H}_3\text{PO}_4 + \_\_ \text{NaBr} \rightarrow \_\_ \text{HBr} + \_\_ \text{Na}_3\text{PO}_4$
- 7)  $\_\_ \text{C} + \_\_ \text{H}_2 \rightarrow \_\_ \text{C}_3\text{H}_8$
- 8)  $\_\_ \text{CaO} + \_\_ \text{MnI}_4 \rightarrow \_\_ \text{MnO}_2 + \_\_ \text{CaI}_2$
- 9)  $\_\_ \text{Fe}_2\text{O}_3 + \_\_ \text{H}_2\text{O} \rightarrow \_\_ \text{Fe}(\text{OH})_3$
- 10)  $\_\_ \text{C}_2\text{H}_2 + \_\_ \text{H}_2 \rightarrow \_\_ \text{C}_2\text{H}_6$
- 11)  $\_\_ \text{VF}_5 + \_\_ \text{HI} \rightarrow \_\_ \text{V}_2\text{I}_{10} + \_\_ \text{HF}$
- 12)  $\_\_ \text{OsO}_4 + \_\_ \text{PtCl}_4 \rightarrow \_\_ \text{PtO}_2 + \_\_ \text{OsCl}_8$
- 13)  $\_\_ \text{CF}_4 + \_\_ \text{Br}_2 \rightarrow \_\_ \text{CBr}_4 + \_\_ \text{F}_2$
- 14)  $\_\_ \text{Hg}_2\text{I}_2 + \_\_ \text{O}_2 \rightarrow \_\_ \text{Hg}_2\text{O} + \_\_ \text{I}_2$
- 15)  $\_\_ \text{Y}(\text{NO}_3)_2 + \_\_ \text{GaPO}_4 \rightarrow \_\_ \text{YPO}_4 + \_\_ \text{Ga}(\text{NO}_3)_2$

### Section 3: Predicting the products of chemical reactions

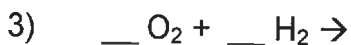
Predict the products of the following reactions:



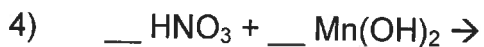
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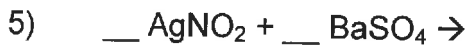
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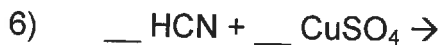
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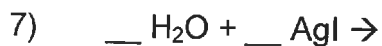
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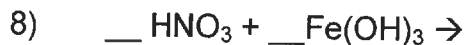
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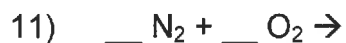
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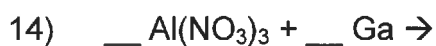
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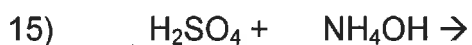
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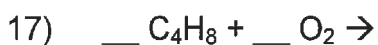
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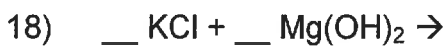
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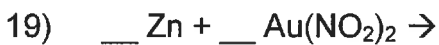
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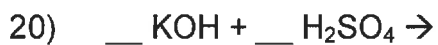
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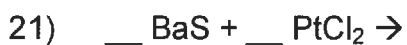
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## STUDENT REFERENCE PAGE - ACTIVITY SERIES AND SOLUBILITY RULES

### Activity Series of Metals

Li  
K  
Ca  
Na  
Mg  
Al  
Mn  
Zn  
Cr  
Fe  
Cd  
Co  
Ni  
Sn  
Pb  
H (a nonmetal)  
Sb (a metalloid)  
Cu  
Hg  
Ag  
Pt

### Solubility Rules

1. All nitrates and acetates are soluble.
2. All chlorides, bromides, and iodides are soluble except those of  $\text{Pb}^{2+}$ ,  $\text{Ag}^+$ , and  $\text{Hg}^{2+}$ ,
3. All sulfates are soluble except those of  $\text{Ba}^{2+}$ ,  $\text{Sr}^{2+}$ , and  $\text{Pb}^{2+}$ .
4. All hydroxide are insoluble except those of Group I in the periodic table,  $\text{NH}_4^+$ , and  $\text{Ba}^{2+}$ .
5. All carbonates and phosphates are insoluble except those of Group I and  $\text{NH}_4^+$ .
6. All sulfides are insoluble except those of Group I and Group II on the periodic table and  $\text{NH}_4^+$ .

In addition, keep in mind the following: when  $\text{H}_2\text{CO}_3$ ,  $\text{H}_2\text{SO}_3$ , and  $\text{NH}_4\text{OH}$  are formed as products:

7.  $\text{H}_2\text{CO}_3$  decomposes into  $\text{CO}_2 + \text{H}_2\text{O}$
8.  $\text{H}_2\text{SO}_3$  decomposes into  $\text{SO}_2 + \text{H}_2\text{O}$
9.  $\text{NH}_4\text{OH}$  decomposes into  $\text{NH}_3 + \text{H}_2\text{O}$



**POLYATOMIC IONS YOU MUST MEMORIZE**

<b>NAME</b>	<b>FORMULA</b>
acetate	$\text{C}_2\text{H}_3\text{O}_2^{-1}$
ammonium	$\text{NH}_4^{+1}$
carbonate	$\text{CO}_3^{-2}$
bicarbonate or hydrogen carbonate	$\text{HCO}_3^{-1}$
chromate	$\text{CrO}_4^{-2}$
chlorate	$\text{ClO}_3^{-1}$
cyanide	$\text{CN}^{-1}$
hydroxide	$\text{OH}^{-1}$
nitrate	$\text{NO}_3^{-1}$
permanganate	$\text{MnO}_4^{-1}$
phosphate	$\text{PO}_4^{-3}$
peroxide	$\text{O}_2^{-2}$
sulfate	$\text{SO}_4^{-2}$







