

NAME \_\_\_\_\_ DATE \_\_\_\_\_ PERIOD \_\_\_\_

## HS CHEMICAL REACTIONS

HS-PS1-2 Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.

HS-PS1-4 Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

HS-PS1-5 Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate of which a reaction occurs.

HS-PS1-7 Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

DATE	Assignment	Pages	√
1.			
2.			
3.			
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## INTRODUCTION AND DESCRIPTION OF CHEMICAL REACTIONS

In the Modern Chemistry book read pages 261 - 274. (Ch. 8 pdf Online Book: 247 - 255)

Fill in Table: Elements that Normally Exist as Diatomic Molecules from page 263 (249)

Element	Symbol	Molecular Formula	Physical State at Room Temperature

Fill in Table: Symbols Used in Chemical Equations from page 266 (252 online pdf)

Symbol	Explanation

Page 290 do questions 1-8 completely. (page 277 ONLINE BOOK)

## Unit 5: Chemical Reactions

### Section 1: Describing Reactions

- Chemical Reaction
- Law of Conservation of Mass
- Chemical Equations and Balancing

## A. Physical and Chemical Changes

- During a \_\_\_\_\_, some properties of a material change, but the \_\_\_\_\_ of the material \_\_\_\_\_.
- Examples of physical changes:

## A. Physical and Chemical changes

- A change that involves one or more substances turning into new substances is called a \_\_\_\_\_.

Examples of chemical changes:

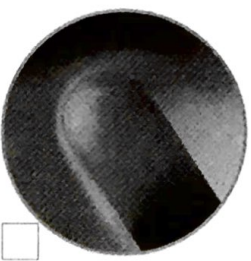
## PA. Physical and Chemical Changes and Chemical Changes

A \_\_\_\_\_.

This is an example of a physical change.

## PhA. Physical and Chemical Changes and Chemical Changes

A mixture of iron and sulfur is heated. The \_\_\_\_\_ This is an example of a chemical change.

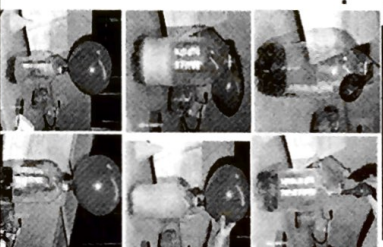


## B. Chemical Reaction

Chemical Change: \_\_\_\_\_ & \_\_\_\_\_ formed.

### 4 Evidences of Chemical Reaction:

- 1) \_\_\_\_\_ transfer (hot or cool)
- 2) \_\_\_\_\_ change
- 3) \_\_\_\_\_ formed
- 4) \_\_\_\_\_ formed (small floating solid)



## B. Chemical Reaction

Represented by a \_\_\_\_\_:



present at the \_\_\_\_\_ of the reaction

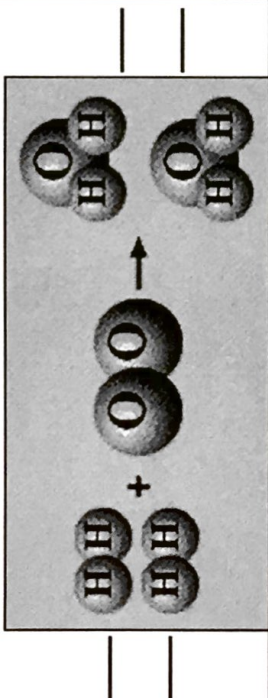
\_\_\_\_\_ in the rxn at the \_\_\_\_\_

### Symbols Used in Chemical Equations

Symbol	Explanation
+	Used to separate two reactants or two products
→	"Yields," separates reactants from products
⇌	Used in place of → for reversible reactions
(s)	Designates a reactant or product in the solid state; placed after the formula
(l)	Designates a reactant or product in the liquid state; placed after the formula
(g)	Designates a reactant or product in the gaseous state; placed after the formula
(aq)	Designates an aqueous solution; the substance is dissolved in water; placed after the formula
$\xrightarrow{\Delta}$	Indicates that heat is supplied to the reaction
$\xrightarrow{\text{Pt}}$	A formula written above or below the yield sign indicates its use as a catalyst (in this example, platinum).

### C. Law of Conservation of Mass

- \_\_\_\_\_
- \_\_\_\_\_ can only \_\_\_\_\_.



### D. Chemical Equations

#### Balancing Equations

**SKELETON**



**BALANCED**

\_\_\_\_\_ - # of units of each substance

### D. Chemical Equations

#### 3 Balancing Steps

1. \_\_\_\_\_ atoms on \_\_\_\_\_
2. Use \_\_\_\_\_ to \_\_\_\_\_  
coefficient  $\times$  subscript = # atoms  
How many N's in: \_\_\_\_\_ Fe(NO<sub>3</sub>)<sub>2</sub> \_\_\_\_\_
3. \_\_\_\_\_ atoms balance!!!

### D. Chemical Equations

Aluminum and copper(II) chloride form copper and aluminum chloride.



### Quick Quiz!

1. Which of the following is a chemical reaction?
- A. melting of lead
  - B. dissolving sugar in water
  - C. rusting of iron
  - D. crushing of stone

### Quick Quiz.

2. Which of the following is NOT a possible clue that a chemical change is taking place?
- A. a change of state
  - B. a change in color
  - C. production of a gas
  - D. formation of a precipitate

### Quick Quiz.

3. Why do we have to balance equations?
- A. it's so much fun!
  - B. it's the law of the west
  - C. it's the law of consternation of moose
  - D. it's the law of conservation of mass

### Quick Quiz.

4. What is the coefficient of HCl when the following reaction is balanced?
- $$\text{Al} + \text{HCl} \rightarrow \text{AlCl}_3 + \text{H}_2$$
- \_\_\_ Al \_\_\_  
\_\_\_ H \_\_\_  
\_\_\_ Cl \_\_\_
- A. 1      B. 2      C. 3      D. 6

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#3

### Chemical Reactions & Balancing Equations WS

1. What is a chemical change?

\_\_\_\_\_

2. What are the four signs of chemical change?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

WORD BANK:

yields  
coefficients (twice)

chemical equation  
reactants

products  
subscripts

**#3-7 Use the WORD BANK above**

3. In a chemical reaction, the substances that are about to react are called \_\_\_\_\_.  
The new substances produced are called \_\_\_\_\_.

4. An expression that describes a chemical reaction using chemical formulas and other symbols is called a \_\_\_\_\_.

5. The symbol  $\longrightarrow$  is read as "\_\_\_\_\_" or "produces" in chemical equations.

6. Numbers written in front of the formulas in a chemical equation are called \_\_\_\_\_.  
What do they represent? \_\_\_\_\_

7. When balancing equations, never change the \_\_\_\_\_. Only add whole-number \_\_\_\_\_ in front of the formulas.

8. What do the symbols mean?

(s) \_\_\_\_\_

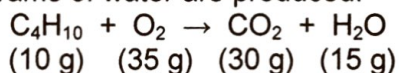
(l) \_\_\_\_\_

(g) \_\_\_\_\_

(aq) \_\_\_\_\_

$\Delta$  \_\_\_\_\_

9. 10 grams of butane in a lighter is burned with 35 grams of oxygen, 30 grams of carbon dioxide and 15 grams of water are produced.



a. How many grams of **reactants** are there altogether? \_\_\_\_\_ grams

b. How many grams of **products** are there altogether? \_\_\_\_\_ grams

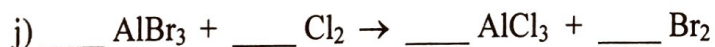
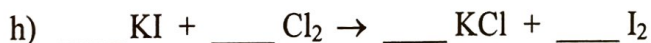
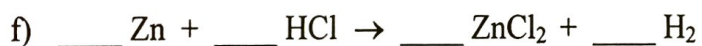
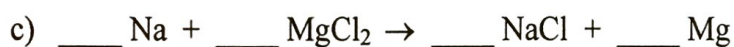
c. Is the law of conservation of mass confirmed or rejected in this reaction? \_\_\_\_\_

Explain: \_\_\_\_\_

10. What makes a chemical equation “balanced?”

11. What is the law of conservation of mass, and how does it explain why we have to balance equations?

12. Balance the following chemical equations. (*count the atoms on each side and make them equal*)





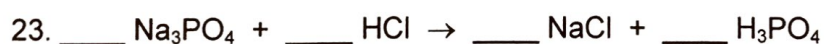
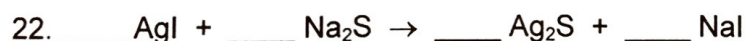
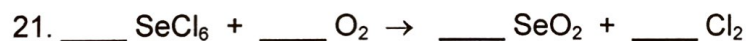
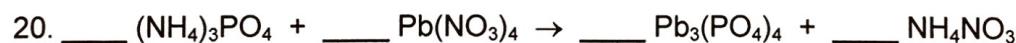
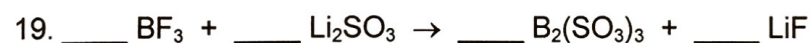
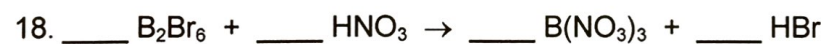
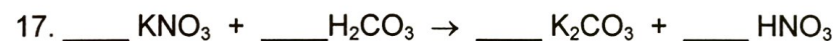
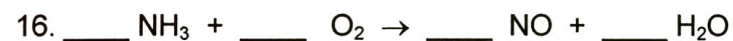
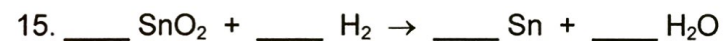
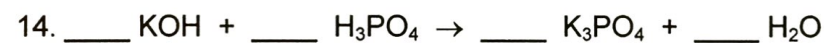
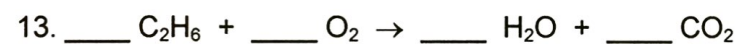
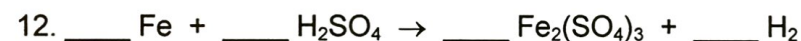
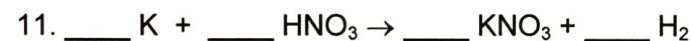
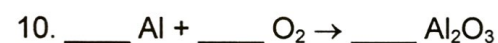
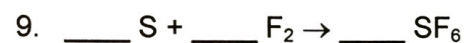
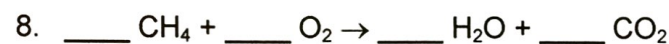
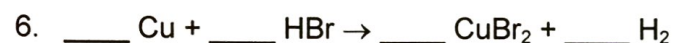
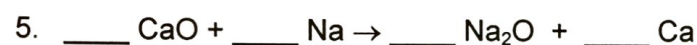
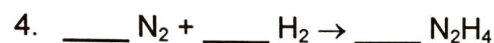
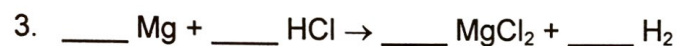
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**Balancing Equations Practice WS # 1**

Balance the following chemical equations.



24.  $\text{Ba}_3\text{N}_2 + \text{H}_2\text{O} \rightarrow \text{Ba}(\text{OH})_2 + \text{NH}_3$
25.  $\text{TiCl}_4 + \text{H}_2\text{O} \rightarrow \text{TiO}_2 + \text{HCl}$
26.  $\text{CaCl}_2 + \text{Na}_3\text{PO}_4 \rightarrow \text{Ca}_3(\text{PO}_4)_2 + \text{NaCl}$
27.  $\text{PCl}_5 + \text{H}_2\text{O} \rightarrow \text{H}_3\text{PO}_4 + \text{HCl}$
28.  $\text{Mg}(\text{OH})_2 + \text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2\text{O}$
29.  $\text{SiCl}_4 + \text{H}_2\text{O} \rightarrow \text{SiO}_2 + \text{HCl}$
30.  $\text{As} + \text{NaOH} \rightarrow \text{Na}_3\text{AsO}_3 + \text{H}_2$
31.  $\text{Au}_2\text{S}_3 + \text{H}_2 \rightarrow \text{Au} + \text{H}_2\text{S}$
32.  $\text{V}_2\text{O}_5 + \text{HCl} \rightarrow \text{VOCl}_3 + \text{H}_2\text{O}$
33.  $\text{Hg}(\text{OH})_2 + \text{H}_3\text{PO}_4 \rightarrow \text{Hg}_3(\text{PO}_4)_2 + \text{H}_2\text{O}$
34.  $\text{SiO}_2 + \text{HF} \rightarrow \text{SiF}_4 + \text{H}_2\text{O}$
35.  $\text{HClO}_4 + \text{P}_4\text{O}_{10} \rightarrow \text{H}_3\text{PO}_4 + \text{Cl}_2\text{O}_7$
36.  $\text{N}_2 + \text{O}_2 + \text{H}_2\text{O} \rightarrow \text{HNO}_3$
37.  $\text{NH}_4\text{NO}_3 \rightarrow \text{N}_2 + \text{O}_2 + \text{H}_2\text{O}$
38.  $\text{CO} + \text{H}_2 \rightarrow \text{C}_8\text{H}_{18} + \text{H}_2\text{O}$
39.  $\text{FeO}_3 + \text{CO} \rightarrow \text{Fe} + \text{CO}_2$
40.  $\text{H}_2\text{SO}_4 + \text{Pb}(\text{OH})_4 \rightarrow \text{Pb}(\text{SO}_4)_2 + \text{H}_2\text{O}$

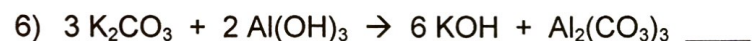
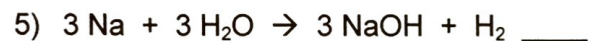
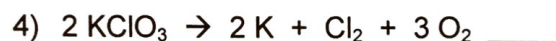
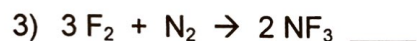
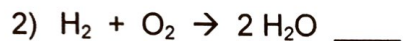
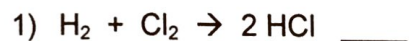
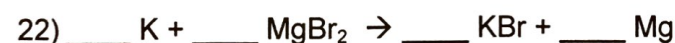
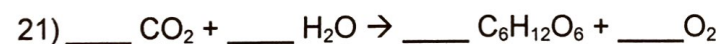
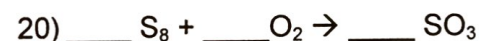
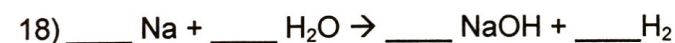
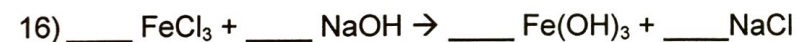
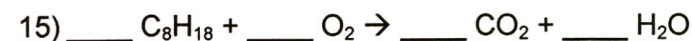
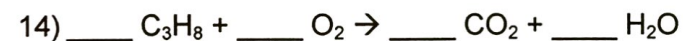
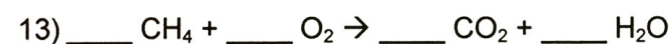
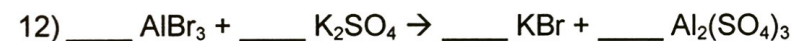
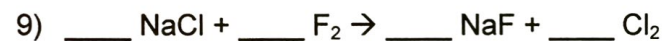
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**Balancing Equations Practice WS # 2**

For 1 – 6, take inventory of each side and determine whether the equation is balanced (Y) or not (N).

For 7 – 46, balance the equation by writing in the appropriate coefficients (lowest whole-numbers). Check your answers by taking inventory (like above). **HINT: use a pencil or erasable pen!!!**

- 25) \_\_\_  $\text{H}_2\text{O}$  + \_\_\_  $\text{O}_2$   $\rightarrow$  \_\_\_  $\text{H}_2\text{O}_2$
- 26) \_\_\_  $\text{NaBr}$  + \_\_\_  $\text{CaF}_2$   $\rightarrow$  \_\_\_  $\text{NaF}$  + \_\_\_  $\text{CaBr}_2$
- 27) \_\_\_  $\text{H}_2\text{SO}_4$  + \_\_\_  $\text{NaNO}_2$   $\rightarrow$  \_\_\_  $\text{HNO}_2$  + \_\_\_  $\text{Na}_2\text{SO}_4$
- 28) \_\_\_  $\text{K}$  + \_\_\_  $\text{S}$   $\rightarrow$  \_\_\_  $\text{K}_2\text{S}$
- 29) \_\_\_  $\text{N}_2$  + \_\_\_  $\text{O}_2$   $\rightarrow$  \_\_\_  $\text{N}_2\text{O}$
- 30) \_\_\_  $\text{Li}$  + \_\_\_  $\text{O}_2$   $\rightarrow$  \_\_\_  $\text{Li}_2\text{O}$
- 31) \_\_\_  $\text{Fe}$  + \_\_\_  $\text{O}_2$   $\rightarrow$  \_\_\_  $\text{Fe}_2\text{O}_3$
- 32) \_\_\_  $\text{KBr}$   $\rightarrow$  \_\_\_  $\text{K}$  + \_\_\_  $\text{Br}_2$
- 33) \_\_\_  $\text{MgCl}_2$   $\rightarrow$  \_\_\_  $\text{Mg}$  + \_\_\_  $\text{Cl}_2$
- 34) \_\_\_  $\text{Al}_2\text{O}_3$   $\rightarrow$  \_\_\_  $\text{Al}$  + \_\_\_  $\text{O}_2$
- 35) \_\_\_  $\text{FeBr}_3$  + \_\_\_  $\text{F}_2$   $\rightarrow$  \_\_\_  $\text{FeF}_3$  + \_\_\_  $\text{Br}_2$
- 36) \_\_\_  $\text{NH}_4\text{OH}$   $\rightarrow$  \_\_\_  $\text{NH}_3$  + \_\_\_  $\text{H}_2\text{O}$
- 37) \_\_\_  $\text{Na}$  + \_\_\_  $\text{H}_2\text{O}$   $\rightarrow$  \_\_\_  $\text{NaOH}$  + \_\_\_  $\text{H}_2$
- 38) \_\_\_  $\text{NH}_3$  + \_\_\_  $\text{O}_2$   $\rightarrow$  \_\_\_  $\text{NO}$  + \_\_\_  $\text{H}_2\text{O}$
- 39) \_\_\_  $\text{BaO}$  + \_\_\_  $\text{HCl}$   $\rightarrow$  \_\_\_  $\text{BaCl}_2$  + \_\_\_  $\text{H}_2\text{O}$
- 40) \_\_\_  $\text{Sn}_3(\text{BO}_3)_4$   $\rightarrow$  \_\_\_  $\text{Sn}$  + \_\_\_  $\text{B}$  + \_\_\_  $\text{O}_2$
- 41) \_\_\_  $\text{H}_3\text{PO}_4$  + \_\_\_  $\text{Ca}(\text{OH})_2$   $\rightarrow$  \_\_\_  $\text{Ca}_3(\text{PO}_4)_2$  + \_\_\_  $\text{H}(\text{OH})$
- 42) \_\_\_  $\text{C}_5\text{H}_{12}\text{O}$  + \_\_\_  $\text{O}_2$   $\rightarrow$  \_\_\_  $\text{CO}_2$  + \_\_\_  $\text{H}_2\text{O}$
- 43) \_\_\_  $\text{Al}_2\text{O}_3$  + \_\_\_  $\text{C}$  + \_\_\_  $\text{Cl}_2$   $\rightarrow$  \_\_\_  $\text{AlCl}_3$  + \_\_\_  $\text{CO}$
- 44) \_\_\_  $\text{SiF}_4$  + \_\_\_  $\text{H}_2\text{O}$   $\rightarrow$  \_\_\_  $\text{H}_4\text{SiO}_4$  + \_\_\_  $\text{H}_2\text{SiF}_6$
- 45) \_\_\_  $\text{HNO}_3$  + \_\_\_  $\text{P}_4\text{O}_{10}$   $\rightarrow$  \_\_\_  $\text{N}_2\text{O}_5$  + \_\_\_  $\text{H}_3\text{PO}_4$  (hint – balance phosphorus first)

**Bonus!!**

- 46) \_\_\_  $\text{NH}_3$  + \_\_\_  $\text{NO}_2$   $\rightarrow$  \_\_\_  $\text{N}_2\text{O}$  + \_\_\_  $\text{H}_2\text{O}$  (all #'s are less than 10, reactants are both even #'s)