

# Chemical Reactions: An Introduction

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Translating Word Equations

# • Chemical Equations: Recognizing Reactants and Products

- In our last lesson we learned the terms related to chemical equations-reactants, products, yields, etc..
- Here are a few more that you may need:
- We often indicate in the equation the *physical states* of the reactants and products by using the following symbols.

Physical States	
Symbol	State
(s)	solid
(l)	liquid
(g)	gas
(aq)	dissolved in water (in aqueous solution)

# Chemical Equations: Recognizing Reactants and Products

- In this lesson, we will extend our learning by translating word equations into unbalanced equations-YIKES- WORD PROBLEMS? Yes, this is where we use what we learned earlier with nomenclature-so if you forget , go back and look those over-
- The chart that we used is on the next slide (it is available as a resource in Marking Period 2 lessons)

## Chemistry Nomenclature (Naming) Summary

B I N A R Y   C O M P O U N D S  2 Elements In compound	<b>Type I</b>  Metal and Nonmetals	Use Page 155 Table 1 <u>Metals have only one charge</u> Metals found in Group 1 and 2 Exceptions: $\text{Ag}^+$ and $\text{Al}^{3+}$	<b>Simple Naming</b> $\text{KCl}$ = potassium chloride $\text{MgCl}_2$ = magnesium chloride $\text{K}_2\text{O}$ = potassium oxide $\text{MgO}$ = magnesium oxide
	<b>Type II</b>  Metals and Nonmetals	Use Page 162 Table 4 <u>Metals have only more than one charge</u> Transition metals found in middle of periodic table Mn = manganese commonly used but not listed in table <u>Balance charges so you have an overall zero charge</u>	<b>Roman Numerals</b> $\text{FeO}$ = iron (II) oxide ( $\text{Fe}^{2+}\text{O}^{2-}$ ) $\text{Fe}_2\text{O}_3$ = iron (III) oxide ( $\text{Fe}^{3+}\text{O}^{2-}$ ) $\text{SnCl}_2$ = tin(II)chloride ( $\text{Sn}^{2+}\text{Cl}^{1-}$ ) $\text{SnCl}_4$ = tin(IV)chloride ( $\text{Sn}^{4+}\text{Cl}^{1-}$ )
	<b>Type III</b>  Nonmetals and Nonmetals	Use Page 165 Table 5 178 Table 6 <u>Nonmetals have only one charge</u> Nonmetals found in Groups 3-7 to the right of stair step in periodic table Common elements are C,N,O,P,S	<b>Prefixes</b> $\text{SO}$ = sulfur monoxide $\text{SO}_2$ = sulfur dioxide $\text{SO}_3$ = sulfur trioxide $\text{N}_2\text{O}_5$ = dinitrogen <u>pent</u> oxide (not penta because two vowels a/o would be together) $\text{CCl}_4$ = carbon tetrafluoride

# Translating and Writing Unbalanced Equations

- We will practice writing the unbalanced equations for reactions.
- Then, in the lessons, we will discuss systematic procedures for balancing equations

# Chemical Equations: Recognizing Reactants and Products

Here is an example of a question that you may be given

i Diatomic? What's that?

l Remember some elements always appear as "Siamese twins" when they stand alone-

they always are two atoms when not joined with other elements-  
they are: **HONCIBrIF**- HUH?

**H**-hydrogen  $H_2$

**O**-oxygen  $O_2$

**N**-nitrogen  $N_2$

**Cl**-chlorine  $Cl_2$

**Br**-bromine  $Br_2$

**I**-iodine  $I_2$

**F**-fluorine  $F_2$

and is represented by a + sign

oxygen gas contains diatomic molecules and is represented as  $O_2(g)$

Forms means yield and is represented by the arrow  $\rightarrow$

Liquid water is represented by  $H_2O(l)$  so...



# So....

- hydrogen gas contains diatomic molecules and is represented as  $\text{H}_2(g)$
- Oxygen gas contains diatomic molecules and is represented as  $\text{O}_2(g)$
- Forms means yield and is represented by the arrow  $\rightarrow$
- Liquid water is represented by  $\text{H}_2\text{O}(l)$
- hydrogen gas and oxygen gas react with each other to form liquid water

**The unbalanced chemical equation is:**



## Chemical Equations: Recognizing Reactants and Products

- Here's another example, when solid potassium reacts with liquid water, the products are hydrogen gas and potassium hydroxide; the latter remains dissolved in the water.
  - From this information about the reactants and products, we can write the equation for the reaction.
    - solid potassium is represented by  $\text{K (s)}$ ;
    - liquid water is written as  $\text{H}_2\text{O (l)}$ ;
    - hydrogen gas contains diatomic molecules and is represented as  $\text{H}_2 (\text{g})$ ;
    - potassium hydroxide dissolved in water is written as  $\text{KOH (aq)}$ .

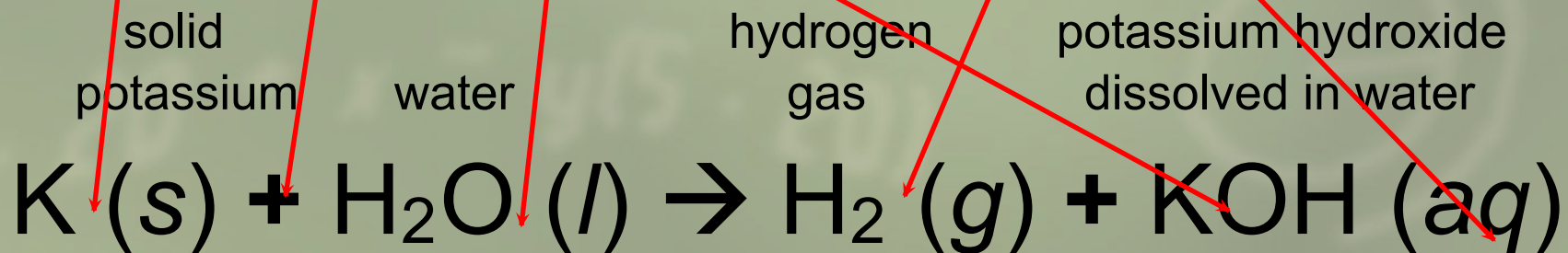


# Chemical Equations

## Word Problem:

solid potassium reacts with liquid water, the products are hydrogen gas and potassium hydroxide; the latter remains dissolved in the water

- So the *unbalanced* equation for the reaction is:



# Chemical Equations

## Chemical Equations: Recognizing Reactants and Products

Identify the reactants and products and write the *unbalanced* equation (including symbols for states) for each of the following chemical reactions:

Solid magnesium metal reacts with liquid water to form solid magnesium hydroxide and hydrogen gas.

# Chemical Equations

## Chemical Equations: Recognizing Reactants and Products

Solid magnesium metal reacts with liquid water to form solid magnesium hydroxide and hydrogen gas.

### Solution

#### Reactants

We have 2 reactants, magnesium metal and liquid water.

- Magnesium metal is Mg and you add a (s) because it is a solid.
- Water is H<sub>2</sub>O and you add a (l) because it is a liquid.

#### Products

The products are magnesium hydroxide and hydrogen gas.

- Hydrogen exists as a diatomic molecule, H<sub>2</sub> (g).
- Magnesium hydroxide is a combination of the cation Mg<sup>+2</sup> and the anion OH<sup>-</sup> -- so, you get the formula Mg(OH)<sub>2</sub> (s).

# Chemical Equations

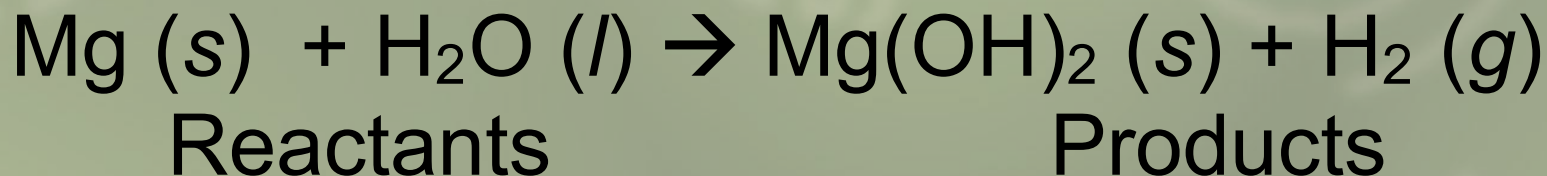
## Chemical Equations: Recognizing Reactants and Products

Solid magnesium metal reacts with liquid water to form solid magnesium hydroxide and hydrogen gas.

### **Solution (cont'd)**

### **Chemical Equation**

The unbalanced equation is:



**The End**