Chemical Reactions: An Introduction

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

BINARY ICOMPOUNDS 2 Elements In compound	**Type 1** Metal and Nonmetals	**Use Page 155 Table 1** Metals have only one charge Metals found in Group 1 and 2 Exceptions: Ag^{+} and Al^{3+}	**Simple Naming** KCl =potassium chloride $MgCl_2$= magnesium chloride K_2O= potassium oxide MgO=magnesium oxide
	Type II Metals and Nonmetals	**Use Page 162 Table 4** Metals have only more than one charge Transition metals found in middle of periodic table Mn= manganese commonly used but not listed in table Balance charges so you have an overall zero charge	**Roman Numerals** FeO= iron (II) oxide ($Fe^{2+}O^{2-}$) Fe_2O_3= iron (III) oxide ($Fe^{3+}O^{2-}$) $SnCl_2$= tin(II)chloride ($Sn^{2+}Cl^{1-}$) $SnCl_4$= tin(IV)chloride ($Sn^{4+}Cl^{1-}$)
	Type III Nonmetals and Nonmetals	**Use Page 165 Table 5** **178 Table 6** Nonmetals have only one charge Nonmetals found in Groups 3-7 to the right of stair step in periodic table Common elements are C,N,O,P,S	**Prefixes** **SO=sulfur monoxide** SO_2=sulfur dioxide SO_3- sulfur trioxide N_2O_5= dinitrogen pentoxide (not penta because two vowels a/o would be together) CCl4= 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

Ic

u

Diatomic? What's that?
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: **HONClBrIF**- 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 →

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

So….

- hydrogen gas contains diatomic molecules and is represented as H_2 (*g*)
- Oxygen gas contains diatomic molecules and is represented as O_2 (*g*)
- Forms means yield and is represented by the arrow →
- Liquid water is represented by $H_2O(l)$

- hydrogen gas and oxygen gas react with each other to form liquid water

The unbalanced chemical equation is:

$H_2(g) + O_2(g) \rightarrow H_2O(l)$

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 K (*s*); liquid water is written as H_2O (*l*);
    - hydrogen gas contains diatomic molecules and is represented as H_2 (*g*);
    - potassium hydroxide dissolved in water is written as 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:

solid potassium + water → hydrogen gas + potassium hydroxide dissolved in water

$$K(s) + H_2O(l) \rightarrow H_2(g) + KOH(aq)$$

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_2O 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_2 (*g*).
- Magnesium hydroxide is a combination of the cation Mg^{+2} and the anion OH^- -- so, you get the formula $Mg(OH)_2$ (*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:

$$Mg\,(s) + H_2O\,(l) \rightarrow Mg(OH)_2\,(s) + H_2\,(g)$$

Reactants → Products

The End