Chemical Reactions

Writing Skeleton Equations
Predicting the Products

LEARNING OUTCOMES

You Should Be Able To…

1. **Convert word equations into a skeleton equations.**
2. **Predict products of a chemical reaction.**

Chemical reactions can be written in different ways.

– A _____:
• Nitrogen monoxide + oxygen → nitrogen dioxide

– A _____:

• $2NO_{(g)} + O_{2(g)} \rightarrow 2NO_{2(g)}$

_____
Indicates how many of each molecule there is.

-ie: there are 2 molecules of NO.

STATE OF MATTER
- Letters indicate the state of each compound.
(aq) =
(s) =
(l) =
(g) =

Diatomics!

• Some atoms exist in diatomic form:

   gases…   **H, N, O, F, Cl, Br and I**

• **All exist with two of the element:**

   _____

Convert word equations into a skeleton equations.

Example #1:
Word Equation: Solutions of lead (II) nitrate react with potassium iodide *to produce* **solid lead (II) iodide and a solution of potassium nitrate.**

Step ONE: Write the correct formula for each compound identified in the word equation. IMPORTANT-look up oxidation numbers if it is an ionic compound!

lead (II) iodide
                                    potassium nitrate
                    lead (II) nitrate   potassium iodide

Skeleton Equation:

Step TWO: Balance the equation!

Balanced Equation:

Example #2:
Word Equation: Copper reacts with hydrogen nitrate to produce copper (II) nitrate plus hydrogen.

Step ONE: Write the correct formula for each compound identified in the word equation. IMPORTANT-look up oxidation numbers if it is an ionic compound!

Step TWO: Balance the equation!

Check your understanding:

1) Iron reacts with oxygen gas to produce Iron (III) oxide.

2) Iron (III) Chloride reacts with sodium hydroxide to produce Iron (III) hydroxide and sodium chloride.

Once you classify the reaction, predict the products.

- **If it is <u>synthesis</u>, write a compound that contains both elements.** *(remember to …*

- **If it is <u>decomposition</u>, then attempt to break it into two elements or compounds.**

Once you classify the reaction, predict the products.

- **If it is <u>single replacement</u>, then replace the single element with the corresponding element in the compound.**
  - *A metal will replace the _____ in the compound*
  - *A non-metal will replace the _____ in the compound*

- **If it is <u>double replacement</u>, then the cation and anions switch places.**
  - *It is helpful to separate each compound into their cation and anionic parts with their _____.*

A + B → Synthesis

Example #1:

Na(s) + Cl_2(g) →
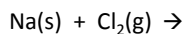
Steps

1. Look up the charges for each
2. Write the compound correctly
3. Then Balance the Reaction

Example #2:

K + O_2 →
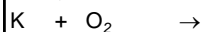
AB + C → Single Displacement
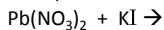
Example #1:

$CuSO_4$ + Zn →
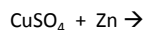
Steps

1. Look up the charges for each
2. If single atom is a metal, it replaces the cation.
3. If single atom is a non-metal, it replaces the anion.
4. Write the compound correctly
5. Then Balance the Reaction

Example #2:

I_2 + NaCl →
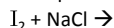
AB + CD → Double Displacement

Example #1:

$Pb(NO_3)_2$ + KI →

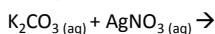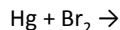**Steps**

1. Separate each compound & write their charges.
2. Switch places (cation swaps with the other cation).
3. Re-write new compounds (using oxidation numbers).
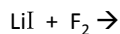4. Final step is to balance!

Example #2:

$K_2CO_{3\ (aq)}$ + $AgNO_{3\ (aq)}$ →

Check your understanding:

<u>Synthesis</u>

Hg + Br_2 →

<u>Single replacement</u>

LiI + F_2 →

<u>Double replacement</u>

$CaCl_{2(s)}$ + $FeSO_{4\ (aq)}$ →

1. **Did you remember to take into account the charges on the cation and anion and write the formula correctly?**

2. **Check your diatomics!**
   H_2 N_2 O_2 F_2 Cl_2 Br_2 I_2