**YOULearn #3 – Balancing and Identifying Types of Chemical Reactions Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. **Balancing Chemical Reactions:**
   1. Balance atoms that are alone first if possible.
   2. Leave the balancing of ***Hydrogen*** and ***Oxygen*** atoms to the end.
   3. If the ***Same*** polyatomic ions appear on both the reactant and product sides of a reaction, leave the polyatomic ion as one ***Unit***.
   4. List all the atom/polyatomic ion from the skeletal equation below the arrow
   5. *Remember you can only list a polyatomic if it appears on BOTH sides of the equation*
   6. Tally the total of each atoms/polyatomic ions from the left and right side of the equation
   7. When you change the coefficients, change the number of atoms/polyatomic ions until they are equal on both sides

*Example*: 2Al(s) + 6HBr(aq)  2AlBr3(aq) + 3H2(g)

*Example*: 3Pb(NO­3)2(aq) + Al2(SO4)3(aq) 3PbSO4(s) + 2Al(NO3)3 (aq)

*Example*: 3Zn(OH)2(aq) + 2H3PO4(aq) Zn3(PO4)2(aq) + 6H2O(l)

*Write the following word equations into chemical equations and balance each equation.*

1. hydrogen gas + oxygen gas water

2H2 + O2 2H2O

1. iron + sulphur iron (II) sulphide (*note: Sulpher is found as S8 in nature*)

8Fe + S8 🡪 8FeS

1. sodium chloride + silver nitrate silver chloride + sodium nitrate

NaCl + AgNO3 🡪 AgCl + NaNO3

1. carbon + oxygen gas carbon dioxide

C + O2 🡪 CO2

1. calcium hydroxide + carbon dioxide calcium carbonate + water

Ca(OH)2 + CO2 🡪 CaCO3 + H2O

1. zinc + copper (II) sulfate zinc sulfate + copper

Zn + CuSO4 🡪 ZnSO4 + Cu

1. sodium + water sodium hydroxide + hydrogen gas

2Na + 2H2O 🡪 2NaOH + H2

1. aluminum + iron (III) oxide aluminum oxide + iron

2Al + Fe2O3 🡪 Al2O3 + 2Fe

1. Zinc and lead (II) nitrate react to form zinc nitrate and lead.

Zn + Pb(NO3)2 🡪 Pb + Zn(NO3)2

1. Aluminum bromide and chlorine gas react to form aluminum chloride and bromine gas.

2AlBr3 + 3Cl2 🡪 2AlCl3 + 3Br2

1. Sodium phosphate and calcium chloride react to form calcium phosphate and sodium chloride.

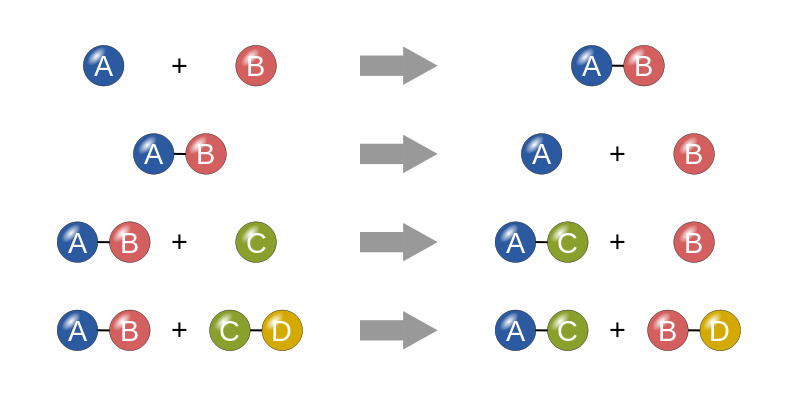
2Na3PO4 + 3CaCl2 🡪 Ca3(PO4)2 + 6NaCl

1. Calcium hydroxide and phosphoric acid react to form calcium phosphate and water.

3Ca(OH)2 + 2H3PO4 🡪 Ca3(PO4)2 + 6H2O

1. Copper and sulfuric acid react to form copper (II) sulfate and water and sulfur dioxide.

Cu + 2H2SO4 🡪 CuSO4 + SO2 + 2H2O

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1. **Types of Reactions:**

Compound XY Atom X + Atom Y

* 1. Decomposition

Atom X + Atom Y Compound XY

* 1. Synthesis

Ionic Compound AB + Atom M Ionic Compound MB + Atom A

* 1. Single Replacement

Ionic compound CD + Ionic Compound EF Ionic compound CF + Ionic Compound ED

* 1. Double Replacement

HX + YOH H2O + YX

(*note: HX represents a standard acid/YOH a standard base)*

* 1. Acid Base Neutralization

CxHy + O2(g) CO2(g) + H2O(g)

* 1. Combustion

Ionic Compound AB + water Ion A+ (aq) + Ion B-(aq)

* 1. \_\_\_\_\_\_\_\_\_\_\_Dissociation\_\_\_\_\_\_\_\_\_\_\_

**Predicting Products and Identifying Chemical Reactions**

*Identify the products for the following word equations. Change the word equations into chemical equations and identify the type of reaction. YOU DO NOT NEED TO BALANCE*

1. sodium chloride + hydrogen carbonate Double Replacement

2NaCl + H2CO3 🡪 Na2CO3 + 2HCl

1. mercury (II) oxide Decomposition

HgO 🡪 Hg + O2

1. potassium + water Single Replacement

2K + H2O 🡪 K2O + H2

1. zinc + hydrogen chloride Single Replacement

Zn + 2HCl 🡪 ZnCl2 + H2

1. copper(II) + chlorine gas Synthesis

Cu + Cl2 🡪 CuCl2

1. bromine gas + water Single Replacement

2Br2 + 2H2O 🡪 4HBr + O2

1. manganese (II) + oxygen gas Synthesis

2Mn + O2 🡪 2MnO

1. H3PO4 + Mg(OH)2 AB Neutralization

2H3PO4 + 3Mg(OH)2  🡪 Mg3(PO4)2 + 6H2O

1. ammonium sulfide + zinc chloride Double Replacement

(NH4)2S + ZnCl2 🡪 2NH4Cl + ZnS

1. barium phosphate + sodium sulfate Double Replacement

Ba3(PO4)2 + 3Na2SO4 🡪 2Na3PO4 + 3BaSO4

1. iron (III) chloride + water Double Replacement

FeCl3 + 3H2O 🡪 3HCl + Fe(OH)3

1. tricarbon octahydride + oxygen gas Combustion

C3H8 + 5O2 🡪 3CO2 + 4H2O

1. hydrogen phosphate + calcium hydroxide AB Neutralization

2H3PO4 + 3Ca(OH)2 🡪 Ca3(PO4)2 + 6H2O

1. copper (I) + hydrogen sulfate Single Replacement

2Cu + H2S 🡪 Cu2S + H2

1. iron (III) chloride + sodium carbonate sodium chloride + iron (III) carbonate

Double Replacement

2FeCl3 + 3Na2CO3 🡪 Fe2(CO3)3 + 6NaCl

1. aluminum sulphate + water Double Replacement

Al2(SO4)3 + 6H2O 🡪 2Al(OH)3 + 3H2SO4

1. iron(III) + water Single Replacement

Fe + 3H2O 🡪 Fe(OH)3 + 3H2