

# STEPS TO PREDICTING THE PRODUCTS OF CHEMICAL REACTIONS

# ONCE YOU CLASSIFY THE REACTION, THEN WRITE THE PRODUCTS.

- If it is combustion, then just write  $\text{H}_2\text{O}$  and  $\text{CO}_2$  as products.
- If it is synthesis, write a compound that contains both elements. (remember to balance the charges for ionic compounds)
- If it is decomposition, then attempt to break it into two elements or compounds.

- If it is single replacement, then replace the single element with the corresponding element in the compound.
  - A metal will replace the cation in the compound
  - A non-metal will replace the anion in the compound
- Remember to take into account the charges on the cation and anion and write the formula correctly!
- If it is double replacement, then the cation and anions switch places.
  - It is helpful to separate each compound into their cation and anionic parts with their charges.
  - Then switch places, and crisscross the new compounds to make sure they are the correct neutral compound formulas.

# DIATOMICS!

- Remember the elements that exist in diatomic form.
  - H, N, O, F, Cl, Br and I
- All exist with two of the element:
  - H<sub>2</sub> N<sub>2</sub> O<sub>2</sub> F<sub>2</sub> Cl<sub>2</sub>, Br<sub>2</sub> , I<sub>2</sub>

# A + B → SYNTHESIS/COMBINATION

■ Example:



- 2 elements in reactants indicates synthesis
- Write Charges for each then write compound
- $\text{Na}^+ \text{Cl}^-$
- $\text{NaCl}$
- Balance Reaction

# AB → DECOMPOSITION

- A single reactant indicates a decomposition reaction.
- Separate to elements (remember diatomics!) or less complex compounds (we will be memorizing some of these later!)

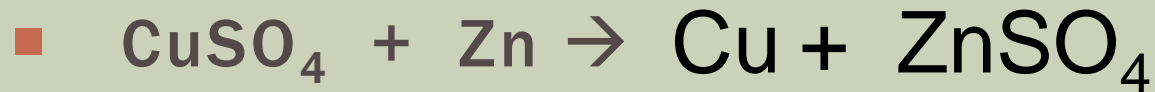
Examples:

- $2\text{MgO} \rightarrow 2 \text{Mg} + \text{O}_2$
- $\text{NH}_4\text{OH} \rightarrow \text{NH}_3 + \text{H}_2\text{O}$

# AB + C → SINGLE DISPLACEMENT

- AB is an ionic compound and C is an element.

- If element is a metal, it replaces the cation.



- If element is a non-metal, it replaces the anion.



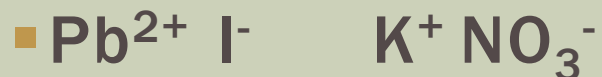
- Remember correct charges and diatomics!

- Then balance at the end.

# AB + CD → DOUBLE DISPLACEMENT

- AB and CD are both ionic compounds.
- Separate each compound & write their charges.
- Switch places and re-write new compounds.

Example:



- Balance at the end





- Can also be  $\text{C}_x\text{H}_y\text{O}_z$
- A hydrocarbon and oxygen indicate a combustion reaction.
- Just write  $\text{CO}_2$  and  $\text{H}_2\text{O}$  as products and then balance (this is the hard part!)
- $2 \text{C}_4\text{H}_{10} + 13 \text{O}_2 \rightarrow 8 \text{CO}_2 + 10 \text{H}_2\text{O}$