

- Given only the reactants of a chemical reaction, it is possible for us to predict the products that will be created
- We first need to determine what type of reaction it is, and then follow the guidelines for that reaction classification

Predicting Products

- Classifications of reactions:
 - Synthesis:
 - two elements combine
 - Decomposition:
 - one compound breaks apart
 - Single Replacement:
 - one element reacts with one compound
 - Double Replacement:
 - two compounds react
 - Neutralization:
 - Acid + Base
 - Combustion:
 - hydrocarbon reacts with oxygen



Predicting Products (Synthesis and Decomposition)



- If it is synthesis, write a compound that contains both elements (remember to balance the charges for ionic compounds).
 - Example: Na + $Cl_2 \rightarrow ?????$
 - 2Na + $Cl_2 \rightarrow 2NaCl$
- If it is decomposition, then attempt to break it into two elements or compounds.
 - Example: $2H_2O \rightarrow ??????$
 - $2H_2O \rightarrow 2H_2 + O_2$

Predicting Products (Single Replacement)



- If it is <u>single replacement</u>, then replace the single element with the corresponding element in the compound.
 - A metal will replace the metal in the compound
 - A non-metal will replace the non-metal in the compound
 - Remember to take into account the charges on the cation and anion and write the formula correctly!
 - Example: Mg + HCI \rightarrow ??????
 - Mg + 2HCl \rightarrow MgCl₂ + H₂

Predicting Products (Double Replacement)



- If it is <u>double replacement</u>, then the metals and non-metals^L switch places.
 - It is helpful to separate each compound into their ion parts with the charges.
 - Then switch places, and crisscross the new compounds to make sure they are the correct neutral compound formulas.
 - Example: $Pb(NO_3)_2 + KI \rightarrow ?????$
 - $Pb(NO_3)_2 + 2KI \rightarrow PbI_2 + 2KNO_3$



Predicting Products (Neutralization)



- Neutralization Reactions are a special case of Double Replacement Reactions
 - Remember the general formula: acid + base \rightarrow salt + water
 - Example: $H_2SO_4 + Ca(OH)_2 \rightarrow ?????$
 - $H_2SO_4 + Ca(OH)_2 \rightarrow CaSO_4 + 2H_2O$



- Combustion Reactions ALWAYS have exactly the same products
- <u>Every</u> Combustion Reaction yields carbon dioxide and water, so just write CO₂ and H₂O as the products, then balance it

• Example:
$$C_4H_{10} + O_2 \rightarrow ?????$$

• 2
$$C_4H_{10}$$
 + 13 $O_2 \rightarrow 8 CO_2$ + 10 H_2O_2

