

POGIL

“High School Drama”

Bookstores, supermarket, and music stores are among many places where things are classified and organized. Chemists classify chemical reactions in order to organize the numerous numbers of reactions that occur daily in living things and in laboratories.

Knowing the main categories of chemical reactions can help you to remember and understand them. It also helps you to recognize patterns and predict the products of many chemical reactions.

Model 1: Types of Chemical Reactions

Type of Reaction	Symbols	Chemical Equations
Synthesis	$A+B \rightarrow AB$	$2\text{NH}_3 + \text{H}_2\text{SO}_4 \rightarrow (\text{NH}_4)_2\text{SO}_4$
Decomposition	$AB \rightarrow A+B$	$2\text{NaN}_3 \rightarrow 2\text{Na} + 3\text{N}_2$
Single Replacement	$A+XY \rightarrow AY+X$	$2\text{NH}_3 + \text{H}_2\text{SO}_4 \rightarrow (\text{NH}_4)_2\text{SO}_4$
Double Replacement	$AB+XY \rightarrow AY+XB$	$2\text{NaBr} + \text{Ca}(\text{OH})_2 \rightarrow \text{CaBr}_2 + 2\text{NaOH}$
Combustion	$A + \text{O}_2 \rightarrow \text{AO}_x$	$\text{C}_{10}\text{H}_8 + 12\text{O}_2 \rightarrow 10\text{CO}_2 + 4\text{H}_2\text{O}$

Questions:

- 1- What is the key to identify a single replacement reaction?
- 2- How can you relate Synthesis reaction to the Decomposition reaction?
- 3- What does (x) represent in the Combustion reaction?
- 4- Is combustion reaction endothermic or exothermic?
- 5- Use a complete sentence to describe the Double Replacement reaction.

Exercise 1

Predict products and write complete balanced chemical equations for the following reactions:

1. Lead (II) nitrate reacts with potassium chromate (chromate ion = CrO_4^{-2})
2. Combustion of isopropyl alcohol, $\text{C}_3\text{H}_7\text{OH}$
3. Hydrochloric acid (HCl) reacts with metal magnesium
4. Chlorine gas reacts with sodium metal

Model 2: High School Drama

Paige and Leah always like to chat during the chemistry class; the main daily topic is boyfriend/girlfriend relationships. Paige is dating Collin, and Leah is dating Eric. Both of Paige and Leah keep fight and break up with Collin and Eric, and then go back to each other, a week up and a week down. Lately a big fight started between Paige and Leah after Leah found out that Paige went out with Eric to watch a movie. Now Paige is more interested to see Eric not Collin. Moreover, Leah started to go out with Collin. A month later, Paige is dating Eric, and Leah is dating Collin, no surprise, we are in high school.

Answer the following question:

- 1- Which arrow will you use (\rightarrow) or (\leftrightarrow) to represent the relationship between either Paige and Collin, or Leah and Eric? Explain?
- 2- Represent a happy week of Paige and Collin as a chemical equation? What type of chemical reaction this equation represents?
- 3- Represent a bad week for Leah and Eric (when they break up) as a chemical equation? What type of chemical reaction this equation represents?
- 4- Represent what happened when Paige went out with Eric instead of Collin as a chemical equation? What type of chemical reaction this equation represents?
- 5- Put the old relationships between Paige, Leah, Collin, and Eric, and the new one in a chemical equation? What type of chemical reaction these equations represent?
- 6- In your opinion, why did Paige start to date Eric instead of Collin?
- 7- Finally which chemical reaction precisely represents Mr. Makarious who has to deal with this drama everyday in his room? (Hint: in model one, either second or last reaction)

Exercise 2

Identify the type of chemical reaction shown in the following equations:

