

MINISTRY OF EDUCATION
SECONDARY ENGAGEMENT PROGRAMME
GRADE 10
CHEMISTRY

WEEK 9

LESSON 2

Topic: Writing Formulae and Equations

Sub-topic: Types of Chemical Reactions

Objectives: After looking at equations students will:

- Identify equations based on their types getting at least 8 out of 10 correct.
- Write balanced equations for chemical reactions.

Content

Chemical Reaction: The transformation of a chemical substance into another chemical substance is known as Chemical Reaction. For example: Rusting of iron, the setting of milk into curd, digestion of food, respiration, etc. In a chemical reaction, a new substance is formed which is completely different in properties from the original substance, so in a chemical reaction, a chemical change takes place.

During a chemical reaction, the substances that react are known as *reactants* whereas the substances that are formed during a chemical reaction are known as *products*. Six common types of chemical reactions are discussed shown below.

Types of Chemical Reactions

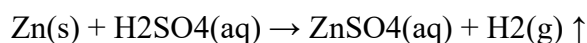
Types of Chemical Reactions	Explanation	General Reaction
Combination	Two or more compounds combine to form one compound.	$A + B \rightarrow AB$ $2Na + Cl_2 \rightarrow 2NaCl$
Decomposition	The opposite of a combination reaction – a complex molecule breaks down to make simpler ones.	$AB \rightarrow A + B$ $CaCO_3 \rightarrow CaO + CO_2$
Precipitation	Two solutions of soluble salts are mixed resulting in an insoluble solid (precipitate) forming.	$A + \text{Soluble salt B} \rightarrow \text{Precipitate} + \text{soluble salt C}$ $NaCl(aq) + AgNO_3(aq) \rightarrow AgCl(s) + NaNO_3(aq)$
Neutralization	An acid and a base react with each other. Generally, the product of this reaction is a salt and water.	$\text{Acid} + \text{Base} \rightarrow \text{Salt} + \text{Water}$
Combustion	Oxygen combines with a compound to form carbon dioxide and water. These reactions are exothermic, meaning they give off heat.	$A + O_2 \rightarrow H_2O + CO_2$
Displacement	One element takes place with another element in the compound.	$A + BC \rightarrow AC + B$ $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$
Double	Ions get exchanged between two reactants which form a new compound	$XY + ZA \rightarrow XZ + YA$ $BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + 2NaCl$

There are 5 primary types of chemical reactions are:

1. Combination reaction
2. Decomposition reaction
3. Displacement reaction
4. Double Displacement reaction
5. Precipitation Reaction

Characteristics of Chemical Reactions

(i) **Evolution of gas:** The chemical reaction between zinc and dilute sulphuric acid is characterized by the evolution of hydrogen gas.



(ii) **Change in Colour:** The chemical reaction between citric acid and purple coloured potassium permanganate solution is characterized by a change in colour from purple to colourless.

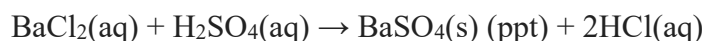
The chemical reaction between sulphur dioxide gas and acidified potassium dichromate solution is characterized by a change in colour from orange to green.

(iii) **Change in state of substance:** The combustion reaction of candle wax is characterized by a change in state from solid to liquid and gas (because the wax is a solid, water formed by the combustion of wax is a liquid at room temperature whereas, carbon dioxide produced by the combustion of wax is a gas). Some chemical reactions can show more than one characteristic.

(iv) **Change in temperature:** The chemical reaction between quick lime water to form slaked lime is characterized by a change in temperature (which is a rise in temperature).

The chemical reaction between zinc granules and dilute sulphuric acid is also characterized by a change in temperature (which is a rise in temperature).

(v) **Formation of precipitate:** The chemical reaction between sulphuric acid and barium chloride solution is characterised by the formation of a white precipitate of barium sulphate.



What is a chemical equation?

A chemical equation is a way to represent the chemical reaction in a concise and informative way.

A chemical equation can be divided into two types: Balanced Chemical Equation and Unbalanced Chemical Equation.

(a) Balanced Chemical Equation: A balanced chemical equation has the number of atoms of each element equal on both sides.

Example: $\text{Zn} + \text{H}_2\text{SO}_4 \rightarrow \text{ZnSO}_4 + \text{H}_2$

In this equation, numbers of zinc, hydrogen and sulphate are equal on both sides, so it is a Balanced Chemical Equation.

According to the Law of Conservation of Mass, mass can neither be created nor destroyed in a chemical reaction. To obey this law, the total mass of elements present in reactants must be equal to the total mass of elements present in products.

(b) Unbalanced Chemical Equation: If the number of atoms of each element in reactants is not equal to the number of atoms of each element present in the product, then the chemical equation is called Unbalanced Chemical Equation.

References

1. <https://www.learncbse.in/chemical-reactions-and-equations-class-10-notes/>
<https://intl.siyavula.com/read/science/grade-10/representing-chemical-change/14-representing-chemical-change-02>