CBSE Class 10 Science

Chemical Reactions and Equations

Section A – 2 Marks Questions

Q1. What is a chemical reaction? Write any two observations that indicate a chemical reaction.

Answer: A chemical reaction is a process in which one or more substances are converted into new substances with different properties.

Two observations are:

1. Change in colour.
2. Evolution of gas.

Q2. Why should a magnesium ribbon be cleaned before burning in air?

Answer: Magnesium ribbon develops a thin layer of magnesium oxide on its surface due to its reaction with oxygen in air. This layer prevents magnesium from burning easily. Therefore, it is cleaned with sandpaper before burning.

Q3. Define a balanced chemical equation. Why should a chemical equation be balanced?

Answer: A chemical equation in which the number of atoms of each element is equal on both sides is called a balanced chemical equation.

It should be balanced to obey the law of conservation of mass.

Q4. What is a combination reaction? Give one example.

Answer: A reaction in which two or more substances combine to form a single product is called a combination reaction.

Example:

$CaO + H_2O \rightarrow Ca(OH)_2$

Q5. What is a decomposition reaction? Give one example.

Answer: A reaction in which a single compound breaks down into two or more simpler substances is called a decomposition reaction.

Example:

$CaCO_3 \rightarrow CaO + CO_2$ (Heat)

Q6. Why is respiration considered an exothermic reaction?

Answer: During respiration, glucose reacts with oxygen and releases energy. Therefore, respiration is considered an exothermic reaction.

$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ + Energy

Q7. What is oxidation? Give one example.

Answer: Oxidation is a chemical process in which a substance gains oxygen or loses hydrogen.

Example:

$2Cu + O_2 \rightarrow 2CuO$

Q8. What is reduction? Give one example.

Answer: Reduction is a chemical process in which a substance loses oxygen or gains hydrogen.

Example:

$CuO + H_2 \rightarrow Cu + H_2O$

Q9. What is a precipitation reaction? Give one example.

Answer: A reaction in which an insoluble solid is formed when two aqueous solutions react is called a precipitation reaction.

Example:

$Pb(NO_3)_2 + 2KI \rightarrow PbI_2\downarrow + 2KNO_3$

Q10. Why is the decomposition of silver chloride called a photochemical reaction?

Answer: Silver chloride decomposes into silver and chlorine gas in the presence of sunlight. Since light energy causes the decomposition, it is called a photochemical reaction.

$2AgCl \rightarrow 2Ag + Cl_2$ (Sunlight)

Section B – 3 Marks Questions

Q1. Explain the three types of decomposition reactions with suitable examples.

Answer: Decomposition reactions are classified into three types:

1. **Thermal Decomposition:** Decomposition caused by heat.

$CaCO_3 \rightarrow CaO + CO_2$

2. **Electrolytic Decomposition:** Decomposition caused by electricity.

$2H_2O \rightarrow 2H_2 + O_2$

3. **Photochemical Decomposition:** Decomposition caused by sunlight.

$2AgCl \rightarrow 2Ag + Cl_2$

Q2. Differentiate between combination and decomposition reactions with examples.

Answer:

Combination Reaction	Decomposition Reaction
Two or more substances combine.	One substance breaks down.
A single product is formed.	Two or more products are formed.
Example: $CaO + H_2O \rightarrow Ca(OH)_2$	Example: $CaCO_3 \rightarrow CaO + CO_2$

Q3. What happens when an iron nail is dipped in copper sulphate solution? Write the chemical equation and observations.

Answer: When an iron nail is dipped in blue copper sulphate solution:

1. The blue solution gradually turns green.
2. A reddish-brown layer of copper is deposited on the iron nail.
3. Iron displaces copper from copper sulphate solution.

Chemical equation:

$Fe + CuSO_4 \rightarrow FeSO_4 + Cu$

It is a displacement reaction.

Q4. Explain oxidation and reduction with the help of a chemical equation.

Answer: Consider the following reaction:

$CuO + H_2 \rightarrow Cu + H_2O$

- Copper oxide loses oxygen and is reduced to copper.
- Hydrogen gains oxygen and is oxidised to water.
- Oxidation and reduction occur simultaneously.

This reaction is called a redox reaction.

Q5. What is rancidity? Mention three methods to prevent it.

Answer: Rancidity is the oxidation of fats and oils in food, which causes an unpleasant smell and taste.

Methods to prevent rancidity:

1. Store food in airtight containers.
2. Keep food refrigerated.
3. Add suitable antioxidants to food.

Q6. Balance the following chemical equations:

(a) $Fe + H_2O \rightarrow Fe_3O_4 + H_2$

(b) $Al + O_2 \rightarrow Al_2O_3$

(c) $Na + H_2O \rightarrow NaOH + H_2$

Answer:

(a) $3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$

(b) $4Al + 3O_2 \rightarrow 2Al_2O_3$

(c) $2Na + 2H_2O \rightarrow 2NaOH + H_2$

Q7. What is a double displacement reaction? Explain with an example.

Answer: A reaction in which two compounds exchange their ions to form two new compounds is called a double displacement reaction.

Example:

$Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2NaCl$

A white precipitate of barium sulphate is formed.

Section C – 5 Marks Questions

Q1. Explain different types of chemical reactions with suitable examples.

Answer: Chemical reactions are classified into the following major types:

1. Combination Reaction: Two or more substances combine to form a single product.

$CaO + H_2O \rightarrow Ca(OH)_2$

2. Decomposition Reaction: One compound breaks down into simpler substances.

$CaCO_3 \rightarrow CaO + CO_2$

3. Displacement Reaction: A more reactive element displaces a less reactive element from its compound.

$Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$

4. Double Displacement Reaction: Two compounds exchange their ions.

$Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2NaCl$

5. Redox Reaction: Oxidation and reduction take place simultaneously.

$CuO + H_2 \rightarrow Cu + H_2O$

Q2. Describe the chemical reaction between lead nitrate and potassium iodide. Write the balanced equation, observations and type of reaction.

Answer: When aqueous solutions of lead nitrate and potassium iodide are mixed, a yellow precipitate of lead iodide is formed.

Balanced chemical equation:

$Pb(NO_3)_2 + 2KI \rightarrow PbI_2 + 2KNO_3$

Observations:

1. A yellow precipitate is formed.
2. The precipitate is lead iodide.
3. Potassium nitrate remains dissolved in the solution.

Type of Reaction:

- Double displacement reaction.
- Precipitation reaction.

Q3. Explain the law of conservation of mass with an example. Why is balancing a chemical equation necessary?

Answer: The law of conservation of mass states that mass can neither be created nor destroyed in a chemical reaction.

According to this law, the total mass of reactants is equal to the total mass of products.

Example:

$2H_2 + O_2 \rightarrow 2H_2O$

Number of atoms:

Element	Reactant Side	Product Side
Hydrogen	4	4
Oxygen	2	2

Thus, the number of atoms of each element remains equal on both sides.

Importance of balancing:

1. It follows the law of conservation of mass.
2. It shows the correct proportion of reactants and products.
3. It provides a scientifically correct chemical equation.

Q4. Explain the process of corrosion. What is rusting? Mention methods to prevent corrosion.

Answer: Corrosion is the gradual destruction of metals due to their reaction with air, moisture or other substances in the environment.

Rusting: The formation of a reddish-brown coating of hydrated iron oxide on iron in the presence of air and moisture is called rusting.

The chemical representation is:

$Fe_2O_3 \cdot xH_2O$

Conditions necessary for rusting:

1. Presence of oxygen.
2. Presence of moisture.

Methods to prevent corrosion:

1. Painting the metal surface.
2. Applying oil or grease.
3. Galvanisation (coating iron with zinc).
4. Electroplating.
5. Alloying.

Q5. What are exothermic and endothermic reactions? Explain with two examples each.

Answer:

Exothermic Reactions: Reactions in which energy is released in the form of heat are called exothermic reactions.

Examples:

1. Respiration:

$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + Energy$

2. Burning of natural gas:

$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O + Heat$

Endothermic Reactions: Reactions in which energy is absorbed are called endothermic reactions.

Examples:

1. Thermal decomposition of calcium carbonate:

$CaCO_3 \rightarrow CaO + CO_2$

2. Photosynthesis:

$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$

Quick Revision – Important Chemical Equations

Reaction	**Balanced Equation**
Burning of magnesium	$2Mg + O_2 \rightarrow 2MgO$
Formation of water	$2H_2 + O_2 \rightarrow 2H_2O$
Iron with copper sulphate	$Fe + CuSO_4 \rightarrow FeSO_4 + Cu$
Zinc with hydrochloric acid	$Zn + 2HCl \rightarrow ZnCl_2 + H_2$
Silver chloride decomposition	$2AgCl \rightarrow 2Ag + Cl_2$
Calcium carbonate decomposition	$CaCO_3 \rightarrow CaO + CO_2$
Sodium with water	$2Na + 2H_2O \rightarrow 2NaOH + H_2$
Copper oxide reduction	$CuO + H_2 \rightarrow Cu + H_2O$