UNIQUE STUDY POINT

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Class: X	**Subject:** Science	**Session:** 2025-26
Chapter: 01 - Chemical Reactions and Equations	**Time:** 1½ Hours	**Max. Marks:** 40

General Instructions:

1. All questions are compulsory.
2. This question paper contains 20 questions divided into five sections A, B, C, D and E.
3. Section A contains 10 MCQs of 1 mark each.
4. Section B contains 4 questions of 2 marks each.
5. Section C contains 3 questions of 3 marks each.
6. Section D contains 1 question of 5 marks.
7. Section E contains 2 Case Study Based questions of 4 marks each.

SECTION A - Multiple Choice Questions (1 mark each)

Q1. Which of the following is a balanced chemical equation?

(a) $Mg + O_2 \rightarrow MgO$

(b) $2Mg + O_2 \rightarrow 2MgO$

(c) $Mg + 2O_2 \rightarrow 2MgO$

(d) $3Mg + O_2 \rightarrow 3MgO$

Q2. When calcium oxide reacts with water, the reaction is:

(a) Endothermic and combination

(b) Exothermic and combination

(c) Endothermic and decomposition

(d) Exothermic and decomposition

Q3. The color of ferrous sulphate crystals is:

(a) White

(b) Green

(c) Brown

(d) Yellow

Q4. Which gas is evolved when zinc reacts with dilute sulphuric acid?

(a) Oxygen

(b) Nitrogen

(c) Hydrogen

(d) Carbon dioxide

Q5. The decomposition of silver chloride on exposure to sunlight is an example of:

(a) Thermal decomposition
(b) Photolytic decomposition
(c) Electrolytic decomposition
(d) Displacement reaction

Q6. In the reaction: $Fe_2O_3 + 2Al \rightarrow Al_2O_3 + 2Fe$, aluminium is:
(a) Oxidized
(b) Reduced
(c) Neither oxidized nor reduced
(d) Both oxidized and reduced

Q7. Which of the following statements is correct about respiration?

(a) It is an exothermic process
(b) It is an endothermic process
(c) No energy is released
(d) Energy is absorbed from surroundings

Q8. The chemical formula for slaked lime is:

(a) $CaCO_3$
(b) $Ca(OH)_2$
(c) CaO
(d) $CaCl_2$

Q9. Rancidity in food can be prevented by:

(a) Adding antioxidants
(b) Keeping in air-tight containers
(c) Flushing with nitrogen gas
(d) All of the above

Q10. In the reaction $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$, which element gets displaced?

(a) Zinc
(b) Copper
(c) Sulphur
(d) Oxygen

SECTION B - Short Answer Questions (2 marks each)

Q11. Why should magnesium ribbon be cleaned before burning in air? Write the balanced chemical equation for the reaction.

Q12. What happens when lead nitrate is heated? Write the balanced chemical equation and name the type of reaction.

Q13. Differentiate between exothermic and endothermic reactions with one example each.

Q14. What is corrosion? Give two examples from everyday life.

SECTION C - Short Answer Questions (3 marks each)

Q15. Explain the activity that demonstrates the electrolysis of water. Write the balanced chemical equation and mention the ratio of gases evolved.

Q16. What is a displacement reaction? Explain with three suitable examples including balanced chemical equations.

Q17. Define oxidation and reduction in terms of:
(i) Gain or loss of oxygen
(ii) Gain or loss of hydrogen
Give one example for each.

SECTION D - Long Answer Question (5 marks)

Q18. (a) What is a balanced chemical equation? Why is it necessary to balance chemical equations?
(b) Balance the following chemical equations:

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

(ii) $NH_3 + O_2 \rightarrow NO + H_2O$

(iii) $Al + HCl \rightarrow AlCl_3 + H_2$

SECTION E - Case Study Based Questions (4 marks each)

Q19. Case Study 1:

Ravi's mother heated ferrous sulphate crystals in a test tube over a burner. She observed that the color of the crystals changed and a smell of burning sulphur was detected. A reddish-brown residue was left in the test tube.

Based on this observation, answer the following:

(a) What was the initial color of ferrous sulphate crystals? (1 mark)

(b) Write the balanced chemical equation for this reaction. (1 mark)

(c) Name the type of reaction taking place. (1 mark)

(d) Name the gases evolved during this reaction. (1 mark)

Q20. Case Study 2:

A student took a solution of sodium sulphate in a test tube and added a few drops of barium chloride solution to it. He observed the formation of a white precipitate which was insoluble in water. On analyzing the products, he found that sodium chloride was also formed in the solution.

Based on this information, answer the following:

(a) Name the white precipitate formed. (1 mark)

(b) Write the balanced chemical equation for this reaction. (1 mark)

(c) What type of reaction is this? (1 mark)

(d) What is the special name given to such reactions where a precipitate is formed? (1 mark)

DETAILED ANSWER KEY - PAPER 01

SECTION A - Answers to MCQs

Ans 1. (b) $2Mg + O_2 \rightarrow 2MgO$

Explanation: In this equation, there are 2 magnesium atoms and 2 oxygen atoms on both sides, making it balanced. The law of conservation of mass is satisfied.

Ans 2. (b) Exothermic and combination

Explanation: $CaO + H_2O \rightarrow Ca(OH)_2$ + Heat. This reaction releases heat (exothermic) and two substances combine to form a single product (combination reaction).

Ans 3. (b) Green

Explanation: Ferrous sulphate crystals ($FeSO_4.7H_2O$) are light green in color.

Ans 4. (c) Hydrogen

Explanation: $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2\uparrow$. Hydrogen gas is evolved which can be tested by bringing a burning splinter near it - it burns with a pop sound.

Ans 5. (b) Photolytic decomposition

Explanation: $2AgCl \rightarrow 2Ag + Cl_2$ (in presence of sunlight). Decomposition caused by light is called photolytic decomposition.

Ans 6. (a) Oxidized

Explanation: Aluminium gains oxygen to form Al_2O_3, hence it is oxidized. Fe_2O_3 loses oxygen and is reduced.

Ans 7. (a) It is an exothermic process

Explanation: During respiration, glucose combines with oxygen to release energy: $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ + Energy.

Ans 8. (b) $Ca(OH)_2$

Explanation: Slaked lime is calcium hydroxide - $Ca(OH)_2$. It is formed when quick lime (CaO) reacts with water.

Ans 9. (d) All of the above

Explanation: Rancidity is caused by oxidation of fats and oils. It can be prevented by adding antioxidants, storing in air-tight containers, and flushing with nitrogen gas.

Ans 10. (b) Copper

Explanation: Zinc is more reactive than copper, so it displaces copper from copper sulphate solution. Copper is the displaced element.

SECTION B - Answers to Short Answer Questions

Ans 11.

Magnesium ribbon should be cleaned before burning because:
• It gets covered with a layer of magnesium oxide (MgO) due to reaction with atmospheric oxygen
• This oxide layer prevents the ribbon from burning properly
• Cleaning with sandpaper removes this layer

Balanced equation:
$2Mg + O_2 \rightarrow 2MgO$

Ans 12.

When lead nitrate is heated:
• It decomposes to form lead oxide (yellow), nitrogen dioxide (brown fumes), and oxygen gas
• The emission of brown fumes of NO_2 can be observed

Balanced equation:
$2Pb(NO_3)_2 \rightarrow 2PbO + 4NO_2 + O_2$

Type of reaction: Thermal decomposition reaction

Ans 13.

Exothermic Reactions	Endothermic Reactions
Reactions in which heat is released	Reactions in which heat is absorbed
Example: Burning of natural gas $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O + Heat$	Example: Decomposition of calcium carbonate $CaCO_3 + Heat \rightarrow CaO + CO_2$

Ans 14.

Corrosion: When a metal is attacked by substances around it such as moisture, acids, etc., and gets damaged, the process is called corrosion.

Examples from everyday life:
1. **Rusting of iron:** Iron objects like gates, railings, and bridges get coated with reddish-brown rust ($Fe_2O_3.xH_2O$)
2. **Green coating on copper:** Copper vessels develop a green coating due to formation of copper carbonate when exposed to moist air containing CO_2

SECTION C - Answers to Short Answer Questions

Ans 15.

Activity for electrolysis of water:
• Take water in a plastic mug and add a few drops of dilute sulphuric acid
• Insert two carbon electrodes connected to a 6V battery
• Invert two test tubes filled with water over the electrodes
• Pass electric current through the water
• Bubbles of gases are formed at both electrodes which displace water in the test tubes

Balanced equation:
$2H_2O \rightarrow 2H_2 + O_2$

Ratio of gases evolved:
Hydrogen : Oxygen = 2 : 1
The volume of hydrogen gas collected is double the volume of oxygen gas.

Ans 16.

Displacement Reaction: A reaction in which a more reactive element displaces a less reactive element from its compound is called a displacement reaction.

Examples:

1. **Iron displacing copper:**
$Fe + CuSO_4 \rightarrow FeSO_4 + Cu$
Iron displaces copper from copper sulphate solution. The blue color of copper sulphate fades and iron nails get coated with brown copper.

2. **Zinc displacing copper:**
$Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$
Zinc being more reactive displaces copper from its salt solution.

3. **Lead displacing copper:**
$Pb + CuCl_2 \rightarrow PbCl_2 + Cu$
Lead displaces copper from copper chloride solution.

Ans 17.

(i) In terms of oxygen:
• **Oxidation:** Addition of oxygen to a substance
Example: $2Cu + O_2 \rightarrow 2CuO$ (Copper gains oxygen)
• **Reduction:** Removal of oxygen from a substance
Example: $CuO + H_2 \rightarrow Cu + H_2O$ (Copper oxide loses oxygen)

(ii) In terms of hydrogen:
• **Oxidation:** Removal of hydrogen from a substance
Example: $H_2S + Cl_2 \rightarrow 2HCl + S$ (Hydrogen sulphide loses hydrogen)
• **Reduction:** Addition of hydrogen to a substance
Example: $Cl_2 + H_2 \rightarrow 2HCl$ (Chlorine gains hydrogen)

SECTION D - Answer to Long Answer Question

Ans 18.

(a) Balanced Chemical Equation:
A balanced chemical equation is one in which the number of atoms of each element is equal on both sides of the equation (reactant side and product side).

Necessity of balancing:
• It follows the Law of Conservation of Mass which states that mass can neither be created nor destroyed in a chemical reaction
• It ensures that the total mass of reactants equals the total mass of products
• It gives the correct stoichiometric ratio of reactants and products

(b) Balanced equations:

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

(ii) $4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$

(iii) $2Al + 6HCl \rightarrow 2AlCl_3 + 3H_2$

SECTION E - Answers to Case Study Based Questions

Ans 19.

(a) The initial color of ferrous sulphate crystals was **green**.

(b) **Balanced equation:**
$2FeSO_4 \rightarrow Fe_2O_3 + SO_2 + SO_3$

(c) This is a **thermal decomposition reaction** (decomposition caused by heat).

(d) The gases evolved are:
- **Sulphur dioxide (SO_2)** - responsible for the burning sulphur smell
- **Sulphur trioxide (SO_3)**

Ans 20.

(a) The white precipitate formed is **Barium sulphate ($BaSO_4$)**.

(b) **Balanced equation:**
$Na_2SO_4 + BaCl_2 \rightarrow BaSO_4\downarrow + 2NaCl$

(c) This is a **double displacement reaction** (exchange of ions between two compounds).

(d) Such reactions where a precipitate is formed are called **precipitation reactions**.
