

# UNIQUE STUDY POINT

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<b>Class:</b> X	<b>Subject:</b> Science	<b>Session:</b> 2025-26
<b>Chapter:</b> 01 - Chemical Reactions and Equations	<b>Time:</b> 1½ Hours	<b>Max. Marks:</b> 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.** The skeletal equation  $\text{Mg} + \text{O}_2 \rightarrow \text{MgO}$  is unbalanced because:

- (a) Number of oxygen atoms is not equal on both sides
- (b) Magnesium oxide formula is wrong
- (c) Magnesium is not reactive
- (d) Oxygen exists as  $\text{O}_3$

**Q2.** Which of the following is NOT an example of a combination reaction?

- (a)  $\text{C} + \text{O}_2 \rightarrow \text{CO}_2$
- (b)  $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$
- (c)  $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
- (d)  $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2$

**Q3.** The brown fumes evolved when lead nitrate is heated are of:

- (a) Oxygen
- (b) Nitrogen dioxide
- (c) Nitrogen
- (d) Lead oxide

**Q4.** Which of the following represents a precipitation reaction?

- (a)  $\text{Zn} + \text{H}_2\text{SO}_4 \rightarrow \text{ZnSO}_4 + \text{H}_2$
- (b)  $\text{Na}_2\text{SO}_4 + \text{BaCl}_2 \rightarrow \text{BaSO}_4 + 2\text{NaCl}$
- (c)  $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$
- (d)  $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$

**Q5.** When hydrogen gas is passed over heated copper oxide, the copper oxide:

- (a) Gets oxidized
- (b) Gets reduced
- (c) Remains unchanged
- (d) Decomposes

**Q6.** The substance used for whitewashing walls is:

- (a) Quick lime
- (b) Slaked lime
- (c) Limestone
- (d) Marble

**Q7.** Which of the following is an endothermic process?

- (a) Burning of coal
- (b) Respiration
- (c) Decomposition of  $\text{CaCO}_3$
- (d) Reaction of  $\text{CaO}$  with water

**Q8.** Silver chloride turns grey in sunlight due to:

- (a) Oxidation
- (b) Photolytic decomposition
- (c) Thermal decomposition
- (d) Hydration

**Q9.** The black coating on silver is due to formation of:

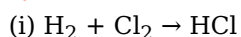
- (a) Silver oxide
- (b) Silver chloride
- (c) Silver sulphide
- (d) Silver carbonate

**Q10.** In the reaction  $2\text{PbO} + \text{C} \rightarrow 2\text{Pb} + \text{CO}_2$ , lead oxide is:

- (a) Oxidized
- (b) Reduced
- (c) Decomposed
- (d) Hydrolyzed

### SECTION B - Short Answer Questions (2 marks each)

**Q11.** What is meant by a skeletal chemical equation? Convert the following into balanced equations:



**Q12.** Why is photosynthesis considered an endothermic reaction? Write the balanced chemical equation for photosynthesis.

**Q13.** What is rancidity? How can we prevent it? Give two methods.

**Q14.** Name the products formed when calcium carbonate is heated. Write the balanced equation and name

the type of reaction.

### SECTION C - Short Answer Questions (3 marks each)

**Q15.** Explain why decomposition reactions are called the opposite of combination reactions. Give one example each with balanced equations.

**Q16.** What is a double displacement reaction? Explain with three examples including balanced chemical equations. Also mention any special feature observed in these reactions.

**Q17.** (a) What happens when iron nails are dipped in copper sulphate solution?

(b) Write the balanced chemical equation.

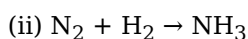
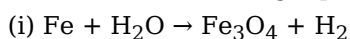
(c) Name the type of reaction.

(d) What color change is observed?

### SECTION D - Long Answer Question (5 marks)

**Q18.** (a) State the law of conservation of mass. How does a balanced chemical equation follow this law?

(b) Balance the following equations step by step:



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

#### Q19. Case Study 1:

During a science practical, students added a few drops of barium chloride solution to sodium sulphate solution taken in a test tube. They observed the formation of a white substance that settled at the bottom of the test tube. This white substance could not be dissolved even on stirring.

Answer the following questions:

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

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

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

(d) What is the special name given to this type of reaction? (1 mark)

#### Q20. Case Study 2:

Ramesh noticed that the iron gate of his house which was recently painted was showing signs of rusting at some places. His father told him that iron reacts with oxygen and moisture present in air to form rust. To prevent further rusting, they applied a fresh coat of paint on the gate.

Based on this information, answer the following:

(a) What is the chemical name and formula of rust? (1 mark)

(b) What is the phenomenon called when iron gets damaged due to rust? (1 mark)

(c) How does painting prevent rusting? (1 mark)

(d) Suggest one more method to prevent rusting of iron. (1 mark)

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## SECTION A - Answers to MCQs

**Ans 1.** (a) Number of oxygen atoms is not equal on both sides

**Explanation:** On LHS there are 2 oxygen atoms ( $O_2$ ) while on RHS there is only 1 oxygen atom (in  $MgO$ ). The equation needs to be balanced to follow the law of conservation of mass.

**Ans 2.** (c)  $CaCO_3 \rightarrow CaO + CO_2$

**Explanation:** This is a decomposition reaction where one substance breaks down into two or more substances. In combination reactions, two or more substances combine to form a single product.

**Ans 3.** (b) Nitrogen dioxide

**Explanation:** When lead nitrate is heated, it decomposes to form  $PbO$ ,  $NO_2$  (brown fumes), and  $O_2$ . The characteristic brown fumes are of nitrogen dioxide gas.

**Ans 4.** (b)  $Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2NaCl$

**Explanation:** Barium sulphate ( $BaSO_4$ ) is an insoluble precipitate formed in this double displacement reaction. Precipitation reactions produce insoluble salts.

**Ans 5.** (b) Gets reduced

**Explanation:**  $CuO + H_2 \rightarrow Cu + H_2O$ . Copper oxide loses oxygen and is converted to copper metal, hence it is reduced. Reduction is the loss of oxygen.

**Ans 6.** (b) Slaked lime

**Explanation:** Slaked lime [ $Ca(OH)_2$ ] is used for whitewashing. It reacts with  $CO_2$  from air to form  $CaCO_3$  which gives a shiny finish to walls.

**Ans 7.** (c) Decomposition of  $CaCO_3$

**Explanation:**  $CaCO_3 + \text{Heat} \rightarrow CaO + CO_2$ . This reaction requires heat energy to proceed, hence it is endothermic. All decomposition reactions are generally endothermic.

**Ans 8.** (b) Photolytic decomposition

**Explanation:**  $2AgCl \rightarrow 2Ag + Cl_2$  (in sunlight). Light energy causes decomposition of silver chloride into silver (grey color) and chlorine. This is photolytic decomposition.

**Ans 9.** (c) Silver sulphide

**Explanation:** Silver reacts with sulphur compounds in air to form silver sulphide ( $Ag_2S$ ) which is black in color. This is an example of corrosion of silver.

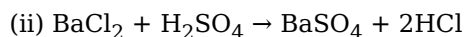
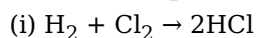
**Ans 10.** (b) Reduced

**Explanation:** Lead oxide ( $PbO$ ) loses oxygen to form lead ( $Pb$ ). Loss of oxygen is called reduction. Carbon gets oxidized as it gains oxygen to form  $CO_2$ .

### Ans 11.

**Skeletal Chemical Equation:** A chemical equation in which the number of atoms of each element is not equal on both sides is called a skeletal equation. It shows only the reactants and products with their formulae.

**Balanced equations:**



### Ans 12.

**Photosynthesis is an endothermic reaction because:**

- It requires energy in the form of sunlight to proceed
- Light energy is absorbed by chlorophyll to convert carbon dioxide and water into glucose
- Energy is stored in the glucose molecules formed

**Balanced equation:**



### Ans 13.

**Rancidity:** When fats and oils present in food items get oxidized, they become rancid and their smell and taste change. This process is called rancidity.

**Methods to prevent rancidity:**

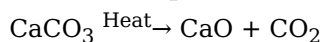
1. **Adding antioxidants:** Substances like BHA (Butylated Hydroxy Anisole) and BHT prevent oxidation of fats and oils
2. **Storing in air-tight containers:** This reduces contact with oxygen and slows down oxidation
3. **Packaging with nitrogen:** Flushing bags with nitrogen gas prevents oxidation (e.g., chips packets)
4. **Refrigeration:** Storing food at low temperature slows down oxidation reactions

### Ans 14.

When calcium carbonate is heated:

- **Calcium oxide (CaO)** - also called quick lime
- **Carbon dioxide (CO<sub>2</sub>)** gas

**Balanced equation:**



**Type of reaction:** Thermal decomposition reaction

## SECTION C - Answers to Short Answer Questions

### Ans 15.

Decomposition reactions are called opposite of combination reactions because:

**In Combination Reactions:**

- Two or more substances combine to form a single product
- $\text{A} + \text{B} \rightarrow \text{AB}$
- Example:  $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$   
(Two substances combine to form one product)

### In Decomposition Reactions:

- A single substance breaks down into two or more simpler substances
- $AB \rightarrow A + B$
- Example:  $2\text{Pb}(\text{NO}_3)_2 \rightarrow 2\text{PbO} + 4\text{NO}_2 + \text{O}_2$   
(One substance breaks into three products)

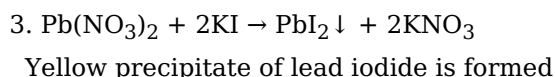
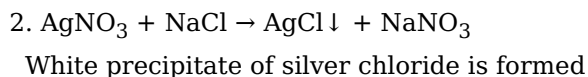
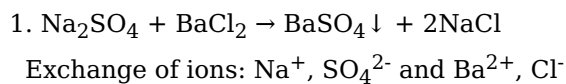
Thus, they are opposite in nature - combination brings together while decomposition breaks apart.

### Ans 16.

**Double Displacement Reaction:** A reaction in which two compounds exchange their ions to form two new compounds is called a double displacement reaction.

General form:  $AB + CD \rightarrow AD + CB$

#### Examples:



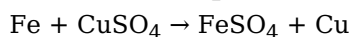
**Special feature:** Many double displacement reactions result in formation of a precipitate (insoluble salt). Such reactions are also called precipitation reactions.

### Ans 17.

#### (a) What happens:

- Iron displaces copper from copper sulphate solution
- Iron nails get coated with reddish-brown copper metal
- The blue color of copper sulphate solution fades
- Iron sulphate (light green) is formed in solution

#### (b) Balanced equation:



#### (c) Type of reaction:

Displacement reaction (Iron being more reactive displaces less reactive copper)

#### (d) Color change observed:

- Solution: Blue color fades (copper sulphate) and becomes light green (iron sulphate)
- Iron nail: Becomes coated with reddish-brown copper metal

## SECTION D - Answer to Long Answer Question

### Ans 18.

#### (a) Law of Conservation of Mass:

This law states that mass can neither be created nor destroyed in a chemical reaction. The total mass of

reactants is always equal to the total mass of products.

**How balanced equation follows this law:**

- A balanced equation has equal number of atoms of each element on both sides
- Since the number of atoms is same, the total mass remains constant
- This ensures that mass is conserved during the reaction
- No atoms are created or destroyed, they are only rearranged

**(b) Balancing equations step by step:**

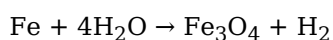
**(i)  $\text{Fe} + \text{H}_2\text{O} \rightarrow \text{Fe}_3\text{O}_4 + \text{H}_2$**

Step 1: Count atoms on both sides (unbalanced):

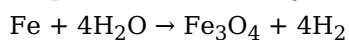
LHS: Fe=1, H=2, O=1

RHS: Fe=3, H=2, O=4

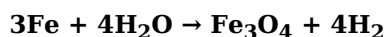
Step 2: Balance oxygen first (maximum atoms in  $\text{Fe}_3\text{O}_4$ ):



Step 3: Now balance hydrogen:



Step 4: Finally balance iron:



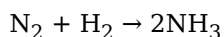
**(ii)  $\text{N}_2 + \text{H}_2 \rightarrow \text{NH}_3$**

Step 1: Count atoms (unbalanced):

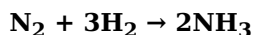
LHS: N=2, H=2

RHS: N=1, H=3

Step 2: Balance nitrogen:



Step 3: Balance hydrogen:

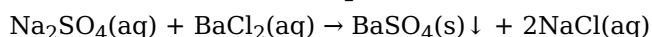


## SECTION E - Answers to Case Study Based Questions

**Ans 19.**

(a) The white substance formed is **Barium sulphate ( $\text{BaSO}_4$ )**.

(b) **Balanced chemical equation:**



(c) **Type of reaction:** This is a **double displacement reaction**.

**Reason:** The ions  $\text{SO}_4^{2-}$  and  $\text{Cl}^-$  are exchanged between sodium and barium to form new compounds.

(d) The special name given to this type of reaction is **Precipitation reaction**, as an insoluble salt (precipitate) is formed.

**Ans 20.**

(a) **Chemical name:** Hydrated iron(III) oxide or Iron oxide

**Formula:**  $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$  (where x varies)

(b) This phenomenon is called **Corrosion** (specifically rusting of iron).

(c) **How painting prevents rusting:**

- Paint forms a protective layer on the iron surface
- It prevents direct contact of iron with oxygen and moisture
- Without oxygen and moisture, the rusting reaction cannot occur
- This prevents further corrosion of iron

(d) **Other methods to prevent rusting:**

- **Galvanization:** Coating iron with a layer of zinc
- **Oiling/Greasing:** Applying oil or grease to prevent moisture contact
- **Alloying:** Making stainless steel by mixing iron with chromium and nickel
- **Electroplating:** Coating with metals like chromium or nickel

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