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27

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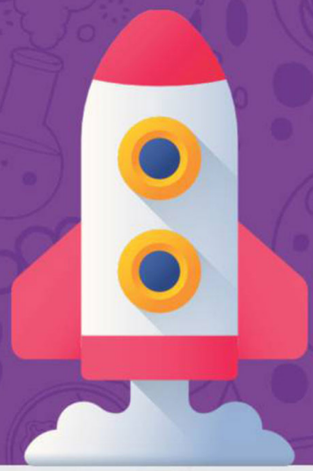

Chapter-wise,

Topic-wise & Skill-wise

Class 10

SCIENCE

Previous Year Solved Papers (2017 - 20[illegible])
with Value Added Notes

13 Chapter | **52** Topics | **8[illegible]** Questions

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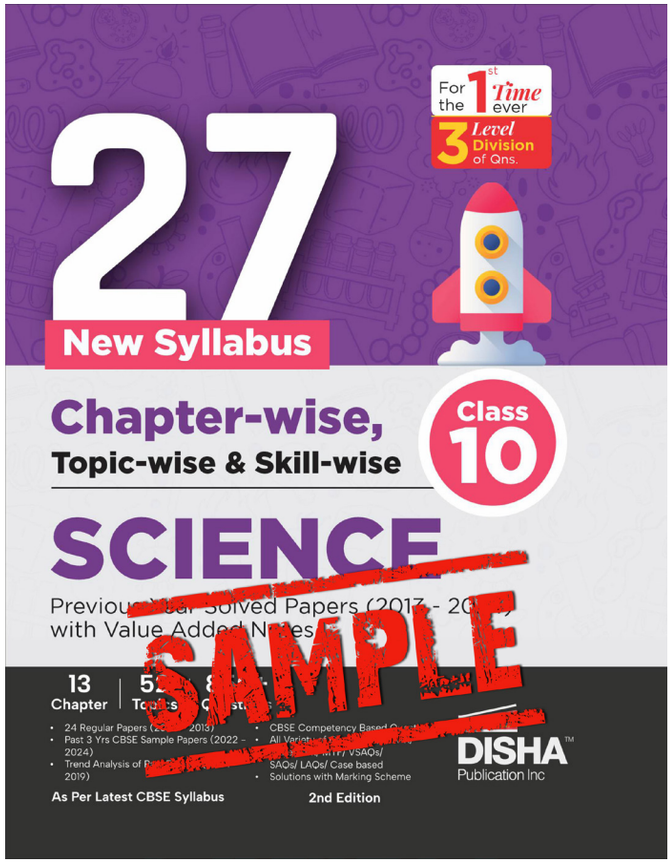

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3rd Level of Division : Skillwise Division

Each Question in the topic has been further divided skillwise using following codes:

K Knowledge **U** Understanding **Ap** Application **A** Analysis

Chapter 1

Chemical Reactions and Equations

Topic-1.1: Chemical Equations

1 Multiple Choice Questions

1. Select the appropriate state symbols of the products given as X and Y in the following chemical equation by choosing the correct option from table given below:

$Zn(s) + H_2SO_4(l) \longrightarrow ZnSO_4(X) + H_2(Y)$

	(X)	(Y)
(a)	(s)	(l)
(b)	(aq)	(g)
(c)	(aq)	(s)
(d)	(g)	(aq)

All India 2023, K

2. Which of the following is a NECESSARY condition for ALL chemical reactions? **CFPQ CBSE 2022, K**

(a) The reactants should be in the same state.
(b) Energy should be supplied to the reactants.
(c) The reactants should be at the same temperature.
(d) There should be physical contact between the reactants.

3. Sodium reacts with water to form sodium hydroxide and hydrogen gas. The balanced equation which represents the above reaction is: **All India 2022, Term-I, K**

(a) $Na(s) + 2H_2O(l) \rightarrow 2NaOH(aq) + 2H_2(g)$
(b) $2Na(s) + 2H_2O(l) \rightarrow 2NaOH(aq) + H_2(g)$
(c) $2Na(s) + 2H_2O(l) \rightarrow NaOH(aq) + 2H_2(g)$
(d) $2Na(s) + H_2O(l) \rightarrow 2NaOH(aq) + 2H_2(g)$

4. It is important to balance the chemical equations to satisfy the law of conservation of mass. Which of the following statements of the law is incorrect? **All India 2022, Term-I, K**

(a) The total mass of the elements present in the reactants is equal to the total mass of the elements presents in the products.
(b) The number of atoms of each element remains the same, before and after a chemical reaction.
(c) The chemical composition of the reactants is the same before and after the reaction.
(d) Mass can neither be created nor can it be destroyed in a chemical reaction.

5. In which of the following the identity of initial susbstance remains unchanged. **All India 2020, K**

(a) Curdling of milk
(b) Formation of crystals by process of crystallisation
(c) Fermentation of grapes
(d) Digestion of food

4 Short Answer Questions (2 or 3 Marks)

6. (a) Copper powder is taken in a china dish and heated over a burner. Name the product formed and state its colour. Write the chemical equation for the reaction involved. **All India 2024, Ap**

OR

(b) Write chemical equation for the chemical reaction which occurs when the aqueous solutions of barium chloride and sodium sulphate react together. Write the symbols of the ions present in the compound precipitated in the reaction. **All India 2024, K**

7. Translate the following statement into a balanced chemical equation. **Delhi 2024, Ap**

"When barium chloride reacts with aluminium sulphate, aluminium chloride and barium sulphate are formed."

State the type of this reaction giving reason to justify your answer.

8. With the help of an appropriate example. Justify that some of the chemical reactions are determined by

(a) Change in temperature.
(b) Evolution of a gas, and
(c) Change in colour

Give chemical equation for the reaction involved in each case. **All India 2023, Set-I, Ap**

9. Complete and balance the following chemical equations:

(i) $NaOH(aq) + Zn(s) \rightarrow$ **All India 2020, Ap**
(ii) $CaCO_3(aq) + H_2O(l) + CO_2(g) \rightarrow$
(iii) $HCl(aq) + H_2O(l) \rightarrow$

10. Balance the following chemical equations :

(a) $HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + H_2O$
(b) $NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$
(c) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + HCl$

All India 2014-2015, Term-1 Ap

Topic-1.2: Types of Chemical Reactions

1 Multiple Choice Questions

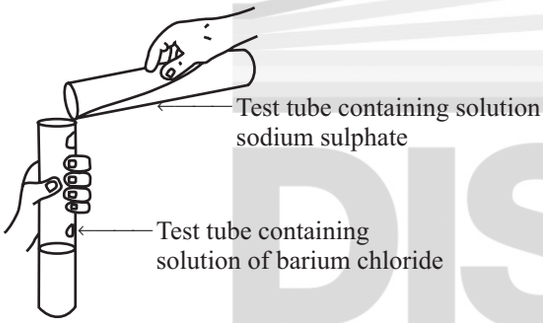
1. Which of the following is **not** a thermal decomposition reaction? **All India 2024, U**

(a) $2\ FeSO_4 \longrightarrow Fe_2O_3 + SO_2 + SO_3$
(b) $CaCO_3 \longrightarrow CaO + CO_2$
(c) $2\ AgCl \longrightarrow 2\ Ag + Cl_2$
(d) $Pb(NO_3)_2 \longrightarrow 2\ PbO + 4\ NO_2 + O_2$

2. Select from the following a decomposition reaction in which source of energy for decomposition is light: **Delhi 2024, K**

(a) $2FeSO_4 \rightarrow Fe_2O_3 + SO_2 + SO_3$
(b) $2H_2O \rightarrow 2H_2 + O_2$
(c) $2AgBr \rightarrow 2Ag + Br_2$
(d) $CaCO_3 \rightarrow CaO + CO_2$

3.



Identify the product which represents the solid state in the above reaction. **CBSE Sample Paper 2023-24, U**

(a) Barium chloride (b) Barium sulphate
(c) Sodium chloride (d) Sodium sulphate

4. The colour of the solution observed after 30 minutes of placing zinc metal to copper sulphate solution is **CBSE Sample Paper 2023-24, U**

(a) Blue (b) Colourless
(c) Dirty green (d) Reddish Brown

5. Consider the following chemical equation I and II

I. $Mg + 2HCl \rightarrow MgCl_2 + H_2$
II. $NaOH + HCl \rightarrow NaCl + H_2O$

The correct statement about these equations is – **All India 2023, Set-I, Ap**

(a) 'I' is a displacement reaction and 'II' is a decomposition reaction.
(b) 'I' is a displacement reaction and 'II' is double displacement reaction.
(c) Both 'I' and 'II' are displacement reactions.
(d) Both 'I' and 'II' are double-displacement reactions.

6. During electrolysis of water, if the volumes of oxygen and hydrogen evolved at the electrodes are V_O and V_H respectively, then V_O/V_H is **All India 2023, Set-II, Ap**

(a) 4 (b) 2
(c) $\frac{1}{2}$ (d) $\frac{1}{4}$

7. In order to balance the following chemical equation, the values of the coefficients x and y respectively are: **All India 2023, Set-II, Ap**

$$x\ Pb(NO_3)_2 \xrightarrow{Heat} 2\ PbO + y\ NO_2 + O_2$$

(a) 2, 4 (b) 2, 2
(c) 2, 3 (d) 4, 2

8. When aqueous solutions of potassium iodide and lead nitrate are mixed, an insoluble substance separates out. The chemical equation for the reaction involved is: **Delhi 2023, Set-I, K**

(a) $KI + PbNO_3 \rightarrow PbI + KNO_3$
(b) $2KI + Pb(NO_3)_2 \rightarrow PbI_2 + 2KNO_3$
(c) $KI + Pb(NO_3)_2 \rightarrow PbI + KNO_3$
(d) $KI + PbNO_3 \rightarrow PbI_2 + KNO_3$

9. A metal ribbon 'X' burns in oxygen with a dazzling white flame forming a white ash 'Y'. The correct description of X, Y and the type of reaction is: **Delhi 2023, Set-I, Ap**

(a) X = Ca; Y = CaO;
Type of reaction = Decomposition
(b) X = Mg; Y = MgO;
Type of reaction = Combination
(c) X = Al; Y = Al_2O_3;
Type of reaction = Thermal decomposition
(d) X = Zn; Y = ZnO;
Type of reaction = Endothermic

10. The balanced chemical equation showing reaction between quicklime and water is: **Delhi 2023, Set-II, K**

(a) $2\ CaO + H_2O \longrightarrow 2\ CaOH + H_2 + Heat$
(b) $CaO + H_2O \longrightarrow Ca(OH)_2 + H_2 + Heat$
(c) $CaO + H_2O \longrightarrow Ca(OH)_2 + Heat$
(d) $2\ CaO + 3\ H_2O \longrightarrow 2\ Ca(OH)_3 + O_2 + Heat$

11. Which of the following an example of simple displacement? **CFPQ CBSE, 2022, U**

(a) the electrolysis of water
(b) the burning of methane
(c) the reaction of a metal with an acid
(d) the reaction of two salt solutions to form a precipitate

12. A student took Sodium Sulphate solution in a test tube and added Barium Chloride solution to it. He observed that an insoluble substance has formed. The colour and molecular formula of the insoluble substance is: **All India 2022, Term-I, Ap**

(a) Grey, Ba_2SO_4 (b) Yellow, $Ba(SO_4)_2$
(c) White, $BaSO_4$ (d) Pink, $BaSO_4$

13. $C_6H_{12}O_6(aq) + 6O_2(aq) \rightarrow 6CO_2(aq) + 6H_2O(l)$
The above reaction is a/an **All India 2022, Term-I, Ap**
(a) displacement reaction
(b) endothermic reaction
(c) exothermic reaction
(d) neutralisation reaction

14. Which one of the following reactions is categorised as thermal decomposition reaction?
All India 2022, Term-I, Ap
(a) $2H_2O(l) \rightarrow 2H_2(g) + O_2(g)$
(b) $2AgBr(s) \rightarrow 2Ag(s) + Br_2(g)$
(c) $2AgCl(s) \rightarrow 2Ag(s) + Cl_2(g)$
(d) $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$

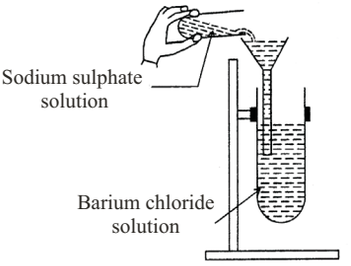
15. Calcium oxide reacts vigorously with water to produce slaked lime. **Delhi 2020, U**
$CaO(s) + H_2O(1) \rightarrow Ca(OH)_2(aq)$
This reaction can be classified as:
(A) Combination reaction
(B) Exothermic reaction
(C) Endothermic reaction
(D) Oxidation reaction
Which of the following is a correct option?
(a) (A) and (C)
(b) (C) and (D)
(c) (A), (C) and (D)
(d) (A) and (B)

16. When hydrogen sulphide gas is passed through a blue solution of copper sulphate, a black precipitate of copper sulphide is obtained and the sulphuric acid so formed remains in the solution. The reaction is an example of a:
(a) Combination reaction **Delhi 2020, U**
(b) Displacement reaction
(c) Decomposition reaction
(d) Double displacement reaction

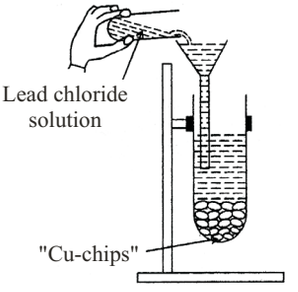
17. In a double displacement reaction such as the reaction between sodium sulphate solution and barium chloride solution: **Delhi 2020, U**
(A) exchange of atoms takes place
(B) exchange of ions takes place
(C) a precipitate is produced
(D) an insoluble salt is produced
The correct option is:
(a) (B) and (D)
(b) (A) and (C)
(c) only (B)
(d) (B), (C) and (D)

18. Take about 1.0g $CaCO_3$ in a test tube. Heat it over a flame, when a colourless gas comes out. The reaction is called a **All India 2016-2017, Term-1 Ap**
(a) decomposition reaction
(b) displacement reaction
(c) double decomposition reaction
(d) double displacement reaction

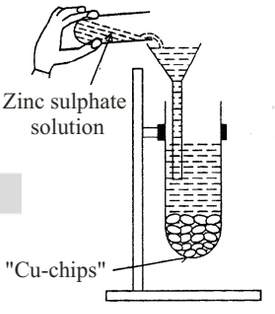
19. Observe the experiment set-up carefully:



Exp. (1)



Exp. (2)

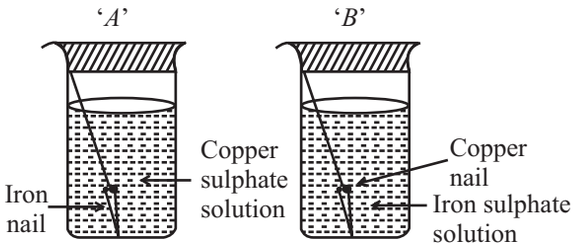


Exp. (3)

In which experiment an insoluble precipitate is formed and of which substance ? **All India 2014-2015, Term-1 A**
(a) Exp 1, Na_2SO_4 (b) Exp 2, $CuCl_2$
(c) Exp 3, $CuSO_4$ (d) Exp 1, $BaSO_4$

20. Three beakers labelled as *A*, *B* and *C* each containing 25 mL of water were taken. *A* small amount of NaOH, anhydrous $CuSO_4$ and NaCl were added to the beakers *A*, *B* and *C* respectively. It was observed that there was an increase in the temperature of the solutions contained in beakers *A* and *B*, whereas in case of beaker *C*, the temperature of the solution falls. Which one of the following statement(s) is (are) correct? **All India 2013-2014, Term-1 U**
(i) In beakers *A* and *B*, exothermic process has occurred.
(ii) In beakers *A* and *B*, endothermic process has occurred.
(iii) In beaker *C* exothermic process has occurred.
(iv) In beaker *C* endothermic process has occurred.
(a) (i) only
(b) (ii) only
(c) (i) and (iv)
(d) (ii) and (iii)

21. Observe the following experimental set-up '*A*' and '*B*' carefully and answer in which beaker reaction will occur? **All India 2013-2014, Term-1 Ap**



(a) In beaker *A*
(b) In beaker *B*
(c) None of the two beakers
(d) Reaction occur in both beakers

2 *Assertion Reason/Two Statement Type Questions*

Given below are two statements labelled as Assertion (A) and Reason (R). Select the most appropriate answer from the options given below:

(a) Both (A) and (R) are true and (R) is the correct explanation of (A).
(b) Both (A) and (R) are true, but (R) is not the correct explanation of (A).
(c) (A) is true, but (R) is false.
(d) (A) is false, but (R) is true.

22. **Assertion (A) :** Reaction of Quicklime with water is an exothermic reaction.
Reason (R) : Quicklime reacts vigorously with water releasing a large amount of heat. **Delhi 2023, Set-I, K**

23. **Assertion (A) :** Burning of Natural gas is an endothermic process.
Reason (R) : Methane gas combines with oxygen to produce carbon dioxide and water.
All India 2022, Term-I, U

3 *Very Short Answer Questions (1 Mark)*

24. Dilip was comparing combination reactions with decomposition reactions.
Which class of chemical substances may be the product of a decomposition reaction but NOT a product of a combination reaction? **CFPQ CBSE, 2022, U**

25. Can a double displacement reaction take place when the products are highly soluble or highly ionized?
All India 2016-2017, Term-1 U

26. What happens chemically when quicklime is added to water? **All India 2015-2016, Term-1 U**

27. Give one example of decomposition reaction in which solid and gas are two products obtained.
All India 2013-2014, Term-1 K

4 *Short Answer Questions (2 or 3 Marks)*

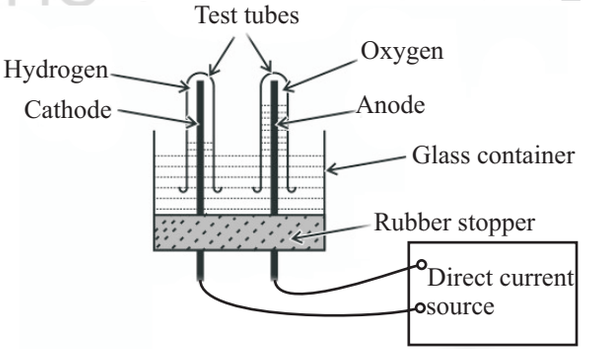
28. Write down the balanced chemical equations for the following reactions and identify the types of reaction in each case. **All India 2023, Set-II, U**
(a) Nitrogen gas is treated with hydrogen gas to form ammonia gas.
(b) Lead nitrate is heated strongly to form lead monoxide, nitrogen dioxide and oxygen.
(c) A copper wire is dipped in silver nitrate solution and a shining deposit of silver is produced.

29. (i) While electrolysing water before passing the current some drops of an acid are added. Why? Name the gases liberated at cathode and anode. Write the relationship between the volume of gas collected at anode and the volume of gas collected at cathode.
Delhi 2023, Set-I, Ap
(ii) What is observed when silver chloride is exposed to sunlight? Give the type of reaction involved.
Delhi 2023, Set-I, K

30. (a) Define a double displacement reaction.
(b) Write the chemical equation of a double displacement reaction which is also a (i) Neutralization reaction and (ii) Precipitation reaction. Give justification for your answer. **Delhi 2023, Set-II, K**

31. Trupti mixes an aqueous solution of sodium sulphate ($Na_2 SO_4$) and an aqueous solution of copper chloride ($CuCl_2$).
Will this lead to a double displacement reaction? Justify your answer. **CFPQ CBSE, 2022, U**

32. The diagram below shows the set-up in which electrolysis of water takes place. **CFPQ CBSE, 2022, A**



(a) What type of reaction takes place?
(b) Explain why this is an example of an endothermic reaction?
(c) The test tube containing hydrogen is removed carefully from the apparatus. A lit match stick is brought near the mouth of this test tube. The gas burns with an explosive "pop" sound.
Write a balanced chemical equation for this reaction and indicate whether energy is absorbed or released.

33. Mention with reason the colour changes observed when : **All India 2020, U**
(i) silver chloride is exposed to sunlight.
(ii) copper powder is strongly heated in the presence of oxygen.
(iii) a piece of zinc is dropped in copper sulphate solution.

34. Identity the type of each of the following reactions. **All India 2020, K**
Also write balanced chemical equation for each reaction.
(i) A reaction in which the reaction mixture becomes warm.
(ii) A reaction in which an insoluble substance is formed

35. Complete and balance the following chemical equations: **All India 2020, K**
(i) $NaOH(aq) + Zn(s) \rightarrow$
(ii) $CaCO_3(s) + H_2O(t) + CO_2(g) \rightarrow$
(iii) $HCl(aq) + H_2O(l) \rightarrow$

36. 2 g of silver chloride is taken in a china dish and the china dish is placed in sunlight for sometime. What will be your observation in this case ? Write the chemical reaction involved in the form of a balanced chemical equation. Identify the type of chemical reaction. **Delhi 2019, U**

37. Identify the type of reactions taking place in each of the following cases and write the balanced chemical equation for the reactions. **Delhi 2019, U**
(a) Zinc reacts with silver nitrate to produce zinc nitrate and silver.
(b) Potassium iodide reacts with lead nitrate to produce potassium nitrate and lead iodide.

38. What would you observe on adding zinc granules to freshly prepared ferrous sulphate solution? Give reason for your answer. **Delhi 2019, K**

39. Decomposition reactions require energy either in the form of heat or light or electricity for breaking down the reactants. Write one equation each for decomposition reactions where energy is supplied in the form of heat, light and electricity. **All India 2018, U**

40. What is observed when a solution of sodium sulphate is added to a solution of barium chloride taken in a test tube? Write equation for the chemical reaction involved and name the type of reaction in this case. **All India 2018, U**

41. (a) State one difference between.
(i) Combination and decomposition reaction.
(ii) Displacement and double displacement reaction
(b) Balance the following chemical equation:

$$Pb(NO_3)_2(s) \xrightarrow{Heat} PbO(s) + NO_2(g) + O_2(g)$$

All India 2015-2016, Term-1 Ap

42. Represent each of the following word equations with a balanced chemical equation.
(a) Disilane gas (Si_2H_6) undergoes combustion to form solid silicon dioxide and water.
(b) Solid aluminium hydride is formed by a combination reaction of its two elements.
(c) When solid calcium bisulfite is heated, it decomposes to solid calcium oxide, sulfur dioxide gas, and water.
All India 2015-2016, Term-1 Ap

43. (a) What is the colour of ferrous sulphate crystals? How does this colour change after heating?
(b) Name the products formed on strongly heating ferrous sulphate crystals. What type of chemical reaction occurs in this change?
All India 2013-2014, Term-1 U

44. (i) Define a decomposition reaction. Write chemical equation for the reaction that occurs when lead nitrate is heated strongly in a boiling tube.
(ii) In electrolytic decomposition of water two gases are liberated at the electrodes. Give the mass ratio of the gas liberated at the cathode and at the anode.
Delhi 2024, Ap

Topic-1.3: *Have You Observed the Effects of Oxidation Reactions in Everyday Life ?*

1 *Multiple Choice Questions*

1. Which of the following is a redox reaction, but **not** a combination reaction? **All India 2024, A**
(a) $C + O_2 \rightarrow CO_2$
(b) $2H_2 + O_2 \rightarrow 2H_2O$
(c) $2Mg + O_2 \rightarrow 2MgO$
(d) $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

2. $MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$
The reaction given above is a redox reaction because in this case: **Delhi 2024, U**
(a) MnO_2 is oxidised and HCl is reduced.
(b) HCl is oxidised.
(c) MnO_2 is reduced.
(d) MnO_2 is reduced and HCl is oxidised.

3. Study the following chemical reaction:

$2\ Na(s) + 2\ H_2O(l) \longrightarrow 2NaOH(aq) + H_2\ (g) \uparrow$

The reducing agent in this reaction is:

Delhi 2023, Set-II, U

(a) Na (b) H_2O

(c) NaOH (d) H_2

4. Which of the following statements about the reaction given below are correct? **All India 2022, Term-I, Ap**

$MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$

(i) HCl is oxidized to Cl_2

(ii) MnO_2 is reduced to $MnCl_2$

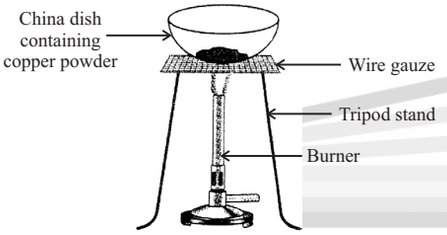
(iii) $MnCl_2$ acts as an oxidizing agent

(iv) HCl acts as on oxidizing agent

(a) (ii), (iii) and (iv) (b) (i), (ii) and (iii)

(c) (i) and (ii) only (d) (iii) and (iv) only

5. Observe this experiment carefully :



In above experiment copper powder turned to black coloured product on heating. It is due to the reason that:

All India 2015-2016, Term-1 U

(a) Copper has absorbed heat

(b) Copper (II) oxide is formed

(c) Copper (I) oxide is formed

(d) Both (a) and (c) are correct

2 *Assertion Reason/Two Statement Type Questions*

Given below are two statements labelled as Assertion (A) and Reason (R). Select the most appropriate answer from the options given below:

(a) Both (A) and (R) are true and (R) is the correct explanation of (A).

(b) Both (A) and (R) are true, but (R) is not the correct explanation of (A).

(c) (A) is true, but (R) is false.

(d) (A) is false, but (R) is true.

6. **Assertion (A):** In the following reaction

$ZnO + C \longrightarrow Zn + CO$

Reason (R): Carbon is a reducing agent that reduces ZnO to Zn. **Delhi 2023, Set-II, U**

4 *Short Answer Questions (2 or 3 Marks)*

7. State whether the given chemical reaction is a redox reaction or not. Justify your answer.

All India 2023, Set-I Ap

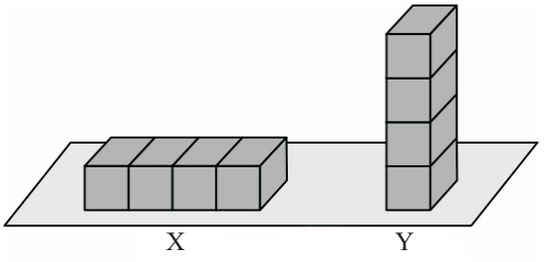
$MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$

8. When copper powder is heated in a watch glass, a black substance is formed.

(i) Why is this black substance formed? Name it.

(ii) How can this black substance be reversed to its original form? **All India 2023, Set-II, U**

9. Eight identical, iron blocks are placed on the ground in the two arrangements X and Y as shown below. The block arrangements are kept moist by sprinkling water every few hours.



Which of the arrangements is likely to gather more rust after days? Justify your answer. **CFPQ CBSE 2022, U**

10. 1 g of copper powder was taken in a China dish and heated. What change takes place on heating? When hydrogen gas is passed over this heated substance, a visible change is seen in it. Give the chemical equations of reactions, the name and the color of the products formed in each case. **Delhi 2020, U**

11. You might have noted that when copper powder is heated in a china dish, the reddish brown surface of copper powder becomes coated with a black substance.

Delhi 2019, U

(a) Why has this black substance formed?

(b) What is this black substnace?

(c) Write the chemical equation of the reaction that takes place.

(d) How can the black coating on the surface be turned reddish brown?

12. (a) Identify the substances that are oxidised and the substances that are reduced in the following reactions.

(i) $ZnO(s) + C\ (s) \longrightarrow Zn(s) + CO\ (g)$

(ii) $CuO(s) + H_2(g) \longrightarrow Cu(s) + H_2O(l)$

(b) Name the oxidising and reducing agent in the following reaction:

$2H_2S + SO_2 \longrightarrow 2H_2O + 3S\downarrow$

All India 2014-2015, Term-1 Ap

13. (a) What is rancidity ? What is the general name of chemical which are added to fat and oil containing food so as to prevent the development of rancidity?

(b) Metal X becomes green when left in air, turns black when heated in air. Name the metal and the compounds formed in both the cases?

All India 2013-2014, Term-1 U

Hints & Solutions

Topic-1.1: Chemical Equations

1. **(b)** The reaction between Zn and H_2SO_4 gives an ionic compound $ZnSO_4$ that remains in aqueous state along with the release of H_2 gas.
Thus, X = (aq.), Y = (q) **(1 Mark)**

Topper's Answer

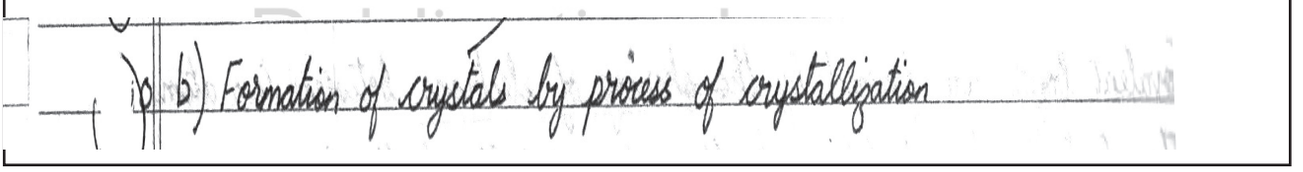
2. **(d)** **(1 Mark)**

3. **(b)** When sodium reacts with water, it forms sodium hydroxide and hydrogen gas.
$Na(s) + H_2O(l) \longrightarrow NaOH(aq) + H_2(g)$
In reactant side; Na and H_2O is multiply by 2 and in product side; NaOH is multiply by 2 to balance the reaction.
Therefore; the balanced equation is:
$2Na(s) + 2H_2O(l) \longrightarrow 2NaOH(aq) + H_2(g)$ **(1 Mark)**

4. **(c)** The chemical composition of the reactants changes but total mass of the reactants remains same before and after the chemical reaction. **(1 Mark)**

5.

Topper's Answer



6. (a) When copper powder is taken into a china dish and heated, a black coloured substance is formed. **(½ mark)**
This substance is a copper oxide (CuO) **(½ mark)**

$$2Cu(s) + O_2(g) \xrightarrow{\Delta} 2CuO(s)$$

The crimson red copper is converted into black copper oxide. **(1 mark)**

OR

(b) Sodium sulphate reacts with barium chloride to give barium sulphate and sodium chloride.
$BaCl_2(aq) + Na_2SO_4(aq) \longrightarrow BaSO_4(s) + 2NaCl(aq)$.
Barium sulphate is insoluble in water and will precipitate as a white solid.
This reaction is an example of double displacement reaction. **(2 marks)**

Note

In double displacement two ionic compound exchanging anion and cations. They are of two types.
(1) Precipitation reaction (2) Neutralization reaction

7. $3\,BaCl_2 + Al_2(SO_4)_2 \longrightarrow 3BaSO_4 + 2AlCl_3$ **(1 mark)**
In this reaction Barium sulphate is formed as a precipitate.
It is a precipitation reaction in which a chemical reaction occurring in an aqueous solution where two compounds combine result in the formation of an insoluble salt. These insoluble salt is called as precipitate. **(1 mark)**

8. (a) Chemical reaction detected by a change in temperature:-

$$\underset{\text{(Quick lime)}}{CaO} + H_2O \longrightarrow Ca(OH)_2 + \text{Heat}$$

This reaction involves release of heat (exothermic reaction) along with the formation of $Ca(OH)_2$.
Thus, the temperature of the system rises indicating a chemical change. **(1 Mark)**

(b) Chemical Reaction detected by evolution of a gas:-

$$Zn + H_2SO_4 \longrightarrow ZnSO_4 + H_2 \uparrow$$

The H_2 gas produced here gives a popping sound upon burning, indicating a chemical change has taken place. **(1 Mark)**

(c) Chemical reaction detected by a change in colour:-

$$\underset{\text{(Green)}}{FeSO_4} \xrightarrow{\text{Heat}} \underset{\text{(Brown-red)}}{Fe_2O_3} + SO_2 + SO_3$$

Here, the thermal decomposition of $FeSO_4$ causes it to give brown-reddish Fe_2O_3. **(1 Mark)**

9. (i) $2NaOH\ (aq.) + Zn\ (s) \rightarrow Na_2ZnO_2 + H_2$ **(1 Mark)**

(ii) $CaCO_3\ (s) + H_2O\ (l.) + CO_2\ (g) \rightarrow Ca(HCO_3)_2$ **(1 Mark)**

(iii) $HCl\ (aq.) + H_2O\ (l) \rightarrow H_3O^+ + Cl^-$ **(1 Mark)**

10. (a) $2HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + 2H_2O$ **(1 Mark)**

(b) $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$ **(1 Mark)**

(c) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$ **(1 Mark)**

Topic-1.2: Types of Chemical Reactions

1. **(c)** $2\ AgCl \longrightarrow 2Ag + Cl_2$
Silver chloride decomposes in the presence of light not heat. **(1 mark)**

2. **(c)** $2\ AgBr \rightarrow 2Ag + Br_2$
It is a type of decomposition in which light or photons are used to break the reactants to born several products. **(1 mark)**

3. **(b)** Barium sulphate **(1 Mark)**

4. **(b)** Colourless **(1 Mark)**

5. **(b)** 'I' is a displacement reaction as it involves displacement of H^+ ions from HCl and formation of $MgCl_2$.
'II' is a double displacement reaction as it involves exchange of ions between NaOH and HCl. **(1 Mark)**

Topper's Answer

12. b) 'I' is a displacement reaction and 'II' is a double displacement reaction.

6. **(c)** During the electrolysis of water, volume of hydrogen evolved (V_H) at cathode is double than that of volume of oxygen evolved (V_O)at anode.

$$\underset{\text{Cathode}}{2H_2O} \xrightarrow{\text{Electrolysis}} \underset{\text{Cathode}}{2H_2 \uparrow} + \underset{\text{Anode}}{O_2 \uparrow}$$

Thus, $V_H = 2\ V_O$

$$\therefore \frac{V_O}{V_H} = \frac{1}{2}$$

(1 Mark)

7. **(a)** $2Pb(NO_3)_2(s) \xrightarrow{\text{Heat}} 2PbO(s) + 4NO_2(s) + O_2(g)$ **(1 Mark)**

Hence, x = 2, y =4

8. **(b)** Potassium iodide and lead nitrate react and undergo a double-displacement reaction to give a precipitate of lead Iodide (PbI_2)

$2KI + Pb(NO_3)_2 \longrightarrow PbI_2 \downarrow + 2KNO_3$ **(1 Mark)**

9. **(b)** Mg bums in air with a dazzling flame to give white ashes of MgO.
Thus, 'X' = Mg, 'Y' = MgO
The given reaction is a combination reaction as only a single product is obtained. **(1 Mark)**

10. **(c)** Calcium oxide (Quick lime) reacts vigorously with water to produce calcium hydroxide (slaked lime) releasing a large amount of heat. The balanced chemical equation can be given as: **(1 Mark)**

$$\underset{\text{(Quick lime)}}{CaO(s) + H_2O(\ell)} \rightarrow \underset{\text{(Slaked lime)}}{Ca(OH)_2\ (aq)} + \text{Heat}$$

11. **(c)** **(1 Mark)**

12. **(c)** When sodium sulphate reacts with barium chloride solution, then insoluble white precipitate of barium sulphate is formed. **(1 Mark)**

$BaCl_2\ (aq) + Na_2SO_4\ (aq) \longrightarrow \underset{\substack{\text{White}\\ \text{PPt.}}}{BaSO_4 \downarrow} + 2NaCl\ (aq)$

13. **(c)** $C_6H_{12}O_6(aq) + 6O_2(aq) \longrightarrow 6CO_2\ (aq) + 6H_2O(l) + 686\ Kcal$
The given reaction is a type of exothermic reaction as energy is released during the reaction. **(1 Mark)**

14. **(d)** $CaCO_3(s) \xrightarrow{\Delta} CaO(s) + CO_2(g)$; is a type of thermal decomposition reaction. When calcium carbonate is heated, it decomposes into calcium oxide and carbondioxide. **(1 Mark)**

Note

Reaction (b) and (c) are the examples of photodecom-position reactions where decomposition takes place in the presence of light. Reaction in option (a) is the electrolytic process in which decomposition process takes place with electricity.

15. (d) Calcium oxide react with water to form calcium hydroxide with the evolution of heat therefore it is a type of combination reaction and exothermic. **(1 Mark)**

16. (d) $H_2S(g) + CuSO_4(aq) \longrightarrow CuS\downarrow + H_2SO_4(aq)$ **(1 Mark)**

Note

Double displacement reactions are the reactions in which the reactant ions exchange place to form product. Generally precipitate is formed as the product of double displacement reaction.

17. (d) Exchange of ions take place in double displacement reaction that results into the formation of precipitate which is a insoluble salt. **(1 Mark)**

18. (a) $CaCO_3 \xrightarrow{\Delta} CaO + CO_2\uparrow$ **(1 Mark)**

19. (d) $Na_2SO_4(aq) + BaCl_2(aq) \longrightarrow BaSO_4(s)\downarrow + 2NaCl(aq)$ **(1 Mark)**

20. (c) **(1 Mark)**

21. (a) Reaction will occur in beaker *A* only because iron lie above copper in reactivity series thus being more active will displace copper from its salt. **(1 Mark)**

22. (a) Quicklime (CaO) reacts with water to give limewater $Ca(OH)_2$) along with the release of heat.
$CaO + H_2O \longrightarrow Ca(OH)_2 + Heat$ **(1 Mark)**
Thus, the reaction is a fast reaction and an exothermic reaction.

23. (d) Burning of natural gas is an exothermic process. When methane gas combines with oxygen, it will produce carbon dioxide and water.
$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$ **(1 Mark)**

24. Element **[1 Mark]**

25. No, double displacement reaction takes place when there is formation of a sparingly soluble salt. **(1 Mark)**

26. Quicklime reacts with water to produce slaked lime. In this process, large amounts of heat is released.

$$\underset{\text{Calcium oxide (Quick lime)}}{CaO(s)} + H_2O(l) \longrightarrow \underset{\text{Calcium hydroxide (Slaked lime)}}{Ca(OH)_2(aq)} + \text{Heat}$$

(1 Mark)

27. $CaCO_3 \rightarrow CaO + CO_2\downarrow$.
CaO is solid and carbon dioxide is gas. **(1 Mark)**

28. (a) $\underset{\text{(Nitrogen)}}{N_2(g)} + \underset{\text{(Hydrogen)}}{3H_2(g)} \rightarrow \underset{\text{(Ammonia)}}{2NH_3(g)}$ **(½ Mark)**

This is a combination reaction. **(½ Mark)**

(b) $\underset{\text{(lead nitrate)}}{2Pb(NO_3)_2(s)} \xrightarrow{\text{Heat}} \underset{\text{(lead oxide)}}{2PbO(s)} + \underset{\text{(Nitrogen dioxide)}}{4NO_2(g)} + \underset{\text{(Oxygen)}}{O_2(g)}$

(½ Mark)

This is a decomposition reaction **(½ Mark)**

(c) $Cu + 2AgNO_3 \rightarrow Cu(NO_3)_2 + 2Ag$ **(½ Mark)**

This is a displacement reaction. **(½ Mark)**

29. (i) Addition of some drops of acid like dilute H_2SO_4 increases the conductivity of the solution to be electrolysed as water is a bad conductor of electricity. **(½ Mark)**

$$2H_2O(\ell) \xrightarrow[H^+]{\text{electrolysis}} \underset{\text{at cathode}}{2H_2(g)} + \underset{\text{at anode}}{O_2(g)}$$

(½ Mark)

Gas liberated at cathode = H_2
Gas liberated at anode = O_2 **(½ Mark)**
According to the balanced chemical equation, the volume of hydrogen gas collected at the cathode is double the volume of the oxygen gas collected at the anode.
$V(H_2) = 2V(O_2)$ **(½ Mark)**

(ii) AgCl turns grey in the presence of sunlight.
$2AgCl(s) \xrightarrow{\text{Sunlight}} 2Ag(s) + Cl_2(g)$ **(½ Mark)**

This is a decomposition reaction. **(½ Mark)**

30. (a) The reaction in which exchange of ions takes place between the reactants are called double displacement reactions. **(1 Mark)**

(b) (i) A neutralization reaction is the reaction in which an acid reacts with a base to form salt and water.
When sodium hydroxide (base) reacts with hydrochloric acid, it gives sodium chloride (salt) and water. This is a double displacement reaction as well as neutralization reaction.
(1 Mark)

$$\underset{\text{Sodium hydroxide}}{NaOH(aq)} + \underset{\text{Hydrochloric acid}}{HCl(aq)} \rightarrow \underset{\text{Sodium chloride}}{NaCl(aq)} + \underset{\text{Water}}{H_2O(\ell)}$$

(ii) A precipitation is a type of reaction in which two or more reactants react together to form an insoluble solid substance (precipitate).
When sodium sulphate reacts with barium chloride, it forms sodium chloride and white precipitate of barium sulphate. This reaction is an example of precipitation as well as double displacement reaction. **(1 Mark)**

$$\underset{\text{Sodium sulphate}}{Na_2SO_4(aq)} + \underset{\text{Barium chloride}}{BaCl_2(aq)} \rightarrow \underset{\text{Barium sulphate}}{BaSO_4(s)} + 2\underset{\text{Sodium chloride}}{NaCl(aq)}$$

31. There will be no reaction. **(1 Mark)**
All the ions will be in solution.
There is no insoluble product formed on mixing the two solutions. **(1 Mark)**

32. (a) Decomposition/Electrolytic decomposition **(½ Mark)**
(b) Energy in the form of electrical energy is absorbed during the decomposition of water. **(½ Mark)**
(c) Balanced equation:
$2H_2O$ + energy $\rightarrow 2H_2 + O_2$. **(½ + ½ = 1 Mark)**

33. (i) Photo decomposition of silver chloride takes place which results in formation of silver and colour changing to grey. **(1 Mark)**
$2AgCl \rightarrow 2Ag + Cl_2$

(ii) Copper undergoes oxidation and black coloured copper oxide is formed. **(1 Mark)**
$2Cu + O_2 \rightarrow 2CuO$

(iii) Zinc displaces copper from its solution as Zn is relatively and is more active than Cu and forms Zn^{2+} in solution colour of the solution changes from blue to colourless.
$Zn\ (s) + CuSO_4\ (aq.) \rightarrow Cu\ (s) + ZnSO_4\ (aq.)$ **(1 Mark)**

Note

Zinc is placed above copper in the reactivity series therefore zinc is able to displace copper from its solution. Reverse of this reaction is not possible.

34.

Topper's Answer

15 i Exothermic reaction
$CaO + H_2O \rightarrow Ca(OH)_2 + heat$
quick lime — slaked lime

ii Precipitation reaction (double displacement reaction)
$Pb(NO_3)_{2(aq)} + KI_{(aq)} \rightarrow PbI_{2(s)} + KNO_{3(aq)}$
yellow precipitate

35.

Topper's Answer

17 i $2NaOH_{(aq)} + Zn_{(s)} \rightarrow Na_2ZnO_2 + H_{2(g)}$
sodium zincate

ii $CaCO_{3(s)} + H_2O_{(l)} + CO_{2(g)} \rightarrow Ca(HCO_3)_{2(aq)}$

iii $HCl_{(aq)} + H_2O_{(l)} \rightarrow H_3O^+ + Cl^-$
hydronium

36. When silver chloride is kept in sunlight in a china dish we observe that white color of silver chloride changes into grey which is due to the formation of silver in solid state. **(1 Mark)**

$2AgCl(s) \xrightarrow{\text{Sunlight}} 2Ag(s) + Cl_2(g)$ **(1 Mark)**

The above reaction is a type of decomposition reaction. In this reaction silver chloride decomposes in presence of sunlight into silver and chlorine gas. **(1 Mark)**

> **Note**
>
> *Decomposition reaction in presence of light is known as photodecomposition reaction while in presence of heat it is known as thermal decomposition reaction.*

37. (a) displacement reaction **(½ Mark)**

$Zn + 2AgNO_3 \longrightarrow Zn(NO_3)_2 + 2Ag$ **(1 Mark)**

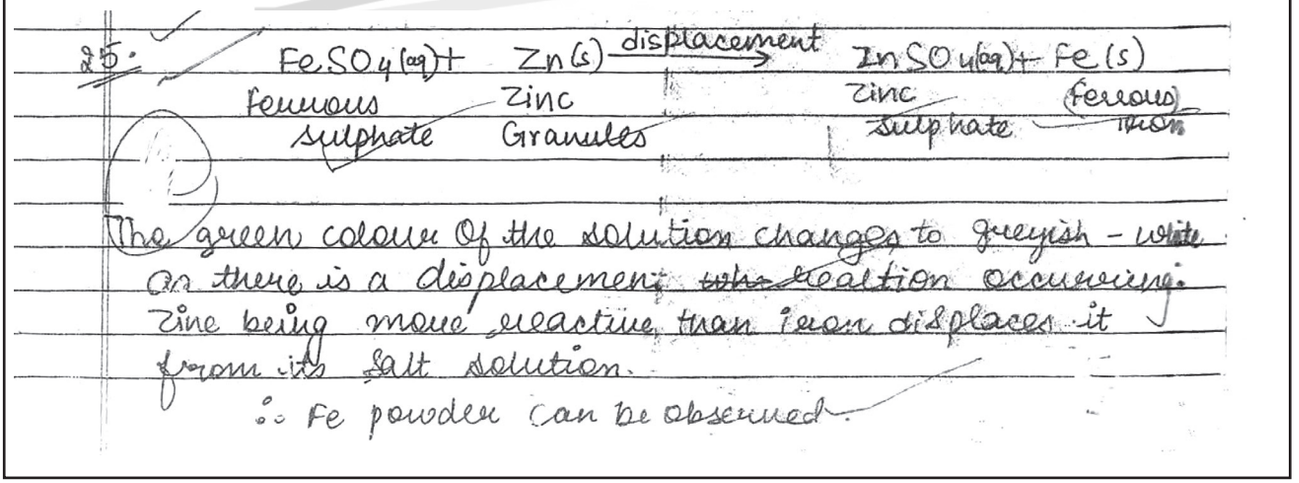
(b) double displacement reaction **(½ Mark)**

$Pb(NO_3)_2(aq) + 2KI(aq) \longrightarrow PbI2(s) + 2KNO_3(aq)$

Lead nitrate — Potassium iodide — Lead iodide (Yellow ppt.) — Potassium nitrate **(1 Mark)**

38.

Topper's Answer



39. (1) $2FeSO_4(s) \xrightarrow{\text{Heat}} Fe_2O_3(s) + SO_2(g) + SO_3(g)$

Ferrous sulphate — Ferric oxide **(1 Mark)**

(2) $2AgCl(s) \xrightarrow{\text{Sunlight}} 2Ag(s) + Cl_2(g)$ **(1 Mark)**

(3) $2H_2O(l) \xrightarrow{\text{electricity}} 2H_2(g) + O_2(g)$ **(1 Mark)**

40. When a solution of sodium sulphate is added to a solution of barium chloride a white insoluble substance is formed.

$Na_2SO_4(aq) + BaCl_2(aq) \longrightarrow BaSO_4(s)\downarrow + 2NaCl(aq)$

white ppt.

This is a double displacement reaction. **(2 Marks)**

41. (a) (i) Combination reactions are generally exothermic whereas decomposition reaction are endothermic. **(1 Mark)**

$2Cu + O_2 \longrightarrow 2CuO$

(ii) In a displacement reaction one element displaces another element from its compound, whereas in double displacement reaction two different atoms or group of atoms are exchanged. **(1 Mark)**

$Na_2SO_4 + BaCl_2 \longrightarrow BaSO_4 + 2NaCl$

(b) $2Pb(NO_3)_2(s) \xrightarrow{\text{Heat}} 2PbO(s) + 4NO_2(g) + O_2(g)$ **(1 Mark)**

42. (a) $2Si_2H_6(g) + 7O_2(g) \longrightarrow 4SiO_2(s) + 6H_2O(l)$ **(1 Mark)**

(b) $2Al(s) + 3H_2(g) \longrightarrow 2AlH_3(s)$ **(1 Mark)**

(c) $Ca(HSO_3)_2(s) \longrightarrow CaO(s) + 2SO_2(s) + H_2O(l)$ **(1 Mark)**

43. (a) The colour of ferrous sulphate crystals is green. On heating, $FeSO_4.7H_2O$ first decomposes to form anhydrous ferrous sulphate ($FeSO_4$) which is white in colour. **(1 ½ Marks)**

(b) The products formed on strongly heating ferrous sulphate crystals are ferric oxide, sulphur dioxide and sulphur trioxide.

$$\underset{\text{Greenish-blue}}{2FeSO_4\ (s)} \xrightarrow{\text{Heat}} \underset{\text{Brown}}{Fe_2O_3\ (s)} + SO_2(g) + SO_3(g)$$

(1 Mark)

This is a type of decomposition reaction (thermal decomposition) **(½ Mark)**

44. (i) A chemical reaction in which one substance splits into two or more single substance is called as decomposition reaction.

Chemical Reaction :-

$$2Pb(NO_3)_2 \xrightarrow[\text{Heat}]{\Delta} 2PbO + 4NO_2(g) + O_2(g)$$

When Lead Nitrate is heated in a boiling tube. It decompose into Lead oxide (PbO) and Nitrogen dioxide (NO_2). O_2 gas evolved from it. Due to formation of Lead oxide it will turn into yellow colour. **(1 mark)**

(ii) In electrolytic decomposition of water two gases Hydrogen and oxygen were liberated.

$2\ H_2O \longrightarrow 2H_2 + O_2(g)$

Two moles of water undergo electrolysis and produce two moles of hydrogen and one mole of oxygen gas . Hydrogen gas released at cathode and oxygen gas is released at anode.

The mass ratio of the gas liberated at the cathode and at the anode is 1 : 8. **(1 mark)**

Note

Anode → It acts as an electron donor.

Cathode → It acts as an electron acceptor.

Topic-1.3: Have You Observed the Effects of Oxidation Reactions in Everyday Life ?

1. **(d)** $Fe_2O_3 + 3\ CO \longrightarrow 2\ Fe + 3\ CO_2$

This is redox reaction and not a combination reaction. In which Fe_2O_3 is reduced and CO is oxidised to form the products. **(1 mark)**

2. **(d)** MnO_2 is reduced and HCl is oxidised. MnO_2 loses oxygen therefore it is reduced and act as a oxidizing agent. On the other side HCl loses hydrogen. It is oxidized and act as reducing agent. **(1 mark)**

3. **(a)** $\overset{\text{Oxidation}}{\overbrace{}}$

$2Na(s) + 2H_2O(l) \longrightarrow 2NaOH(aq) + H_2(g)\uparrow$

$\underbrace{}_{\text{Reduction}}$

In this reaction, H_2O is reduced to H_2 while Na is oxidised to NaOH. Hence, Na is the reducing agent as it reduces H_2O to H_2. **(1 Mark)**

4. **(c)** HCl forms Cl_2 by losing 1'H' atom per molecule. Thus it gets oxidized itself and acts as reducing agent. Simultaneously, MnO_2 loses 2 'O' atoms per molecule and forms $MnCl_2$ thus, it gets reduced and acts as an oxidizing agent.

$$\overset{+4}{Mn}O_2 + 4H\overset{-1}{Cl} \longrightarrow \overset{+4}{Mn}Cl_2 + 2H_2O + \overset{0}{Cl_2}$$

HCl is oxidised to Cl_2, thus there is increase in oxidation state while MnO_2 is reduced to $MnCl_2$, thus there is decrease in oxidation state. Hence MnO_2 act as an oxidizing agent and HCl act as a reducing agent. **(1 Mark)**

Note

Modern definiton of oxidatin Reduction process:

Loss of electron → Charge over element increases → Oxidation

Gain of electron → Charge over elements decreases → Reduction

$\overset{-1}{H}Cl \longrightarrow \overset{0}{Cl_2}$ *(charge increases by one unit) → Oxidation*

$\overset{+4}{Mn}O_2 \longrightarrow \overset{+2}{Mn}Cl_2$ *(charge decrease by two unit) → Reduction*

5. **(b)** $2Cu + O_2 \longrightarrow \underset{\text{Black}}{2CuO\downarrow}$ **(1 Mark)**

6. **(a)** $ZnO + C \rightarrow Zn + CO$

In this reaction, ZnO is reduced to Zn and C is oxidised to CO. Thus, C is reducing agent while ZnO is oxidising agent. **(1 Mark)**

7. The given reaction involves conversion of MnO_2 into $MnCl_2$ in which the oxidation state of Mn changes from +4 to +2. Thus, it is reduced. **(1 Mark)**

The oxidation state of Cl changes from –1 in HCl to 0 in Cl_2. Thus, it is oxidized. **(1 Mark)**

Therefore, the given reaction is a Redox reaction.

Topper's Answer

21. The given reaction:

$MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$

A redox reaction is a reaction in which both oxidation and reduction is taking place. In this reaction, MnO_2 is getting reduced to $MnCl_2$ as O_2 is ~~reduced, from~~ removed from it. HCl is getting oxidised as Cl_2 is separates and H_2O is formed. Hydrogen is removed from HCl and is getting oxidised to form H_2O here. Thus, the given reaction is a redox reaction.

8. When copper powder is heated in a watch glass, a black substance is formed.

(i) This black substance is copper (II) oxide. It is formed due to oxidation of copper.

$2Cu + O_2 \xrightarrow{Heat} 2CuO$ **(½ + ½ = 1 Mark)**

(ii) This black substance (Cu O) can be reversed in its original form by passing hydrogen gas over this heated material. The reverse reaction takes place and the black coating on the surface turns brown and copper is obtained.

$CuO + H_2 \xrightarrow{Heat} Cu + H_2O$ **(1 Mark)**

9. Arrangement Y **[1 Mark]**

Rusting is a surface phenomenon. **[½ Mark]**

Arrangement Y has a larger surface are exposed to air. **[½ Mark]**

10. When copper powder is heated in a china dish it gets oxidised and converted to copper (II) oxide which is black in colour. When Hydrogen gas is passed over this heated substance black coloured copper oxide further reduced to copper and colour changes to brown. **(2 Marks)**

$2Cu + O_2 \xrightarrow{Heat} 2CuO$ (Black)

$CuO + H_2 \xrightarrow{Heat} \underset{(Brown)}{Cu} + H_2O$ **(1 Mark)**

Note

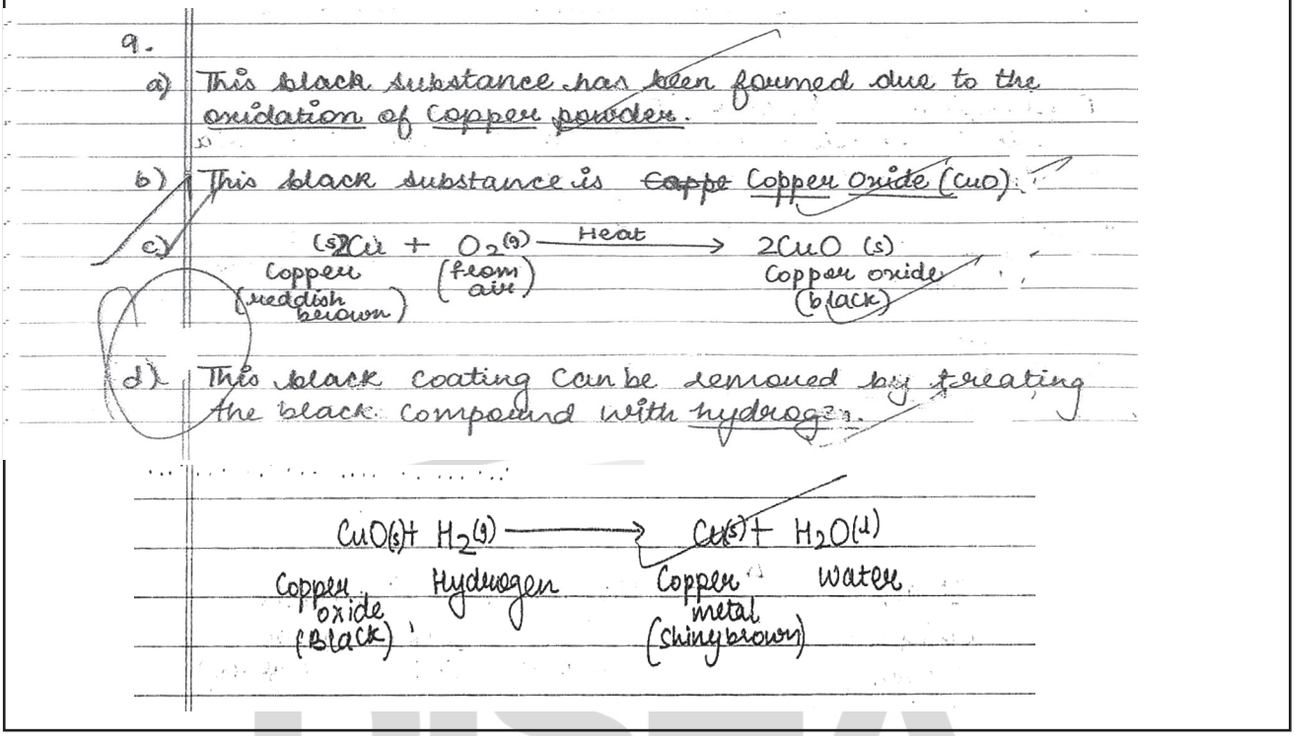
$CuO + H_2 \xrightarrow{Heat} Cu + H_2O$

Reduction

Oxidation : gain of oxygen or loss of Hydrogen
Reduction : loss of oxygen or gain of Hydrogen
Oxidising agent : reduces itself and oxidises other substance.
Reducing agent : oxidises itself and reduces other substance.

11.

Topper's Answer



12. (a)

(i) $\overset{\text{Reduction (removal of oxygen)}}{\overbrace{}}$ $ZnO + C \longrightarrow Zn + CO$ $\underbrace{}_{\text{Oxidation (addition of oxygen)}}$

Therefore the substance

Oxidised = C, Reduced = ZnO **(1 Mark)**

(ii) $\overset{\text{Reduction (removal of oxygen)}}{\overbrace{}}$ $CuO + H_2 \longrightarrow Cu + H_2O$ $\underbrace{}_{\text{Oxidation (addition of oxygen)}}$

Therefore the substance:

Oxidised = H_2, Reduced = CuO **(1 Mark)**

(b) H_2S is the reducing agent while SO_2 is the oxidising agent. **(1 Mark)**

Note

Oxidising agents are the compounds that oxidises the other substance and itself get reduced.
Reducing agent are the compounds that reduces other substance and itself get oxidised.

13. (a) The oil and fat containing food when left exposed to air reacts with oxygen and gets oxidized forming a toxic chemical called rancid, this process is called rancidity. The general name of the chemicals that are added to prevent this oxidation are called as antioxidants. For example, Nitrogen gas is anti-oxidant. **(2 Marks)**

(b) X is copper.

Green compound is due to formation of copper carbonate and black colour compound is due to the formation of copper oxide. **(1 Mark)**

Note

Copper articles when left in open green coating of copper carbonate deposited on the surface: when silver a articles are kept in open they acquire black coating of Ag_2S.