UNIT – I

Chemical Substances : Nature and Behaviour

CHAPTER 1

CHEMICAL REACTIONS AND EQUATIONS

Syllabus

➢ *Chemical reactions : Chemical equation, Balanced chemical equation, implications of a balanced chemical equation, types of chemical reactions : combination, decomposition, displacement, double displacement, precipitation, neutralization, oxidation and reduction.*

Quick Review

- A chemical reaction is a process in which the original substance(s) lose their nature and identity and form new substance(s) with different properties.
- Breaking of the chemical bonds and formation of the new chemical bonds is responsible for the occurrence of a chemical reaction.
- The substances which take part in chemical reaction are called **Reactants.**
- The substances which are formed in a chemical reaction are called **Products.**
- **Examples :** Where chemical reactions takes place :
  - **(i)** Digestion of food
  - **(ii)** Respiration
  - **(iii)** Rusting of iron
  - **(iv)** Burning of Magnesium ribbon
  - **(v)** Formation of curd
- A chemical reaction can be identified by either of the following observations :
  - **(i)** Change in state
  - **(ii)** Change in colour
  - **(iii)** Evolution of gas
  - **(iv)** Change in temperature
  - **(v)** Formation of a precipitate
- Writing a chemical equation :
  - **(i)** The symbols of elements and the formulae of reacting substances are written on the left hand side with a plus (+) sign between them.
  - **(ii)** The symbols and formulae of the substances formed are written on the right hand side with a plus sign (+) between them.
  - **(iii)** An arrow (→) sign is put between the reactants and the products.
  - **(iv)** The physical states of the reactants and products are also mentioned in a chemical equation.
- **Balanced Equations :** The equations in which atoms of various elements on both sides of a chemical equation are equal in accordance with the law of conservation of mass.
- The process of making atoms of various elements equal on either side of an equation is called balancing of chemical equation. This method of balancing the equation is known as hit and trial method.

STEPWISE BALANCING (Hit and Trial)

Step 1. Write a chemical equation and draw boxes around each formula.

$$Fe + H_2O \rightarrow Fe_3O_4 + H_2$$

➢ Do not change anything inside the box.

Step 2. Count the number of atoms of each element on both the sides of chemical equation.

Element	No. of atoms at reactant side	No. of atoms at product side
1. Fe	1	3
2. H	2	2
3. O	1	4

Step 3. Equalise the number of atoms of element which has maximum number by putting in front of it.

$$Fe + 4H_2O \rightarrow Fe_3O_4 + H_2$$

Step 4. Try to equalize all the atoms of elements on reactant and product side by adding coefficient in front of it.

$$3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$$

➢ Now all the atoms of elements are equal on both sides.

Step 5. Write the physical states of reactants and products.

$$3Fe\,(s) + 4H_2O\,(g) \rightarrow Fe_3O_4\,(s) + 4H_2\,(g)$$

Solid state = (s)
Liquid state = (l)
Gaseous state = (g)
Aqueous state = (aq)

Step 6. Write necessary conditions of temperature, pressure or catalyst on arrow above or below.

TYPES OF CHEMICAL REACTIONS

I. **COMBINATION REACTION :** The reaction in which two or more reactant combine to form a single product.

e.g.,(i) Burning of coal

$$C\,(s) + O_2\,(g) \rightarrow CO_2\,(g)$$

(ii) Formation of water

$$2H_2\,(g) + O_2\,(g) \rightarrow 2H_2O\,(l)$$

(iii) $CaO\,(s) + H_2O\,(l) \rightarrow Ca(OH)_2\,(aq)$

Quick lime Slaked lime

Exothermic Reactions : Reaction in which heat is released along with formation of products.

e.g.,(i) Burning of natural gas.

$$CH_4\,(g) + O_2\,(g) \rightarrow CO_2\,(g) + 2H_2O\,(g) + Heat$$

(ii) Respiration is also an exothermic reaction.

$$C_6H_{12}O_6\,(aq) + 6O_2\,(g) \rightarrow 6CO_2\,(aq) + 6H_2O\,(l) + energy$$

II. **DECOMPOSITION REACTION :** The reaction in which a compound splits into two or more simple substances is called decomposition reaction.

$$A \rightarrow B + C$$

➢ **Thermal decomposition :** When decomposition is carried out by heating.

e.g.,(i) $2FeSO_4\,(s) \xrightarrow{Heat} Fe_2O_3\,(s) + SO_2\,(g) + SO_3\,(g)$

(Ferrous sulphate) (Ferric oxide)
Green colour Red-brown colour

(ii) $CaCO_3\,(s) \xrightarrow{Heat} CaO\,(s) + CO_2\,(g)$

(Lime stone) (Quick lime)

➢ **Electrolytic Decomposition :** When decomposition is carried out by passing electricity.

e.g., $2H_2O \xrightarrow[current]{Electric} 2H_2 + O_2$

➢ **Photolytic Decomposition :** When decomposition is carried out in presence of sunlight.

e.g.,(i) $2AgCl\,(s) \xrightarrow{Sunlight} 2Ag\,(s) + Cl_2\,(g)$

$2AgBr\,(s) \xrightarrow{Sunlight} 2Ag\,(s) + Br_2\,(g)$

➢ Above reaction is used in black and white photography.

➢ **Endothermic Reaction :** The reactions which require energy in the form of heat, light or electricity to break reactants are called endothermic reactions.

III. DISPLACEMENT REACTION : The chemical reactions in which more reactive element displaces less reactive element from its salt solution.

$$Fe\,(s) + CuSO_4\,(aq) \rightarrow FeSO_4\,(aq) + Cu\,(s)$$

The iron nail becomes brownish in colour by deposition of Cu and blue colour of $CuSO_4$ changes dirty green colour due to formation of $FeSO_4$.

$$Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$$

Zn is more reactive than copper.

IV. DOUBLE DISPLACEMENT REACTION : A reaction in which new compounds are formed by mutual exchange of ions between two compounds.

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

White precipitate of $BaSO_4$ is formed, so it is also called precipitation reaction.

V. OXIDATION AND REDUCTION :

Oxidation : It is a process of gaining oxygen during a reaction.

$$2Cu + O_2 \xrightarrow{Heat} 2CuO$$

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

Reduction : Reduction is just reverse of oxidation. It is a process of losing oxygen during a reaction.

$$CuO + H_2 \longrightarrow Cu + H_2O$$

In this reaction CuO is reduced to Cu and H_2 is oxidized H_2O. In other words, one reactant gets oxidised while the other gets reduced. Such reactions are called oxidation-reduction reactions or redox reactions.

➢ **Corrosion :** The surface of the reactive metals are attacked by air, water and other substances around it, and corrodes, the process is called corrosion. It is a redox reaction where metal gets oxidised to metal oxide and oxygen gets reduced to oxide ion.

➢ Rust is mainly hydrated iron (III) oxide $Fe_2O_3.xH_2O$. Rusting weakens the structure of the body of vehicles, bridges, iron railing etc.

➢ **Prevention of Rusting :**

(i) The iron articles should be painted.

(ii) The machine parts should be oiled and greased.

(iii) Galvanised iron pipes are used for water supply.

(iv) Iron can be coated with chromium to prevent rusting.

➢ **Rancidity :** Rancidity is the process of slow oxidation of oil and fat present in the food materials resulting in the production of foul odour and taste in them.

➢ When cooked food items are placed for a long time, they become rancid and unsuitable for the consumption.

➢ **Methods to prevent Rancidity :**

(i) Packing of food materials in air tight containers.

(ii) Refrigeration of cooked food at low temperature.

Know the Terms

➢ **Valency :** The number of electrons shared by an atom is called its valency. It is also called the combining capacity of an atom, *e.g.*, chlorine atom can share one valence electron as its valency is 1, oxygen can share two valence electrons as its valency is 2.

➢ **Chemical equation :** It is a complete symbolic representation of a chemical reaction involving reactants and products.

➢ **Balanced equation :** It is the equation in which atoms of various elements on the reactants and the products side are equal. The number of atoms of elements on both the sides of a chemical equation should be equal in accordance with the law of conservation of mass.

- In a **combination reaction**, two or more reactants combine to give a single product.

  For example : $\underset{\text{(Quick lime)}}{CaO(s)} + H_2O(l) \longrightarrow \underset{\text{(Slaked lime)}}{Ca(OH)_2(aq)}$

  Here, two reactants (quick lime and water) combine to produce a single product (slaked lime).
- In a **decomposition reaction**, a single reactant breaks down into two or more simpler products.

  For example : $\underset{\text{(Lead nitrate)}}{2Pb(NO_3)_2} \xrightarrow{\text{Heat}} \underset{\text{(Lead oxide)}}{2PbO(s)} + \underset{\text{(Nitrogen dioxide)}}{4NO_2(g)} + \underset{\text{(Oxygen)}}{O_2(g)}$
- When a decomposition reaction is carried out by heating, it is called **thermal decomposition reaction**.

  For example : $\underset{\text{(Calcium carbonate)}}{CaCO_3(s)} \xrightarrow{\text{Heat}} \underset{\text{(Quick lime)}}{CaO(s)} + \underset{\text{(Carbon dioxide)}}{CO_2(g)}$
- When a decomposition reaction is carried out in the presence of sunlight, the process is called as **photochemical decomposition**.

  For example : $\underset{\text{(Silver bromide)}}{2AgBr(s)} \xrightarrow{\text{Sunlight}} \underset{\text{(Silver)}}{2Ag(s)} + \underset{\text{(Bromine)}}{Br_2(g)}$

  This decomposition is used in black and white photography.
- **Electrolysis :** When a decomposition reaction is carried out with the help of electric current, the process is called electrolysis.

  For example : When a electric current is passed through the acidified water, it decomposes into hydrogen and oxygen gas.

  $\underset{\text{(Water)}}{2H_2O(l)} \xrightarrow{\text{Electric current}} \underset{\text{(Hydrogen gas)}}{2H_2(g)} + \underset{\text{(Oxygen gas)}}{O_2(g)}$
- In a **displacement reaction**, a more reactive element displaces a less reactive element from a compound.

  For example : $\underset{\text{(Iron)}}{Fe(s)} + \underset{\text{(Copper sulphate)}}{CuSO_4(aq)} \longrightarrow \underset{\text{(Iron sulphate)}}{FeSO_4(aq)} + \underset{\text{(Copper)}}{Cu(s)}$

  Here, more reactive element (Iron) displaces the less reactive element (Copper) from the salt of copper.
- The reactions in which the different atoms or group of atoms are displaced by other atoms or group of atoms, *i.e.* two compounds exchange their ions and one of the products formed is insoluble, are said to be **double displacement reactions**.

  For example : $\underset{\text{(Sodium sulphate)}}{Na_2SO_4(aq)} + \underset{\text{(Barium chloride)}}{BaCl_2(aq)} \longrightarrow \underset{\text{(Barium sulphate)}}{BaSO_4(s)} + \underset{\text{(Sodium chloride)}}{2NaCl(aq)}$
- The reactions in which acid or acidic oxide reacts with base or basic oxide to form salt and water are called **neutralization reactions.**

  For example : $\underset{\text{(Sodium hydroxide)}}{2NaOH} + \underset{\text{(Sulphuric acid)}}{H_2SO_4} \longrightarrow \underset{\text{(Sodium sulphate)}}{Na_2SO_4} + \underset{\text{(Water)}}{H_2O}$
- **Oxidation** is a process in which oxygen or an electronegative element is added. It can also be defined as a process in which hydrogen or an electropositive element is removed. In terms of electronic concept, oxidation is a process in which loss of electrons takes place.
- **Reduction** is a process in which addition of hydrogen or an electropositive element takes place. It is also defined as a process in which oxygen or an electronegative element is removed. In electronic concept, reduction process involves the gain of electrons.
- Those reactions in which oxidation and reduction take place simultaneously are called **redox reactions**.

  For example :

$$\overset{\text{Oxidation}}{\overbrace{}} \quad \overset{\overset{\text{Oxidation}}{\overbrace{}}}{MnO_2(s) + 4HCl\ (conc.) \longrightarrow MnCl_2(aq) + Cl_2(g) + 2H_2O} \quad \underset{\text{Reduction}}{\underbrace{}}$$

- **Oxidising agent** is a substance which can add oxygen or an electronegative element to other materials. It can also remove hydrogen or an electropositive element from other materials.
- **Reducing agent** is a substance which can add hydrogen or an electropositive element to other materials. It can also remove oxygen or an electronegative element from other materials.

TOPIC-1

Chemical Reactions and Equations

Very Short Answer Type Questions (1 mark each)

R Q.1. **What is meant by a chemical reaction ?**

Ans. A process in which two or more substances react to form some other new substances with new set of properties is called a chemical reaction. 1

A Q.2. **Which one is a chemical change–rusting of iron or melting of iron ? [Board Term-I Set-11, 2011]**

Ans. Rusting of iron. 1

R Q.3. **Name and state the law which is kept in mind while we balance a chemical equation.**

[Board Term-I Set-21, 2011]

Ans. Law of conservation of mass.

Mass can neither be created nor be destroyed during a chemical reaction. ½ + ½

U Q.4. **State one basic difference between a physical change and a chemical change.**

[Board Term-I Set-21, 2011]

Ans. In a physical change, no new substance is formed.

In a chemical change, new substance is formed. ½ + ½

U Q.5. **What happens when quick lime is added to water ? [Board Term-I Set-A1, 2011, 2010]**

Ans. Quick lime reacts with water vigorously to produce slaked lime and a large amount of heat.

$CaO(s) + H_2O \longrightarrow Ca(OH)_2 + Heat$

(Quick lime) (Slaked lime) 1

A Q.6. **Identify in the following reaction :**

$2PbO_{(s)} + C_{(s)} \longrightarrow 2Pb_{(s)} + CO_{(g)}$

(a) the substance oxidised and

(b) the substance reduced. [KVS][NCERT]

Ans. (a) Carbon is oxidised to Carbon monoxide

(b) PbO (lead oxide) is reduced to lead. ½ + ½

A Q.7. **Identify the chemical change :**

Melting of Ice or Conversion of milk into curd.

[DDE]

Ans. Chemical Change is :

Conversion of milk into curd. 1

U Q.8. **What happens when $ZnCO_3$ is heated in the absence of air ? Give the relevant equation.**

[Board Term-I Set-14, 2011]

Ans. $ZnO(s)$ and $CO_2(g)$ are formed.

Chemical Equation :

$ZnCO_3 \longrightarrow ZnO + CO_2$ ½ + ½

A Q.9. **Write a balanced chemical equation for the following reaction.**

Ethanol is warmed with ethanoic acid to form ethyl acetate in the presence of concentrated H_2SO_4. [NCERT Exemplar]

Ans. $C_2H_5OH + CH_3COOH \xrightarrow[\text{Esterification}]{\text{Conc. } H_2SO_4} CH_3COOC_2H_5 + H_2O.$ 1

A Q.10. **Is burning of a candle, a physical change or a chemical change ? [Board Term-I Set-33, 2011]**

[NCERT Exemplar]

Ans. Both, chemical change and physical change. 1

A Q.11. **Write the chemical equation for reactions that takes place when lead nitrate and potassium iodide solutions are mixed. [Board Term-I 2011]**

Ans. $Pb(NO_3)_2 + 2KI \longrightarrow 2KNO_3 + PbI_2$

(Lead nitrate) (Potassium iodide) (Potassium nitrate) (Lead iodide) 1

A Q.12. **Write a balanced chemical equation :**

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

[Board Term-I 2011]

Ans. Balanced Equation

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

Short Answer Type Questions-I (2 marks each)

R Q.1. **List four observations that help us to determine whether a chemical reaction has taken place.**

[Board Term-I, Set-51, 2012]

Ans. (i) Evolution of a gas ½

(ii) Change in temperature ½

(iii) Change in state ½
(iv) Change in colour. ½
[CBSE Marking Scheme, 2012]

R **Q. 2. (i) State the law which is followed in balancing a chemical equation.** **[DDE 2017]**

(ii) Balance the following chemical equation :

$$Fe + H_2O \longrightarrow Fe_3O_4 + H_2$$

[Board Term-I, Set-49, 2012]

Ans. (i) Mass can neither be created nor destroyed in a chemical reaction-Law of conservation of mass. **1**

(ii) $3Fe + 4H_2O \longrightarrow Fe_3O_4 + 4H_2$ **1**
[CBSE Marking Scheme, 2012]

A **Q. 3. Give one example of each :**

(a) Chemical reaction showing evolution of gas.

(b) Change in substance's colour during a chemical reaction. **[DDE, 2017]**

Ans. (a) Chemical reaction showing evolution of gas :

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

(b) Change in Substance's colour during a chemical reaction :

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

Ferrous Sulphate (Green colour) — Ferric Oxide (Red-brown colour) **1 + 1**

A **Q. 4. Translate the following statements into chemical equations and then balance them.**

(a) Hydrogen gas combines with nitrogen to form ammonia.

(b) Hydrogen sulphide gas burns in air to give water and sulpur dioxide.

(c) Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate.

(d) Potassium metal reacts with water to give potassium hydroxide and hydrogen gas.

[NCERT]

Ans. (a) $2N_2 + 3H_2 \longrightarrow 2NH_3$

(b) $2H_2S + 3O_2 \longrightarrow 2SO_2\uparrow + 2H_2O$

(c) $3BaCl_2 + Al_2(SO_4)_3 \longrightarrow 2AlCl_3 + 3BaSO_4$

(b) $2K + 2H_2O \longrightarrow 2KOH + H_2\uparrow$ ½ + ½ + ½ + ½

U **Q. 5. What is observed when carbon dioxide gas is passed through lime water.**

(i) For a short duration

(ii) For long duration ? Also write the chemical equations for the reaction involved.

[Board Term I, Set-L7ZSVLH, 2016]

Ans. (i) For short duration : Limewater turns milky due to formation of $CaCO_3$, Which is insoluble in water.

$Ca(OH)_2(aq) + CO_2(g) \longrightarrow CaCO_3(s) + H_2O(l)$

Lime water — White ppt.

(ii) For Long duration : A clear solution is obtained due to formation of calcium bicarbonate. $Ca(HCO_3)_2$ which is soluble in water

$CaCO_3(s) + H_2O(l) + CO_2(g) \longrightarrow Ca(HCO_3)_2(aq)$

[CBSE Marking Scheme, 2016] 1 + 1

U **Q. 6. A copper plate was dipped into a solution of silver nitrate. After sometime, a black layer was observed on the surface of copper plate. State the reason for it and write chemical equation of the reaction involved.**

[Board Term-I Set-OQKPLGV, 2016]

Ans. Black layer was deposited due to coating of silver, because copper being more reactive than silver, displaced silver from silver nitrate solution.

$2AgNO_3(aq) + Cu \longrightarrow Cu(NO_3)_2(aq) + 2Ag(s)$ **2**
[CBSE Marking Scheme, 2016]

U **Q. 7. When iron rod is kept dipped in copper sulphate solution for some time, a brown coating is formed on the iron rod. What change will be observed in the colour of the solution? Also write chemical equation for the reaction involved.** **[Board Term-I Set-2ZGOVVV, 2015]**

Ans. Blue colour of the solution changes to light green. Reddish brown deposit is formed on the iron nail.

$Fe(s) + CuSO_4(aq) \longrightarrow FeSO_4(aq) + Cu(s)$ **1 + 1**

A **Q. 8. Balance the following chemical equations.**

(a) $HNO_3 + Ca(OH)_2 \longrightarrow Ca(NO_3)_2 + H_2O$

(b) $NaOH + H_2SO_4 \longrightarrow Na_2SO_4 + H_2O$

(c) $NaCl + AgNO_3 \longrightarrow AgCl + NaNO_3$

(d) $BaCl_2 + H_2SO_4 \longrightarrow BaSO_4 + HCl$

[NCERT] [2017] [NCT 2014]

Ans. (a) $2HNO_3 + Ca(OH)_2 \longrightarrow Ca(NO_3)_2 + 2H_2O$

(b) $2NaOH + H_2SO_4 \longrightarrow Na_2SO_4 + 2H_2O$

(c) $NaCl + AgNO_3 \longrightarrow AgCl + NaNO_3$

(d) $BaCl_2 + H_2SO_4 \longrightarrow BaSO_4 + 2HCl$

½ + ½ + ½ + ½

A **Q. 9. When Hydrogen gas is passed over heated copper (II) oxide, copper and steam are formed. Write the balanced chemical equation with physical states for this reaction. State what kind of chemical reaction is this ?**

[Board Term-I Set - A85V2K, 2015]

Ans. (i) $CuO(s) + H_2(g) \xrightarrow{Heat} Cu(s) + H_2O(g)$

(ii) Redox reaction.

[CBSE Marking Scheme, 2015] 1+1

R **Q. 10. Write the skeletal equation for the following reactions :**

(i) Hydrogen sulphide reacts with sulphur dioxide to form sulphur and water. **[NCERT Exemplar]**

(ii) Methane on burning combines with oxygen to produce carbon dioxide and water.

What is the need of balance equations ?

[Board Term-I Set-36, 2012]

Ans. (i) $4H_2S + 2SO_2 \longrightarrow 6S + 4H_2O$ ½

(ii) $CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$ ½

To obey the law of conservation of mass; so that the number of atoms of each element before and after the reaction remain the same. **1**

[CBSE Marking Scheme, 2012]

U **Q. 11. Translate the following statement into chemical equation and then balance it :**

"A metal in the form of ribbon burns with a dazzling white flame and changes into a white powder." [Board Term-I Set-46, 2012]

Ans. Magnesium combines with atmospheric oxygen to form magnesium oxide.

$2Mg + O_2 \longrightarrow 2MgO$ 2

[CBSE Marking Scheme, 2012]

U **Q. 12. State what happens when zinc granules are heated with sodium hydroxide solution. Write the balanced chemical equation for the reaction. Name the main product formed in this reaction.**

[DDE-2015]

Ans. When zinc granules are heated with NaOH solution, sodium zincate is formed with the evolution of hydrogen gas.

$2NaOH(aq) + Zn(s) \xrightarrow{Heat} Na_2ZnO_2(aq) + H_2(g)$

The main product formed in this reaction is H_2 gas. 2

A **Q. 13. Give reactions of calcium and magnesium with dilute nitric acid.**

[Board Term-I, Set-WJ7QPA9; Set-3R6WRQL, 2013]

Ans. $Ca + 2HNO_3 \longrightarrow Ca(NO_3)_2 + H_2$

$Mg + 2HNO_3 \longrightarrow Mg(NO_3)_2 + H_2$ 1+1

[CBSE Marking Scheme, 2013]

A **Q. 14. Write balanced chemical equations for the following reactions :**

(i) Silver bromide on exposure to sunlight decomposes into silver and bromine.

(ii) Sodium metal reacts with water to form sodium hydroxide and hydrogen gas.

[Board Term-I Set-31, 2012]

Ans. (i) $2AgBr(s) \xrightarrow{Sunlight} 2Ag(s) + Br_2(g)$ 1

(ii) $2Na(s) + 2H_2O(l) \longrightarrow 2NaOH(aq) + H_2(g)$ 1

[CBSE Marking Scheme, 2012]

U **Q. 15 In a test-tube, hydrochloric acid is poured over a few zinc granules. List two observations that suggest that a chemical reaction has occurred.**

$2HCl + Zn \longrightarrow ZnCl_2 + H_2$

[Board Term-I 2012 Set (47) (NCERT Exemplar)]

Ans. (i) A colourless gas is evolved. 1

(ii) Test-tube becomes hot. 1

[CBSE Marking Scheme, 2012]

A **Q. 16. Convert the following statements into balanced chemical equations :**

(i) Zinc reacts with sulphuric acid to form zinc sulphate and hydrogen gas.

(ii) Magnesium burns in oxygen to form magnesium oxide. [Board Term-I Set (48) 2012]

Ans. (i) $Zn + H_2SO_4 \longrightarrow ZnSO_4 + H_2$ 1

(ii) $2Mg + O_2 \longrightarrow 2MgO$ 1

[CBSE Marking Scheme, 2012]

A **Q. 17. Write the balanced chemical equations for the following reactions.**

(a) Calcium hydroxide + Carbon dioxide → Calcium carbonate + Water

(b) Zinc + Silver nitrate → Zinc nitrate + Silver

(c) Aluminium + Copper chloride → Aluminium chloride + Copper

(d) Barium chloride + Potassium sulphate → Barium sulphate + Potassium chloride [NCERT][2017]

Ans. (a) $Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$

(b) $Zn + 2AgNO_3 \longrightarrow Zn(NO_3)_2 + 2Ag$

(c) $2Al + 3CuCl_2 \longrightarrow 2AlCl_3 + 3Cu$

(d) $BaCl_2 + K_2SO_4 \longrightarrow BaSO_4 + 2KCl$

½ + ½ + ½ + ½

Short Answer Type Questions-II (3 marks each)

R **Q. 1. Define a chemical reaction. Which observation help you to determine whether a chemical reaction has taken place ? [DDE-2015]**

Ans. Chemical Reaction : Refer to Very Short Answer Type Question No. 1 and Short Answer Type-I Question No. 1.

R **Q. 2. Define the term decomposition reaction. Give one example each of thermal decomposition and electrolytic decomposition.**

[Board Term-I Set-WDCXXOV, L7ZSVLH, 2016]

Ans. Reaction in which a single reactant breaks down to give simpler products.

Thermal decomposition—

$CaCO_3 \xrightarrow{\Delta} CaO + CO_2$ **(Or any other)**

Electrolytic decomposition—

$2H_2O \xrightarrow{Electric\ current} 2H_2 + O_2$

[CBSE Marking Scheme, 2016] 3

Detailed Answer :

In a decomposition reaction, a single reactant breaks down into two or more simpler products.

When a decomposition reaction is carried out by heating, it is called thermal decomposition reaction.

$CaCO_3(s) \xrightarrow{Heat} CaO(s) + CO_2(g)$

(Calcium carbonate) (Calcium oxide) (Carbon dioxide)

When a decomposition reaction is carried out with the help of electric current, the process is called electrolysis.

$$2H_2O\ (l) \xrightarrow{\text{Electric current}} 2H_2(g) + O_2(g)$$

(Water) (Hydrogen gas) (Oxygen gas)

R **Q. 3. Write the steps for balancing the chemical equation for the formation of ammonia by the combination of nitrogen and hydrogen.**

[DDE-2014]

Ans. $N_2 + H_2 \longrightarrow NH_3$ (Unbalanced equation).

(i) Examine the number of atoms of different elements present in the unbalanced equation.

(ii) In the above reaction, left hand N_2 and H_2 of both the sides are unbalanced.

(iii) To balance hydrogen, H_2 is multiplied by 3 on side. It makes 6H- atoms on the left hand side.

(iv) Now to balance hydrogen atoms on the right hand side, NH_3 should be multiplied by 2. It makes 6H- atoms on this side.

(v) Now to balance nitrogen atoms, they are counted separately for both the sides and we will find that, nitrogen atoms are 2 on both the sides.

(vi) Balanced chemical equation will be :

$$N_2 + 3H_2 \longrightarrow 2NH_3 \quad ½+½+½+½+½+½$$

R **Q. 4. (a) Mention the four informations given by an equation.**

(b) State the law of conservation of mass as applicable in a chemical reaction.

[Board Term-I Set-WJ7QPA9, 2013]

Ans. (a) (i) Physical state of reactants and products.

(ii) Conditions such as temperature, pressure, heat etc.

(iii) Catalyst involved.

(iv) Change in state. ½ × 4

(b) Total mass of the elements present in the products in a chemical reaction has to be equal to the total mass of elements present in the reactants or Mass can neither be created nor destroyed in a chemical reaction. **[CBSE Marking Scheme, 2013] 1**

A **Q. 5. When a copper wire was left in silver nitrate solution for sometime, it was observed that the solution turned bluish green.**

(i) Explain the observation.

(ii) Write the balanced chemical equation to represent the change taking place.

[Board Term-I Set-1ZHNPNO, 2016]

Ans. (i) Copper is more reactive than silver. Hence, when copper wire is dipped in silver nitrate solution, it displaces silver from $AgNO_3$ solution forming copper nitrate which is bluish green in colour.

(ii) $Cu + 2AgNO_3 \longrightarrow \underset{\text{Copper (II) nitrate bluish green}}{Cu(NO_3)_2} + \underset{\text{Silver}}{2Ag}$

[CBSE Marking Scheme, 2016] 1½ + 1½

U **Q. 6. 2 g ferrous sulphate crystals are heated in a dry boiling tube.**

(i) List any two observations.

(ii) Name the type of chemical reaction taking place.

(iii) Write the chemical equation of the reaction.

[Board Term-I Set-NS9SX1D, 2016]

Ans. (i) Before heating, it is pale green.

After heating, it is brown or reddish brown.

Two observations are :

(a) Change in state and colour.

(b) Evolution of gas.

(ii) Decomposition reaction.

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

1 + 1 + 1

A **Q. 7. (a) In the following reactions, name the reactants, which undergo oxidation and reduction :**

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

(ii) $CuO(s) + Zn(s) \longrightarrow ZnO(s) + Cu(s)$

(b) State one industrial application of reduction.

[DDE - 2015]

Ans. (a) (i) The reactants are copper oxide and hydrogen. Copper oxide undergoes reaction and hydrogen (H_2) undergoes oxidation.

(ii) The reactants are copper oxide and zinc. Zinc undergoes oxidation and copper oxide undergoes reduction.

(b) Calcium carbonate is reduced in industries to get CaO and CO_2. **2 + 1**

A **Q. 8. (a) Write chemical equations.**

(i) When carbon dioxide gas is passed through lime water.

(ii) When excess of carbon dioxide gas is passed through lime water.

(b) List two natural forms of calcium carbonate.

[DDE - 2015]

Ans. (a) (i) $Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$

(ii) $Ca(OH)_2(aq) + CO_2(g) \longrightarrow CaCO_3(s) + H_2O(l)$

$CaCO_3(s) + H_2O(l) + CO_2(g) \longrightarrow Ca(HCO_3)_2(aq)$

(b) Aragonite and calcite **2 + 1**

R **Q. 9. Identify the type of each of the following reactions. Also write balanced chemical equation for each.**

(i) The reaction mixture becomes warm.

(ii) An insoluble substance is formed.

[Board Term-I, Set-A85V2IL, 2015]

Ans. (i) Exothermic Reaction

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

(ii) Double displacement reaction.

$BaCl_2 + Na_2SO_4 \longrightarrow BaSO_4 + 2NaCl$ **1½ + 1½**

[CBSE Marking Scheme, 2015]

A **Q. 10. (i) Solution of a substance 'X' is used for testing carbon dioxide. Write the equation of the reaction of 'X' with carbon dioxide.**

(ii) How is 'X' obtained ? Write chemical equation.

[Board Term-I Set-2ZGOVVV, 2015]

Ans. (i) Substance X-Calcium Hydroxide.

$$Ca(OH)_2(aq) + CO_2(g) \longrightarrow CaCO_3(s) + H_2O$$
(White ppt.)

(ii) Calcium hydroxide is obtained by reaction of calcium oxide and water.

$$CaO(s) + H_2O(l) \longrightarrow Ca(OH)_2(aq) + \text{Heat}$$ **1 + 2**

A **Q. 11. What happens when :**

(i) Dilute hydrochloric acid is added to solid sodium carbonate.

(ii) Quicklime is treated with water.

(iii) Sodium chloride solution is added to lead nitrate solution.

Also write the chemical equation in each case.

[Board Term-I Set-INI4KGB, 2014]

Ans. (i) $Na_2CO_3(s) + 2HCl(aq) \longrightarrow 2NaCl(aq) + H_2O(l) + CO_2(g)$

(ii) $CaO(s) + H_2O(l) \longrightarrow Ca(OH)_2(aq) + \text{Heat}$

(iii) $Pb(NO_3)_2(aq) + NaCl(aq) \longrightarrow PbCl_2(s) + 2NaNO_3(aq)$ **1+1+1**

[CBSE Marking Scheme, 2014]

A **Q. 12. Write the chemical equation of the reaction with an example each in which the following change has taken place :**

(i) Change in colour

(ii) Change in temperature

(iii) Formation of precipitate.

[Board Term-I Set-WH1SGOB, 2014]

Ans. (i) Change in colour : Reaction between lead nitrate solution and potassium iodide solution.

$Pb(NO_3)_2(aq) + 2KI \longrightarrow PbI_2(s) + 2KNO_3(aq)$

In this reaction, colour changes from colourless to yellow.

(ii) Change in temperature : Action of dilute sulphuric acid on zinc.

$Zn(s) + H_2SO_4(aq) \longrightarrow ZnSO_4(aq) + H_2$

In this reaction, heat is evolved

(iii) Formation of precipitate : Action of barium chloride on sodium sulphate.

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

ppt.

[CBSE Marking Scheme, 2014] 1+1+1

A **Q. 13. Complete and balance the following chemical equations :**

(i) $CaCO_3 + HCl$ **(ii)** $Al + HCl$

(iii) $MnO_2 + HCl$ **[Board Term-I Set-WH1SG0B, 2014]**

Ans. (i) $CaCO_3(s) + 2HCl(aq) \longrightarrow CaCl_2(s) + H_2O(l) + CO_2(g)$

(ii) $2Al(s) + 6HCl(aq) \longrightarrow 2AlCl_3(aq) + 3H_2(g)$

(iii) $MnO_2 + 4HCl(aq) \longrightarrow MnCl_2 + 2H_2O(l) + Cl_2(g)$ **1+1+1**

[CBSE Marking Scheme, 2014]

A **Q. 14. Write balanced chemical equations for the following reactions :**

(i) dilute sulphuric acid reacts with aluminium powder.

(ii) dilute hydrochloric acid reacts with sodium carbonate.

(iii) Carbon-dioxide is passed through lime water.

[Board Term-I Set-WJ7QPA9, 3R6WRQL, 2013]

Ans. (i) $2Al + 3H_2SO_4 \longrightarrow Al_2(SO_4)_3 + 3H_2$

(ii) $Na_2CO_3 + 2HCl \longrightarrow 2NaCl + H_2O + CO_2$

(iii) $Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$ **1×3**

[CBSE Marking Scheme, 2013]

A **Q. 15. Balance the following chemical equations and state whether they are exothermic or endothermic :**

(i) $Na + H_2O \longrightarrow NaOH + H_2$

(ii) $FeSO_4 \longrightarrow Fe_2O_3 + SO_2 + SO_3$

[Board Term-I Set-NS9SX1D, 2016]

Ans. (i) $2Na + 2H_2O \longrightarrow 2NaOH + H_2$

It is an exothermic reaction.

(ii) $2FeSO_4(s) \xrightarrow{\Delta} Fe_2O_3 + SO_2(g) + SO_3(g)$

It is an endothermic reaction. **1½ + 1½**

A **Q. 16. Write the chemical equations involved in the following chemical reactions :**

(i) White washing.

(ii) Black and white photography.

[Board Term-I Set-OQKPLGV, 2016]

Ans. (i) In white washing, quicklime reacts with water to form slaked lime.

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

Quick lime Slaked lime

(ii) Silver bromide, when exposed to light decomposes to silver and bromine.

$2AgBr(s) \xrightarrow{\text{Sunlight}} 2Ag(s) + Br_2(g)$

(Silver bromide) (Silver) (Bromine)

[CBSE Marking Scheme, 2016] 1½ + 1½

U **Q. 17. 2 g of ferrous sulphate crystals are heated in a boiling tube.**

(i) State the colour of ferrous sulphate crystals both before heating and after heating.

(ii) Name the gases produced during heating.

(iii) Write the chemical equation for the reaction.

[Board Term-I Set-38, 2012]

Ans. (i) Before heating : Pale green

After heating : Brown or reddish brown. **1**

(ii) SO_2 and SO_3. **1**

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

[CBSE Marking Scheme, 2012]

Long Answer Type Questions

(5 marks each)

R **Q. 1. Define a chemical reaction. State four observations which help us to determine that a chemical reaction has taken place. Write one example of each observation with a balanced chemical equation.**

[Board Term-I Set-WDCXXOV, 2016]

Ans. Process in which new substances with new properties are formed by the rearrangement of atoms is known as chemical reaction.

(i) Evolution of gas : The chemical reaction between zinc and dilute H_2SO_4.

$Zn(s) + H_2SO_4(aq) \longrightarrow ZnSO_4(sq) + H_2(g) \uparrow$

(ii) Change in colour : The chemical reaction between potassium iodide solution and lead nitrate solution.

$Pb(NO_3)_2(aq) + 2KI \longrightarrow 2KNO_3(aq) + PbI_2(s)$

Colourless — Yellow

(iii) Formation of precipitate : The chemical reaction between sulphuric acid and barium chloride solution.

$BaCl_2(aq) + H_2SO_4(aq) \longrightarrow 2HCl(aq) + BaSO_4(s)$

White precipitate

(iv) Change in temperature : The chemical reaction between quick lime and water.

$CaO(s) + H_2O(l) \longrightarrow Ca(OH)_2(aq) + Heat$

Quicklime **[CBSE Marking Scheme, 2016] 5**

R **Q. 2. What is a balanced chemical equation ? Why should chemical equation be balanced ?**

[NCERT 2017]

Ans. The equation in which atoms of various elements on both sides of a chemical equation are equal in accordance with the law of conservation of mass is known as balanced chemical equation.

The chemical equation is to be balanced in accordance to the law of conservation of mass. It means the total mass of the elements present in the products of a chemical reaction has to be equal to the total mass of the elements present in the reactants. In other words, the number of atoms of each element remains the same, before and after a chemical reaction. Hence, we need to balance a chemical equation. 2 + 3

A **Q. 3. Write balanced chemical equations for the following statements :**

(i) Bleaching powder is kept open in air.

(ii) Blue crystals of copper sulphate are heated.

(iii) Chlorine gas is passed through dry slaked lime.

(iv) Carbon dioxide gas is passed through lime water.

(v) NaOH solution is heated with zinc granules.

[Board Term-I Set-L7ZSVLH, 2016]

Ans. (i) $CaOCl_2(s) + CO_2(g) \longrightarrow CaCO_3(s) + Cl_2(g)$

Bleaching powder — Carbon dioxide — Calcium carbonate — Chlorine

(ii) $CuSO_4 . 5H_2O \xrightarrow{Heat} CuSO_4 + 5H_2O$

Blue — White

(iii) $Ca(OH)_2 + Cl_2 \longrightarrow CaOCl_2 + H_2O$

Dry slaked lime — Chlorine — Bleaching powder

(iv) $Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$

Lime water — Calcium carbonate (Milky)

(v) $2NaOH + Zn \xrightarrow{Heat} Na_2ZnO_2 + H_2$

Sodium zincate — Hydrogen

[CBSE Marking Scheme, 2016] 1 × 5

A **Q. 4. Identify the type of chemical reaction in the following statements and define each of them :**

(i) Digestion of food in our body

(ii) Rusting of iron

(iii) Heating of manganese dioxide with aluminium powder

(iv) Blue colour of copper sulphate solution disappears when iron filings are added to it

(v) Dilute hydrochloric acid is added to sodium hydroxide solution to form sodium chloride and water. **[Board Term-I Set-OQKPLGV, 2016]**

Ans. (i) Decomposition Reaction : Carbohydrates are broken down to form glucose.

(ii) Oxidation Reaction : When an iron object is left in moist air for a considerable time, it gets covered with a red brown flaky substance called rust.

(iii) Displacement reaction : More reactive metal displaces less reactive metal from its salt solution.

(iv) Displacement reaction : More reactive metal displaces less reactive metal from its salt solution.

(v) Double displacement reaction : Reaction in which two compounds react by an exchange of ions to form two new compounds. 1 × 5

[CBSE Marking Scheme, 2016]

A **Q. 5. Write balanced chemical equations for the following statements :**

(i) NaOH solution is heated with zinc granules.

(ii) Excess of carbon dioxide gas is passed through lime water.

(iii) Dilute sulphuric acid reacts with sodium carbonate.

(iv) Egg shells are dropped in hydrochloric acid.

(v) Copper (II) oxide reacts with dilute hydrochloric acid. **[Board Term-I Set-5X7289R, 2014]**

Ans. (i) $2NaOH(aq) + Zn(s) \longrightarrow Na_2ZnO_2(aq) + H_2(g)$

(ii) $Ca(OH)_2(aq) + CO_2(g) \longrightarrow CaCO_3(s) + H_2O$

$CaCO_3(s) + H_2O(l) + CO_2(g) \longrightarrow Ca(HCO_3)_2(aq)$

(iii) $Na_2CO_3 + H_2SO_4(dil) \longrightarrow Na_2SO_4(aq) + H_2O(l) + CO_2(g)$

(iv) $CaCO_3 + 2HCl \longrightarrow CaCl_2 + H_2O + CO_2$

(v) $CuO + 2HCl\ (dil) \longrightarrow CuCl_2 + H_2O$

1+1+1+1+1

R + A **Q. 6. (a) List any three observations which determine that a chemical reaction has taken place. Also list three informations that cannot be obtained about a chemical reaction, merely by its chemical equation.**

(b) Balance the following chemical equations. **[DDE-2014]**

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

(ii) $CO_2 + H_2O \longrightarrow C_6H_{12}O_6 + O_2$

Ans. (a) Three observations which determine that a chemical reaction has taken place are :

(i) Change in state and colour.

(ii) Evolution of gas.

(iii) Change in temperature.

Three informations that cannot be obtained about a chemical reaction, merely by its chemical equation are :

(i) The state of a matter of the reactants and products.

(ii) Amount of heat evolved or absorbed in a reaction.

(iii) The change of colour after the chemical reaction.

(b) Balanced chemical equations :

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

(ii) $6CO_2 + 6H_2O \longrightarrow C_6H_{12}O_6 + 6O_2$ **3+2**

U **Q. 7. What happens when zinc granules are treated with dilute solutions of H_2SO_4, HCl, HNO_3, NaCl and NaOH ? Also write the chemical equation.** **[Board Term-I Set-WJ7QPA9, 2013]**

Ans. (i) With dilute H_2SO_4 : H_2 gas is evolved.

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

(ii) With dilute HCl : H_2 gas is evolved.

$$Zn + HCl \longrightarrow ZnCl_2 + H_2\uparrow$$

(iii) With dilute HNO_3 : H_2 gas is evolved.

$$Zn + 2HNO_3 \longrightarrow Zn(NO_3)_2 + 5H_2O + H_2$$

(iv) With dilute NaCl : No chemical reaction takes place.

(v) With dilute NaOH : Sodium Zincate is formed and H_2 gas is evolved.

$$Zn + 2NaOH \longrightarrow Na_2ZnO_2 + H_2\uparrow$$ **1×5**

[CBSE Marking Scheme, 2013]

TOPIC-2

Types of Chemical Reactions–Corrosion and Rancidity

Very Short Answer Type Questions (1 mark each)

R **Q. 1. Why is respiration considered as exothermic reaction ?** **[DDE, 2017][NCERT 2017]**

Ans. Respiration is considered as exothermic reaction because heat is released along with the formation of products. **1**

U **Q. 2. Why are decomposing reactions called the opposite of combination reactions ?**

[Board Term-I Set-23, 2011 (NCERT)]

Ans. In combination reactions, two substances combine to form one compound and in decomposition reactions, a compound breaks down into two or more substances, so they are opposite to each other. **1**

U **Q. 3. Why is photosynthesis considered an endothermic reaction ?**

[Board Term-I Set-36, 2011]

Ans. Because heat is absorbed in this process. **1**

R **Q. 4. Why we store silver chloride in dark coloured bottles ?** **[DDE, 2017]**

Ans. Dark coloured bottles interrupt the path of light such that light cannot reach silver chloride in the bottles and its decomposition is prevented. **1**

A **Q. 5. State the type of chemical reaction used for the extraction of metals from their naturally occurring chlorides or oxides.**

[Board Term-I Set-32, 2011]

Ans. Electrolytic reduction. **1**

U **Q. 6. Why is hydrogen peroxide kept in coloured bottles ?**

[Board Term-I Set-36, Set (A1), 2011, 2010]

Ans. Hydrogen peroxide decomposes into H_2O and O_2 in the presence of sunlight and hence to prevent decomposition, they are kept in coloured bottles.

$$2H_2O_2 \xrightarrow{\text{Sunlight}} 2H_2O + O_2$$ **1**

R Q. 7. **Why do Copper vessel lose shine when exposed to air ?** **[DDE, 2017]**

Ans. When Copper vessel is exposed to air it losses it shine due to corrosion because a green coating is deposited on Copper. **1**

A Q. 8. **A shiny brown coloured element 'X' on heating in air becomes black in colour. Name the element 'X' and the black coloured compound formed.** **[KVS 2017][NCERT 2017]**

Ans. Element 'X' is Copper and the black coloured compound is Cupric oxide Cu_2O. ½ + ½

A Q. 9. **$N_2 + 3H_2 \longrightarrow 2NH_3$, name the type of reaction.** **[Board Term-I Set-A2, 2010]** **[DDE, 2017]**

Ans. It is a combination reaction. **1**

U Q. 10. **Why do silver articles become black after sometime when exposed to air ?** **[Board Term-I 2011]**

Ans. They get tarnished by reacting with atmospheric air to form silver sulphide. **1**

U Q. 11. **Give reasons why do chips manufacturers usually flush bags of chips with gas such as nitrogen ?** **[Board Term-I Set (12), 2011]** **[DDE, 2017]**

Ans. To prevent the oil and fats of the chips from being oxidized or become rancid. **1**

U Q. 12. **Identify the reducing agent in the following reaction :**

$$Fe_2O_3 + 3CO \longrightarrow 2Fe + 3CO_2$$

[NCERT Exemplar]

Ans. CO *i.e.,* carbon monoxide is the reducing agent in the given reaction, as it removes oxygen from Fe_2O_3 and causes its reduction. **1**

A Q. 13. **Write a balanced chemical equation for a chemical combination reaction.** **[Board Term-I Set-13, 2011]**

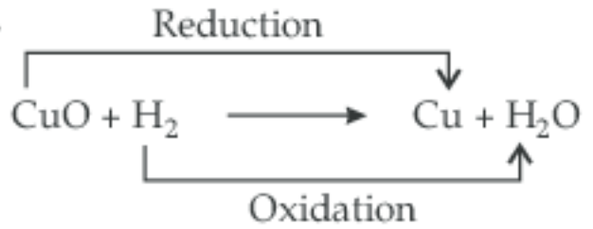
Ans. $2CO(g) + O_2(g) \longrightarrow 2CO_2(g)$
(Carbon monoxide) (Oxygen) (Carbon dioxide) **1**

U Q. 14. **Identify the substance that is oxidized and substance that is reduced in the reaction.**

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

[NCT-2014]

Ans.



Substance reduced = CuO
Substance oxidised = H_2 ½+½

A Q. 15. **Write a chemical equation of double displacement reaction.** **[DDE, 2017]** **[Board Term, 2011]**

Ans. Double displacement Reaction—
$Na_2SO_4(aq) + BaCl_2(aq) \longrightarrow BaSO_4(s) + 2NaCl(aq)$ **1**

R Q. 16. **What happens when milk is left open at room temperature during summers ?** **[DDE, 2017]**

Ans. When milk is left open at room temperature during Summers it gets oxidised become rancid and it smell and taste changes. **1**

R Q. 17. **What changes do you observe in the iron nails and colour of copper sulphate solution, if iron nails are dipped in $CuSO_4$ solution for 15 minutes ?** **[DDE, 2017]**

Ans. The Iron nail become brownish in colour and the blue colour of Copper sulphate solution fade, because Iron has displaced or removed another element, copper form Copper sulphate solution. **1**

Short Answer Type Questions-I

(2 marks each)

R Q. 1. **What is a combination reaction ? State one example giving balanced chemical equation for the reaction.** **[Board Term-I Set-41, 2012]** **[DDE, 2017]**

Ans. A reaction in which two or more simpler substances combine to form a single product. **1**

Example : $C + O_2 \xrightarrow{\text{Burn}} CO_2$ ½

$2H_2 + O_2 \longrightarrow 2H_2O$ ½

[CBSE Marking Scheme, 2012]

R Q. 2. **What is a precipitation reaction ? Give an example.** **[KVS 2017]**

Ans. The Reaction in which an insoluble Substance or precipitate is formed called precipitation reaction.

Example :

$Na_2SO_4 + BaCl_2 \longrightarrow 2NaCl + BaSO_4 \downarrow$ **1 + 1**

R Q. 3. **What does one mean by exothermic and endothermic reactions ? Give examples.** **[NCERT 2017]**

Ans. Exothermic Reactions : Reaction in which heat is released along with formation of products.

Example :

$CH_4(g) + O_2(g) \longrightarrow CO_2(g) + 2H_2O(g) + Heat$

Endothermic Reaction : The reaction in which the energy required in the form of heat, light or electricity to break reactants are called endothermic reaction.

$2AgCl_{(s)} \xrightarrow{\text{Sunlight}} 2Ag_{(s)} + Cl_2(g)$ **1 + 1**

A Q. 4. **Classify the following reaction as combination, Decomposition, displacement and double displacement reaction :**

(a) **$BaCl_2 + H_2SO_4 \longrightarrow BaSO_4 + 2HCl$**

(b) $C + O_2 \longrightarrow CO_2$

(c) $3CuSO_4 + 2Al \longrightarrow Al_2(SO_4)_3 + 3Cu$

(d) $ZnCO_3 \longrightarrow ZnO + CO_2$ **[KVS 2017]**

Ans. (a) Double displacement reaction.

(b) Combination reaction.

(c) Displacement reaction.

(d) Decomposition reaction. ½ + ½ + ½ + ½

R **Q. 5. (i)** $2PbO + C \longrightarrow 2Pb + CO_2$

(ii) $MnO_2 + 4HCl \longrightarrow MnCl_2 + 2H_2O + Cl_2$

What is redox reaction ? Identify the substance oxidised and the substance reduced in the above reactions. [Board Term-I Set-36, 2012]

Ans. Those reactions in which both oxidation and reduction occur simultaneously. **1**

(i) PbO is reduced, C is oxidised. ½

(ii) HCl is oxidised, MnO_2 is reduced. ½

[CBSE Marking Scheme, 2012]

U **Q. 6. Identify the type of reaction from the following equation and define it.**

$$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O + \text{heat}$$

[Board Term-I Set-50, 2012]

Ans. Exothermic reaction : It is a reaction in which heat energy is released along with the formation of products. **[CBSE Marking Scheme, 2012]** 2

A **Q. 7. State reason for the following :**

(i) Potato chips manufacturers fill the packet of chips with nitrogen gas.

(ii) Iron articles are shining when new, but get coated with a reddish brown powder, when left for some time. [Board Term-I Set-WH1SGOB, 2014]

Ans. (i) To prevent rancidity.

(ii) Rusting and corrosion. **1+1**

[CBSE Marking Scheme, 2014]

R **Q. 8. (i) List any two changes which take place when oily food gets oxidized.**

(ii) Mention a measure which prevents or slows down its oxidation. [Board Term-I Set-45, 2012]

Ans. (i) (a) Food becomes rancid. ½

(b) Its taste and smell changes. ½

(ii) Keeping food in air tight containers / flushing the container with an inert gas like Nitrogen (N_2). **1**

[CBSE Marking Scheme, 2012]

R **Q. 9. What happens when Zn strip is dipped in $CuSO_4$ solution ? [DDE 2017]**

Ans. Zinc strip displaces or removes Copper from Copper sulphate solution and this reaction is known as displacement reactions.

$Zn(s) + CuSO_4(sq) \longrightarrow ZnSO_4(aq) + Cu(s)$

1 + 1

A **Q. 10. A student prepares aqueous solutions of the following salts :**

Copper sulphate, ferrous sulphate, sodium sulphate, barium chloride.

Write the colour of each solution thus formed.

[Board Term-I Set-JYNE6XG, 2015]

Ans. Copper sulphate — Blue

Ferrous sulphate — Pale green

Sodium sulphate — Milky white

Barium chloride — White ½ + ½ + ½ + ½

U **Q. 11. Mention the colour of $FeSO_4.7H_2O$ crystals. How does this colour change upon heating ? Give balanced chemical equation for the change. [Board Term-I Set-40, 2012]**

Ans. Light green is the colour of crystalline $FeSO_4.7H_2O$. Light green changes to reddish brown or brown upon heating. **1**

(i) $FeSO_4.7H_2O \xrightarrow{\Delta} FeSO_4 + 7H_2O$

(ii) $2FeSO_4 \xrightarrow{\text{Heat}} Fe_2O_3 + SO_2 + SO_3$ **1**

[CBSE Marking Scheme, 2012]

A **Q. 12. Write balanced equation for the reaction between magnesium and hydrochloric acid. Name the product obtained, identify the type of reaction. [Board Term-I Set-39, 2012]**

Ans. $Mg + 2HCl \longrightarrow MgCl_2 + H_2$ **1**

(Magnesium chloride) ½

Reaction is a displacement reaction. ½

[CBSE Marking Scheme, 2012]

A **Q. 13. Barium chloride reacts with aluminium sulphate to give aluminium chloride and barium sulphate.**

(i) State the two types in which the above reaction can be classified.

(ii) Translate the above statement into a chemical equation. [Board Term-I Set (37), 2012]

Ans. (i) Double displacement reaction and Precipitation reaction. **1**

(ii) $3BaCl_2 + Al_2(SO_4)_3 \longrightarrow 2AlCl_3 + 3BaSO_4(\downarrow)$ **1**

[CBSE Marking Scheme, 2012]

R **Q. 14. What are two conditions which promotes corrosion ? [DDE 2017]**

Ans. Two conditions which promotes corrosion are :

(i) Substance is exposed to air, water

(ii) Metal gets oxidised to metal oxide. **1 + 1**

R **Q. 15. Identify the type of reaction from the following equations :**

(i) $CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$

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

(iii) $CaO + H_2O \longrightarrow Ca(OH)_2$

(iv) $CuSO_4 + Zn \longrightarrow ZnSO_4 + Cu$

[Board Term-I Set (38), 2012]

Ans. (i) Exothermic/oxidation Reaction ½

(ii) Double Displacement Reaction ½

(iii) Combination Reaction ½

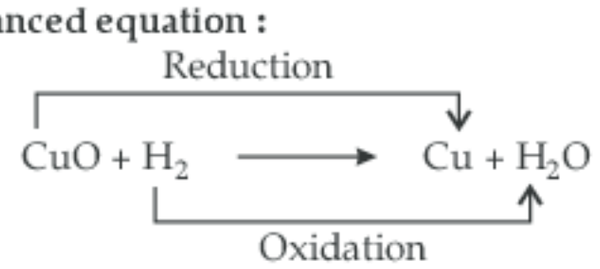
(iv) Displacement Reaction. ½

[CBSE Marking Scheme, 2012]

U **Q. 16. When hydrogen gas is passed over heated copper (II) oxide, copper and steam are formed. Write the balanced chemical equation for this reaction and state (i) the substance oxidized and (ii) the substance reduced in the reaction.**

[Board Term-I Set-5X7289R, 2014]

Ans. Balanced equation :



(i) Substance oxidised = H_2

(ii) Substance reduced = CuO. **1+½+½**

A **Q. 17. Write the balanced chemical equation for the following reaction and identify the type of reaction and define it. 'Iron III oxide reacts with aluminium and gives molten iron and aluminium oxide'. [Board Term-I Set-15, 2012]**

Ans. $Fe_2O_3 + 2Al \longrightarrow Al_2O_3 + 2Fe$ **1**

Displacement reaction is the reaction in which one element displaces another element. **½+½**

[CBSE Marking Scheme, 2012]

R **Q. 18. Identify the oxidising agents (oxidants) in the following reactions :**

(i) $Pb_3O_4 + 8HCl \longrightarrow 3PbCl_2 + Cl_2 + 4H_2O$

(ii) $CuSO_4 + Zn \longrightarrow Cu + ZnSO_4$

[NCERT Exemplar]

Ans. (i) Pb_3O_4 = Oxidising agent

(ii) $CuSO_4$ = Oxidising agent **1+1**

U **Q. 19. A silver article generally turns black when kept in the open for a few days. The articles when rubbed with toothpaste again starts shining.**

(i) Why do they turn black ? Name the phenomenon involved.

(ii) Name the black substance formed and write its formula. [NCERT Exemplar]

Ans. (i) Silver article reacts with sulphur compounds such as H_2S present in air. The phenomenon is called corrosion. For silver particularly, it is called tarnishing of silver.

(ii) The black substance is silver sulphide (Ag_2S). **1+1**

Short Answer Type Questions-II

(3 marks each)

R **Q. 1. What is rancidity ? Mention any two ways by which rancidity can be prevented. [DDE 2017]**

[NCT 2014, Board Term-I Set-18, 2012]

Ans. The oxidation of oils or fats in a food resulting into bad smell and bad taste is called rancidity. **1**

It can be prevented by—

(i) adding anti-oxidants. **1**

(ii) flushing with nitrogen gas. **1**

[CBSE Marking Scheme, 2012]

R **Q. 2. What is meant by a precipitation reaction ? Explain by giving an example. Also give a balanced chemical equation for the reaction stating the states of the reactants and the products formed.**

[Board Term-I Set-WJ7QPA9, 2013 (NCERT)]

Ans. On mixing the clear solution of two ionic compounds, a substance which is insoluble in water, is formed. This insoluble substance is known as a precipitate and the reaction in which precipitate is formed is called precipitation reaction.

Example : When sodium sulphate solution is mixed with barium chloride solution, a white precipitate of a substance ($BaSO_4$) is formed.

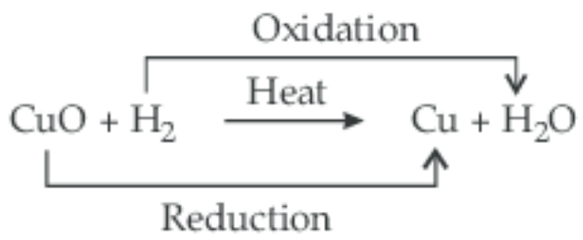
$$Na_2SO_4(aq) + BaCl_2(aq) \longrightarrow BaSO_4(\downarrow) + 2NaCl(aq)$$

[CBSE Marking Scheme, 2013] 1+1+1

R **Q. 3. What is Redox reaction ? Write down a chemical reaction representing it. [DDE 2017]**

Ans. The addition of oxygen to substance and the removal of hydrogen from a substance is called oxidation reaction. The addtion of hydrogen to substance or the removal of oxygen from a substance is called reduction reaction. So, when oxidation and reduction take place together it is called redox reaction.

Example :



2 + 1

R **Q. 4. Name the term used to indicate the development of unpleasant smell and taste in fat and oil containing food due to oxidation. What are anti-oxidants ? Why are they added to fat and oil containing food.**

[Board Term-I Set-1ZHNPNO, 2016]

Ans. Rancidity.

Anti-oxidant is a substance which prevents oxidation, actually reducing agents. When added to food, the fats and oils present in the food do not get oxidized easily, hence do not turn rancid and remain good to eat for longer time.

[CBSE Marking Scheme, 2016] 3

Detailed Answer : Rancidity.
Antioxidants are substances that inhibit oxidation, especially one used to counteract the deterioration of stored food products.
Antioxidants are added to the food materials containing fats and oils to prevent their oxidation. Oxidation of food materials containing fats and oils is known as rancidity because of which they become unfit for consumption and develop bad odour.

U **Q. 5. A solution of copper sulphate was kept in an iron pot. After few days, the iron pot was found to have a number of holes in it. Explain the reaction with the help of a chemical equation.**
[Board Term-I 2015]

Ans. Iron is more reactive than copper. Iron displaces copper from copper sulphate solution and forms iron sulphate, hence holes appear on the pot equation :

$Fe + CuSO_4(aq) \longrightarrow FeSO_4(aq) + Cu$

R **Q. 6. Give an example, each for thermal decomposition and photochemical decomposition reactions. Write balanced equation for the same.**
[KVS 2017]

Ans. Thermal Decomposition : Heating of lime stone

$CaCO_3 \longrightarrow CaO + CO_2$

Photochemical Decomposition : Action of light on silver bromide.

$2\,AgBr \longrightarrow 2\,Ag + Br_2$ 1½ + 1½

R **Q. 7. Some articles made of silver, copper and iron get coloured coating over them when they are exposed to air. Identify the colour and chemical name of the substance of coating in each case.**
[Board Term-I Set-2ZGOVVV, 2015]

Ans. (i) Silver : Colour — Black
Chemical name — Silver sulphide
(ii) Copper : Colour — Green
Chemical name — Copper oxide
(iii) Iron : Colour — Reddish Brown
Chemical name — Ferric oxide. 1+1+1

A **Q. 8. Write one equation each for decomposition reactions where energy is supplied in the form of heat, light and electricity.** **[NCT-2014]**

Ans. (i) $CaCO_3(s) \xrightarrow{Heat} CaO(s) + CO_2(g)$
(Calcium carbonate) (Calcium oxide) (Carbon dioxide)

(ii) $2AgCl(s) \xrightarrow{Sunlight} 2Ag(s) + Cl_2(g)$
(Silver chloride) (Silver) (Chlorine)

(iii) $2H_2O(l) \xrightarrow{Electric\ current} 2H_2(g) + O_2(g)$
(Water) (Hydrogen) (Oxygen)
1+1+1

A **Q. 9. Write balanced equation for the following reactions and also name the type of chemical reaction in each case :**
(i) Magnesium ribbon is burnt in air.
(ii) Lime stone is heated. **[Board Term-I 2015]**

Ans. (i) $2Mg + O_2 \longrightarrow 2MgO$

$MgO + H_2O \longrightarrow Mg(OH)_2$
Oxidation reaction/Combination reaction

(ii) $CaCO_3(s) \longrightarrow CaO(s) + CO_2(g)$
(Lime stone) (quick lime)
Decomposition reaction. 1½+1½

A **Q. 10. In the reaction**

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

(a) Name the oxidised substance
(b) Name the reduced substance
(c) Name the oxidizing agent. **[DDE 2017]**

Ans. (a) Hydrogen is oxidised to Water
(b) Copper oxide is reduced to Copper
(c) Copper oxide is the oxidising agent. 1 + 1 + 1

A **Q. 11. Select (i) combination reaction (ii) decomposition reaction and (iii) displacement reaction from the following chemical equations :**

(i) $ZnCO_3(s) \longrightarrow ZnO(s) + CO_2(g)$

(ii) $Pb(s) + CuCl_2(aq) \longrightarrow PbCl_2(aq) + Cu(s)$

(iii) $NaBr(aq) + AgNO_3(aq) \longrightarrow AgBr(s) + NaNO_3(aq)$

(iv) $H_2(g) + Cl_2(g) \longrightarrow 2HCl(g)$

(v) $Fe_2O_3(g) + 2Al \longrightarrow Al_2O_3 + 2Fe(s)$

(vi) $3H_2(g) + N_2(g) \longrightarrow 2NH_3(g)$
[Board Term-I Set-5X7289R, 2014]

Ans. (i) Decomposition reaction
(ii) Displacement reaction
(iii) Double displacement reaction
(iv) Combination reaction
(v) Displacement reaction
(vi) Combination reaction ½+½+½+½+½+½

A **Q. 12. State the kind of chemical reactions in the following examples :**
(i) Digestion of food in stomach
(ii) Combustion of coal in air
(iii) Heating of limestone.

Ans. (i) Decomposition reaction and Exothermic reaction

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

(ii) Combination reaction

$C + O_2 \longrightarrow CO_2$

(iii) Decomposition reaction

$CaCO_3(s) \xrightarrow{Heat} CaO(s) + CO_2(g)$ 1+1+1

U **Q. 13. Differentiate between a combination reaction and a decomposition reaction. Write one chemical equation each for these reactions.**
[Board Term-I Set-42, 2012]

Ans. The chemical reaction in which a single product is formed from two or more reactants and energy is evolved, is known as combination reaction.
Example : $2Mg + O_2 \xrightarrow{Burn} 2MgO$ 1½

When a single reactant on gaining energy decomposes to give two or more simpler products, such a reaction is called a decomposition reaction.

Example : $CaCO_3 \xrightarrow{\Delta} CaO + CO_2$ 1½

[CBSE Marking Scheme, 2012]

U **Q. 14. The following diagram displays a chemical reaction. Observe carefully and answer the following questions :**

(i) Identify the type of chemical reaction that will take place and define it.

How will the colour of the salt change ?

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

(iii) Mention one commercial use of this salt.

[Board Term-I Set-18, 2012]

Ans. (i) Photochemical decomposition : A single reactant breaks down to give simpler products. ½+½

White silver chloride changes to grey, as it decomposes to silver and chlorine in presence of sunlight. ½

(ii) $2AgCl(s) \xrightarrow{\text{Sunlight}} 2Ag(s) + Cl_2(g)$ ½

(iii) Black and white photography. **1**

[CBSE Marking Scheme, 2012]

R **Q. 15. When is a chemical reaction considered a double displacement reaction ? Explain giving example. State a difference between displacement and double displacement reaction. [NCERT 2017]**

[Board Term-I Set-41, 2016 (NCERT)]

Ans. A reaction is considered a double displacement reaction if during the chemical reaction an exchange of ions takes place between two ionic substances.

Example : $BaCl_2 + Na_2SO_4 \longrightarrow BaSO_4 + 2NaCl$

In a displacement reaction, a more reactive element displaces or removes another less reactive element. from its compound *e.g.* $Fe + CuSO_4 \longrightarrow FeSO_4 + Cu$ whereas in a double displacement reaction, the compounds react by exchanging their ions and form two new compounds. 1½+1½

[CBSE Marking Scheme, 2012]

U **Q. 16. Name two metals which do not corrode easily. Give an example in each of the following case to support that :**

(i) Corrosion of some metals is an advantage.

(ii) Corrosion of a metal is a serious problem.

[Board Term-I Set-OQRPLGV, 2016]

Ans. Gold and platinum.

(i) Corrosion of aluminium is useful. A protective layer of aluminium oxide is formed on the surface of the metal which renders the metal passive and prevents is further corrosion.

(ii) Corrosion of iron is a serious problem. Every year large amount of money is spent to replace damaged iron and steel structures. Here, corrosion is a serious problem. **3**

[CBSE Marking Scheme, 2016]

U **Q. 17. In the electrolysis of water :**

(i) Name the gas collected at the cathode and anode respectively. [SQP 2018]

(ii) Why is the volume of one gas collected at one electrode is double than that at the other ? Name this gas. [DDE, 2017]

(iii) How will you test the evolved gases ?

[Board Term-I Set-37, 2012]

Ans. (i) At Cathode : hydrogen gas (H_2) ½

At Anode : oxygen gas (O_2) ½

(ii) Since $2H_2O \xrightarrow{\text{Electric current}} 2H_2 + O_2$

2 molecules of H_2 combine with 1 mol of O_2 to form H_2O, so the volume of H_2, liberated is double that of O_2. **1**

(iii) When a burning splinter is brought near the mouth of the liberated gases, the burning splinter extinguishes near the H_2 gas while the burning splinter keeps burning more near the O_2 gas. **1**

[CBSE Marking Scheme, 2012]

U **Q. 18. A small amount of calcium oxide is taken in a beaker and water is added slowly to it.**

(i) Will there be any change in temperature of the contents ? Explain.

(ii) Name and define the type of reaction taking place.

(iii) Write chemical equation for the above reaction.

[Board Term-I Set-39, 2012]

Ans. (i) Yes, temperature rises as the beaker gets hot. This is because large amount of heat is released or the reaction is exothermic. **1**

(ii) Combination reaction. Reaction in which a single product is obtained from two or more reactants. **1**

(iii) $CaO + H_2O \longrightarrow Ca(OH)_2 + \text{heat}$ **1**

(Quicklime) (Slaked lime)

[CBSE Marking Scheme, 2012]

U **Q. 19. 2 g of lead nitrate powder is taken in a boiling tube. The boiling tube is heated over a flame. Now answer the following :**

(i) State the colour of the fumes evolved and the residue left.

(ii) Name the type of chemical reaction that has taken place, stating its balanced equation.

[Board Term-I Set-41, 2012]

Ans. (i) Brown fumes, white residue. **1**

(ii) Decomposition reaction **1**

$2Pb(NO_3)_2 \longrightarrow 2PbO + 4NO_2 + O_2$ **1**

[CBSE Marking Scheme, 2012]

A **Q. 20. In the following chemical reaction "zinc oxide reacts with carbon to produce zinc metal and carbon monoxide."**

$$ZnO + C \longrightarrow Zn + CO$$

(i) Identify the substance getting oxidised and the one getting reduced.

(ii) State the reason for choosing the substances in (i).

(iii) Name the type of reaction and give another example of similar type of reaction.

[Board Term-I Set-46, 2012]

Ans. (i) C is getting oxidized to CO, ZnO is getting reduced to Zn. ½+½

(ii) As carbon is gaining oxygen and ZnO is losing oxygen. 1

(iii) It is a redox reaction or oxidation and reduction reaction.

$CuO + H_2 \longrightarrow Cu + H_2O$ 1

[CBSE Marking Scheme, 2012]

A **Q. 21. Name the salts that are used in black and white photography. Give reactions when they are exposed to light. Define the type of chemical reaction taking place.**

[Board Term-I Set-39, 2012]

Ans. Silver chloride (AgCl) and Silver bromide (AgBr) ½+½

$2AgCl \xrightarrow{\text{Sunlight}} 2Ag + Cl_2$ ½

$2AgBr \xrightarrow{\text{Sunlight}} 2Ag + Br_2$ ½

Those reactions in which energy is absorbed (in form of heat, light or electricity) to break down the reactants is called decomposition reaction. 1

[CBSE Marking Scheme, 2012]

U **Q. 22. When food containing fat or oil is not used and left for a long time, their smell and taste changes. Name the process which is responsible for this change. List two methods to prevent or slow down the above change.**

[Board Term-I Set-43, 2012]

Ans. When food containing fat or oil is not used and left over for a long time, their smell and taste changes because fats and oils are getting slowly oxidized. This process is called rancidity. 1

Two methods which are used to slow down the oxidation process are :

(i) keeping food in airtight container. 1

(ii) flushing the bags containing food with nitrogen gas. **[CBSE Marking Scheme, 2012]** 1

R **Q. 23. "Combination reaction is the reverse of decomposition reaction." Justify this statement with the help of appropriate chemical equation of each.** **[Board Term-I Set-45, 2012]**

Ans. Combination reaction : Single product is formed from two or more reactants.

$CaO + H_2O \longrightarrow Ca(OH)_2$ 1½

Decomposition reaction : A single reactant breaks down to give simpler products.

$CaCO_3 \xrightarrow{\Delta} CaO + CO_2$ 1½

[CBSE Marking Scheme, 2012]

A **Q. 24. (i) Give an example for a combination reaction which is exothermic.**

(ii) Identify the oxidising agent, reducing agent in the following reaction :

$$H_2S + Cl_2 \longrightarrow 2HCl + S$$

(iii) Name the phenomenon due to which the taste and smell of oily food changes when kept for a long time in open. Suggest one method to prevent it.

[Board Term-I Set (15), 2012]

Ans. (i) Any suitable exothermic reaction like

$CaO + H_2O \longrightarrow Ca(OH)_2 + heat$ 1

(ii) Oxidising agent—Cl_2 ½

Reducing agent—H_2S ½

(iii) Rancidity, keep food in airtight containers. ½+½

[CBSE Marking Scheme, 2012]

A **Q. 25. Write balanced chemical equation for the reactions that take place during respiration. Identify the type of combination reaction that takes place during this process and justify the name. Give one more example of this type of reaction.**

[Board Term-I Set-31] 2012

Ans. $C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O + Energy$ 1

It is exothermic reaction because a large amount of heat is released. 1

Example : Decomposition of vegetable matter into compost. **[CBSE Marking Scheme, 2012]** 1

Long Answer Type Questions

(5 marks each)

R **Q. 1. (i) Define corrosion.**

(ii) What is corrosion of iron called ?

(iii) How will you recognise the corrosion of silver ?

(iv) Why corrosion of iron is a serious problem ?

(v) How can we prevent corrosion of iron ?

[Board Term-I Set-NS9SX1D, 2016]

[NCERT 2017]

OR

(i) Define corrosion, what name is given to the corrosion of iron ?

(ii) Name the colour of coating formed on silver and copper articles, when exposed to air ?

(iii) List two damages caused by corrosion and suggest how corrosion can be prevented.

[Board Term-I 2016, Set-L7ZSVLH]

Ans. (i) Correct definition.

(ii) rusting.

(iii) Silver - black, copper - green.

(iv) Destruction of Car bodies, bridges, railing, etc **(Any two)**

(v) Painting, alloying, greasing etc **(Any two)**

[CBSE Marking Scheme, 2016] 5

Detailed Answer :

(i) Corrosion is a process in which metals, are deteriorated by action of air, moisture, chemicals etc.

(iii) Corrosion of iron is called Rusting.

(iii) Silver turns black as it reacts with H_2S present in air and form a layer of Ag_2S.

(iv) Corrosion of iron is a serious problem because it leads to wastage of tonnes of iron every year and lot of money is spent to repair or replace it.

(v) The iron articles should be painted.

1 + 1 + 1 + 1 + 1

R **Q. 2. (a) Explain the term "rancidity."**
Name the type of chemical reaction responsible for causing rancidity and define it.

(b) Write three methods for preventing rancidity of food. **[DDE-2014] [NCERT 2017]**

Ans. (a) When fats and oils are oxidised, the food becomes rancid *i.e.,* their smell and taste changes.
The type of chemical reaction is oxidation.
Definition : Rancidity is the process of slow oxidation of oil and fat present in the food materials resulting in the production of foul odour and taste in them.

(b) Methods to prevent Rancidity :

(i) Refrigeration of cooked food at low temperatures.

(ii) Packing of food materials in air tight containers.

(iii) By adding antioxidants *e.g.,* BHA (Butylated hydroxyanisole) **1+1+3**

U **Q. 3. (a) Most of the metals acquire a dull surface when exposed to air. Name the chemical phenomenon responsible for this process.**

(b) State the conditions under which the iron articles get rusted. Design an activity to investigate the conditions necessary for rusting. Suggest any two methods to prevent rusting of iron.
[Board Term-I Set-3R6WRQL, 2013]

Ans. (a) Corrosion. ½

(b) Conditions are – air and moisture. ½+½

Activity : Take three test-tubes. Place clean iron nails in each test-tube.

(i) Pour some water in test-tube 1, cork it.

(ii) Pour water (boiled/distilled) in test-tube 2, add some oil and cork it.

(iii) Put some anhydrous calcium chloride in test-tube 3 and cork it.

(iv) After 2-3 days, we observe that the nails in test-tube 1 get rusted because they are exposed to air and water both, while nail in test-tube 2 and 3 do not get rusted. This shows rusting of iron takes place in the presence of air and moisture, both. 2½

Methods to prevent rusting : Alloying, galvanization, painting, lubrication **(Any two).** ½+½

A **Q. 4. (a) Write one equation each for decomposition reaction when energy is supplied in the form of :**
(i) heat, (ii) light.

(b) Account for the following : **[NCERT 2017]**

(i) Paint is applied on iron articles.

(ii) Oil and fat containing food items are flushed with nitrogen.

(iii) When an iron nails kept in copper sulphate solution, blue colour of the solution fades and iron nails becomes brownish.
[Board Term-I Set (C1), 2010]

Ans. (a) (i) $CaCO_3(s) \xrightarrow{\Delta} CaO(s) + CO_2(g)$ **1**

(ii) $2AgBr \xrightarrow{\text{Sunlight}} 2Ag + Br_2$ **1**

(b) (i) To protect the iron articles from corrosion. When iron articles are exposed to moist air, corrosion takes place. When the surface is covered by paint, it is not exposed to moist air. **1**

(ii) To flush out any air or oxygen present in the packet. In the absence of oxygen, food items will not get rancid. **1**

(iii) Since iron is more reactive than copper, it displaces copper from copper sulphate solution and the blue colour of solution fades. Due to the deposition of copper on iron nail, iron nail become brownish. **1**

A **Q. 5. (i) Account for the following :**

(a) White silver chloride turns grey in sunlight.

(b) Brown coloured copper powder on heating in air turns into black coloured substance.

(ii) What do you mean by : **[DDE 2017]**

(a) Displacement reaction

(b) Reduction reaction

(c) Combination reaction ?

Write balanced chemical equation.
[Board Term-I Set (C2), 2010]

Ans. (i) (a) Due to the decomposition of silver chloride into silver and chlorine by sunlight

$2AgCl \xrightarrow{\text{Sunlight}} 2Ag + Cl_2$ **1**

(b) Due to the oxidation of copper powder to copper oxide, brown colour turns into black **1**

$2Cu(s) + O_2(g) \longrightarrow 2CuO(s)$

(ii) (a) A chemical reaction in which the more reactive element displaces the less reactive element from its compound is called displacement reaction.

$CuSO_4(aq) + Zn(s) \longrightarrow ZnSO_4(aq) + Cu(s)$ **1**

(b) A chemical reaction in which hydrogen is added or oxygen is removed is called reduction reaction.

$ZnO + C \longrightarrow Zn + CO$ **1**

(c) Combination reaction is a reaction in which two or more than two substances combine and form a single substance.

$CaO + H_2O \longrightarrow Ca(OH)_2 + \text{Heat}$ **1**

[CBSE Marking Scheme, 2012]

U **Q. 6. (i) Solid calcium oxide was taken in a container and water was added slowly to it :**

(a) Write the observation,

(b) Write the chemical formula of the product formed.

(ii) What happens when carbon dioxide gas is bubbled through lime water :

(a) In small amount,

(b) In excess ?

(iii) Why do you apply paint on iron articles ?

[Board Term-I Set (C2), 2010]

Ans. (i) (a) Calcium oxide reacts vigorously with water and releases a large amount of heat. **1**

(b) Calcium hydroxide (Slaked lime) *i.e.*, $Ca(OH)_2$ is formed. **1**

(ii) (a) In small amount, solution becomes milky due to the formation of calcium carbonate.

Or

$Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$. **1**

(b) In excess

Milkiness disappears because calcium carbonate changes to calcium hydrogen carbonate which is colourless in nature.

$CaCO_3 + H_2O + CO_2 \longrightarrow Ca(HCO_3)_2$

Colourless **1**

(iii) Paint forms a protective coating on the surface of iron. So that oxygen and moisture present in the air cannot have a direct contact with iron. **1**

[CBSE Marking Scheme, 2010]

U **Q. 7. (i) What happens chemically when quick lime is added to water ?**

(ii) Balance the following chemical equation

$MnO_2 + HCl \longrightarrow MnCl_2 + Cl_2 + H_2O$

(iii) What is decomposition reaction ? Explain it with suitable example. [Board Term-I Set (C1), 2010]

[NCERT 2017]

Ans. (i) Quick lime reacts with water vigorously to produce slaked lime releasing a large amount of heat. **1**

$CaO(s) + H_2O(l) \longrightarrow Ca(OH)_2(aq)$ **1**

(Quick lime) (Slaked lime)

(ii) $MnO_2 + 4HCl \longrightarrow MnCl_2 + 2H_2O + Cl_2$ **1**

(iii) A simple reactant breaks down to give simpler products and the process is known as decomposition reaction. **1**

Example : $CaCO_3(s) \xrightarrow{Heat} CaO(s) + CO_2(g)$

(Quick lime) **1**

[CBSE Marking Scheme, 2010]

High Order Thinking Skills (HOTS) Questions

Q. 1. Why do fire flies glow at night ? **3**

[NCERT Exemplar]

Ans. Fire flies have a special kind of substances *i.e.*, luciferin that undergoes oxidation (in the presence of air) in the presence of an enzyme. This reaction is accompanied by the emission of light. Therefore, fire flies glow at night. **3**

Q. 2. Grapes hanging on the plant do not ferment but after being plucked from the plant can be fermented. Under what conditions do these grapes ferment ? Is it a chemical change ? **3**

[NCERT Exemplar]

Ans. Grapes when attached to the plants are living and therefore their own immune system presents fermentation. The microbes can grow in the plucked grapes and under anaerobic conditions, these can be fermented. **3**

Q. 3. A metal '*x*' available in the form of ribbons burn in air with a dazzling white light, once heated to its ignition temperature. It leaves a white powder '*y*' which dissolves in water. The solution so formed turns red litmus blue. Identify '*x*' and '*y*' and write the balanced chemical equation of the reaction. **3**

Ans. Magnesium ribbon burns with dazzling white light, once heated to its ignition temperature. The white powder formed is Magnesium oxide which dissolves in water to give a basic solution which turns red litmus blue. Thus '*x*' is Mg and '*y*' is MgO.

$2Mg + O_2 \longrightarrow 2MgO$

$MgO + H_2O \longrightarrow Mg(OH)_2$ **3**

Q. 4. Identify the type of chemical reaction and also write the chemical equation for the reaction that takes place when a solution of potassium chloride is mixed with silver nitrate solation. Write the chemical name of one of the products obtained. **3**

Ans. $AgNO_3(aq) + KCl(aq) \longrightarrow AgCl(s) + KNO_3(aq)$ **1½**

It is a double displacement reaction.

Silver chloride / Potassium nitrate. **1½**

Q. 5. A solution of substance 'X' is used for white washing :

(i) Name the substance 'X' and write its formula.

(ii) Express the reaction of 'X' with water in the form of a balanced chemical equation. **3**

Ans. (i) X ⟶ Quick lime, formula — CaO

(ii) $CaO + H_2O \longrightarrow Ca(OH)_2$ **1½ + 1½**

Q. 6. A compound 'X' is a constituent of baking powder. It is used as an antacid. When 'X' is heated it gives out a gas 'Y' which when passed through lime water turns it milky and a salt 'Z' is formed which is the main constituent of washing power. Identify X, Y and Z. Write balanced chemical equations for the reactions involved. **[DDE-2015]**

Ans. Baking powder ($NaHCO_3$) salt X is commonly used in bakery products. On heating, it forms sodium carbonate (Na_2CO_3), Y and CO_2 gas, Z is evolved. When CO_2 gas, Z is passed through lime water, it

forms calcium carbonate ($CaCO_3$), which is slightly soluble in water making it milky. **1 ½**

X - $NaHCO_3$; Y - Na_2CO_3 ; Z - CO_2 ½

$2\,NaHCO_3 \xrightarrow{Heat} Na_2CO_3 + H_2O + CO_2$ ½

$Na_2CO_3 \cdot 10H_2O \xrightarrow{Heat} Na_2CO_3 + 10H_2O$ ½

Q. 7. (i) A solution of a substance 'X' is used for testing carbon dioxide. Write the equation of the reaction of 'X' with carbon dioxide.

(ii) How is X obtained ? Write chemical equation.

Ans. (i) Substance X is lime water.

$Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$

(Lime water) (Carbon dioxide) (Calcium carbonate) (Water)

(ii) Calcium oxide reacts vigorously with water to produce slaked lime (calcium hydroxide) releasing a large amount of heat.

$CaO(s) + H_2O(l) \longrightarrow Ca(OH)_2(aq)$

(Quick lime) (slaked lime) **1½ + 1½**

Q. 8. Give reasons for the following :

(i) All decomposition reactions are endothermic reactions.

(ii) Colour of copper sulphate solution changes when an iron nail is dipped in it.

(iii) Respiration is an exothermic reaction. 3

Ans. (i) Decomposition reactions require energy either in the form of heat, light or electricity for breaking down the reactants. So energy is absorbed and are endothermic in nature.

(ii) Iron has displaced copper from copper sulphate solution to form iron sulphate which is light green in colour because Fe is more reactive than copper.

(iii) During digestion, food containing carbohydrates are broken down to form glucose. This glucose combines with oxygen in the cells of our body and provides energy. Since energy is given, so it is exothermic. **1 × 3 = 3**

[CBSE Marking Scheme, 2012]

Q. 9. A brown substance 'X' on heating in air forms a substance 'Y'. When hydrogen gas is passed over heated 'Y', it again changes back into X.

(i) Name the substances 'X' and 'Y'

(ii) Name the chemical process occurring during both the changes.

(iii) Write the chemical equations involved in both the changes. [Board Term-I Set (40), 2012] 3

Ans. (i) 'X' is Copper (Cu), 'Y' is Copper oxide (CuO) **1**

(ii) Oxidation and Reduction ½ + ½

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

$CuO + H_2 \xrightarrow{Heat} Cu + H_2O$ ½ + ½

[CBSE Marking Scheme, 2012]

Value Based Questions

Q. 1. Asmita visited her grandmother during summer holidays. Her grandmother prepared chips for her and stored it in airtight containers.

(a) What value is shown by her grandmother ?

(b) Why did Asmita's grandmother store the snack in airtight container ? [KVS 2017]

Ans. (a) Grandmother shows scientific temperament and concern for health.

(b) Asmita's grandmother store the snack in airtight container to prevent the food items from getting rancid. **1 + 1**

Q. 2. Spoilage is the process in which food deteriorates to the point in which it is not edible to humans or its quality of edibility becomes reduced

(i) Why does the food get spoiled ?

(ii) How the spoilage of food can be prevented ?

(iii) How chips are prevented from getting spoiled in packets for so many days? 3

Ans. (i) When fats and oils are oxidised, they become rancid and their smell and taste changes. **1**

(ii) To prevent spoilage of food, special types of substances called antioxidants are added to fatty foods. **1**

(iii) Chips are packed in packets flushed with nitrogen to prevent spoilage by oxidation. **1**

Q. 3. Atul and Shivam are best friends and study in the same school, grade 5. One day, in the recess, they had taken their lunch together. After the lunch, Shivam felt uncomfortable and had a stomachache. Atul, on observation found that Shivam had eaten spicy junk food in his lunch instead of eating nutritious food. He took Shivam to the infirmary where a teacher gave him a spoon of antacid syrup. Now Shivam felt better and gave thanks to Atul.

(i) What problem was Shivam suffering from ?

(ii) What happened when Shivam took antacid ? Name the type of reaction.

(iii) What values were shown by Atul and Shivam ? 3

Ans. (i) Shivam had spicy food, so he was suffering from acidity. **1**

(ii) Antacids are alkaline in nature, so when Shivam took a spoon of **antacid** it neutralized the acid. The type of reaction is Neutralisation reaction. **1**

(iii) Friendship, concern for each other, value and balanced diet. **1**

Q. 4. Reema is fond of cheese. She took stale vegetable from the refrigerator and started eating it. She observed the taste and smell of spoiled staled vegetable. She asked her mother to taste the vegetable. Her mother tasted it and asked her not to eat. Reema asked her mother some questions :

(i) Why does the food get spoiled ?
(ii) How the spoilage of food can be prevented ?
(iii) How chips are packed in packets for so many days? 3

Ans. (i) When fats and oils are oxidised, they become rancid and their smell and taste changes. **1**

(ii) To prevent spoilage of food, special types of substances called antioxidants are added to fatty foods. **1**

(iii) Chips are packed in packets flushed with nitrogen to prevent spoilage by oxidation. **1**

Practical Based Questions

Experiment 1 : To perform and observe the following reactions and classifying them into :
(a) Combination reaction
(b) Decomposition reaction
(c) Displacement reaction
(d) Double displacement reaction
(i) Action of water on quick lime
(ii) Action of heat on ferrous sulphate crystals
(iii) Iron nails kept in copper sulphate solution
(iv) Reaction between sodium sulphate and barium chloride solutions

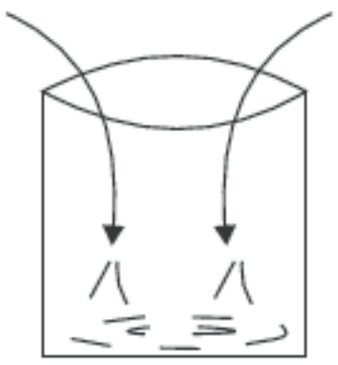
Q. 1. You want to study a decomposition reaction by taking ferrous sulphate crystals in a boiling tube. List two precautions you would follow while doing the experiment.

[Board Term-I Set-WDCXXOV, 2016]

Ans. (i) Take a dry boiling tube.
(ii) Keep mouth of test-tube away from yourself. **1 + 1**

[CBSE Marking Scheme, 2016]

Q. 2. While studying a type of reactions, Neena mixed the substances as shown below :



(i) Has Neena observed the occurrence of reaction ? If not why ?

(ii) What kind of reaction she wanted to study ?

[Board Term-I Set-L7ZSVLH, 2016]

Ans. (i) No, the substances should be taken in solution form.
(ii) Double displacement reaction. **1 + 1**

[CBSE Marking Scheme, 2016]

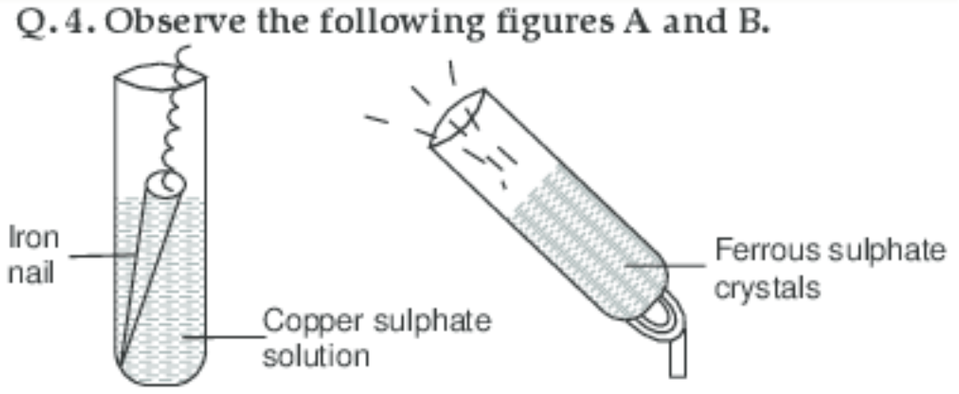
Q. 3. On keeping iron nails in blue coloured copper sulphate solution, it is observed that the colour of the solution turns light green after some time. Give reason for this colour change. Name the type of this reaction.

[Board Term-I Set-OQKPLGV, 2016]

Ans. (i) Copper is displaced by iron.
(ii) It is a displacement reaction. **1 + 1**

[CBSE Marking Scheme, 2016]

Q. 4. Observe the following figures A and B.



State the change in substances taken is test-tubes A and B. Mention the type of reaction in each case.

[Board Term-I Set-1ZHNPNO, 2016]

Ans. In A, green colour of solution fades away and brown red deposition on iron nail occurs- displacement reaction.
In B, a reddish brown substance is left in the test-tube-decomposition reaction. **1 + 1**

[CBSE Marking Scheme, 2016]

Q. 5. While performing an experiment a student observes that when he heats some green crystals in a boiling tube, the colour of the crystals changes to brown and a gas evolves which smells like burning sulphur. Interpret the observations and results.

[Board Term-I Set-NS9SX1D, 2016]

Ans. Observation : The green colour of ferrous sulphate crystals changes to brownish black ferric oxide and smell of burning sulphur is observed.
Result : Heating of ferrous sulphate is a thermal decomposition reaction because ferrous sulphate breaks down into simpler compounds—Fe_2O_3, SO_2 and SO_3.

$$2FeSO_4(s) \xrightarrow{Heat} Fe_2O_3(s) + SO_{2(g)} + SO_{3(g)}$$

1 + 1

Q. 6. Fill up the gaps left in the following table :

Experiment	Observation	Inference in the type of reaction
(i) Quick lime + water		
(ii) Ferrous sulphate + Heat crystals		

Ans. (i) Evolution of steamy vapours/container becomes warm, combination reaction.

(ii) Evolution of gases (colourless)/smell like burning sulphur/brown residue left in container, Decomposition reaction. **1+1**

Q. 7. What is the theory behind the precipitation reaction between aqueous solution of barium chloride with aqueous solution of sodium sulphate ?

Ans. When a solution of sodium sulphate is mixed with a solution of barium chloride, the following double displacement reaction takes place :

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

In this reaction, sulphate ions from sodium sulphate are displaced by chloride ions (Cl^-) and chloride ions in barium chloride are displaced by sulphate ions. As a result, a white precipitate of barium sulphate is formed and sodium chloride remains in the solution. **1+1**

Q. 8. What happens when barium chloride solution and sodium sulphate solution are mixed together? Write the chemical equation.

Ans. An insoluble salt is formed, which is barium sulphate and white in colour.

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

(White ppt.)

Q. 9. Solutions of ferrous sulphate, zinc sulphate, copper sulphate and aluminium sulphate were separately taken in four test-tubes and some iron nails were placed in each of the solutions. What will you observe after few seconds?

Ans. Iron will react only with $CuSO_4$ solution as Fe is more reactive than Cu.

Q. 10. A student added aluminium pieces in ferrous sulphate solution taken in a test-tube. Write down the colour change she observed in the solution?

Ans. Solution becomes pale green to colourless.

Q. 11. Sarthak took two test-tubes A and B containing pale green and blue solutions respectively. Write down the name of the respective solutions taken in test tube A and B?

Ans. Solution taken in A is $FeSO_4$ and B is $CuSO_4$.

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