SCERT FOLDER

text Questions

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

 Pg 6
- Magnesium ribbon reacts with oxygen present in air to form a protective and inert layer of magnesium oxide on its surface. This layer is unreactive and prevents the ribbon from burning. Hence, it needs to be cleaned with sand paper before burning in air.
 - Write the balanced equation for the following chemical reactions:

 Pg 6

 - (ii) Barium chloride + Aluminium sulphate
 - (iii) Sodium + Water
 - → Sodium hydroxide + Hydrogen
- Sol. (i) $H_2 + Cl_2 \longrightarrow 2HCl$
 - (ii) $3BaCl_2 + Al_2(SO_4)_3 \longrightarrow 3BaSO_4 + 2AlCl_3$
 - (iii) $2Na + 2H_2O \longrightarrow 2NaOH + H_2$
- Write a balanced chemical equation with state symbols for the following reactions: Pg 6
 - (i) Solutions of barium chloride and sodium sulphate in water react to give insoluble barium sulphate and the solution of sodium chloride.
 - (ii) Sodium hydroxide solution (in water) reacts with hydrochloric acid solution (in water) to produce sodium chloride solution and water.
- iol. (i) $BaCl_2(aq) + Na_2SO_4(aq)$

$$\longrightarrow$$
 BaSO₄(s) \downarrow + 2NaCl (aq)

- (ii) NaOH (aq) + HCl (aq) \longrightarrow NaCl (aq) + H₂O (1)
- A solution of a substance 'X' is used for white washing.
 - (i) Name the substance 'X' and write its formula.
- (ii) Write the reaction of the substance 'X' named in (i) above with water.Pg 10
- (i) Substance X is calcium oxide or quicklime.

 Its formula is CaO
 - (ii) Quicklime reacts with water as:

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

X
Water
Slaked lime
(Calcium hydroxide)

- Why is the amount of gas collected in one of the test tubes in activity 1.7 (electrolysis of water) double of the amount collected in the other?

 Name this gas.

 Pg 10
- Sol. The composition of water, i.e. the chemical formula H_2O , suggests that the molar ratio of hydrogen and oxygen is 2:1. Therefore, when water is electrically decomposed, the constituent gases hydrogen and oxygen are produced in the same molar ratio, 2:1. Thus, the amount (volume) of hydrogen gas is double than that of oxygen gas. So, this gas is hydrogen.
 - 6 Why does the colour of copper sulphate solution change when an iron nail is dipped in it?

 Pg 13
- Sol. The colour of copper sulphate solution changes when an iron nail is dipped in it because iron being more reactive than copper, displaces copper metal from aqueous copper sulphate solution. Thus, blue colour of copper sulphate fades away to give green colour solution of ferrous sulphate.

Fe (s) + CuSO₄(aq)
$$\longrightarrow$$
 FeSO₄(aq) + Cu (s)
Green Brown

- 7 Give an example of a double displacement reaction other than the reaction of barium chloride with sodium sulphate.
 Pg 13
- Sol. The following reaction is an example of a double displacement reaction:

2NaOH
$$(aq)$$
 + $H_2SO_4(aq)$
Sodium Sulphuric acid hydroxide \longrightarrow Na₂SO₄ (aq) +2H₂O (l) Sodium sulphate Water

- ldentify the substances that are oxidised and the substances that are reduced in the following reactions.

 Pg 13
 - (i) $4\text{Na}(s) + O_2(g) \longrightarrow 2\text{Na}_2O(s)$
 - (ii) CuO (s) + $H_2(g)$ Cu (s) + $H_2O(l)$
- Sol. (i) $4\text{Na}(s) + O_2(g) \longrightarrow 2\text{Na}_2O(s)$ Na has gained oxygen and forms Na_2O .
 - So, Na is oxidised and O_2 is reduced

 (ii) $CuO(s) + H_2(g) \longrightarrow Cu(s) + H_2O(l)$ CuO has lost oxygen and forms Cu.
 - So, Cu is reduced while H₂ has gained oxygen, hence, it is oxidised.

ercises

Pages 14, 15 and 16)

1 Which of the statements about the reaction below are incorrect?

$$2PbO(s) + C(s) \longrightarrow 2Pb(s) + CO_2(g)$$

- (i) Lead is getting reduced
- (ii) Carbon dioxide is getting oxidised
- (iii) Carbon is getting oxidised
- (iv) Lead oxide is getting reduced
- Sol. The given reaction can be written in the form of two separate reactions:

$$\begin{array}{c}
\text{2PbO } (s) \xrightarrow{\text{Reduction}} & \text{2Pb } (s) \\
\text{Loss of oxygen} \\
\text{and} & C(s) \xrightarrow{\text{Oxidation}} & CO_2(g) \\
& \text{Gain of oxygen}
\end{array}$$

Therefore, (i) and (ii) are incorrect, while (iii) and (iv) are correct statements.

2 $Fe_2O_3 + 2AI \longrightarrow AI_2O_3 + 2Fe$

The above reaction is an example of a

- (i) combination reaction
- (ii) double displacement reaction
- (iii) decomposition reaction
- (iv) displacement reaction
- Sol. (iv) In the above reaction, Al is more reactive than Fe. So, it displaces Fe from Fe₂O₃ to form Al₂O₃. Hence, it is a displacement reaction.
 - 3 What happens when dilute hydrochloric acid is added to iron filings? Tick the correct answer.
 - (i) Hydrogen gas and iron chloride are produced
 - (ii) Chlorine gas and iron hydroxide are produced
 - (iii) No reaction takes place
 - (iv) Iron salt and water are produced
- Sol. (i) Iron being more reactive than hydrogen, displaces hydrogen from the dilute hydrochloric acid. Thus, hydrogen gas and iron chloride a salt of iron are formed.

$$Fe(s) + 2HCl(aq) \longrightarrow FeCl_2(aq) + H_2(g)$$

- 4 What is a balanced chemical equation? Why should chemical equations be balanced?
- Sol. A chemical change is represented by a chemical equation. When the number of atoms of different elements on reactant and product side are equal, then the chemical equation is called a balanced chemical equation.

It is important to balance a chemical equation because

(i) to validate the law of conservation of mass which states that the mass of reactants should be equal to the mass of the products. The total mass of a system is thus conserved.

This law holds true only if number of atoms of reactants reacting together is equal to number of product atoms formed.

- (ii) a balanced chemical equation tells us about the physical state of the reactants and products whether they are solid (s), liquid (l) or gas (g) or aqueous (aq).
- (iii) it tells us about heat changes that can take place in a chemical reaction. Δ is the symbol of heat. Hence, it is endothermic or exothermic can be deduced from a balanced chemical equations.
- 5 Translate the following statements into chemical equations and then balance them:
 - (i) Hydrogen gas combines with nitrogen to form ammonia.
 - (ii) Hydrogen sulphide gas burns in air to give water and sulphur dioxide.
 - (iii) Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate.
 - (iv) Potassium metal reacts with water to give potassium hydroxide and hydrogen gas.

Sol. (i)
$$3H_2(g) + N_2(g) \longrightarrow 2NH_3(g)$$

(ii)
$$2H_2S(g) + 3O_2(g)$$

 $\longrightarrow 2H_2O(l) + 2SO_2(g)$

(iii)
$$3\text{BaCl}_2(aq) + \text{Al}_2(SO_4)_3(aq)$$

 $\longrightarrow 2\text{AlCl}_3(aq) + 3\text{BaSO}_4(s) \downarrow$

(iv)
$$2K(s) + 2H_2O(l) \longrightarrow 2KOH(aq) + H_2(g)$$

6 Balance the following chemical equations:

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

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

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

Sol. (i) $2HNO_3 + Ca(OH)_2 \longrightarrow Ca(NO_3)_2 + 2H_2O$

Nitric Calcium Calcium Water acid hydroxide
$$ii$$
 Nitrate ii Nitrate ii Nitrate ii Na₂SO₄ + 2H₂O

- 7 Write the balanced chemical equations for the following reactions:
 - (i) Calcium hydroxide + Carbon dioxide

- (ii) Zinc + Silver nitrate
 - ----- Zinc nitrate + Silver
- (iii) Aluminium + Copper chloride
- (iv) Barium chloride + Potassium sulphate
 - Barium sulphate + Potassium chloride

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

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

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

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

- Write the balanced chemical equation for the following and identify the type of reaction in each case:
 - (i) Potassium bromide (aq) + Barium iodide (aq)
 - - + Barium bromide (s)
 - (ii) Zinc carbonate (s)

$$\longrightarrow$$
 Zinc oxide (s) + Carbon dioxide (g)

- (iii) Hydrogen (g) + Chlorine (g)
- (iv) Magnesium (s) + Hydrochloric acid (aq)

Sol. (i)
$$2KBr(aq) + BaI_2(aq)$$

$$\longrightarrow$$
 2KI (aq) + BaBr₂ (s)

Type: Double displacement reaction

(ii)
$$ZnCO_3(s) \xrightarrow{\Delta} ZnO(s) + CO_2(g)$$

Type: Thermal decomposition reaction

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

Type: Combination reaction

(iv)
$$Mg(s) + 2HCl(aq)$$

$$\longrightarrow$$
 MgCl₂ $(aq) + H2 $(g)$$

Type: Displacement reaction

- What does one mean by exothermic and endothermic reactions? Give examples.
- Sol. Exothermic reactions These reactions proceed with the evolution (or release) of heat or energy,

(i)
$$H_2SO_4(aq) \xrightarrow{Water} 2H^+(aq) + SO_4^{2-}(aq) + Heat$$

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

Methane Oxygen Carbon Water dioxide + Heat

(iii)
$$C_6H_{12}O_6(aq) + 6O_2(g)$$

Glucose Oxygen

$$\longrightarrow$$
 6CO₂(g) + 6H₂O(l) + Energy
Carbon Water
dioxide

Endothermic reactions These reactions involve the absorption of heat or energy, e.g.

(i)
$$2\text{HgO}(s) + \text{Heat} \longrightarrow 2\text{Hg}(l) + O_2(g)$$

Mercuric oxide Mercury Oxygen

(ii) NH₄Cl (aq) + Heat
$$\Longrightarrow$$
 NH₄⁺(aq) + Cl⁻(aq)

(iii)
$$N_2(g) + O_2(g) + Heat \longrightarrow 2NO(g)$$

- 10 Why is respiration considered an exothermic reaction? Explain.
- Sol. The food taken by the living beings is ultimately broken down to glucose by the digestive system. The glucose so formed is slowly oxidised to carbon dioxide and water with the release of heat energy. Thus, respiration is an exothermic reaction.

$$C_6H_{12}O_6(aq)+6O_2(g) \longrightarrow 6CO_2(g)$$

 $(Glucose)$ +6H₂O(l) + energy

- 11 Why are decomposition reactions called the opposite of combination reactions? Write equations for these reactions. **CBSE 2010**
- Sol. In a decomposition reaction, single reactant breaks down to produce two or more products, whereas in a combination reaction, two or more reactants combine to give a single product. Thus, these reactions are supposed to be opposite of each other, e.g.

(i)
$$2H_2 + O_2 \xrightarrow{\text{(Combination)}} 2H_2O$$

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

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

$$Ca(HCO_3)_2 \xrightarrow{\Delta}$$
(Decomposition)

$$CaCO_3 + H_2O + CO_2$$

12 Write one equation each for decomposition reactions where energy is supplied in the form of heat, light or electricity.

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

(ii) Light
$$2AgCl(s) \xrightarrow{Light} 2Ag(s) + Cl_2(g)$$

(iii) Electricity

$$2H_2O$$
 (l) Electric current $\rightarrow 2H_2$ (g) + $O_2(g)$ (Acidulated)

- 13 What is the difference between displacement and double displacement reactions? Write equations for these reactions. CBSE 2012, 11, 10
- Sol. In a displacement reaction, a more reactive element displaces a less reactive element from its salt solution. But in a double displacement reaction, two atoms or groups from different compounds displace each other. Chemical equation for single displacement,

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

Here, Zn displaces Cu from its salt solution (CuSO₄).

Chemical equation for double displacement,

 $BaCl_2(aq) + K_2SO_4(aq)$

$$\longrightarrow$$
 BaSO₄(s) + 2KCl(aq)

Here, Ba and K displace each other.

- In the refining of silver, the recovery of silver solution involved from silver nitrate displacement by copper metal. Write down the reaction involved.
- Sol. The reaction involved is: $2AgNO_3(aq) + Cu(s)$

Silver nitrate Copper metal

 \longrightarrow Cu(NO₃)₂(aq) + 2Ag(s) Copper nitrate Silver metal

- 15 What do you mean by a precipitation reaction? Explain by giving examples.
- Sol. The reaction which is accompanied by the formation of an insoluble solid mass (called precipitate) is known as precipitation reaction, e.g.

(i) When barium chloride solution is added to an aqueous solution of sodium sulphate, a white precipitate of barium sulphate is obtained.

 $BaCl_2(aq) + Na_2SO_4(aq)$ $\xrightarrow{2}$ BaSO₄(s) \downarrow + 2NaCl (aq) (White ppt.)

(ii) When silver nitrate is added to an aqueous solution of sodium chloride, a white precipitate of silver chloride (AgCl), which is soluble in NH₄OH is obtained.

 $AgNO_3(aq) + NaCl(aq)$ $\longrightarrow AgCl(s) \downarrow + NaNO_3 (aq)$ (White ppt.)

- 16 Explain the following in terms of gain or loss of oxygen with two examples each.

(i) Oxidation (ii) Reduction Sol. (i) Oxidation It is a process in which a substance gains oxygen, e.g.

(a) $4Na + O_2 \longrightarrow 2Na_2O$ Sodium Oxygen Sodium oxide

(b) $2H_2 + O_2 \longrightarrow 2H_2O$ Water Hydrogen Oxygen

In the above reactions, Na and H2 gains oxygen to form Na₂O and H₂O respectively.

(ii) Reduction It is a process in which a substance loses oxygen.

e.g. (a) $CuO + H_2 \longrightarrow Cu + H_2O$ CuO loses oxygen to form Cu.

(b) $2KClO_3(s) \xrightarrow{\Delta} 2KCl(s) + 3O_2(g)$ Potassium Oxygen Potassium chloride

KClO₃ loses oxygen to form KCl and O₂.

- 17 A shiny brown coloured element X on heating in air becomes black in colour. Name the element X and the black coloured compound formed.
- Sol. Element X is copper and the black coloured compound is copper (II) oxide.

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

- 18 Why do we apply paint on iron articles?
- Sol. By applying paint on iron articles, they can be prevented from corrosion (rusting). Paint does not allow oxygen (from air) and water (moisture) to come in contact with the surface of iron.
 - 19 Oil and fat containing food items are flushed with **CBSE 2014** nitrogen. Why?
- Sol. Nitrogen is unreactive gas as compared to oxygen. Oil and fat present in the food items get oxidised and become rancid in the presence of air or oxygen. But such reaction is prevented in the presence of nitrogen. Therefore, food items like potato chips etc., are packed with nitrogen gas to prevent them from rancidity for a long time.
- 20 Explain the following terms with one example of each:

(ii) Rancidity (i) Corrosion

Sol. Refer to text on page 5 and 6.

A chemical reaction is a change in which one or more substance(s) (reactant(s)) react(s) to form new substance(s) (product(s)) with entirely different properties.

The symbolic representation of a chemical reaction is chemical equation.

A balanced chemical equation is that in which the total number of atoms of each element are equal on both sides of the equation.

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

 A reaction in which a single reactant breaks down to form two or more products, is known as decomposition reaction.

In displacement reactions a more active element displaces a less active element from its compound.

In double displacement reactions, two different atoms or groups of atoms are exchanged.

- Oxidation is the process of addition of oxygen to a substance or removal of hydrogen from a substance.
- Reduction is the process of removal of oxygen from a substance or addition of hydrogen to a substance.

Those reactions in which oxidation and reduction takes place simultaneously are called redox reactions.

The reactions which are accompanied by the evolution of heat are called exothermic reactions. e.g. respiration.

The reactions which occur by the absorption of heat/energy are called endothermic reactions. e.g. photosynthesis.

- Corrosion is the phenomenon due to which metals are slowly eaten away by the reaction of air, water and chemicals present in the atmosphere, is called corrosion. The corrosion of iron is called rusting.
- Rancidity is the process of slow oxidation of oils and fats present in the food materials resulting in the change of smell and taste in them.

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