Chapter 1: Chemical Reactions and Equations

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In-text 1 — Chemical Equations and Balancing (Page 6)

Q1 Why should a magnesium ribbon be cleaned before burning in air?

SOLUTION

Magnesium is a reactive metal. When stored in air, it reacts with oxygen and moisture to form a layer of magnesium oxide (MgO) on its surface.

This oxide layer is a white, dull coating that acts as a protective barrier and prevents the magnesium from burning properly.

Cleaning the ribbon with sandpaper removes this oxide layer, exposing the fresh, shiny metal surface underneath.

The clean surface ensures that magnesium burns readily and brightly in air, giving a proper demonstration of the combustion reaction:
$2Mg + O_2 \rightarrow 2MgO$

Answer: The magnesium ribbon is cleaned to remove the protective layer of magnesium oxide (MgO) formed on its surface, which would otherwise prevent it from burning properly.

Q2 Write the balanced equation for the following chemical reactions:
(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.

SOLUTION

(i) Hydrogen + Nitrogen → Ammonia
$3H_2 + N_2 \rightarrow 2NH_3$
Verification: H = 6 on both sides, N = 2 on both sides ✓

(ii) Hydrogen sulphide + Oxygen → Water + Sulphur dioxide
$2H_2S + 3O_2 \rightarrow 2H_2O + 2SO_2$
Verification: H = 4, S = 2, O = 6 on both sides ✓

(iii) Barium chloride + Aluminium sulphate → Aluminium chloride + Barium sulphate
$3BaCl_2 + Al_2(SO_4)_3 \rightarrow 2AlCl_3 + 3BaSO_4$
Verification: Ba = 3, Cl = 6, Al = 2, S = 3, O = 12 on both sides ✓

(iv) Potassium + Water → Potassium hydroxide + Hydrogen
$2K + 2H_2O \rightarrow 2KOH + H_2$
Verification: K = 2, H = 4, O = 2 on both sides ✓

Answer: (i) $3H_2 + N_2 \rightarrow 2NH_3$ (ii) $2H_2S + 3O_2 \rightarrow 2H_2O + 2SO_2$ (iii) $3BaCl_2 + Al_2(SO_4)_3 \rightarrow 2AlCl_3 + 3BaSO_4$ (iv) $2K + 2H_2O \rightarrow 2KOH + H_2$

In-text 2 — Types of Chemical Reactions — Corrosion and Rancidity (Page 10)

Q1 Why do we apply paint on iron articles?

SOLUTION

Iron articles are painted to prevent them from rusting (corrosion).

When iron is exposed to moist air, it reacts with oxygen and water to form hydrated iron(III) oxide, commonly known as rust:
$4Fe + 3O_2 + xH_2O \rightarrow 2Fe_2O_3 \cdot xH_2O$ (rust)

Paint forms a protective coating on the surface of iron, preventing the direct contact of iron with oxygen and moisture in the air.

Without this protective layer, the iron would gradually corrode, becoming weak and flaky, eventually damaging the article.

Answer: Paint is applied on iron articles to prevent rusting (corrosion) by forming a protective layer that keeps iron from direct contact with oxygen and moisture.

Q2 Oil and fat containing food items are flushed with nitrogen. Why?

SOLUTION

Oil and fat containing food items are flushed with nitrogen to prevent rancidity.

Rancidity is the oxidation of fats and oils in food when exposed to air (oxygen), leading to bad smell and taste.

Nitrogen is an inert (unreactive) gas. When food packages are flushed with nitrogen:
→ Oxygen is displaced from the package
→ This creates an oxygen-free environment
→ Without oxygen, oxidation of fats cannot occur
→ The food stays fresh for a longer period

This is why chips packets feel inflated — they are filled with nitrogen gas, not air.

Answer: Oil and fat containing food items are flushed with nitrogen to prevent rancidity (oxidation of fats), as nitrogen displaces oxygen and prevents the oxidation reaction.

In-text 3 — Writing and Balancing Chemical Equations (Page 13)

Q1 A shiny brown coloured element 'X' on heating in air becomes black in colour. Name the element 'X' and the black coloured compound formed.

SOLUTION

The shiny brown coloured element X is Copper (Cu).

When copper is heated in air, it reacts with oxygen to form copper(II) oxide, which is black in colour:

$2Cu + O_2 \rightarrow 2CuO$

(brown) (black)

Verification: Cu = 2, O = 2 on both sides ✓

This is a combination reaction as well as an oxidation reaction (copper is oxidized by gaining oxygen).

Answer: Element X is Copper (Cu). The black coloured compound formed is Copper(II) oxide (CuO).

Exercise — Chemical Reactions and Equations

Q1 Which of the following statements about the reaction below are incorrect?

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

(a) Lead is getting reduced.
(b) Carbon dioxide is getting oxidised.
(c) Carbon is getting oxidised.
(d) Lead oxide is getting reduced.
(i) (a) and (b)
(ii) (a) and (c)
(iii) (a), (b) and (c)
(iv) all

SOLUTION

In the reaction: $2PbO(s) + C(s) \rightarrow 2Pb(s) + CO_2(g)$

Let us analyze each statement:

(a) Lead is getting reduced — INCORRECT
→ Lead is not being reduced. PbO (lead oxide) is getting reduced to Pb. Lead itself is not a reactant.

(b) Carbon dioxide is getting oxidised — INCORRECT
→ CO_2 is a product, not a reactant. It is not getting oxidised. Rather, carbon is getting oxidised to form CO_2.

(c) Carbon is getting oxidised — CORRECT
→ Carbon (C) gains oxygen to become CO_2. Gaining oxygen = oxidation.

(d) Lead oxide is getting reduced — CORRECT
→ PbO loses oxygen to become Pb. Losing oxygen = reduction.

Incorrect statements are (a) and (b).
∴ Answer is (i).

Answer: (i) (a) and (b)

Q2 $Fe_2O_3 + 2Al \rightarrow Al_2O_3 + 2Fe$

The above reaction is an example of a

(a) combination reaction.

(b) double displacement reaction.

(c) decomposition reaction.

(d) displacement reaction.

SOLUTION

In this reaction: $Fe_2O_3 + 2Al \rightarrow Al_2O_3 + 2Fe$

Aluminium (Al), a more reactive metal, displaces iron (Fe) from iron oxide (Fe_2O_3).

This is a displacement reaction because a more reactive element (Al) displaces a less reactive element (Fe) from its compound.

This reaction is also known as the thermite reaction. It is highly exothermic and is used for welding railway tracks.

∴ Answer is (d) displacement reaction.

Answer: (d) displacement reaction

Q3 What happens when dilute hydrochloric acid is added to iron filings? Tick the correct answer.

(a) Hydrogen gas and iron chloride are produced.

(b) Chlorine gas and iron hydroxide are produced.

(c) No reaction takes place.

(d) Iron salt and water are produced.

SOLUTION

When dilute hydrochloric acid is added to iron filings:
$Fe(s) + 2HCl(aq) \rightarrow FeCl_2(aq) + H_2(g)$

Iron displaces hydrogen from hydrochloric acid because iron is more reactive than hydrogen (iron is above hydrogen in the reactivity series).

Products formed:
→ Iron(II) chloride ($FeCl_2$) — an iron salt (iron chloride)
→ Hydrogen gas (H_2) — released as bubbles

Verification: Fe = 1, H = 2, Cl = 2 on both sides ✓

∴ Answer is (a) Hydrogen gas and iron chloride are produced.

Answer: (a) Hydrogen gas and iron chloride are produced.

Q4 What is a balanced chemical equation? Why should chemical equations be balanced?

SOLUTION

A balanced chemical equation is one in which the number of atoms of each element on the reactant side (left) is equal to the number of atoms of that element on the product side (right).

For example:
Unbalanced: $H_2 + O_2 \rightarrow H_2O$
Balanced: $2H_2 + O_2 \rightarrow 2H_2O$
(H = 4, O = 2 on both sides)

Chemical equations should be balanced because of the Law of Conservation of Mass, which states that matter can neither be created nor destroyed in a chemical reaction.

This means the total mass of the reactants must be equal to the total mass of the products. Since mass depends on the number and type of atoms, the number of atoms of each element must remain the same before and after the reaction.

Answer: A balanced equation has equal numbers of atoms of each element on both sides. It must be balanced to obey the Law of Conservation of Mass.

Q5 Balance the following chemical equations:
(a) $HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + H_2O$
(b) $NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$
(c) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$
(d) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + HCl$

SOLUTION

(a) $HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + H_2O$
Balanced: $2HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + 2H_2O$
Check: H = 4, N = 2, O = 8, Ca = 1 on both sides ✓

(b) $NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$
Balanced: $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$
Check: Na = 2, O = 6, H = 4, S = 1 on both sides ✓

(c) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$
Already balanced: $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$
Check: Na = 1, Cl = 1, Ag = 1, N = 1, O = 3 on both sides ✓

(d) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + HCl$
Balanced: $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$
Check: Ba = 1, Cl = 2, H = 2, S = 1, O = 4 on both sides ✓

Answer: (a) $2HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + 2H_2O$ (b) $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$ (c) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$ (d) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$

Q6 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

SOLUTION

(a) Calcium hydroxide + Carbon dioxide → Calcium carbonate + Water
$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$
Check: Ca = 1, O = 4, H = 2, C = 1 on both sides ✓
Already balanced.

(b) Zinc + Silver nitrate → Zinc nitrate + Silver
$Zn + 2AgNO_3 \rightarrow Zn(NO_3)_2 + 2Ag$
Check: Zn = 1, Ag = 2, N = 2, O = 6 on both sides ✓

(c) Aluminium + Copper chloride → Aluminium chloride + Copper
$2Al + 3CuCl_2 \rightarrow 2AlCl_3 + 3Cu$
Check: Al = 2, Cu = 3, Cl = 6 on both sides ✓

Answer: (a) $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$ (b) $Zn + 2AgNO_3 \rightarrow Zn(NO_3)_2 + 2Ag$ (c) $2Al + 3CuCl_2 \rightarrow 2AlCl_3 + 3Cu$

Q7 Write the balanced chemical equation for the following and identify the type of reaction in each case:
(a) Potassium bromide(aq) + Barium iodide(aq) → Potassium iodide(aq) + Barium bromide(s)
(b) Zinc carbonate(s) → Zinc oxide(s) + Carbon dioxide(g)
(c) Hydrogen(g) + Chlorine(g) → Hydrogen chloride(g)
(d) Magnesium(s) + Hydrochloric acid(aq) → Magnesium chloride(aq) + Hydrogen(g)

SOLUTION

(a) $2KBr(aq) + BaI_2(aq) \rightarrow 2KI(aq) + BaBr_2(s)$
Check: K = 2, Br = 2, Ba = 1, I = 2 on both sides ✓
Type: Double displacement reaction (exchange of ions between two compounds)

(b) $ZnCO_3(s) \rightarrow ZnO(s) + CO_2(g)$
Check: Zn = 1, C = 1, O = 3 on both sides ✓
Already balanced.
Type: Decomposition reaction (one compound breaks into two or more simpler substances on heating)

(c) $H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$
Check: H = 2, Cl = 2 on both sides ✓
Type: Combination reaction (two elements combine to form a single compound)

(d) $Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$
Check: Mg = 1, H = 2, Cl = 2 on both sides ✓
Type: Displacement reaction (magnesium displaces hydrogen from HCl)

Answer: (a) $2KBr + BaI_2 \rightarrow 2KI + BaBr_2$ — Double displacement (b) $ZnCO_3 \rightarrow ZnO + CO_2$ — Decomposition (c) $H_2 + Cl_2 \rightarrow 2HCl$ — Combination (d) $Mg + 2HCl \rightarrow MgCl_2 + H_2$ — Displacement

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Q8 What does one mean by exothermic and endothermic reactions? Give examples.

SOLUTION

Exothermic reactions are chemical reactions in which heat energy is released along with the formation of products. The temperature of the surroundings increases.

Examples of exothermic reactions:
→ Burning of natural gas: $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g) + \text{heat}$

→ Respiration: $C_6H_{12}O_6(aq) + 6O_2(g) \rightarrow 6CO_2(g) + 6H_2O(l) + energy$
→ Decomposition of vegetable matter into compost

Endothermic reactions are chemical reactions in which heat energy is absorbed from the surroundings. The temperature of the surroundings decreases.

Examples of endothermic reactions:
→ Decomposition of calcium carbonate: $CaCO_3(s) + heat \rightarrow CaO(s) + CO_2(g)$
→ Decomposition of water by electrolysis: $2H_2O(l) + electricity \rightarrow 2H_2(g) + O_2(g)$
→ Dissolving ammonium chloride in water (beaker feels cold)

Answer: Exothermic reactions release heat (e.g., burning of CH_4). Endothermic reactions absorb heat (e.g., decomposition of $CaCO_3$ on heating).

Q9 Why is respiration considered an exothermic reaction? Explain.

SOLUTION

Respiration is considered an exothermic reaction because it releases energy.

During respiration, glucose (food) combines with oxygen in our cells to produce carbon dioxide and water, along with a large amount of energy:
$C_6H_{12}O_6(aq) + 6O_2(g) \rightarrow 6CO_2(g) + 6H_2O(l) + energy$

This energy is used by our body for various life processes such as:
→ Maintaining body temperature
→ Muscle contraction and movement
→ Growth and repair of cells
→ Nerve impulse conduction

Since energy is released during this reaction (not absorbed), respiration is an exothermic process. This is why our body stays warm even in cold weather.

Answer: Respiration is exothermic because glucose reacts with oxygen to release energy: $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + energy$. This energy maintains body temperature and drives life processes.

Q10 Why are decomposition reactions called the opposite of combination reactions? Write equations for these reactions.

SOLUTION

Decomposition reactions are the opposite of combination reactions because:

In a combination reaction, two or more substances combine to form a single product.
In a decomposition reaction, a single compound breaks down into two or more simpler substances.

They are exactly reverse processes.

Example of Combination reaction:
$CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(aq) + heat$
(Quick lime and water combine to form calcium hydroxide)

Example of Decomposition reaction:
$Ca(OH)_2(s) \rightarrow CaO(s) + H_2O(g)$
(Calcium hydroxide breaks down on heating into quick lime and water)

Another pair:
Combination: $2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$
Decomposition: $2H_2O(l) \rightarrow 2H_2(g) + O_2(g)$ (electrolysis)

Answer: Decomposition reactions break one compound into simpler substances (opposite of combination where substances join). E.g., Combination: $CaO + H_2O \rightarrow Ca(OH)_2$; Decomposition: $Ca(OH)_2 \rightarrow CaO + H_2O$

Q11 Write one equation each for decomposition reactions where energy is supplied in the form of heat, light and electricity.

SOLUTION

(a) Decomposition by heat (Thermal decomposition):
$CaCO_3(s) \rightarrow[heat] CaO(s) + CO_2(g)$
Calcium carbonate decomposes on heating to form calcium oxide (quick lime) and carbon dioxide.
Check: Ca = 1, C = 1, O = 3 on both sides ✓

(b) Decomposition by light (Photolytic decomposition):
$2AgCl(s) \rightarrow[sunlight] 2Ag(s) + Cl_2(g)$
Silver chloride decomposes in sunlight to form silver metal and chlorine gas. (This

is why AgCl turns grey in sunlight.)
Check: Ag = 2, Cl = 2 on both sides ✓

(c) Decomposition by electricity (Electrolytic decomposition):
$2H_2O(l) \rightarrow [electricity]\ 2H_2(g) + O_2(g)$
Water decomposes by passing electric current through it to form hydrogen and oxygen gases.
Check: H = 4, O = 2 on both sides ✓

Answer: (a) Heat: $CaCO_3 \rightarrow CaO + CO_2$ (b) Light: $2AgCl \rightarrow 2Ag + Cl_2$ (c) Electricity: $2H_2O \rightarrow 2H_2 + O_2$

Q12 What is the difference between displacement and double displacement reactions? Write equations for these reactions.

SOLUTION

Displacement reaction:
A more reactive element displaces a less reactive element from its compound.
Only one element is displaced.

Example: $Fe(s) + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$
Iron (more reactive) displaces copper (less reactive) from copper sulphate solution.
Check: Fe = 1, Cu = 1, S = 1, O = 4 on both sides ✓

Double displacement reaction:
Two compounds exchange their ions to form two new compounds.
Both compounds exchange partners — two displacements happen simultaneously.

Example: $Na_2SO_4(aq) + BaCl_2(aq) \rightarrow BaSO_4(s) + 2NaCl(aq)$
Sodium and barium exchange their partners (sulphate and chloride).
Check: Na = 2, S = 1, O = 4, Ba = 1, Cl = 2 on both sides ✓

Key difference: In displacement, one element replaces another. In double displacement, two compounds swap their ions.

Answer: Displacement: one reactive element replaces another ($Fe + CuSO_4 \rightarrow FeSO_4 + Cu$). Double displacement: two compounds exchange ions ($Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2NaCl$).

Q13 In the refining of silver, the recovery of silver from silver nitrate solution involved displacement by copper metal. Write down the reaction involved.

SOLUTION

When copper metal is placed in silver nitrate solution, copper displaces silver because copper is more reactive than silver.

The balanced equation is:
$Cu(s) + 2AgNO_3(aq) \rightarrow Cu(NO_3)_2(aq) + 2Ag(s)$

Check: Cu = 1, Ag = 2, N = 2, O = 6 on both sides ✓

This is a displacement reaction.
→ Copper goes into solution as copper nitrate (blue colour appears)
→ Silver is deposited as a shiny metal

The reaction can be observed by the colour change: the colourless silver nitrate solution turns blue due to the formation of copper nitrate.

Answer: $Cu(s) + 2AgNO_3(aq) \rightarrow Cu(NO_3)_2(aq) + 2Ag(s)$ — Displacement reaction

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Q14 What do you mean by a precipitation reaction? Explain by giving examples.

SOLUTION

A precipitation reaction is a type of double displacement reaction in which two soluble reactants combine to form one insoluble product that settles down as a solid (precipitate).

Example 1:
$Na_2SO_4(aq) + BaCl_2(aq) \rightarrow BaSO_4(s)\downarrow + 2NaCl(aq)$
Barium sulphate ($BaSO_4$) is insoluble in water and forms a white precipitate.
Check: Na = 2, S = 1, O = 4, Ba = 1, Cl = 2 on both sides ✓

Example 2:
$Pb(NO_3)_2(aq) + 2KI(aq) \rightarrow PbI_2(s)\downarrow + 2KNO_3(aq)$
Lead iodide (PbI_2) is insoluble and forms a bright yellow precipitate.
Check: Pb = 1, N = 2, O = 6, K = 2, I = 2 on both sides ✓

The insoluble substance formed is called a precipitate, and the reaction is called a precipitation reaction.

Answer: A precipitation reaction produces an insoluble solid (precipitate) from two soluble reactants. E.g., $Na_2SO_4(aq) + BaCl_2(aq) \rightarrow BaSO_4(s)\downarrow + 2NaCl(aq)$

Q15 Explain the following in terms of gain or loss of oxygen with two examples each.
(a) Oxidation
(b) Reduction

SOLUTION

(a) Oxidation — Gain of oxygen by a substance.

Example 1: $2Cu + O_2 \rightarrow 2CuO$
Copper gains oxygen to form copper oxide. Copper is oxidized.

Example 2: $2Mg + O_2 \rightarrow 2MgO$
Magnesium gains oxygen to form magnesium oxide. Magnesium is oxidized.

(b) Reduction — Loss of oxygen from a substance.

Example 1: $CuO + H_2 \rightarrow Cu + H_2O$
Copper oxide loses oxygen to form copper. CuO is reduced.

Example 2: $ZnO + C \rightarrow Zn + CO$
Zinc oxide loses oxygen to form zinc. ZnO is reduced.

Note: In both examples above, oxidation and reduction occur simultaneously:
→ In $CuO + H_2 \rightarrow Cu + H_2O$: CuO is reduced (loses O), H_2 is oxidized (gains O)
→ In $ZnO + C \rightarrow Zn + CO$: ZnO is reduced (loses O), C is oxidized (gains O)
Such reactions are called redox reactions.

Answer: (a) Oxidation = gain of oxygen. E.g., $2Cu + O_2 \rightarrow 2CuO$; $2Mg + O_2 \rightarrow 2MgO$.
(b) Reduction = loss of oxygen. E.g., $CuO + H_2 \rightarrow Cu + H_2O$; $ZnO + C \rightarrow Zn + CO$.

Q16 A shiny brown coloured element 'X' on heating in air becomes black in colour. Name the element 'X' and the black coloured compound formed.

SOLUTION

The shiny brown coloured element X is Copper (Cu).

When copper is heated in air, it reacts with oxygen to form copper(II) oxide (CuO), which is black in colour.

Balanced equation:
$2Cu(s) + O_2(g) \rightarrow[heat] 2CuO(s)$
(shiny brown) (black)

Check: Cu = 2, O = 2 on both sides ✓

This is an example of:
→ Combination reaction (two substances combine to form one product)
→ Oxidation (copper gains oxygen)

Answer: Element X is Copper (Cu). The black compound formed is Copper(II) oxide (CuO). Reaction: $2Cu + O_2 \rightarrow 2CuO$

Q17 Why do we apply paint on iron articles?

SOLUTION

We apply paint on iron articles to prevent them from rusting (corrosion).

Rusting occurs when iron reacts with oxygen and moisture (water) present in the air:
$4Fe + 3O_2 + xH_2O \rightarrow 2Fe_2O_3 \cdot xH_2O$
(iron) (rust — hydrated iron(III) oxide)

Rust is a reddish-brown, flaky substance that weakens the iron over time and eventually destroys the article.

Paint forms a protective layer on the iron surface that:
→ Prevents direct contact of iron with oxygen and moisture
→ Stops the oxidation reaction from occurring
→ Extends the life of the iron article

Other methods to prevent rusting include galvanisation (coating with zinc), oiling/greasing, and chrome plating.

Answer: Paint forms a protective layer that prevents iron from coming in contact with oxygen and moisture, thereby preventing rusting (corrosion).

Q18 Oil and fat containing food items are flushed with nitrogen. Why?

SOLUTION

Oil and fat containing food items are flushed with nitrogen to prevent rancidity.

Rancidity: When fats and oils present in food get oxidised by oxygen in air, they become rancid — the food develops an unpleasant smell and bad taste. This process is called rancidity.

How nitrogen helps:
→ Nitrogen is an inert (unreactive) gas

→ When the food package is flushed with nitrogen, oxygen is pushed out
→ In the absence of oxygen, oxidation of fats cannot take place
→ The food remains fresh for a longer period

Other methods to prevent rancidity:
→ Adding antioxidants (like BHA, BHT) to food
→ Storing food in airtight containers
→ Refrigeration (slows down oxidation)
→ Storing in the absence of light

Answer: Nitrogen is an inert gas that displaces oxygen from the food package, preventing oxidation of fats and oils, thus avoiding rancidity and keeping the food fresh.

Q19 Explain the following terms with one example each:
(a) Corrosion
(b) Rancidity

SOLUTION

(a) Corrosion:
Corrosion is the process in which metals are slowly eaten away by the action of air, moisture, or chemicals on their surface.

Example: Rusting of iron
When iron is exposed to moist air, it reacts with oxygen and water to form a reddish-brown flaky substance called rust (hydrated iron(III) oxide):
$4Fe + 3O_2 + xH_2O \rightarrow 2Fe_2O_3 \cdot xH_2O$ (rust)

Other examples: Green coating on copper (copper carbonate — $CuCO_3$), black coating on silver (silver sulphide — Ag_2S).

(b) Rancidity:
Rancidity is the condition in which fats and oils in food get oxidised (by oxygen in air), resulting in an unpleasant smell and bad taste.

Example: Butter left in the open for a long time starts smelling bad because the fats in butter get oxidised.

Prevention methods: storing food in airtight containers, flushing with nitrogen gas, adding antioxidants, refrigeration.

Answer: (a) Corrosion: metals react with air/moisture and degrade, e.g., rusting of iron ($4Fe + 3O_2 + xH_2O \rightarrow 2Fe_2O_3 \cdot xH_2O$). (b) Rancidity: fats/oils oxidise giving bad smell, e.g., butter going stale.