CLASS X CASE STUDY BASED QUESTIONS

Case Study Questions

Chemical Reactions and Equations - 01

When the fats and oil present in the food material get oxidized by the oxygen (of air), their oxidation products have unpleasant smells and tastes. Due to this taste of food material containing fats and oil change and become very unpleasant. The condition produced by aerial oxidation of fats and oils in food marked by unpleasant smell and taste is called rancidity. Rancidity spoils the food material prepared in the fats and oils which have been kept for a considerable time and makes them unfit for eating.
The development of rancidity in food can be prevented in the following ways-

a. Rancidity can be prevented by adding an antioxidant to foods containing fats and oils.
b. Rancidity can be prevented by packaging fat and oil-containing food in Nitrogen gas.
c. Rancidity can be prevented by keeping food in a refrigerator.

i. What do you understand by oxidation?
ii. How does the food become rancid?
iii. How can we prevent the rancidity of food?
iv. Which type of food material gets spoiled by the phenomenon of rancidity?

Answer Key:

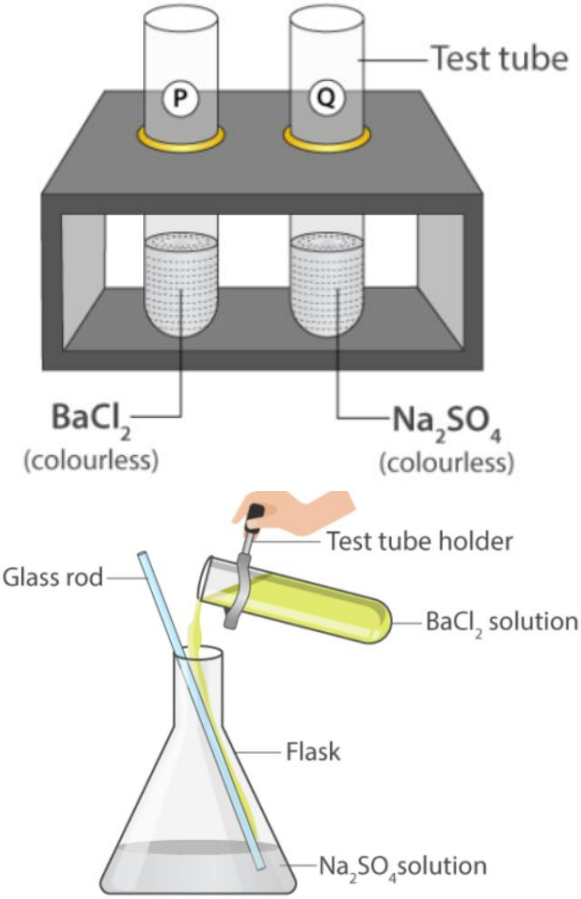
i. The process in which the addition of Oxygen and removal of hydrogen to a substance take place is called oxidation.
ii. Food becomes rancid when fat and oils present in the food are oxidised.
iii. Rancidity can be prevented by packaging fat and oil-containing food in Nitrogen gas.
iv. Rancidity spoils those food materials that are prepared in the fats and oils which have been kept for a considerable time and make them unfit for eating.

Case Study Questions

Chemical Reactions and Equations - 02

When a more reactive element displaces a less reactive element from its compound, it is called a displacement reaction. The reaction is of two types. Single displacement reaction and double displacement reaction.
Iron being more reactive than copper displaces copper from an aqueous solution of copper sulphate. This is an example of a single displacement reaction.
On adding silver nitrate solution to sodium bromide, a yellow ppt of silver bromide and solution of sodium nitrate is formed. This is an example of a double displacement reaction.

i. When dil. sulphuric acid is added to pieces of iron sulphide, hydrogen sulphide gas is produced and soluble ferrous sulphate is formed. Which chemical reaction is involved in this process?
ii. Mention reaction which is used for the preparation of oxygen gas in the laboratory.
iii. What are the products formed in the double displacement reaction discussed below?



iv. Which elements displace aluminium from its salt?

Answer Key:

i. Double displacement reaction
ii. $2KClO_3 \xrightarrow[Catalyst]{Heat} 2KCl\ (s) + 3O_2\ (g)$
It is a decomposition reaction and endothermic in nature.
iii. Barium Sulphate, Sodium Chloride
iv. Ca elements displace aluminium from its salt.

Case Study Questions

Chemical Reactions and Equations - 03

Those reactions in which two compounds react by an exchange of ions to form two new compounds are called double displacement reactions. A double displacement reaction usually occurs in solution and one of the products, being insoluble, precipitate out (separates as a solid). Any reaction in which an insoluble solid (called precipitate) is formed that separates from the solution is called a precipitation reaction. The reaction in which acid

or acidic oxide reacts with base or basic oxide to form salt and water is called neutralisation reaction.
For example, $2NaOH + H_2SO_4 \longrightarrow Na_2SO_4 + H_2O$

i. When hydrogen sulphide gas is passed through a blue solution of copper sulphate, a black precipitate of copper sulphide is obtained and the sulphuric acid so formed remains in the solution. Mention the type of reaction.
ii. Balance the following chemical reaction.
$Pb(NO_3)_{2(aq)} + KI_{(aq)} \longrightarrow PbI_{2(s)} + KNO_{3(aq)}$
iii. Barium chloride in reaction with ammonium sulphate forms barium sulphate and ammonium chloride. Which type of chemical reaction represents in this reaction?
iv. Identify A in the following reaction.
$AlCl_{3(aq)} + 3NH_4OH_{(aq)} \longrightarrow A + 3NH_4Cl_{(aq)}$

Answer Key:

i. Double displacement reaction
$CuSO_4 + H_2S \longrightarrow 4CuS + H_2SO_4$
Both $CuSO_4$ and H_2S exchange their ions to give new compounds-CuS and H_2SO_4.
Hence, this is a double displacement reaction.
ii. $Zn_{(s)} + H_2SO_{4(aq)} \longrightarrow ZnSO_{4(aq)} + H_{2(g)}$
It is an example of single displacement reaction.
iii. $BaCl_2 + (NH_4)_2SO_4 \rightarrow \underset{(ppt.)}{BaSO_4\downarrow} + 2NH_4Cl$
It is a precipitation reaction as well as double displacement reaction.
iv. $AlCl_3 + 3NH_4OH \longrightarrow Al(OH)_3 + 3NH_4Cl$

Case Study Questions

Chemical Reactions and Equations - 04

When oxygen combines with other elements or compounds, the process is called oxidation the substances that combine with oxygen are said to have been oxidized.
The reduction is exactly the opposite of oxidation. If a substance loses oxygen during a reaction, it is said to be reduced. When hydrogen burns the hydrogen combines with oxygen to form water $2H_2 + O_2 = H_2O$
The hydrogen is oxidized in this reaction, but at the same time, the oxygen is reduced. Whatever oxidation occurs reduction must also occur.

i. Which chemical process is used for obtaining a metal from its oxide?
ii. In the given reaction, which reactant species is oxidized?
iii. In the given reaction, which reactant species is reduced?
iv. If four molecules of Hydrogen are combined with oxygen then how many molecules of water are formed?

Answer Key:

i. The process is known as the reduction of metal oxide.
ii. In the given reaction, H_2 is oxidized.
iii. In the given reaction, O_2 is reduced.
iv. If four molecules of Hydrogen are combined with oxygen then four molecules of water are formed.

Case Study Questions

Chemical Reactions and Equations - 05

In a redox reaction, both oxidation, as well as reduction, takes place together, oxidation involves loss of electrons while reduction involves the gain of electrons. The redox- reaction may involve a combination of atoms and molecules, displacement of metals, or non-metals.
Example: $CuSO_4 + Zn \longrightarrow ZnSO_4 + Cu$
displacement of Cu metal from its compound.

i. In the below equation, which gets reduced?
$CuSO_4 + Zn \longrightarrow ZnSO_4 + Cu$
ii. The oxidising agent generally loses or gains an electron.
iii. Identify the oxidising agent and reducing agent in the above reaction.
$CuSO_4 + Zn \longrightarrow ZnSO_4 + Cu$
iv. Identify the type of given reaction.
$CuSO_4 + Zn \longrightarrow ZnSO_4 + Cu$

Answer Key:

i. $CuSO_4$ gets reduced.
ii. The oxidising agent generally gains the electron.
iii. Oxidizing agent - Copper,
Reducing agent - Zinc
iv. Displacement reaction