# CHEMISTRY STUDY MATERIALS FOR CLASS 10 (NCERT Based notes of Chapter -01)

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### **CHEMICAL REACTIONS AND EQUATIONS**

#### **EXERCISE QUESTIONS PAGE NO. 14, 15 and 16**

Question 9: What does one mean by exothermic and endothermic reactions? Give examples.

**Answer**: Chemical reactions that release energy in the form of heat, light, or sound are called exothermic reactions.

Example: Mixture of sodium and chlorine to yield table salt

$$Na_{(s)} + \frac{1}{2} Cl_{2(s)} \longrightarrow NaCl_{(s)} + 411 \text{ kJ of energy}$$

In other words, combination reactions are exothermic.

Reactions that absorb energy or require energy in order to proceed are called endothermic reactions.

For example: In the process of photosynthesis, plants use the energy from the sun to convert carbon dioxide and water to glucose and oxygen.

$$6CO_{2(g)} + 6H_2O_{(l)} \xrightarrow{Sunlight} C_6H_{12}O_{6(aq)} + 6O_{2(g)}$$
Glucose

Question 10: Why is respiration considered an exothermic reaction? Explain.

**Answer :** Energy is required to support life. Energy in our body is obtained from the food we eat. During digestion, large molecules of food are broken down into simpler substances such as glucose. Glucose combines with oxygen in the cells and provides energy. The special name of this combustion reaction is respiration. Since energy is released in the whole process, it is an exothermic process.

$$C_6H_{12}O_{6(aq)}$$
 +  $6O_{2(g)}$   $\rightarrow$   $6CO_{2(g)}$  +  $6H_2O_{(f)}$  + Energy  
Glucose Oxygen Carbon dioxide Water

Question 11: Why are decomposition reactions called the opposite of combination reactions? Write equations for these reactions.

**Answer**: Decomposition reactions are those in which a compound breaks down to form two or more substances. These reactions require a source of energy to proceed. Thus, they are the exact opposite of combination reactions in which two or more substances combine to give a new substance with the release of energy.

Decomposition reaction: 
$$AB + Energy \longrightarrow A + B$$

$$2H_2O_{(\ell)} \xrightarrow{Electrolysis} 2H_{2(g)} + O_{2(g)}$$
Combination reaction:  $A + B \longrightarrow AB + Energy$ 

$$2H_{2(g)} + O_{2(g)} \longrightarrow 2H_2O_{(\ell)} + Energy$$

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

**Answer:** (a) Thermal decomposition:

$$2 \operatorname{FeSO}_{4(s)} \xrightarrow{\Delta} \operatorname{Fe}_2 \operatorname{O}_{3(s)} + \operatorname{SO}_{2(g)} + \operatorname{SO}_{3(g)}$$
Ferrous sulphate Ferric oxide Sulphur dioxide Sulphur trioxide

(b) Decomposition by light:

$$2 \operatorname{AgCl}_{(s)} \xrightarrow{\operatorname{Light}} 2 \operatorname{Ag}_{(s)} + \operatorname{Cl}_{2(g)}$$
  
Silver chloride Silver Chlorine

(c) Decomposition by electricity:

$$2AI_2O_{3(aq)} \xrightarrow{Electricity} 4AI_{(s)} + 3O_{2(g)}$$
Aluminium oxide Aluminium Oxygen

Question 13: What is the difference between displacement and double displacement reactions? Write equations for these reactions.

**Answer**: In a displacement reaction, a more reactive element replaces a less reactive element from a compound.

$$A + BX \longrightarrow AX + B;$$

Where A is more reactive than B

In a double displacement reaction, two atoms or a group of atoms switch places to form new compounds.

$$AB + CD \longrightarrow AD + CB$$

For example:

Displacement reaction:

$$CuSO_{4(aq)} + Zn_{(s)} \longrightarrow ZnSO_{4(aq)} + Cu_{(s)}$$

Double displacement reaction:

$$Na_2SO_{4(\alpha q)} + BaCl_{2(\alpha q)} \longrightarrow BaSO_{4(x)} + 2NaCl_{(\alpha q)}$$

Question 14: In the refining of silver, the recovery of silver from silver nitrate solution involved displacement by copper metal. Write down the reaction involved.

#### Answer:

$$2 \operatorname{AgNO}_{3(aq)} + \operatorname{Cu}_{(s)} \longrightarrow \operatorname{Cu}(\operatorname{NO}_3)_{2(aq)} + 2 \operatorname{Ag}_{(s)}$$
  
Silver nitrate Copper Copper nitrate Silver

Question 15: What do you mean by a precipitation reaction? Explain by giving examples.

**Answer**: A reaction in which an insoluble solid (called precipitate) is formed is called a precipitation reaction.

For example:

$$Na_2CO_{3(aq)}$$
 +  $CaCI_{2(aq)}$   $\longrightarrow$   $CaCO_{3(s)}$  +  $2NaCI_{(aq)}$ 

Sodium carbonate Calcium chloride Calcium carbonate Sodium chloride In this reaction, calcium carbonate is obtained as a precipitate. Hence, it is a precipitation reaction.

Another example of precipitation reaction is:

$$Na_2SO_{4(aq)}$$
 +  $BaCl_{2(aq)}$   $\longrightarrow$   $BaSO_{4(s)}$  +  $2NaCl_{(aq)}$ 

Sodium sulphate Barium chloride Barium sulphate Sodium chloride

In this reaction, barium sulphate is obtained as a precipitate.

## Question 16: Explain the following in terms of gain or loss of oxygen with two examples each. (a) Oxidation (b) Reduction

**Answer**: (a) Oxidation is the gain of oxygen. For example:

(i) 
$$CO_2 + \underbrace{H_2 \longrightarrow CO + H_2O}_{Addition \text{ of oxgyen - oxidation}}$$

(ii) 
$$\underbrace{\frac{2Cu + O_2 \longrightarrow 2CuO}{Gain \text{ of oxgyen - oxidation}}}_{Gain \text{ of oxgyen - oxidation}}$$

In equation (i), H<sub>2</sub> is oxidized to H<sub>2</sub>O and in equation (ii), Cu is oxidised to CuO.

(b) Reduction is the loss of oxygen.

For example:

(i) 
$$CO_2 + H_2 \longrightarrow CO + H_2O$$
  
Removal of oxgyen - reduction

(ii) 
$$CuO + H_2 \xrightarrow{\Delta} Cu + H_2O$$
  
Loss of oxgyen - reduction

In equation (i), CO<sub>2</sub> is reduced to CO and in equation (ii), CuO is reduced to Cu.

Question 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.

**Answer**: 'X' is copper (Cu) and the black-coloured compound formed is copper oxide (CuO). The equation of the reaction involved on heating copper is given below.

$$2Cu$$
 +  $O_2$   $\xrightarrow{Heat}$   $2CuO$  (Shiny brown in colour) (Black in colour)

### Question 18: Why do we apply paint on iron articles?

**Answer**: Iron articles are painted because it prevents them from rusting. When painted, the contact of iron articles from moisture and air is cut off. Hence, rusting is prevented. So presence of air and moisture is essential for rusting to take place.

# Question 19: Oil and fat containing food items are flushed with nitrogen. Why?

**Answer**: Nitrogen is an inert gas and does not easily react with these substances. On the other hand, oxygen reacts with food substances and makes them rancid. Thus, bags used in packing food items are flushed with nitrogen gas to remove oxygen inside the pack. When oxygen is not present inside the pack, rancidity of oil and fat containing food items is avoided.

Question 20: Explain the following terms with one example each.

#### (a) Corrosion (b) Rancidity

Answer:

#### (a) Corrosion:

Corrosion is defined as a process where materials, usually metals, deteriorate as a result of a chemical reaction with air, moisture, chemicals, etc.

For example, iron, in the presence of moisture, reacts with oxygen to form hydrated iron oxide.

$$4 \text{ Fe} + 3 \text{ O}_2 + n \text{ H}_2 \text{O} \longrightarrow 2 \text{ Fe}_2 \text{O}_3 . n \text{H}_2 \text{O}$$
Hydrated iron oxide

This hydrated iron oxide is rust.

#### (b) Rancidity:

The process of oxidation of fats and oils that can be easily noticed by the change in taste and smell is known as rancidity.

For example, the taste and smell of butter changes when kept for long. Rancidity can be avoided by:

- 1. Storing food in air tight containers
- 2. Storing food in refrigerators
- 3. Adding antioxidants
- 4. Storing food in an environment of nitrogen

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