

## Chapter Objectives

This chapter will help you to understand :

- Chemical reactions with experimental examples. Chemical equations.
- Writing and Balancing a chemical equation, Types of Chemical reactions, Oxidation and Reduction, Effects of Oxidation in everyday life



## TOPIC-1 Chemical Reactions

### TOPIC - 1

Chemical Reactions

P. 1

### TOPIC - 2

Types of Chemical Reactions

P. 4



## Quick Review

- ❖ Chemical changes are generally accompanied by an exchange of energy.
- ❖ The magnesium ribbon is cleaned by rubbing with a sand paper before burning in air, to remove the protective layer of basic magnesium carbonate from the surface of magnesium ribbon so that it may readily combine with the oxygen of air.
- ❖ The double arrow between the left-hand part and right-hand part shows that changes are taking place in both the directions.



## Know the Links

- 🔗 <http://ncerthelp.com/text.php?ques=1071+chemical+reactions+and+equations+cbse+notes+for+class+10+science>
- 🔗 [http://physicscatalyst.com/Class10/chemical\\_reaction1.php#1](http://physicscatalyst.com/Class10/chemical_reaction1.php#1)
- 🔗 <http://school.eckovation.com/chemical-reactions-boards-class-10/>

## TIPS...

- ✍ Give more emphasis on the following topics  
Different types of chemical reactions, Corrosion and rancidity.
- ✍ To fully understand the reactions, learn them with examples.
- ✍ Relate the examples of corrosion and rancidity with daily life.
- ✍ For last minute revisions write reactions in points.

## TRICKS...

- ✍ Learn the experimental examples step-by-step.
- ✍ Practice Balance the chemical equations by writing them step by step.



## Multiple Choice Questions

(1 mark each)

Q. 1. Which of the following is not a physical change?

- (a) Boiling of water to give water vapour
- (b) Melting of ice to give water
- (c) Dissolution of salt in water
- (d) Combustion of liquefied petroleum gas (LPG)

[NCERT Exemp. Q. 1, Page 1]

Ans. Correct option : (d)

**Explanation :** During combustion of liquefied petroleum gas (LPG), it forms  $\text{CO}_2$  and  $\text{H}_2\text{O}$ .

Q. 2. Which one of the following processes involve chemical reactions?

- (a) Storing of oxygen gas under pressure in a gas cylinder
- (b) Liquefaction of air
- (c) Keeping petrol in a china dish in the open
- (d) Heating copper wire in presence of air at high temperature [NCERT Exemp. Q. 16, Page 4]

Ans. Correct option : (d)

**Explanation :** Chemical changes involve formation of new compounds from one or more substances. On heating copper wire in presence of air at high temperature copper (II) oxide is formed.

**Very Short Answer Type Questions**

(1 or 2 marks each)

Q. 1. Which among the following are physical or chemical changes?

- Evaporation of petrol
- Burning of liquefied petroleum gas (LPG)
- Heating of an iron rod to red hot.
- Curdling of milk
- Sublimation of solid ammonium chloride

[NCERT Exemp. Q. 30, Page 6]

Ans. Physical change : (a), (c) and (e)

Chemical change : (b) and (d)

*Explanation* : Changes which are temporary with no new substance being formed, are known as physical changes.

Change in which one or more new substances are formed is known as chemical change. [2]

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 or a physical change?

[NCERT Exemp. Q. 29, Page 6]

Ans. Grapes when attached to the plants are living and therefore their own immune system prevents fermentation. The microbes can grow in the plucked grapes and under anaerobic conditions these can be fermented. This is a chemical change. [2]

Q. 3. Translate the following statements into chemical equations and then balance them.

- Hydrogen gas combines with nitrogen to form ammonia.
- Hydrogen sulphide gas burns in air to give water and sulphur dioxide.
- Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate.
- Potassium metal reacts with water to give potassium hydroxide and hydrogen gas.

[NCERT Ex. Q. 5, Page 15]

Ans. •  $3\text{H}_2(\text{g}) + \text{N}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$   
 •  $2\text{H}_2\text{S}(\text{g}) + 3\text{O}_2(\text{g}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + 2\text{SO}_2(\text{g})$   
 •  $3\text{BaCl}_2(\text{aq}) + \text{Al}_2(\text{SO}_4)_3(\text{aq}) \rightarrow 2\text{AlCl}_3(\text{aq}) + 3\text{BaSO}_4\downarrow$   
 •  $2\text{K}(\text{s}) + 2\text{H}_2\text{O}(\text{l}) \rightarrow 2\text{KOH}(\text{aq}) + \text{H}_2(\text{g})$  (ppt) [2]

Q. 4. Balance the following chemical equations.

- $\text{HNO}_3 + \text{Ca}(\text{OH})_2 \rightarrow \text{Ca}(\text{NO}_3)_2 + \text{H}_2\text{O}$
- $\text{NaOH} + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + \text{H}_2\text{O}$
- $\text{NaCl} + \text{AgNO}_3 \rightarrow \text{AgCl} + \text{NaNO}_3$
- $\text{BaCl}_2 + \text{H}_2\text{SO}_4 \rightarrow \text{BaSO}_4 + \text{HCl}$

[NCERT Ex. Q. 6, Page 15]

Ans. (a)  $2\text{HNO}_3 + \text{Ca}(\text{OH})_2 \rightarrow \text{Ca}(\text{NO}_3)_2 + 2\text{H}_2\text{O}$

(b)  $2\text{NaOH} + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$

(c)  $\text{NaCl} + \text{AgNO}_3 \rightarrow \text{AgCl} + \text{NaNO}_3$

(d)  $\text{BaCl}_2 + \text{H}_2\text{SO}_4 \rightarrow \text{BaSO}_4 + 2\text{HCl}$  [2]

Q. 5. Write the balanced chemical equations for the following reactions.

- Calcium hydroxide + Carbon dioxide → Calcium carbonate + Water
- Zinc + Silver nitrate → Zinc nitrate + Silver
- Aluminium + Copper chloride → Aluminium chloride + Copper
- Barium chloride + Potassium sulphate → Barium sulphate + Potassium chloride

[NCERT Ex. Q. 7, Page 15]

Ans. (a)  $\text{Ca}(\text{OH})_2 + \text{CO}_2 \rightarrow \text{CaCO}_3 + \text{H}_2\text{O}$

(b)  $\text{Zn} + 2\text{AgNO}_3 \rightarrow \text{Zn}(\text{NO}_3)_2 + 2\text{Ag}$

(c)  $2\text{Al} + 3\text{CuCl}_2 \rightarrow 2\text{AlCl}_3 + 3\text{Cu}$

(d)  $\text{BaCl}_2 + \text{K}_2\text{SO}_4 \rightarrow \text{BaSO}_4 + 2\text{KCl}$  [2]

Q. 6. In which of the following chemical equations, the abbreviations represent the correct states of the reactants and products involved at reaction temperature?

(a)  $2\text{H}_2(\text{l}) + \text{O}_2(\text{l}) \rightarrow 2\text{H}_2\text{O}(\text{g})$

(b)  $2\text{H}_2(\text{g}) + \text{O}_2(\text{l}) \rightarrow 2\text{H}_2\text{O}(\text{l})$

(c)  $2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{H}_2\text{O}(\text{l})$

(d)  $2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{H}_2\text{O}(\text{g})$

[NCERT Exemp. Q. 17, Page 4]

Ans. (c)  $2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{H}_2\text{O}(\text{l})$

*Explanation* : It is because, the standard state for hydrogen and oxygen is gas and for water is liquid at reaction temperature. [2]

**Short Answer Type Questions**

(3 marks each)

Q. 1. Write the balanced chemical equations for the following reactions :

- Sodium carbonate on reaction with hydrochloric acid in equal molar concentrations gives sodium chloride and sodium hydrogencarbonate.
- Sodium hydrogencarbonate on reaction with hydrochloric acid gives sodium chloride, water and liberates carbon dioxide.
- Copper sulphate on treatment with potassium iodide precipitates cuprous iodide ( $\text{Cu}_2\text{I}_2$ ), liberates iodine gas and also forms potassium sulphate.

[NCERT Exemp. Q. 25, Page 6]

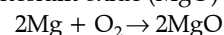
Ans. (a)  $\text{Na}_2\text{CO}_3 + \text{HCl} \rightarrow \text{NaCl} + \text{NaHCO}_3$

(b)  $\text{NaHCO}_3 + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O} + \text{CO}_2$

(c)  $2\text{CuSO}_4 + 4\text{KI} \rightarrow \text{Cu}_2\text{I}_2 + 2\text{K}_2\text{SO}_4 + \text{I}_2$  [3]

Q. 2. Why should a magnesium ribbon be cleaned before burning in air? [NCERT Q. 1, Page 6]

Ans. Magnesium is very reactive metal like Na, Ca, etc.. When exposed to air it reacts with oxygen to form a layer of magnesium oxide (MgO) on its surface.



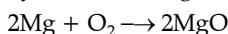
This layer of magnesium oxide is pretty stable and prevents additional reaction of magnesium with

oxygen. The magnesium ribbon is cleaned by sand paper to remove this layer so that the underlying metal can be used for the reaction. [3]

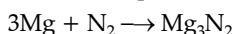
**Q. 3. A magnesium ribbon is burnt in oxygen to give a white compound X accompanied by emission of light. If the burning ribbon is now placed in an atmosphere of nitrogen, it continues to burn and forms a compound Y.**

- (a) Write the chemical formulae of X and Y.  
 (b) Write a balanced chemical equation, when X is dissolved in water. [NCERT Exemp. Q. 36, Page 7]

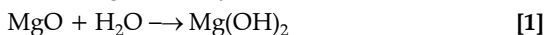
**Ans.** When magnesium ribbon burns in air, it forms magnesium oxide, a white compound accompanied by emission of light.



When the burning ribbon is placed in an atmosphere of nitrogen, it continues to burn and forms a compound magnesium nitride.

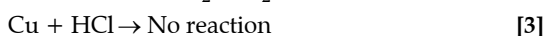
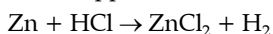


- (a) Thus, X is MgO and Y is Mg<sub>3</sub>N<sub>2</sub> [2]  
 (b) When magnesium oxide is dissolved in water, it forms magnesium hydroxide.



**Q. 4. Zinc liberates hydrogen gas when reacted with dilute hydrochloric acid, whereas copper does not. Explain why? [NCERT Exemp. Q. 37, Page 7]**

**Ans.** In the activity series of metals, zinc is placed above hydrogen whereas copper is placed below hydrogen. That is why zinc displaces hydrogen from dilute hydrochloric acid and liberates hydrogen gas, while copper does not.



**Q. 5. Write the balanced equation for the following chemical reactions.**

- (i) Hydrogen + Chlorine  $\rightarrow$  Hydrogen chloride  
 (ii) Barium chloride + Aluminium sulphate  $\rightarrow$  Barium sulphate + Aluminium chloride  
 (iii) Sodium + Water  $\rightarrow$  Sodium hydroxide + Hydrogen  
 [NCERT Q. 2, Page 6]

**Ans. (i)**  $\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$

**(ii)**  $3\text{BaCl}_2 + \text{Al}_2(\text{SO}_4)_3 \rightarrow 3\text{BaSO}_4 + 2\text{AlCl}_3$

**(iii)**  $2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2 \quad [3]$

**Q. 6. Write a balanced chemical equation with state symbols for the following reactions.**

- (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.

[NCERT Q. 3, Page 6]

**Ans. (i)**  $\text{BaCl}_2(\text{aq}) + \text{Na}_2\text{SO}_4(\text{aq}) \rightarrow \text{BaSO}_4(\text{s}) + 2\text{NaCl}(\text{aq})$

**(ii)**  $\text{NaOH}(\text{aq}) + \text{HCl}(\text{aq}) \rightarrow \text{NaCl}(\text{aq}) + \text{H}_2\text{O}(\text{l}) \quad [3]$

**Q. 7. Write chemical equation of the reaction of ethanoic acid with the following :**

- (a) Sodium, (b) Sodium hydroxide and (c) Ethanol  
 Write the name of one main product of each reaction. [CBSE Board, All India Region, 2016]

**Ans. (a)**  $2\text{CH}_3\text{COOH} + 2\text{Na} \rightarrow 2\text{CH}_3\text{COONa} + \text{H}_2$

$\text{CH}_3\text{COONa}$ ----- sodium ethanoate

**(b)**  $\text{CH}_3\text{COOH} + \text{NaOH} \rightarrow \text{CH}_3\text{COONa} + \text{H}_2\text{O}$

$\text{CH}_3\text{COONa}$  ----- sodium ethanoate

**(c)**  $\text{CH}_3\text{COOH} + \text{C}_2\text{H}_5\text{OH} \rightarrow \text{CH}_3\text{COOC}_2\text{H}_5 + \text{H}_2\text{O}$

$\text{CH}_3\text{COOC}_2\text{H}_5$  ----- Ethyl ethanoate (ester) [3]

**Q. 8. Complete the following chemical equations :**

(i)  $\text{CH}_3\text{COOC}_2\text{H}_5 + \text{NaOH} \rightarrow$

(ii)  $\text{CH}_3\text{COOH} + \text{NaOH} \rightarrow$

(iii)  $\text{C}_2\text{H}_5\text{OH} + \text{CH}_3\text{COOH} \xrightarrow{\text{Conc. H}_2\text{SO}_4}$

[CBSE Board, Delhi Region, 2017]

**Ans.**  $\text{CH}_3\text{COOC}_2\text{H}_5 + \text{NaOH} \rightarrow \text{CH}_3\text{COONa} + \text{C}_2\text{H}_5\text{OH}$

$\text{CH}_3\text{COOH} + \text{NaOH} \rightarrow \text{CH}_3\text{COONa} + \text{H}_2\text{O}$

$\text{C}_2\text{H}_5\text{OH} + \text{CH}_3\text{COOH} \xrightarrow{\text{Conc. H}_2\text{SO}_4}$

$\text{CH}_3\text{COOC}_2\text{H}_5 + \text{H}_2\text{O} \quad [3]$

**Q. 9. Complete the following chemical equations :**

$\text{CH}_3\text{COOH} + \text{Na}_2\text{CO}_3 \rightarrow$

$\text{CH}_4 + \text{O}_2 \rightarrow$

$\text{C}_2\text{H}_5\text{OH} + \text{Na} \rightarrow$

[CBSE Board, Delhi Region, 2017]

**Ans.**  $\text{CH}_3\text{COOH} + \text{Na}_2\text{CO}_3 \rightarrow 2\text{CH}_3\text{COONa} + \text{CO}_2 + \text{H}_2\text{O}$

$\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$

$2\text{C}_2\text{H}_5\text{OH} + 2\text{Na} \rightarrow 2\text{C}_2\text{H}_5\text{ONa} + \text{H}_2 \quad [3]$

**Q. 10. Complete the following chemical equations :**

$\text{C}_2\text{H}_5\text{OH} + \text{O}_2 \rightarrow$

$\text{C}_2\text{H}_5\text{OH} \xrightarrow[443\text{K}]{\text{Conc. H}_2\text{SO}_4}$

$\text{CH}_3\text{COOH} + \text{NaHCO}_3 \rightarrow$

[CBSE Board, Delhi Region, 2017]

**Ans.**  $\text{C}_2\text{H}_5\text{OH} + \text{O}_2 \rightarrow \text{CH}_3\text{COOH} + \text{H}_2\text{O}$

$\text{C}_2\text{H}_5\text{OH} \xrightarrow[443\text{K}]{\text{Conc. H}_2\text{SO}_4} \text{CH}_2=\text{CH}_2 + \text{H}_2\text{O}$

$\text{CH}_3\text{COOH} + \text{NaHCO}_3 \rightarrow \text{CH}_3\text{COONa} + \text{CO}_2 + \text{H}_2\text{O} \quad [3]$



## Long Answer Type Question

(5 marks each)

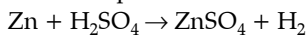
**Q. 1. What is a balanced chemical equation? Why should chemical equations be balanced?**

[NCERT Ex. Q. 4, Page 15]

**Ans.** A reaction which has an equal number of atoms of all the elements on both sides of the chemical equation is called a balanced chemical equation.

**Example :** Zinc metal reacts with dilute sulphuric acid to form zinc sulphate and hydrogen gas

Zinc + Sulphuric acid → Zinc sulphate + Hydrogen



The number of atoms of different elements on both sides of the arrow.

| Element | Number of atoms in reactants LHS | Number of atoms in products (RHS) |
|---------|----------------------------------|-----------------------------------|
| Zn      | 1                                | 1                                 |
| H       | 2                                | 2                                 |

|   |   |   |
|---|---|---|
| O | 4 | 4 |
| S | 1 | 1 |

As the number of atoms of each element is same on both sides of the arrow, the equation is a balanced chemical equation.

According to the law of conservation of mass, mass can neither be created nor destroyed, it means total mass of the elements present in the reactants must be equal to the total mass of the elements present in products. It means that the total number of atoms of each element should be equal on both sides of a chemical equation. Hence, it is for this reason that chemical equations should be balanced. [5]



## TOPIC-2

### Types of Chemical Reactions



### Quick Review

- ❖ In an exothermic reaction, the potential energy of the system decreases as reactants are converted to products. The molecules move with a faster speed and therefore the temperature of the reaction system increases.
- ❖ Condensation of water vapour into rain releasing energy in the form of heat is an example of an exothermic process.
- ❖ In endothermic reaction, the potential energy of the products is higher than that of the reactants.
- ❖ In precipitation reaction, the insoluble solid is called the precipitate, and the remaining liquid is called the supernate.
- ❖ Electrolysis of water and carbonic acid in soda are the real life example of decomposition reaction.
- ❖ The decomposition reaction which requires light is known as photolytic.

#### TIPS...

- ✎ Give more emphasis on the following topics : Different types of chemical reactions, Corrosion and rancidity.
- ✎ To fully understand the reactions, learn and classify them with examples.

#### TRICKS...

- ✎ Make a flowchart of different chemical reactions with example to memorize them.
- ✎ Learn concept of reaction with example. Make flowchart of classification of chemical reaction with example to memorize them quickly.



### Know the Links

- 🔗 <http://ncerthelp.com/text.php?ques=1071+chemical+reactions+and+equations+cbse+notes+for+class+10+science>
- 🔗 [http://physicscatalyst.com/Class10/chemical\\_reaction1.php#1](http://physicscatalyst.com/Class10/chemical_reaction1.php#1)
- 🔗 <http://school.eckovation.com/chemical-reactions-boards-class-10/>



## Multiple Choice Questions

(1 mark each)

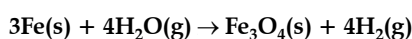
Q. 1. The following reaction is an example of a  
 $4\text{NH}_3(\text{g}) + 5\text{O}_2(\text{g}) \rightarrow 4\text{NO}(\text{g}) + 6\text{H}_2\text{O}(\text{g})$

- (i) Displacement reaction
  - (ii) Combination reaction
  - (iii) Redox reaction
  - (iv) Neutralisation reaction [NCERT Exemp. Q. 2, Page 1]
- (a) (i) and (iv)                      (b) (ii) and (iii)  
 (c) (i) and (iii)                      (d) (iii) and (iv)

Ans. Correct option : (c)

**Explanation :** Displacement reaction is the chemical reaction in which an element displaces another element from its solution and redox reaction is the reaction in which one reactant gets oxidised while other gets reduced. In the given question, in ammonia hydrogen is displaced with oxygen and it is reduced to NO.

Q. 2. Which of the following statements about the given reaction are correct?



- (i) Iron metal is getting oxidised
- (ii) Water is getting reduced
- (iii) Water is acting as reducing agent
- (iv) Water is acting as oxidising agent

[NCERT Exemp. Q. 3, Page 1]

- (a) (i), (ii) and (iii)                      (b) (iii) and (iv)
- (c) (i) (ii) and (iv)                      (d) (ii) and (iv)

Ans. Correct option : (c)

*Explanation* : The substance which oxidises the other substances in a chemical reaction is known as an oxidising agent. Likewise, the substance which reduces the other substance in a chemical reaction is known as reducing agent.

Q. 3. Which of the following are exothermic processes?

- (i) Reaction of water with quick lime
- (ii) Dilution of an acid
- (iii) Evaporation of water
- (iv) Sublimation of camphor (crystals)

[NCERT Exempt. Q. 4, Page 1]

- (a) (i) and (ii)                                  (b) (ii) and (iii)
- (c) (i) and (iv)                                  (d) (iii) and (iv)

Ans. Correct option : (a)

*Explanation* : Exothermic reactions are the reactions in which heat is released along with the formation of products.

Q. 4. Three beakers labelled as A, B and C each containing 25 mL of water was taken. A small amount of NaOH, anhydrous  $\text{CuSO}_4$  and NaCl were added to the beakers A, B and C respectively. It was observed that there was an increase in the temperature of the solutions contained in beakers A and B, whereas in case of beaker C, the temperature of the solution falls. Which one of the following statement(s) is (are) correct?

- (i) In beakers A and B, exothermic process has occurred.
  - (ii) In beakers A and B, endothermic process has occurred.
  - (iii) In beaker C exothermic process has occurred.
  - (iv) In beaker C endothermic process has occurred.
- (a) (i) only    (b) (ii) only
  - (c) (i) and (iv)                                      (d) (ii) and (iii)

[NCERT Exemp. Q. 5, Page 2]

Ans. Correct option : (c)

*Explanation* : Exothermic reactions are the reactions in which heat is released along with the formation of products and there is rise in temperature whereas endothermic reaction are accompanied by or requires the absorption of heat which results in fall of temperature.

Q. 5. A dilute ferrous sulphate solution was gradually added to the beaker containing acidified permanganate solution. The light purple colour of the solution fades and finally disappears. Which of the following is the correct explanation for the observation?

- (a)  $\text{KMnO}_4$  is an oxidising agent, it oxidises  $\text{FeSO}_4$
- (b)  $\text{FeSO}_4$  acts as an oxidising agent and oxidises  $\text{KMnO}_4$
- (c) The colour disappears due to dilution; no reaction is involved

- (d)  $\text{KMnO}_4$  is an unstable compound and decomposes in presence of  $\text{FeSO}_4$  to a colourless compound.

[NCERT Exemp. Q. 6, Page 2]

Ans. Correct option : (a)

*Explanation* : A dilute ferrous sulphate solution was gradually added to the beaker containing acidified permanganate solution. A permanganate solution is usually purple in colour. The light purple colour of the solution fades and finally disappears. This is because Potassium permanganate ( $\text{KMnO}_4$ ) is relatively an unstable compound, it tends to decompose in the presence of ferrous sulphate ( $\text{FeSO}_4$ ). This changes the colour of the solution from purple to colourless. The  $\text{FeSO}_4$  gets oxidised to  $\text{Fe}_2(\text{SO}_4)_3$  as  $\text{KMnO}_4$  acts as a good oxidising agent in an acidic medium

Q. 6. Which among the following is (are) double displacement reaction(s)?

- (i)  $\text{Pb} + \text{CuCl}_2 \rightarrow \text{PbCl}_2 + \text{Cu}$
  - (ii)  $\text{Na}_2\text{SO}_4 + \text{BaCl}_2 \rightarrow \text{BaSO}_4 + 2\text{NaCl}$
  - (iii)  $\text{C} + \text{O}_2 \rightarrow \text{CO}_2$
  - (iv)  $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$
- (a) (i) and (iv)                                      (b) (ii) only
  - (c) (i) and (ii)                                      (d) (iii) and (iv)

[NCERT Exemp. Q. 7, Page 2]

Ans. Correct option : (b)

*Explanation* : Double displacement reaction is the reaction in which two different atoms or group of atoms are mutually exchanged. In this reaction ( $\text{Na}_2\text{SO}_4 + \text{BaCl}_2 \rightarrow \text{BaSO}_4 + 2\text{NaCl}$ ), sodium and barium were mutually exchanged.

Q. 7. Which among the following statement(s) is (are) true? Exposure of silver chloride to sunlight for a long duration turns grey due to

- (i) The formation of silver by decomposition of silver chloride
  - (ii) Sublimation of silver chloride
  - (iii) Decomposition of chlorine gas from silver chloride
  - (iv) Oxidation of silver chloride
- (a) (i) only    (b) (i) and (iii)
  - (c) (ii) and (iii)                                      (d) (iv) only

[NCERT Exemp. Q. 8, Page 2]

Ans. Correct option : (a)

*Explanation* : In the presence of sunlight, the heavy amount of energy of light decomposes  $\text{AgCl}$  to silver ( $\text{Ag}^+$ ) and chloride ( $\text{Cl}^-$ ) ions. The silver flakes are truly black which when fully spread over white silver chloride looks grey.

Q. 8. Solid calcium oxide reacts vigorously with water to form calcium hydroxide accompanied by liberation of heat. This process is called slaking of lime. Calcium hydroxide dissolves in water to form its solution called lime water. Which among the following is (are) true about slaking of lime and the solution formed?

- (i) It is an endothermic reaction.
- (ii) It is an exothermic reaction.
- (iii) The pH of the resulting solution will be more than seven.



- (iv) Lead oxide is getting reduced.  
 (a) (i) and (ii) (b) (i) and (iii)  
 (c) (i), (ii) and (iii) (d) All

[NCERT Ex. Q. 1, Page 14]

Ans. Correct option : (a)

*Explanation* : Lead oxide is getting reduced to lead and Carbon dioxide is getting oxidised.



The above reaction is an example of a

- (a) combination reaction.  
 (b) double displacement reaction.  
 (c) decomposition reaction.  
 (d) displacement reaction [NCERT Ex. Q. 2, Page 14]

Ans. Correct option : (d)

*Explanation* : The given reaction is an example of a displacement reaction.

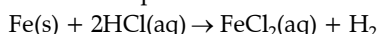
Q. 18. What happens when dilute hydrochloric acid is added to iron filings? Tick the correct answer.

- (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.

[NCERT Ex. Q. 3, Page 15]

Ans. Correct option : (a)

*Explanation* : When dilute hydrochloric acid is added to iron filings, hydrogen gas and iron chloride are produced. The reaction is as follows :



## Very Short Answer Type Questions

(1 or 2 marks each)

Q. 1. Write the balanced chemical equation for the following and identify the type of reaction in each case.

Potassium bromide(aq) + Barium iodide(aq) →

Potassium iodide(aq) + Barium bromide(s)

Zinc carbonate(s) → Zinc oxide(s) + Carbon

dioxide(g)

Hydrogen(g) + Chlorine(g) → Hydrogen chloride(g)

Magnesium(s) + Hydrochloric acid(aq) →

Magnesium chloride(aq) + Hydrogen(g)

[NCERT Ex. Q. 8, Page 15]

Ans.  $2\text{KBr(aq)} + \text{BaI}_2\text{(aq)} \rightarrow 2\text{KI(aq)} + \text{BaBr}_2\text{(s)}$ ;

Double displacement reaction

$\text{ZnCO}_3\text{(s)} \rightarrow \text{ZnO(s)} + \text{CO}_2\text{(g)}$ ; [½]

Decomposition reaction

$\text{H}_2\text{(g)} + \text{Cl}_2\text{(g)} \rightarrow 2\text{HCl(g)}$ ;

Combination reaction

$\text{Mg(s)} + 2\text{HCl(aq)} \rightarrow \text{MgCl}_2\text{(aq)} + \text{H}_2\text{(g)}$ ;

Displacement reaction [½]

Q. 2. Write the balanced chemical equations for the following reactions and identify the type of reaction in each case.

- (a) Nitrogen gas is treated with hydrogen gas in the presence of a catalyst at 773 K to form ammonia gas.  
 (b) Sodium hydroxide solution is treated with acetic acid to form sodium acetate and water.  
 (c) Ethanol is warmed with ethanoic acid to form ethyl acetate in the presence of concentrated  $\text{H}_2\text{SO}_4$ .  
 (d) Ethene is burnt in the presence of oxygen to form carbon dioxide, water and releases heat and light.

[NCERT Exemp. Q. 19, Page 5]

Ans. (a)  $\text{N}_2\text{(g)} + 3\text{H}_2\text{(g)} \xrightarrow[773\text{K}]{\text{Catalyst}} 2\text{NH}_3$

Combination reaction

(b)  $\text{NaOH(aq)} + \text{CH}_3\text{COOH(aq)} \rightarrow \text{CH}_3\text{COONa(aq)} + \text{H}_2\text{O(l)}$

Double displacement reaction/Neutralisation reaction

(c)  $\text{C}_2\text{H}_5\text{OH(l)} + \text{CH}_3\text{COOH(l)} \xrightarrow[\text{H}_2\text{SO}_4]{\text{conc.}} \text{CH}_3\text{COOC}_2\text{H}_5\text{(l)} + \text{H}_2\text{O(l)}$

Double Displacement reaction/Esterification reaction

(d)  $\text{C}_2\text{H}_4\text{(g)} + 3\text{O}_2\text{(g)} \rightarrow 2\text{CO}_2\text{(g)} + 2\text{H}_2\text{O(g)} + \text{Heat} + \text{Light}$

Redox reaction/Combustion reaction [2]

Q. 3. A solution of potassium chloride when mixed with silver nitrate solution, an insoluble white substance is formed. Write the chemical reaction involved and also mention the type of the chemical reaction? [NCERT Exemp. Q. 26, Page 6]

Ans.  $\text{KCl(aq)} + \text{AgNO}_3\text{(aq)} \rightarrow \text{AgCl(s)} + \text{KNO}_3\text{(aq)}$

In this reaction, insoluble white substance is formed so it is a precipitation reaction and K is mutually exchanged with Ag, so it is a double displacement. [2]

Q. 4. Write the balanced chemical equations for the following reactions and identify the type of reaction in each case.

- (a) Thermite reaction, iron (III) oxide reacts with aluminium and gives molten iron and aluminium oxide.  
 (b) Magnesium ribbon is burnt in an atmosphere of nitrogen gas to form solid magnesium nitride.  
 (c) Chlorine gas is passed in an aqueous potassium iodide solution to form potassium chloride solution and solid iodine.  
 (d) Ethanol is burnt in air to form carbon dioxide, water and releases heat.

[NCERT Exemp. Q. 20, Page 5]

Ans. (a)  $\text{Fe}_2\text{O}_3\text{(s)} + 2\text{Al(s)} \rightarrow \text{Al}_2\text{O}_3\text{(s)} + 2\text{Fe(l)} + \text{Heat}$

Displacement reaction/redox reaction

(b)  $3\text{Mg(s)} + \text{N}_2\text{(g)} \rightarrow \text{Mg}_3\text{N}_2\text{(s)}$

Combination reaction

(c)  $2\text{KI(aq)} + \text{Cl}_2\text{(g)} \rightarrow 2\text{KCl(aq)} + \text{I}_2\text{(s)}$

Displacement reaction

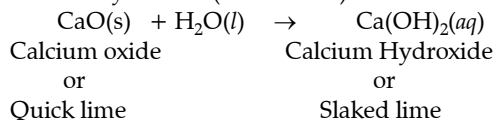
(d)  $\text{C}_2\text{H}_5\text{OH(l)} + 3\text{O}_2\text{(g)} \rightarrow 2\text{CO}_2\text{(g)} + 3\text{H}_2\text{O(l)} + \text{Heat}$   
 Redox reaction/combination reaction. [2]

Q. 5. 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. [NCERT Q. 1, Page 10]

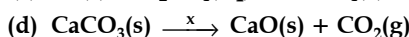
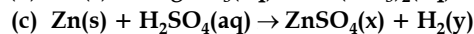
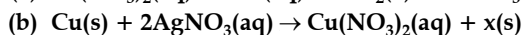
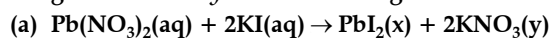
**Ans. (i)** The substance 'X' is calcium oxide. Its chemical formula is CaO.

**(ii)** Calcium oxide reacts vigorously with water to form calcium hydroxide (slaked lime)



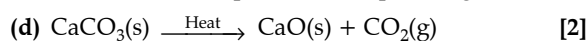
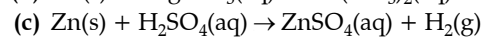
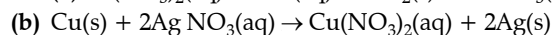
[2]

**Q. 6. Complete the missing components/variables given as  $x$  and  $y$  in the following reactions**



[NCERT Exemp. Q. 21, Page 5]

**Ans. (a)**  $\text{Pb(NO}_3)_2\text{(aq)} + 2\text{KI(aq)} \rightarrow \text{PbI}_2\text{(s)} + 2\text{KNO}_3\text{(aq)}$



**Q. 7. Which amongst the following changes are exothermic or endothermic in nature?**

(a) Decomposition of ferrous sulphate

(b) Dilution of sulphuric acid

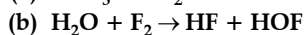
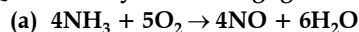
(c) Dissolution of sodium hydroxide in water

(d) Dissolution of ammonium chloride in water

[NCERT Exemp. Q. 22, Page 5]

**Ans.** Decomposition of ferrous sulphate and dissolution of ammonium chloride in water are endothermic reactions as heat is absorbed in these changes. Dilution of sulphuric acid and dissolution of sodium hydroxide in water are exothermic reactions as heat is released in these changes. [2]

**Q. 8. Identify the reducing agent in the following reactions**



**Ans.** Substances which have the ability of adding hydrogen or removing oxygen from the other substances are known as reducing agents.

(a) Ammonia ( $\text{NH}_3$ )

(b) Water ( $\text{H}_2\text{O}$ ) as  $\text{F}_2$  is getting reduced to HF

(c) Carbon monoxide (CO)

(d) Hydrogen [2]

**Q. 9. In the refining of silver, the recovery of silver from silver nitrate solution involved displacement by copper metal. Write down the reaction involved.**

[NCERT Ex. Q. 14, Page 16]

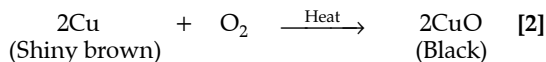
**Ans.**  $2\text{AgNO}_3\text{(aq)} + \text{Cu(s)} \rightarrow \text{Cu(NO}_3)_2\text{(aq)} + 2\text{Ag(s)}$

Silver nitrate    Copper    Copper nitrate    silver [2]

**Q. 10. A shiny brown-coloured element 'X' on heating in air becomes black in colour. Name the element 'X' and the black coloured compound formed.**

[NCERT Ex. Q. 17, Page 16]

**Ans.** X' is copper (Cu) and the black-coloured compound formed is copper oxide ( $\text{CuO}$ ). The equation of the reaction involved on heating copper is given below.



**Q. 11. Why do we apply paint on iron articles?**

[NCERT Ex. Q. 18, Page 16]

**Ans.** 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. Their presence is essential for rusting to take place. [2]

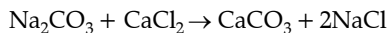
**Q. 12. Why is the amount of gas collected in one of the test tubes during electrolysis water, double of the amount collected in the other? Name this gas.**

[NCERT Q. 2, Page 10]

**Ans.** During the electrolysis of water, hydrogen and oxygen gets separated by the electricity. Water ( $\text{H}_2\text{O}$ ) contains two parts hydrogen and one part of oxygen. Since hydrogen goes to one test tube and oxygen goes to another, the amount of gas collected in one of the test tubes is double of the amount collected in the other [2]

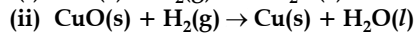
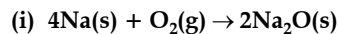
**Q. 13. Give an example of a double displacement reaction other than formation of barium sulphate and sodium chloride.** [NCERT Q. 2, Page 13]

**Ans.** Sodium carbonate reacts with calcium chloride to form calcium carbonate and sodium chloride.



In this reaction, sodium carbonate and calcium chloride exchange ions to form two new compounds. Hence, it is a double displacement reaction. [2]

**Q. 14. Identify the substances that are oxidised and the substances that are reduced in the following reactions.**



[NCERT Q. 3, Page 13]

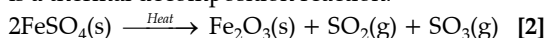
**Ans. (i)** Sodium (Na) is oxidised as it gains oxygen and oxygen gets reduced.

(ii) Copper oxide ( $\text{CuO}$ ) is reduced to copper (Cu) while hydrogen ( $\text{H}_2$ ) gets oxidised to water ( $\text{H}_2\text{O}$ ). [2]

**Q. 15. Ferrous sulphate decomposes with the evolution of a gas having a characteristic odour of burning sulphur. Write the chemical reaction involved and identify the type of reaction.**

[NCERT Exemp. Q. 27, Page 6]

**Ans.** Ferrous sulphate decomposes with the evolution of a gas having a typical odour of burning sulphur. It is a thermal decomposition reaction.



**Q. 16. Why do fire flies glow at night?**

[NCERT Exemp. Q. 28, Page 6]

**Ans.** Fire flies glow at night because they have a protein which in the presence of an enzyme undergoes aerial oxidation. This is a chemical reaction which involves emission of visible light. [2]

**Q. 17. During the reaction of some metals with dilute hydrochloric acid, following observations were made.**

(a) Silver metal does not show any change.

(b) The temperature of the reaction mixture rises when aluminium (Al) is added.

(c) The reaction of sodium metal is found to be highly explosive.



- (d) Some bubbles of a gas are seen when lead (Pb) is reacted with the acid.

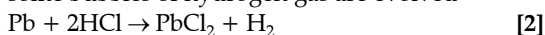
Explain these observations giving suitable reasons. [NCERT Exemp. Q. 31, Page 6]

Ans. (a) Silver metal does not react with dilute HCl, hence it does not show any change.

- (b) The temperature of the reaction mixture rises when aluminium comes in contact of dil. HCl because it is an exothermic reaction.

- (c) The reaction of sodium metal is found to be highly explosive with dilute hydrochloric acid because it is an exothermic reaction

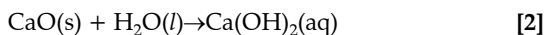
- (d) When lead is treated with dilute hydrochloric acid, some bubbles of hydrogen gas are evolved



Q. 18. A substance X, which is an oxide of a Group 2 element, is used intensively in the cement industry. This element is present in bones also. On treatment with water it forms a solution which turns red litmus blue. Identify X and also write the chemical reactions involved.

[NCERT Exemp. Q. 32, Page 7]

Ans. Substance is an oxide of a Group 2 element and is used intensively in the cement industry is Calcium oxide. Present in bones also. On treatment with water it forms a solution which turns red litmus blue.



Q. 19. Write a balanced chemical equation for each of the following reactions and also classify them.

- (a) Lead acetate solution is treated with dilute hydrochloric acid to form lead chloride and acetic acid solution.

- (b) A piece of sodium metal is added to absolute ethanol to form sodium ethoxide and hydrogen gas.

- (c) Iron (III) oxide on heating with carbon monoxide

gas reacts to form solid iron and liberates carbon dioxide gas.

- (d) Hydrogen sulphide gas reacts with oxygen gas to form solid sulphur and liquid water.

[NCERT Exemp. Q. 33, Page 7]

Ans. (a)  $\text{Pb}(\text{CH}_3\text{COO})_2(\text{aq}) + 2\text{HCl}(\text{dil}) \rightarrow \text{PbCl}_2 + \text{CH}_3\text{COOH}(\text{dil})$ ; Double displacement reaction

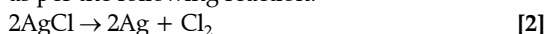
- (b)  $2\text{Na} + 2\text{C}_2\text{H}_5\text{OH} \rightarrow 2\text{C}_2\text{H}_5\text{ONa} + \text{H}_2\uparrow$   
Displacement reaction

- (c)  $\text{Fe}_2\text{O}_3 + 3\text{CO} \xrightarrow{\text{Heat}} 2\text{Fe} + 3\text{CO}_2$ ;  
Redox reaction

- (d)  $2\text{H}_2\text{S(g)} + \text{O}_2\text{(g)} \rightarrow 2\text{S} + 2\text{H}_2\text{O}$ ; [2]  
Redox reaction

Q. 20. Why do we store silver chloride in dark coloured bottles? [NCERT Exemp. Q. 34, Page 7]

Ans. Silver chloride is stored in dark coloured bottles because on exposure to sunlight it may decompose as per the following reaction.



Q. 21. A silver article generally sunlight turns black when kept in the open for a few days. The article when rubbed with toothpaste again starts shining.

- (a) Why do silver articles turn black when kept in the open for a few days? Name the phenomenon involved.

- (b) Name the black substance formed and give its chemical formula. [NCERT Exemp. Q. 38, Page 7]

Ans. (a) Silver articles turn black when kept in the open for a few days are said to be corroded and this phenomenon is called corrosion. This is because they are attacked by substances around it such as moisture, acids, gases, etc.

- (b) The black substance formed is thin black coating of silver sulphide ( $\text{Ag}_2\text{S}$ ) because silver (Ag) reacts with  $\text{H}_2\text{S}$  present in air. [2]

## Short Answer Type Questions

(3 marks each)

Q. 1. Balance the following chemical equations and identify the type of chemical reaction.

[NCERT Exemp. Q. 35, Page 7]

- (a)  $\text{Mg(s)} + \text{Cl}_2\text{(g)} \rightarrow \text{MgCl}_2\text{(s)}$

- (b)  $\text{HgO(s)} \xrightarrow{\text{Heat}} \text{Hg(l)} + \text{O}_2\text{(g)}$

- (c)  $\text{Na(s)} + \text{S(s)} \xrightarrow{\text{Fuse}} \text{Na}_2\text{S(s)}$

- (d)  $\text{TiCl}_4\text{(l)} + 2\text{Mg(s)} \rightarrow \text{Ti(s)} + 2\text{MgCl}_2\text{(s)}$

- (e)  $\text{CaO(s)} + \text{SiO}_2\text{(s)} \rightarrow \text{CaSiO}_3\text{(s)}$

- (f)  $\text{H}_2\text{O}_2\text{(l)} \xrightarrow{\text{UV}} \text{H}_2\text{O(l)} + \text{O}_2\text{(g)}$

Ans. (a) Balanced; Combination reaction

- (b)  $2\text{HgO(s)} \xrightarrow{\text{Heat}} 2\text{Hg(l)} + \text{O}_2\text{(g)}$ ;  
Decomposition reaction

- (c)  $2\text{Na(s)} + \text{S(s)} \xrightarrow{\text{Fuse}} \text{Na}_2\text{S(s)}$ ;  
Combination reaction

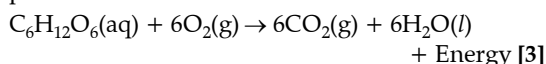
- (d)  $\text{TiCl}_4\text{(l)} + 2\text{Mg(s)} \rightarrow \text{Ti(s)} + 2\text{MgCl}_2\text{(s)}$ ;  
Displacement reaction

- (e) Balanced; Combination reaction

- (f)  $2\text{H}_2\text{O}_2\text{(l)} \xrightarrow{\text{UV}} 2\text{H}_2\text{O(l)} + \text{O}_2\text{(g)}$ ; Decomposition reaction [3]

Q. 2. Why is respiration considered an exothermic reaction? Explain. [NCERT Ex. Q. 10, Page 15]

Ans. 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.



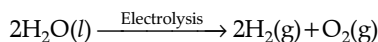
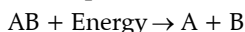
Q. 3. Why are decomposition reactions called the opposite of combination reactions? Write equations for these reactions.

[NCERT Ex. Q. 11, Page 15]

Ans. 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 :**



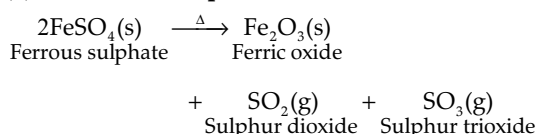
**Combination reaction :**



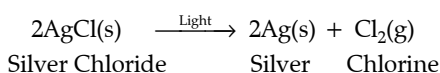
**Q. 4. Write one equation, each for decomposition reactions, where energy is supplied in the form of heat, light or electricity.**

[NCERT Ex. Q. 12, Page 16]

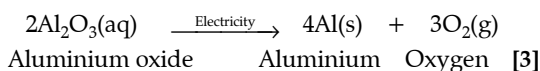
**Ans. (1) Thermal decomposition :**



**(2) Decomposition by light :**



**(3) Decomposition by electricity :**



**Q. 5. Identify the oxidising agent (oxidant) in the following reactions**

- $\text{Pb}_3\text{O}_4 + 8\text{HCl} \rightarrow 3\text{PbCl}_2 + \text{Cl}_2 + 4\text{H}_2\text{O}$
- $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$
- $\text{CuSO}_4 + \text{Zn} \rightarrow \text{Cu} + \text{ZnSO}_4$
- $\text{V}_2\text{O}_5 + 5\text{Ca} \rightarrow 2\text{V} + 5\text{CaO}$
- $3\text{Fe} + 4\text{H}_2\text{O} \rightarrow \text{Fe}_3\text{O}_4 + 4\text{H}_2$
- $\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$

[NCERT Exemp. Q. 24, Page 6]

**Ans. (a)**  $\text{Pb}_3\text{O}_4$

**(b)**  $\text{O}_2$

**(c)**  $\text{CuSO}_4$

**(d)**  $\text{V}_2\text{O}_5$

**(e)**  $\text{H}_2\text{O}$

**(f)**  $\text{CuO}$

[3]

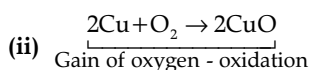
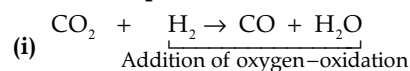
**Q. 6. Explain the following in terms of gain or loss of oxygen with two examples each.**

**(a) Oxidation**

**(b) Reduction** [NCERT Ex. Q. 16, Page 16]

**Ans.** Oxidation is the gain of oxygen.

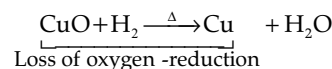
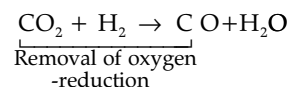
**For example :**



In equation (i),  $\text{H}_2$  is oxidized to  $\text{H}_2\text{O}$  and in equation (ii), Cu is oxidised to  $\text{CuO}$ .

Reduction is the loss of oxygen.

**For example :**



In equation (i),  $\text{CO}_2$  is reduced to  $\text{CO}$  and in equation (ii),  $\text{CuO}$  is reduced to  $\text{Cu}$ . [3]

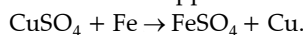
**Q. 7. Oil and fat containing food items are flushed with nitrogen. Why?** [NCERT Ex. Q. 19, Page 16]

**Ans.** 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. [3]

**Q. 8. Why does the colour of copper sulphate solution change when an iron nail is dipped in it?**

[NCERT Q. 1, Page 13]

**Ans.** When an iron nail is dipped in a copper sulphate solution, iron displaces copper from copper sulphate solution forming iron sulphate, which is green in colour. This is because iron is more reactive than copper.

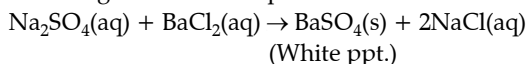


Therefore, the blue colour of copper sulphate solution fades and green colour appears. [3]

**Q. 9. What is observed when a solution of sodium sulphate is added to a solution of barium chloride taken in a test tube? Write equation for the chemical reaction involved and name the type of reaction in this case.**

[CBSE Board, Delhi Region, All India Region, 2018]

**Ans.** When a solution of sodium sulphate is added to a solution of barium chloride taken in a test tube, following reaction takes place :



$\text{BaSO}_4$  White precipitate is formed

$\text{NaCl}$  Remain in the solution

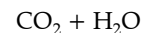
In this reaction, exchange of ions between the reactant takes place, thus this reaction is double displacement reaction. [3]

**Q. 10. Write three different chemical reactions showing the conversion of ethanoic acid to sodium ethanoate. Write balanced chemical equation in each case. Write the name of reactants and products other than ethanoic acid and sodium ethanoate in each case.**

[CBSE Board, All India Region, 2016]

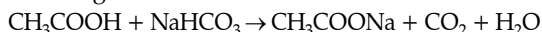
**Ans. (i) Reaction with sodium carbonate :**

Ethanoic acid reacts with sodium carbonate to form sodium ethanoate and carbon dioxide gas.



**(ii) Reaction with sodium hydrogen carbonate :**

Ethanoic acid reacts with sodium hydrogen carbonate to evolve brisk effervescence of carbon dioxide gas.


**(iii) Reaction with sodium hydroxide :**

Ethanoic acid reacts with sodium hydroxide to form a salt of sodium ethanoate and water.



## Long Answer Type Questions

(5 marks each)

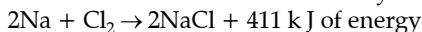
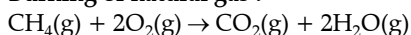
**Q. 1. What does one mean by exothermic and endothermic reactions? Give examples.**

[NCERT Ex. Q. 9, Page 15]

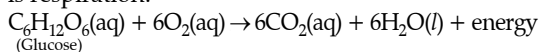
**Ans. Exothermic reaction :** Reactions in which energy is released in the form of heat, light, or sound along with the formation of products are called exothermic reactions.

**Examples :**

Mixture of sodium and chlorine to yield table salt :


**Burning of natural gas :**


We get energy to stay alive from the food we eat. During digestion, food is broken down into simpler substances. For example, rice, potatoes and bread contain carbohydrates. These carbohydrates are broken down to form glucose. This glucose combines with oxygen in the cells of our body and provides energy. The special name of this reaction is respiration.

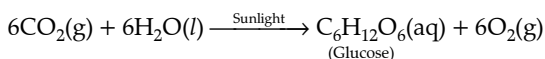


The decomposition of vegetable matter into compost is also an example of an exothermic reaction.

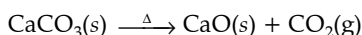
**Endothermic reaction :** Reactions in which energy is absorbed or required energy either in the form of heat, light or electricity for breaking down the reactants are known as endothermic reactions.

**Example :**

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



Endothermic reactions—



**Q. 2. What is the difference between displacement and double displacement reactions? Write equations for these reactions.** [NCERT Ex. Q. 13, Page 16]

**Ans.** Difference between displacement and double displacement reactions are given ahead :

| Displacement reaction   | Double displacement reaction   |
|---|--|
| In a displacement reaction, a more reactive element replaces a less reactive element from a compound. | In a double displacement reaction, two atoms or a group of atoms switch places to form new compounds |

|   |  |
|---|--|
| In a displacement reaction, one displacement takes place<br>$\text{A} + \text{BX} \rightarrow \text{AX} + \text{B}$   | In a double displacement reaction, two displacements take place to complete the reaction<br>$\text{AB} + \text{CD} \rightarrow \text{AC} + \text{BD}$  |
| Change of colour takes place, no precipitate forms  | Precipitates are formed  |
| Metals react with salt solution of another metal  | Salt solutions of two different metals react with each other.  |
| <b>Examples :</b><br>$\text{Zn}(\text{s}) + \text{CuSO}_4(\text{aq}) \rightarrow \text{ZnSO}_4(\text{aq}) + \text{Cu}(\text{s})$<br>$\text{Pb}(\text{s}) + \text{CuCl}_2(\text{aq}) \rightarrow \text{PbCl}_2(\text{aq}) + \text{Cu}(\text{s})$ | <b>Examples :</b><br>$\text{Na}_2\text{SO}_4(\text{aq}) + \text{BaCl}_2(\text{aq}) \rightarrow \text{BaSO}_4(\text{s}) + 2\text{NaCl}(\text{aq})$<br>$2\text{KBr}(\text{aq}) + \text{BaCl}_2 \rightarrow 2\text{KCl}(\text{aq}) + \text{BaBr}_2(\text{s})$ |

[5]

**Q. 3. What do you mean by a precipitation reaction? Explain by giving examples.**

[NCERT Ex. Q. 15, Page 16]

**Ans.** A reaction in which an insoluble solid (called precipitate) is formed is called a precipitation reaction. The salts formed are precipitates and are the products of precipitation reaction. The precipitation reactions are the double displacement reactions involving the production of a solid form residue called the precipitate. The reaction also occurs when two or more solutions with different salts are combined, resulting in the formation of insoluble salts that precipitates out of the solution.

**Examples :**

- (i)  $\text{Na}_2\text{SO}_4(\text{aq}) + \text{BaCl}_2(\text{aq}) \rightarrow \text{BaSO}_4(\text{s}) + 2\text{NaCl}(\text{aq})$   
The white precipitate of  $\text{BaSO}_4$  is formed by the reaction of  $\text{SO}_4^{2-}$  and  $\text{Ba}^{2+}$ . The other product formed is sodium chloride which remains in the solution.
- (ii)  $\text{Na}_2\text{CO}_3(\text{aq}) + \text{CaCl}_2(\text{aq}) \rightarrow \text{CaCO}_3(\text{s}) + 2\text{NaCl}(\text{aq})$   
In this reaction, calcium carbonate is obtained as a precipitate. Hence, it is a precipitation reaction
- (ii)  $\text{AgNO}_3(\text{aq}) + \text{KCl}(\text{aq}) \rightarrow \text{AgCl}(\text{ppt.}) + \text{KNO}_3(\text{aq})$   
In this reaction, a white precipitate called as silver chloride or  $\text{AgCl}$  is formed which is in a solid state.

**Q. 4. Explain the following terms with one example each.**

(a) Corrosion

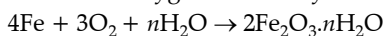
(b) Rancidity

[NCERT Ex. Q. 20, Page 16]

**Ans. (a) Corrosion :** A process where materials, usually metals, deteriorate on interaction with air, moisture, chemicals, etc., as a result of chemical reactions between them is known as corrosion.

The black coating on silver and the green coating on copper are other examples of corrosion. Corrosion causes damage to car bodies, bridges, iron railings, ships and to all objects made of metals, especially those of iron. Corrosion of iron is a serious problem. Corrosion makes the metals scaly and decreases their envisioned usage period. The strength, appearance and permeability are also degraded. A considerable amount of damage is done by corrosion every year, which includes damaging of cars, grills, buses, railings, sinking of ships, falling off bridges, deterioration of statues, etc.

**For example**, iron, in the presence of moisture, reacts with oxygen to form 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. It spoils food materials that makes difficult consumption.

**For example**, the taste and smell of butter changes when kept for long.

Rancidity can be avoided by :

- Storing food in air tight containers
- Storing food in refrigerators or at very low temperatures
- Adding antioxidants
- Storing food in an environment of nitrogen [5]

**Q. 5. You are provided with two containers made up of copper and aluminium. You are also provided with solutions of dilute HCl, dilute HNO<sub>3</sub>, ZnCl<sub>2</sub> and H<sub>2</sub>O. In which of the above containers these solutions can be kept?**

[NCERT Exemp. Q. 44, Page 8]

**Ans. (i)** When solutions are kept in copper containers.

Dilute HCl

Copper does not react with dilute HCl. Therefore, it can be kept.

Dilute HNO<sub>3</sub>

Nitric acid cannot be kept because it acts as a strong oxidising agent and reacts with copper vessel.

ZnCl<sub>2</sub>

Zinc is more reactive than copper (Cu) therefore, no displacement reaction occurs and hence it can be kept.

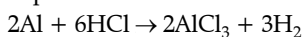
H<sub>2</sub>O

Copper does not react with water. Therefore, it can be kept.

(ii) When solutions are kept in aluminium containers.

Dilute HCl

Aluminium reacts with dilute HCl to form its salt and hydrogen is evolved. Therefore, it cannot be kept.

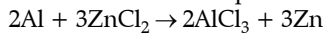


Dilute HNO<sub>3</sub>

Aluminium gets oxidised by dilute HNO<sub>3</sub> to form a layer of Al<sub>2</sub>O<sub>3</sub> and can be kept.

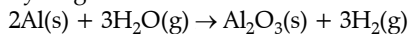
ZnCl<sub>2</sub>

Aluminium being more reactive than zinc can displace zinc ion from the solution. Therefore, the solution cannot be kept.



Aluminium does not react with cold or hot water.

Therefore, water can be kept. Aluminium is attacked by steam to form aluminium oxide and hydrogen



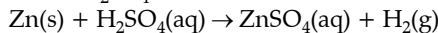
H<sub>2</sub>O

[5]

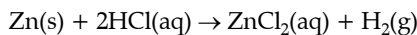
**Q. 6. What happens when zinc granules are treated with dilute solution of H<sub>2</sub>SO<sub>4</sub>, HCl, HNO<sub>3</sub>, NaCl and NaOH, also write the chemical equations if reaction occurs. [NCERT Exemp. Q. 42, Page 8]**

**Ans.** The reaction of Zn granules with

Dilute H<sub>2</sub>SO<sub>4</sub>

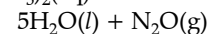
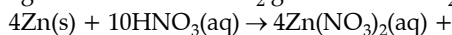


Dilute HCl

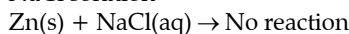


Dilute HNO<sub>3</sub>

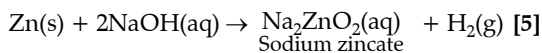
Reaction with dilute HNO<sub>3</sub> is different as compared to other acids because nitric acid is an oxidising agent and it oxidises. H<sub>2</sub> gas evolved to H<sub>2</sub>O.



NaCl solution



NaOH solution



Sodium zincate

**Q. 7. Give the characteristic tests for the following gases**

(a) CO<sub>2</sub>

(b) SO<sub>2</sub>

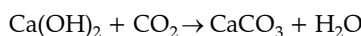
(c) O<sub>2</sub>

(d) H<sub>2</sub>

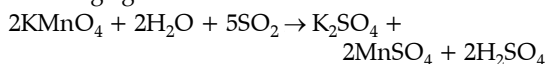
[NCERT Exemp. Q. 40, Page 8]

**Ans. The characteristic tests :**

(a) Carbon dioxide (CO<sub>2</sub>) gas turns lime water milky when passed through it due to the formation of insoluble calcium carbonate.



(b) Sulphur dioxide (SO<sub>2</sub>) gas when passed through acidic potassium permanganate solution (purple in colour) turns it colourless because SO<sub>2</sub> is a strong reducing agent



(c) The evolution of oxygen (O<sub>2</sub>) gas during a reaction can be confirmed by bringing a burning candle near the mouth of the test tube containing the reaction mixture. The intensity of the flame increases because oxygen supports burning.

(d) Hydrogen (H<sub>2</sub>) gas burns with a pop sound when a burning candle is taken near it. [5]

**Q. 8. On heating blue coloured powder of copper (II) nitrate in a boiling tube, copper oxide (black), oxygen gas and a brown gas X is formed**

(a) Write a balanced chemical equation of the reaction.

(b) Identify the brown gas X evolved.

(c) Identify the type of reaction.

(d) What could be the pH range of aqueous solution of the gas X? [NCERT Exemp. Q. 39, Page 8]

Ans. (a) **Balanced chemical equation :**



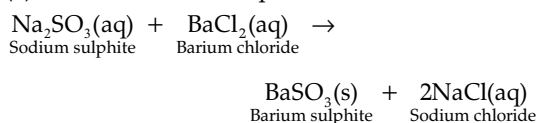
- (b) The brown gas X evolved is nitrogen dioxide ( $\text{NO}_2$ ).  
 (c) This is a decomposition reaction.  
 (d) Nitrogen dioxide is an oxide of non-metal so it dissolves in water to form acidic solution. Thus, pH of this solution is less than 7.

Q. 9. On adding a drop of barium chloride solution to an aqueous solution of sodium sulphite, white precipitate is obtained.

- (a) Write a balanced chemical equation of the reaction involved  
 (b) What other name can be given to this precipitation reaction?  
 (c) On adding dilute hydrochloric acid to the reaction mixture, white precipitate disappears. Why?

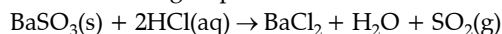
[NCERT Exemp. Q. 43, Page 8]

Ans. (a) **Balanced chemical equation**



- (b) This reaction is also known as double displacement reaction.  
 (c)  $\text{BaSO}_3$  is a salt of a weak acid ( $\text{H}_2\text{SO}_3$ ), therefore dilute acid such as HCl decomposes barium

sulphite to produce sulphur dioxide gas which has the smell of burning sulphur.



White precipitate

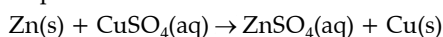
$\text{BaCl}_2$  is soluble in water, hence white precipitate disappears. [3]

Q. 10. What happens when a piece of :

- (a) zinc metal is added to copper sulphate solution?  
 (b) aluminium metal is added to dilute hydrochloric acid?  
 (c) silver metal is added to copper sulphate solution?

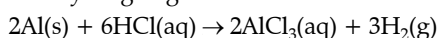
Also, write the balanced chemical equation if the reaction occurs. [NCERT Exemp. Q. 41, Page 8]

Ans. (a) Zinc being more reactive than copper displaces copper from its solution and a solution of zinc sulphate is obtained

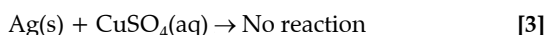


This is an example of displacement reaction.

- (b) Aluminium being more reactive displaces hydrogen from dilute hydrochloric acid solution and hydrogen gas is evolved.



- (c) Silver metal being less reactive than copper cannot displace copper from its salt solution. Therefore, no reaction occurs.



## Some Commonly Made Errors

- While writing the equation of a chemical reaction, students do not balance the chemical reaction.
- Sometimes students write the chemical equation when asked the observations of a reaction.
- Students forget to give example of equation when asked to define it.
- Students forget to mention the consequence, that is the type of reaction or phenomenon is missing.



### EXPERT ADVICE

- 🔊 Be thorough with all the equations and processes.
- 🔊 Practice Balancing the Chemical Equation.
- 🔊 Make a proper chart of chemical reactions with examples of day-to-day life.
- 🔊 Remember to mention the consequence or types of reaction in answer.
- 🔊 Focus on important topic from balancing the equations, displacement reaction, decomposition reaction, corrosion and rancidity.



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