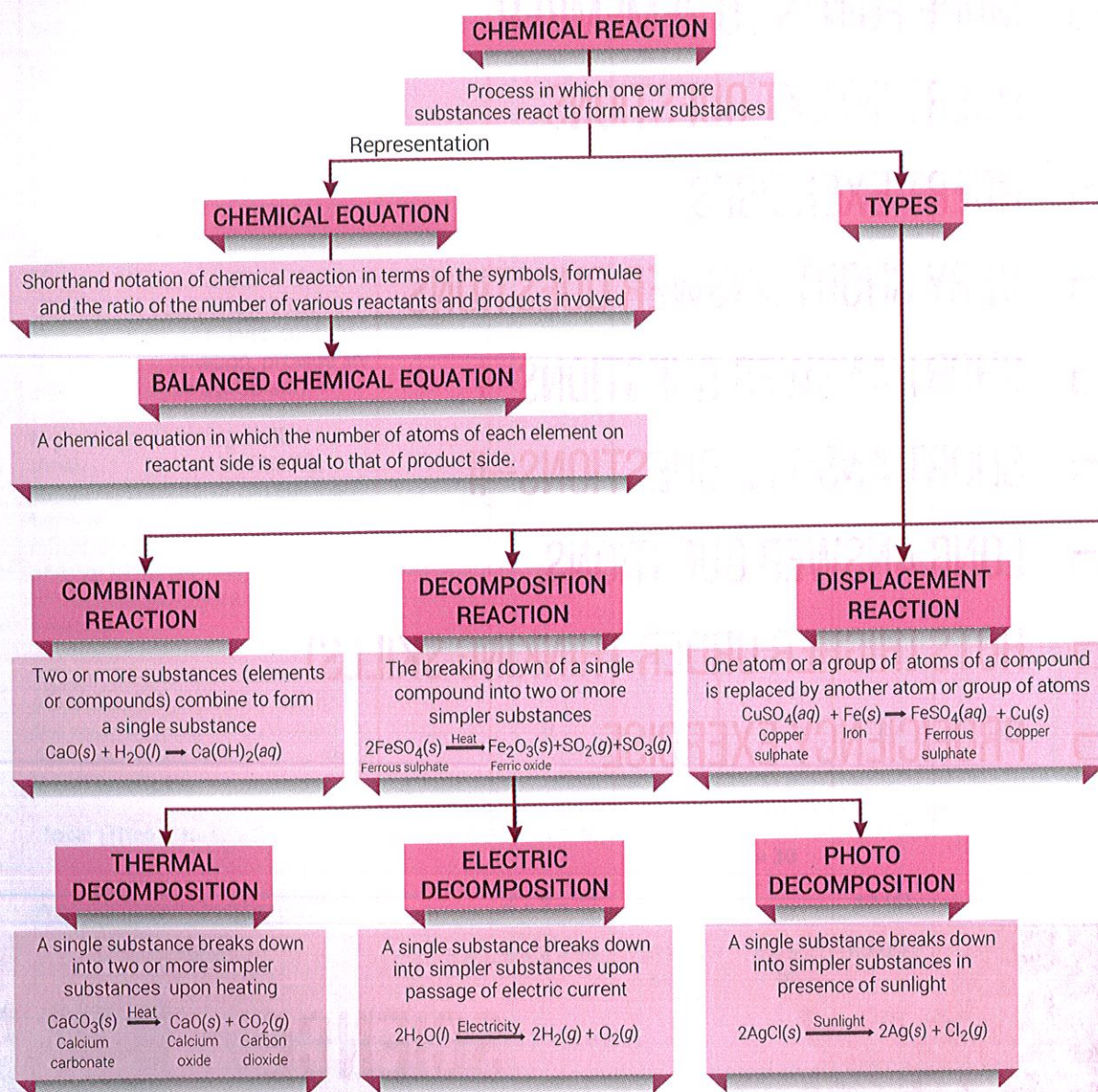
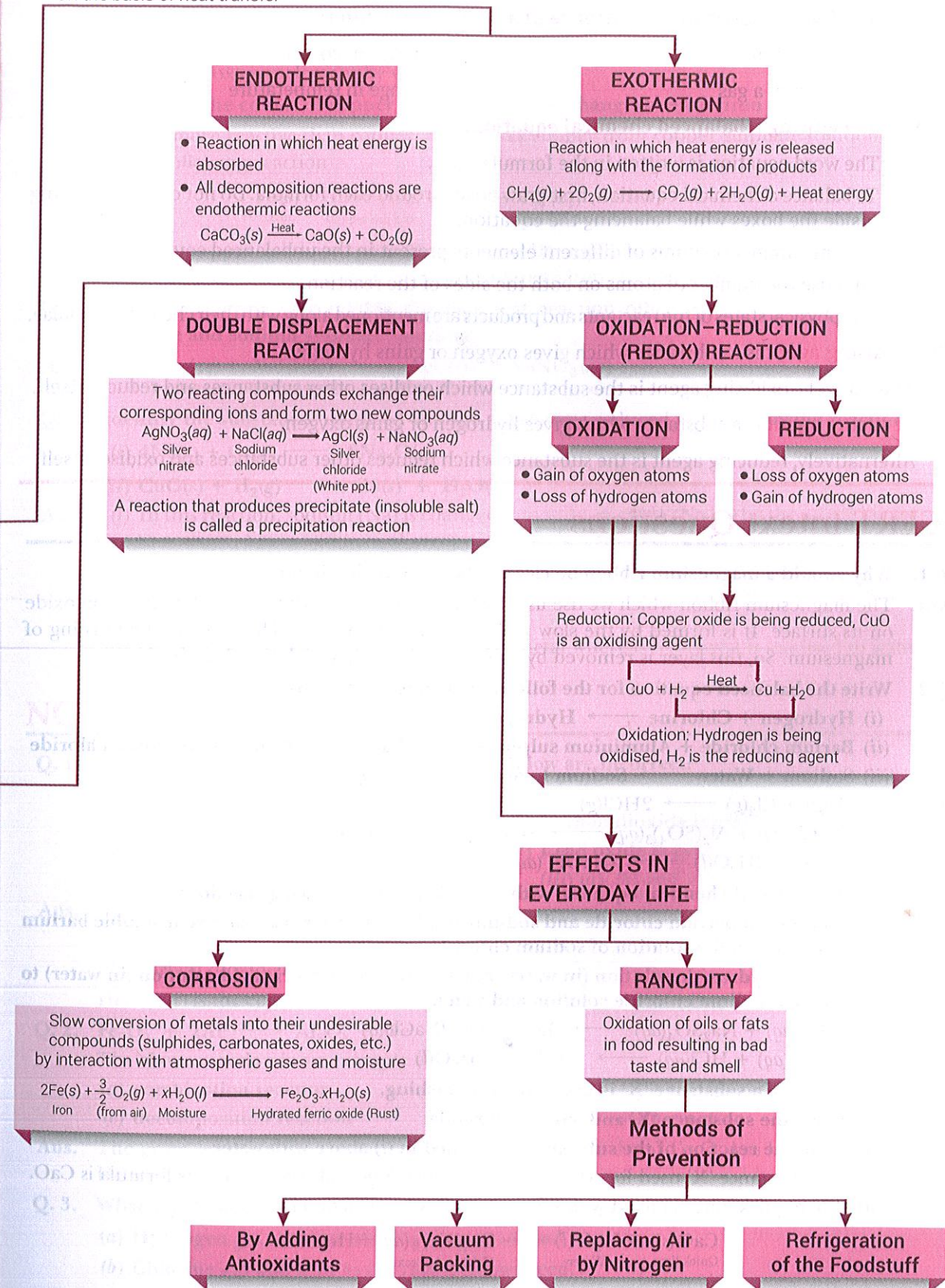


CHEMICAL REACTIONS AND EQUATIONS

BASIC CONCEPTS – A FLOW CHART



On the basis of heat transfer



MORE POINTS TO REMEMBER

Observations to determine occurrence of a chemical reaction:

- (i) Change in state
- (ii) Change in colour
- (iii) Evolution of a gas
- (iv) Change in temperature

Steps in writing a balanced chemical equation:

- (i) The word equation is written in the formula form.
- (ii) To balance a chemical equation, first draw boxes around each formula. Do not change anything inside the boxes while balancing the equation.
- (iii) List the number of atoms of different elements present in the unbalanced equation.
- (iv) Equalise the number of atoms on both the sides of the reaction.
- (v) The physical states of the reactants and products are mentioned along with their chemical formulae.

Oxidising agent is a substance which gives oxygen or gains hydrogen.

Alternatively, oxidising agent is the substance which oxidises other substances and reduces itself.

Reducing agent is a substance which gives hydrogen or gains oxygen.

Alternatively, reducing agent is the substance which reduces other substances and oxidises itself.

NCERT Intext Questions

Q. 1. Why should a magnesium ribbon be cleaned before burning in air?

Ans. The magnesium ribbon which we use usually has a coating of a white layer of magnesium oxide on its surface. It is formed by the slow reaction of moist air on it. This hinders the burning of magnesium. So, this layer is removed by rubbing with sandpaper before burning.

Q. 2. Write the balanced equation for the following chemical reactions:

- (i) Hydrogen + Chlorine \longrightarrow Hydrogen chloride
- (ii) Barium chloride + Aluminium sulphate \longrightarrow Barium sulphate + Aluminium chloride
- (iii) Sodium + Water \longrightarrow Sodium hydroxide + Hydrogen

Ans. (i) $\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \longrightarrow 2\text{HCl}(\text{g})$
 (ii) $3\text{BaCl}_2(\text{aq}) + \text{Al}_2(\text{SO}_4)_3(\text{aq}) \longrightarrow 3\text{BaSO}_4(\text{s}) + 2\text{AlCl}_3(\text{aq})$
 (iii) $2\text{Na}(\text{s}) + 2\text{H}_2\text{O}(\text{l}) \longrightarrow 2\text{NaOH}(\text{aq}) + \text{H}_2(\text{g})$

Q. 3. Write a balanced chemical equation with symbols for the following reactions:

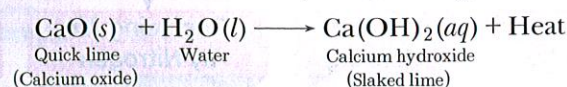
- (i) Solutions of barium chloride and sodium sulphate in water react to give insoluble barium sulphate and the solution of sodium chloride.
- (ii) Sodium hydroxide solution (in water) reacts with hydrochloric acid solution (in water) to produce sodium chloride solution and water.

Ans. (i) $\text{BaCl}_2(\text{aq}) + \text{Na}_2\text{SO}_4(\text{aq}) \longrightarrow \text{BaSO}_4(\text{s}) + 2\text{NaCl}(\text{aq})$
 (ii) $\text{NaOH}(\text{aq}) + \text{HCl}(\text{aq}) \longrightarrow \text{NaCl}(\text{aq}) + \text{H}_2\text{O}(\text{l})$

Q. 4. A solution of a substance 'X' is used for whitewashing.

- (i) Name the substance 'X' and write its formula.
- (ii) Write the reaction of the substance 'X' named in (i) above with water.

Ans. (i) The substance 'X' used for whitewashing is quick lime (calcium oxide). Its formula is CaO .
 (ii) When quick lime is mixed with water, the following reaction takes place:



Q. 5. Why is the amount of gas collected in one of the test tubes double of the amount collected in the other in electrolysis of water experiment? Name this gas.

Ans. The gas which is collected in double the amount in the electrolysis of water experiment is hydrogen. This is because water (H_2O) contains two parts of hydrogen element as compared to one part of oxygen element by volume.

Q. 6. Why does the colour of copper sulphate solution change when an iron nail is dipped in it?

Ans. Iron is more reactive than copper. It displaces copper from copper sulphate solution according to the following reaction:



Thus, as copper sulphate reacts to form iron(II) sulphate, the blue colour of copper sulphate solution fades and the solution turns green due to iron (II) sulphate.

Q. 7. Give an example of a double displacement reaction other than the one between barium chloride and sodium sulphate solutions.

Ans. $\text{AgNO}_3(\text{aq}) + \text{NaCl}(\text{aq}) \longrightarrow \text{AgCl}(\text{s}) + \text{NaNO}_3(\text{aq})$
 Silver nitrate Sodium chloride Silver chloride Sodium nitrate

Q. 8. Identify the substances oxidised and the substances reduced in the following reactions:

- (i) $4\text{Na}(\text{s}) + \text{O}_2(\text{g}) \longrightarrow 2\text{Na}_2\text{O}(\text{s})$
- (ii) $\text{CuO}(\text{s}) + \text{H}_2(\text{g}) \longrightarrow \text{Cu}(\text{s}) + \text{H}_2\text{O}(\text{l})$

Ans. (i) In this reaction, sodium (Na) is changed into sodium oxide (Na_2O) by the addition of oxygen to sodium. Since addition of oxygen is called oxidation, therefore, the substance sodium (Na) is oxidised.

Oxygen (O_2) is changed into Na_2O . Here, the addition of metal to oxygen takes place. So, the substance reduced is oxygen.

(ii) Here, copper oxide is reduced to copper metal whereas hydrogen is oxidised to water.

NCERT Exercises

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



- (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

Ans. The incorrect statements are:

- (a) Lead is getting reduced and
- (b) Carbon dioxide is getting oxidised.

Hence, (i) is the correct answer.

Q. 2. $\text{Fe}_2\text{O}_3 + 2\text{Al} \longrightarrow \text{Al}_2\text{O}_3 + 2\text{Fe}$

The above reaction is an example of

- (a) combination reaction
- (b) double displacement reaction
- (c) decomposition reaction
- (d) displacement reaction

Ans. The given equation is a displacement reaction in which Fe of Fe_2O_3 has been displaced by Al. Hence, (d) is the correct answer.

Q. 3. What happens when dilute hydrochloric acid is added to iron filings? Choose 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.

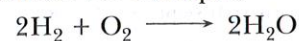
Ans. The following reaction takes place:



Thus, hydrogen and iron chloride are produced. Therefore, (a) is the correct answer.

Q. 4. What is a balanced chemical equation? Why should the chemical equations be balanced?

Ans. A balanced chemical equation is one which contains an equal number of atoms of each element on both sides of the equation. For example,



According to the law of conservation of mass, matter can neither be created nor destroyed in a chemical reaction. During a chemical reaction, the total mass of reactants and products remain the same. Hence, in a chemical reaction, the number of atoms of the various elements on both sides should be equal. Therefore, a chemical equation is to be balanced in accordance with the law of conservation of mass.

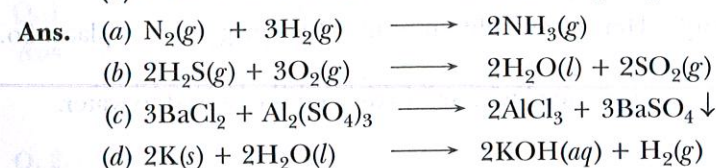
Q. 5. Translate the following statements into chemical equations and then balance them.

(a) Hydrogen gas combines with nitrogen to form ammonia.

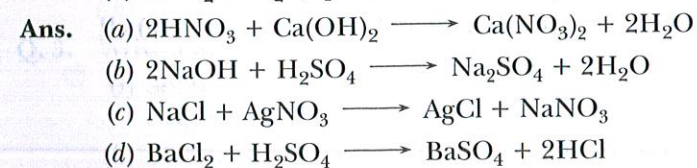
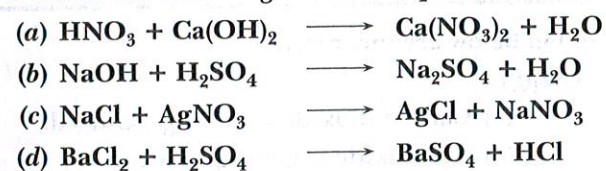
(b) Hydrogen sulphide gas burns in air to give water and sulphur dioxide.

(c) Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate.

(d) Potassium metal reacts with water to give potassium hydroxide and hydrogen gas.



Q. 6. Balance the following chemical equations:



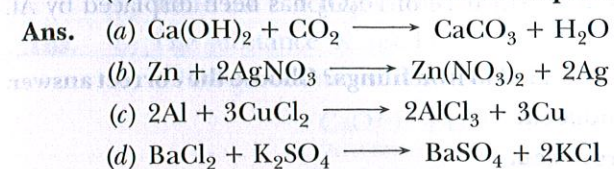
Q. 7. Write the balanced chemical equations for the following reactions.

(a) Calcium hydroxide + Carbon dioxide \longrightarrow Calcium carbonate + Water

(b) Zinc + Silver nitrate \longrightarrow Zinc nitrate + Silver

(c) Aluminium + Copper chloride \longrightarrow Aluminium chloride + Copper

(d) Barium chloride + Potassium sulphate \longrightarrow Barium sulphate + Potassium chloride



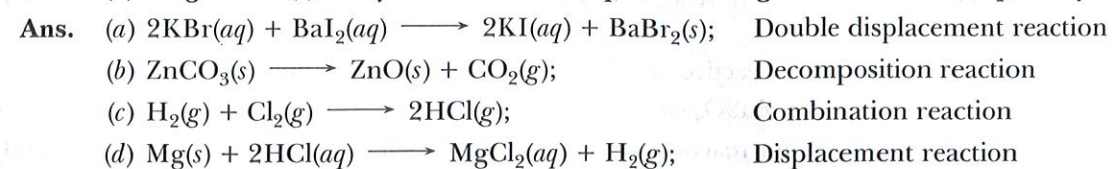
Q. 8. Write the balanced chemical equation for the following and identify the type of reaction in each case.

(a) Potassium bromide(aq) + Barium iodide(aq) \longrightarrow Potassium iodide(aq) + Barium bromide(s)

(b) Zinc carbonate(s) \longrightarrow Zinc oxide(s) + Carbon dioxide(g)

(c) Hydrogen(g) + Chlorine(g) \longrightarrow Hydrogen chloride(g)

(d) Magnesium(s) + Hydrochloric acid(aq) \longrightarrow Magnesium chloride(aq) + Hydrogen(g)



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

Ans. **Exothermic reaction:** In exothermic reaction, heat is evolved during the reaction which is indicated by '+ heat' sign on the right hand side of the equation.

For example:



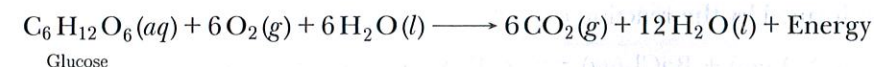
Endothermic reaction: In this reaction, heat is absorbed which is indicated by putting '+ heat' sign on the left hand side of the equation.

For example:



Q. 10. Why is respiration considered as an exothermic reaction? Explain.

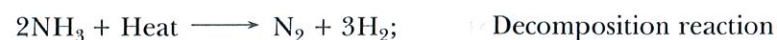
Ans. During respiration, the glucose combines with oxygen in the cells of our body and provides energy. Thus, respiration is an exothermic process because energy is produced during this process.



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

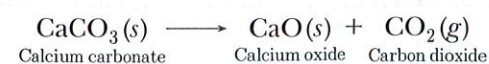
Ans. In a combination reaction, two or more substances combine to form a single product. Also, a large amount of heat is evolved.

The decomposition reactions require energy either in the form of heat, light or electricity for breaking down one substance into two or more substances.

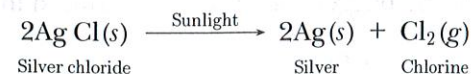


Q. 12. Write one equation each for decomposition reactions where energy is supplied in the form of heat, light or electricity.

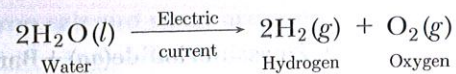
Ans. Decomposition reaction involving absorption of heat:



Decomposition reaction involving absorption of light:



Decomposition reaction involving absorption of electrical energy:



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

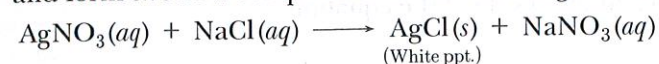
Ans. In a displacement reaction, a more reactive element displaces or removes another element from its compound.

For example, zinc being more reactive, displaces copper from its compound.

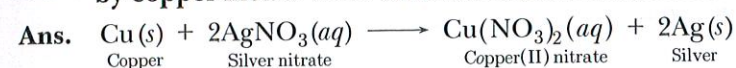


In case of double displacement reactions, two compounds react by exchanging their ions and form two new compounds.

For example, silver nitrate and sodium chloride exchange their ions, NO_3^- and Cl^- respectively and form two new compounds in the following reaction.



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



Q. 15. What do you mean by precipitation reactions? Explain giving examples.

Ans. On mixing the clear solutions of two ionic compounds, a substance which is insoluble in water, is formed. This insoluble substance formed is known as precipitate. Any reaction that produces a precipitate is called a precipitation reaction.

When sodium sulphate solution is mixed with barium chloride solution, a white precipitate of BaSO_4 is formed by the reaction of SO_4^{2-} and Ba^{2+} .

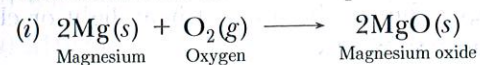


The other product formed is sodium chloride which remains in the solution.

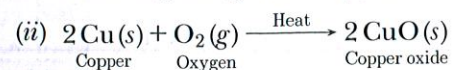
Q. 16. Explain the following in terms of gain or loss of oxygen with two examples each:

(a) Oxidation (b) Reduction.

Ans. (a) **Oxidation:** It is defined as a process which involves gain of oxygen. For example,

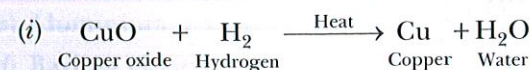


Here, Mg has gained oxygen to form MgO. Hence, Mg has been oxidised to MgO.

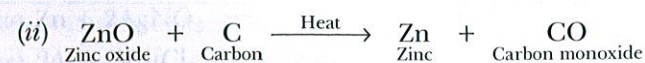


In this reaction, Cu has gained oxygen to form CuO. Thus, Cu is oxidised to copper oxide (CuO).

(b) **Reduction:** It is defined as the process which involves loss of oxygen. For example,



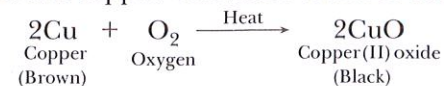
In this reaction, copper oxide is losing oxygen. So, it is being reduced to copper.



In this reaction, zinc oxide is losing oxygen. So it is being reduced to zinc.

Q. 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.

Ans. Element X is copper. The black coloured compound formed is copper (II) oxide.



Q. 18. Why do we apply paint on iron articles?

Ans. By coating paint over iron articles, the contact of moist air with iron is cut off. So, moist air cannot attack on the surface of iron articles and there is no risk of rusting (corrosion of iron). Thus, iron articles can be protected from damage for many years.

Q. 19. Oil and fat containing food items are flushed with nitrogen. Why?

Ans. In the presence of oxygen in the air, the fats present in the fatty food are oxidised to compounds which have a bad smell, *i.e.*, the food becomes rancid. Flushing with nitrogen cuts off the contact of food with oxygen and protects the food from rancidity.

Q. 20. Explain the following terms with one example each.

(a) Corrosion (b) Rancidity

Ans. (a) **Corrosion:** It is a process of slow and gradual conversion of a metal into its undesirable compounds (sulphides, carbonates, oxides, *etc.*) by the attack of air and moisture (water) present in the atmosphere.

For example, reddish brown coating on iron, black coating on silver and green coating on copper are some examples of corrosion of iron, silver and copper respectively. Corrosion of iron is known as rusting.

(b) **Rancidity:** When the food items are kept for a long period, the fats and oils present in them get oxidised and their smell and taste change. They become rancid and so the process is called rancidity.

For example, rancid (decaying) flavour or smell in old cooking oil.

VERY SHORT ANSWER QUESTIONS

[1 mark]

Q. 1. Why is combustion of Liquefied Petroleum Gas (LPG) a chemical change?

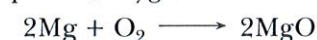
Ans. Combustion of Liquefied Petroleum Gas (LPG) is a chemical change because after its combustion, a new substance is formed and cannot be turned back into LPG.

Q. 2. What is wrong with the following equation?



Identify the mistake and balance the equation.

Ans. In this equation, oxygen should be in molecular form (O_2).



Q. 3. What is meant by skeletal equation?

Ans. The equation where the number of atoms of each element on both the sides of a chemical equation are not equal is called skeletal equation.

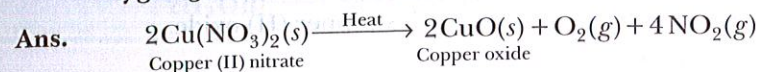
Q. 4. Potassium chlorate (KClO_3) on heating forms potassium chloride and oxygen. Write a balanced equation for this reaction.



Q. 5. What do you observe when magnesium ribbon is burnt?

Ans. When magnesium ribbon is burnt, formation of white powder is observed along with white dazzling flame.

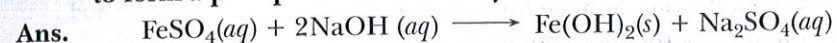
Q. 6. On heating blue coloured powder of copper(II) nitrate in a boiling tube, copper oxide (black), oxygen gas and a brown gas 'X' is formed. Identify the brown gas 'X'.



'X' is nitrogen dioxide gas.

Q. 7. Convey the following information in the form of a balanced chemical equation:

"An aqueous solution of ferrous sulphate reacts with an aqueous solution of sodium hydroxide to form a precipitate of ferrous hydroxide and sodium sulphate remains in solution."

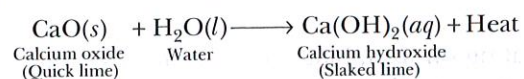


Q. 8. Balance the following chemical equation:



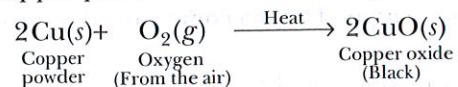
Q. 9. Give one example of a combination reaction which is also exothermic.

Ans. When quicklime or calcium oxide (CaO) reacts with water, slaked lime [Ca(OH)₂] is formed. During this reaction a large amount of heat is released. So, this reaction is an exothermic reaction.

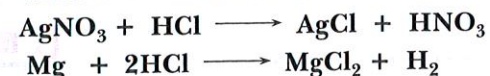


Q. 10. Why will the colour of heated copper powder become black when air is passed over it?

Ans. When copper powder is heated in the presence of air, black copper oxide is formed.



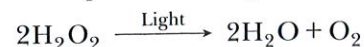
Q. 11. What is the difference between the following two types of reactions?



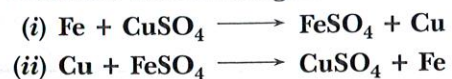
Ans. The first reaction is a double displacement reaction whereas second reaction is a single displacement reaction.

Q. 12. Why is hydrogen peroxide kept in coloured bottles?

Ans. This is done in order to cut off light because hydrogen peroxide decomposes into water and oxygen in the presence of light.



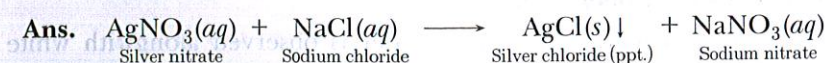
Q. 13. Consider the following reactions:



Which of these two reactions will take place and why?

Ans. Reaction (i) will take place. This is because Fe (iron) is more reactive than Cu (copper) and so it can displace Cu from its compound (CuSO₄). On the other hand, copper (Cu) cannot displace iron (Fe), so reaction (ii) will not take place.

Q. 14. Give one example of a reaction which is a double displacement reaction as well as a precipitation reaction.



Q. 15. Why is photosynthesis considered an endothermic reaction?

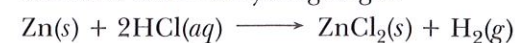
Ans. Photosynthesis is an endothermic reaction because energy, in the form of sunlight is absorbed during the process of photosynthesis by green plants.

Q. 16. What type of reaction is represented by the digestion of food in our body?

Ans. Decomposition reaction.

Q. 17. How will you test for the gas which is liberated when hydrochloric acid reacts with an active metal?

Ans. When an active metal like Zn reacts with HCl, the gas produced burns with a pop sound which indicates that it is hydrogen gas.



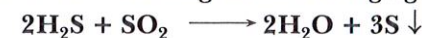
Q. 18. Can a double displacement reaction take place when the products are highly soluble or highly ionised?

Ans. No, double displacement reaction takes place when there is a formation of a slightly soluble salt.

Q. 19. What changes in the colour of iron nails and copper sulphate solution do you observe after keeping the iron nails dipped in copper sulphate solution for about 30 minutes?

Ans. Iron nails become brownish in colour and the blue colour of copper sulphate solution fades. This is because iron displaces copper from copper sulphate solution and forms ferrous sulphate which is light green in colour.

Q. 20. Name the oxidising and reducing agent in the following reaction:



Ans. H₂S is the reducing agent while SO₂ is the oxidising agent.

Q. 21. A dilute ferrous sulphate solution was gradually added to the beaker containing acidified potassium permanganate solution. The light purple colour of the solution fades and finally disappears. Write the correct explanation for this observation.

Ans. Potassium permanganate solution (KMnO₄) is an oxidising agent. It oxidises ferrous sulphate (FeSO₄) to ferric sulphate [Fe₂(SO₄)₃].

Q. 22. Define rancidity.

Ans. The oxidation of oils or fats in food resulting in a bad taste and smell is called rancidity.

Q. 23. Name one synthetic antioxidant.

Ans. Butylated hydroxyanisole (BHA).

SHORT ANSWER QUESTIONS-I

[2 marks]

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

Ans. (a) Physical change (b) Chemical change
(c) Physical change (d) Chemical change
(e) Physical change

[NCERT Exemplar]

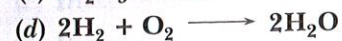
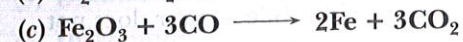
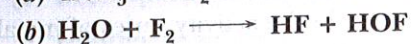
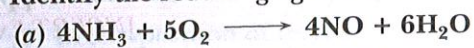
Q. 2. How do we come to know that a chemical reaction has taken place?

Ans. The presence of any of the following changes helps us to determine that a chemical reaction has taken place.

- Formation of new substance(s)
- Change in state
- Change in colour
- Change in temperature
- Formation of a precipitate
- Evolution of a gas

For example, if on mixing two substances a gas is evolved, then we can say that a chemical reaction has taken place.

Q. 17. Identify the reducing agent in the following reactions.



Ans. (a) Ammonia (NH_3)

(b) Water (H_2O) as F_2 is getting reduced to HF

(c) Carbon monoxide (CO)

(d) Hydrogen (H_2)

Q. 18. What is the role of a catalyst in a chemical reaction?

Ans. Catalyst changes (usually increases but sometimes decreases) the rate of a chemical reaction without itself being consumed in the reaction.

SHORT ANSWER QUESTIONS-II

[3 marks]

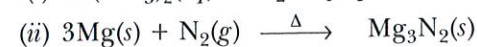
Q. 1. Translate the following statements into chemical equations and balance them:

(i) Lead nitrate reacts with sulphuric acid to form a precipitate of lead sulphate and nitric acid.

(ii) Magnesium burns in the presence of nitrogen to form magnesium nitride.

(iii) Aluminium metal strip is added in hydrochloric acid to produce aluminium chloride and hydrogen gas. [CCE 2016]

Ans. (i) $\text{Pb}(\text{NO}_3)_2(\text{aq}) + \text{H}_2\text{SO}_4(\text{aq}) \longrightarrow \text{PbSO}_4(\text{s}) + 2\text{HNO}_3(\text{aq})$



Q. 2. Write the balanced chemical equations for the following reactions:

(a) Sodium carbonate on reaction with hydrochloric acid in equal molar concentrations gives sodium chloride and sodium hydrogen carbonate.

(b) Sodium hydrogencarbonate on reaction with hydrochloric acid gives sodium chloride, water and liberates carbon dioxide.

(c) Copper sulphate on treatment with potassium iodide precipitates cuprous iodide (Cu_2I_2), liberates iodine gas and also forms potassium sulphate. [NCERT Exemplar]

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



Q. 3. Write the balanced chemical equations for the following reactions and identify the type of reaction in each case.

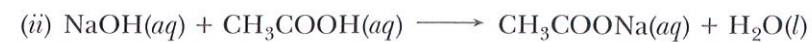
(i) Nitrogen gas is treated with hydrogen gas in the presence of a catalyst at 773 K to form ammonia gas.

(ii) Sodium hydroxide solution is treated with acetic acid to form sodium acetate and water.

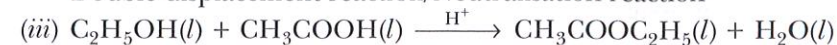
(iii) Ethanol is warmed with ethanoic acid to form ethyl acetate in the presence of concentrated H_2SO_4 .

(iv) Ethene is burnt in the presence of oxygen to form carbon dioxide, water and releases heat and light. [NCERT Exemplar]

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



Double displacement reaction/Neutralisation reaction



Double displacement reaction/Esterification reaction



Redox reaction/Combustion reaction

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

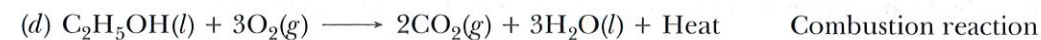
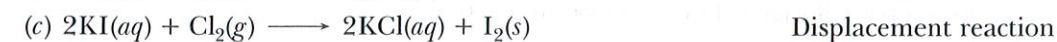
(a) Thermit reaction, iron (III) oxide reacts with aluminium and gives molten iron and aluminium oxide.

(b) Magnesium ribbon is burnt in an atmosphere of nitrogen gas to form solid magnesium nitride.

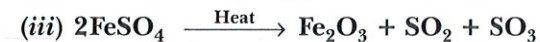
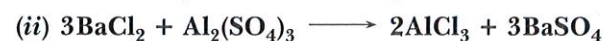
(c) Chlorine gas is passed in an aqueous potassium iodide solution to form potassium chloride solution and solid iodine.

(d) Ethanol is burnt in air to form carbon dioxide, water and releases heat. [NCERT Exemplar]

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



Q. 5. Name the type of chemical reaction represented by the following equation:



Ans. (i) Combination reaction

(ii) Double displacement reaction

(iii) Thermal decomposition reaction

Q. 6. Translate the following statements into chemical equations and then balance the equations:

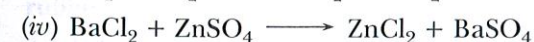
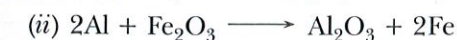
(i) Phosphorus burns in oxygen to give phosphorus pentoxide.

(ii) Aluminium metal replaces iron from ferric oxide, Fe_2O_3 , giving aluminium oxide and iron.

(iii) Carbon disulphide burns in air to give carbon dioxide and sulphur dioxide.

(iv) Barium chloride reacts with zinc sulphate to give zinc chloride and barium sulphate.

Ans. (i) $\text{P}_4 + 5\text{O}_2 \longrightarrow 2\text{P}_2\text{O}_5$



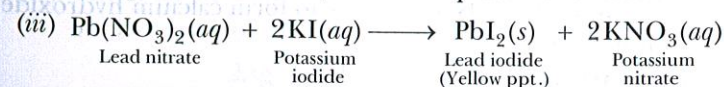
Q. 7. (i) What is observed when a solution of potassium iodide is added to a solution of lead nitrate taken in a test tube?

(ii) What type of reaction is this?

(iii) Write a balanced chemical equation to represent the above reaction.

Ans. (i) A yellow precipitate of lead iodide (PbI_2) is formed.

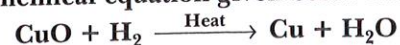
(ii) Precipitation reaction/Double displacement reaction.



LONG ANSWER QUESTIONS

[5 marks]

Q. 1. Consider the chemical equation given below and answer the questions that follow:



- Name the substance which is getting oxidised.
- Name the substance which is getting reduced.
- Name the oxidising agent.
- Name the reducing agent.
- What type of a reaction does this equation represent?

Ans. (i) The substance getting oxidised is H_2 .
 (ii) The substance getting reduced is CuO .
 (iii) CuO is the oxidising agent.
 (iv) H_2 is the reducing agent.
 (v) Since oxidation and reduction is taking place simultaneously, this reaction is an example of redox reaction.

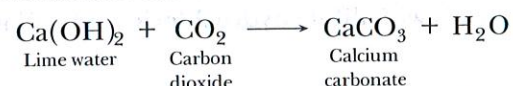
Q. 2. Give the characteristic tests for the following gases:

- CO_2
- SO_2
- O_2
- H_2

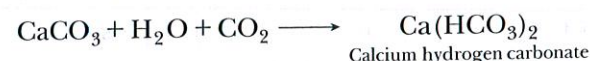
[NCERT Exemplar]

Ans. The characteristic test for

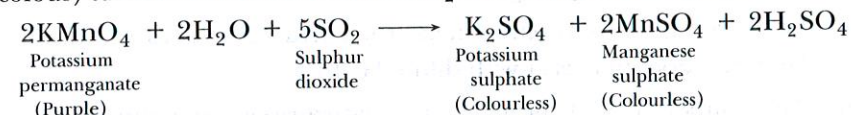
- Carbon dioxide (CO_2) gas turns lime water milky when passed through it due to the formation of insoluble calcium carbonate.



When CO_2 gas is passed in excess through lime water, milkiness disappears due to formation of soluble calcium hydrogen carbonate.



- Sulphur dioxide (SO_2) gas when passed through acidic potassium permanganate solution (purple in colour) turns it colourless because SO_2 is a strong reducing agent.



- The evolution of oxygen (O_2) 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.

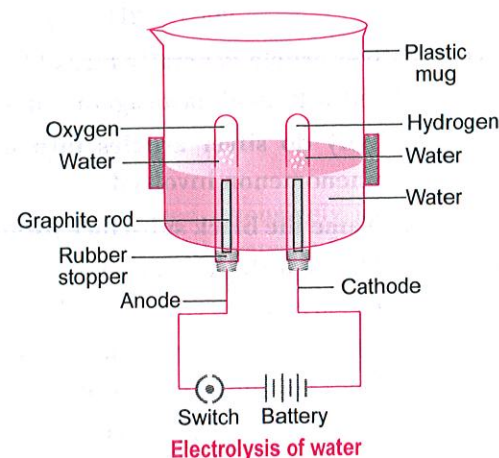
- Hydrogen (H_2) gas burns with a pop sound when a burning candle is brought near it.

Q. 3. With the help of an activity explain that hydrogen and oxygen are released when an electric current is passed through water.

Ans. (i) Take a plastic vessel. Drill two holes at its bottom and set rubber stoppers in these holes.

- Insert carbon electrodes in these rubber stoppers and connect these electrodes to a 6 volt battery and a switch.

- Fill the vessel with water such that the electrodes are immersed. Add a few drops of dilute sulphuric acid to the water in the vessel.



- Take two graduated test tubes filled with water and invert them over the two carbon electrodes.
- Switch on the current.
- After sometime, you will observe the formation of bubbles at both the electrodes. These bubbles displace water in the graduated tubes.
- Once the test tubes are filled with the respective gases, remove them carefully.
- Test these gases one by one by bringing a burning splinter of wood close to the mouth of test tubes.

When the glowing splinter of wood is brought close to the mouth of one test tube, it relights and when it is brought close to the mouth of other test tube, the gas burns with a pop. Oxygen is the only common gas that relights the splinter and hydrogen gas burns with a pop.

Q. 4. What happens when a piece of

- zinc metal is added to copper sulphate solution?
- aluminium metal is added to dilute hydrochloric acid?
- silver metal is added to copper sulphate solution?

Also, write the balanced chemical equation if the reaction occurs. [NCERT Exemplar]

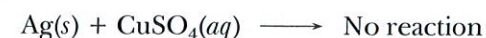
Ans. (a) Zinc being more reactive than copper displaces copper from its solution and a solution of zinc sulphate is obtained.



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



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



Q. 5. What happens when zinc granules are treated with dilute solution of H_2SO_4 , HCl , HNO_3 , NaCl and NaOH ? Also write the chemical equations if reaction occurs. [NCERT Exemplar]

Ans. The reaction of Zn granules with

- dilute H_2SO_4

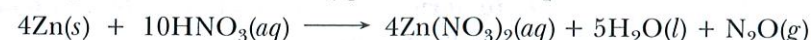


- dilute HCl

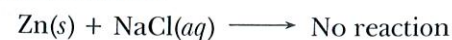


- dilute HNO_3

Reaction with dilute HNO_3 is different as compared to other acids because nitric acid is an oxidising agent and it oxidises H_2 gas evolved to H_2O .



- NaCl solution



- NaOH solution



Q. 6. (i) Crystals of copper sulphate are heated in a test tube for some time.

- What is the colour of copper sulphate crystals before heating, and after heating?

- What is the source of liquid droplets seen on the inner upper side of the test tube during the heating process?

Proficiency Exercise

Very Short Answer Questions

[1 mark]

- Balance the following chemical equation:

$$\text{Fe}(s) + \text{H}_2\text{O}(g) \longrightarrow \text{Fe}_3\text{O}_4(s) + \text{H}_2(g)$$
- $\text{N}_2 + 3\text{H}_2 \rightleftharpoons 2\text{NH}_3 + \text{Heat}$
 What can be concluded from the above reaction?
- Why do iron articles lose their shine gradually?
- State one industrial application of reduction.
- A blue coloured salt of copper sulphate becomes white on heating. Give reason.
- What type of chemical reaction takes place when silver bromide is exposed to sunlight?

Short Answer Questions-I

[2 marks]

- Classify the following chemical reactions as exothermic or endothermic:
 - Electrolysis of water
 - Burning of natural gas
 - Decomposition of calcium carbonate
 - Burning of magnesium ribbon in air
- What change will you observe if white silver chloride is placed in sunlight? Write an equation for the reaction and the type of the reaction.
- What happens chemically when quicklime is added to water?
- Explain the following terms:
 - Corrosion
 - Rancidity
- Identify the type of chemical reaction taking place
 - on mixing a solution of potassium chloride with silver nitrate, an insoluble white substance is formed.
 - on heating green coloured ferrous sulphate crystals, reddish-brown solid is left and smell of a gas having odour of burning sulphur is observed.

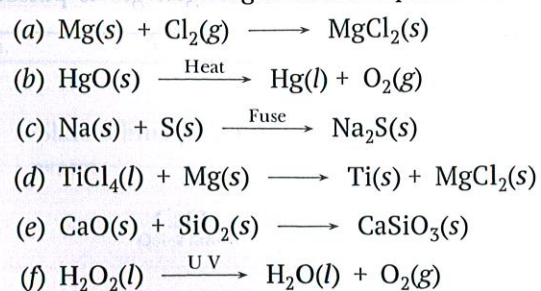
Short Answer Questions-II

[3 marks]

- Write a balanced chemical equation for each of the following reactions and also classify them.
 - Lead acetate solution is treated with dilute hydrochloric acid to form lead chloride and acetic acid solution.
 - A piece of sodium metal is added to absolute ethanol to form sodium ethoxide and hydrogen gas.
 - Iron (III) oxide on heating with carbon monoxide gas reacts to form solid iron and liberates carbon dioxide gas.
 - Hydrogen sulphide gas reacts with oxygen gas to form solid sulphur and liquid water.

[NCERT Exemplar]

- Balance the following chemical equations and identify the type of chemical reaction.



[NCERT Exemplar]

- When a green iron salt is heated strongly, its colour finally changes to black and odour of burning sulphur is given out.
 - Name the iron salt.
 - Name the type of reaction that takes place during the heating of iron salt.
 - Write the balanced chemical equation for the reaction involved.
- A, B and C are three elements which undergo chemical reactions according to the following equations.

$$\text{A}_2\text{O}_3 + 2\text{B} \longrightarrow \text{B}_2\text{O}_3 + 2\text{A}$$

$$3\text{CSO}_4 + 2\text{B} \longrightarrow \text{B}_2(\text{SO}_4)_3 + 3\text{C}$$

$$3\text{CO} + 2\text{A} \longrightarrow \text{A}_2\text{O}_3 + 3\text{C}$$
 Answer the following questions with reasons.
 - Which element is the most reactive?
 - Which element is the least reactive?
 - What is the type of reactions listed above?
- What is redox reaction? Identify the substance oxidised and the substance reduced in the following reactions.
 - $\text{Pb}_3\text{O}_4 + 8\text{HCl} \longrightarrow 3\text{PbCl}_2 + \text{Cl}_2 + 4\text{H}_2\text{O}$
 - $\text{CuO} + \text{H}_2 \longrightarrow \text{Cu} + \text{H}_2\text{O}$
- Identify the type of each of the following reactions:
 - A reaction in which a single product is formed from two or more reactants.
 - The reaction mixture becomes warm.
 - An insoluble substance is formed.
- Illustrate an activity to show a double displacement reaction. Give the chemical equation of the reaction that takes place.

Long Answer Questions

[5 marks]

- Why aluminium sheets do not corrode easily? Why does a copper vessel get covered with a green coating in rainy season?
- Observe the diagram given alongside and answer the following questions:
 - What do you observe when lead nitrate is heated?
 - Mention the two gases evolved during heating.
 - Write the balanced chemical equation for it.
 - What is the type of chemical reaction called?
 - Give one more example of this type of reaction.
- You are provided with two containers made up of copper and aluminium. You are also provided with solutions of dilute HCl, dilute HNO_3 , ZnCl_2 and H_2O . In which of the above containers these solutions can be kept?

[NCERT Exemplar]

- Define corrosion. Under what conditions does corrosion take place?
 - Give the formula and the chemical name of rust.
 - Give two methods to slow down rancidity.

- Write balanced chemical equations for the following word equations:

