

1

Chemical Reactions and Equations

IMPORTANT NOTES

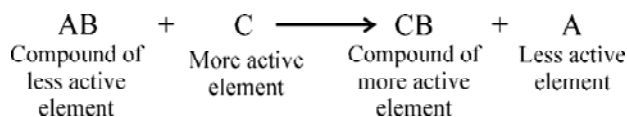
1. The changes which take place in substances can be broadly classified as **physical changes** and **chemical changes**.
2. During a **physical change**, only the state of the substance changes, but not its chemical composition. Furthermore, a physical change is a temporary change, which can be reversed by changing the physical experimental conditions. At the same time no net energy is absorbed or given out.
3. During a **chemical change**, the state as well as the chemical composition of a substance changes. Furthermore, a chemical change is a permanent change, which cannot be reversed by changing the physical experimental conditions. At the same time, either energy is absorbed or given out.
4. Whenever, a chemical change occurs, the process which takes place, is called a **chemical reaction**.
5. During a chemical reaction one or more of the following changes occur :
 - (i) Energy (generally in the form of heat or light) is either absorbed or given out.
 - (ii) New substances are formed.
 - (iii) The state of the reacting substances changes.
 - (iv) There may be a change in colour of the reacting substances.
 - (v) The temperature of the reacting substances changes.
 - (vi) A gas may be evolved during the chemical reaction.
 - (vii) The substances formed during a chemical reaction do not change back to the original substance, when the physical experimental conditions are altered.
6. A chemical equation which represents a chemical reaction briefly in words is called a **word equation**.
7. The substance/substances which take part in a chemical reaction are called **reactants**.
8. The new substance/substances formed as a result of chemical reactions, are called **products**.
9. A **plus sign** is put in between reactants or products, if their number is two or more.
10. An **arrow (\longrightarrow)** is put between reactants and products. This sign is read as "**to yield**" or "**to form**".
11. The **direction of the arrow** points in the direction in which the reaction proceeds.
12. A **chemical equation** is a statement that describes a chemical reaction in terms of symbols and formulae.
13. A chemical equation expressed in symbols and formulae, such that the number of atoms of different elements towards the side of the reactants is not equal to number of atoms of the same elements towards the side of the products, is called a **skeletal equation or an unbalanced equation**.
14. An unbalanced equation is **unacceptable or is no equation**, because, it goes against the law of conservation of mass.
15. A chemical equation in which the number of atoms of each element are same on the side of reactants and products, is called a **balanced chemical equation**.
16. A **balanced chemical equation tells us** :
 - (i) about the substances taking part in a chemical reaction and the products formed.
 - (ii) about the symbols and formulae of the reactants and products.
 - (iii) about the number of atoms or molecules of the reactants and products involved in the chemical reaction.
 - (iv) about the weights of the reactants and products involved in the chemical reaction.
17. A **balanced chemical equation does not tell us** :
 - (i) the physical state of the reactants and products.

- (ii) whether the reaction will come to completion or not.
 - (iii) about the speed of the chemical reaction.
 - (iv) about the physical conditions which bring about the chemical reaction.
 - (v) about changes, such as precipitation, change in colour, evolution of heat, light, etc., during the chemical reaction.
18. When one or more substances (elements or compounds) undergo a chemical change, with the absorption or release of energy (generally, heat energy) so as to form one or more products, then the change which takes place, is called a **chemical reaction**.
19. **Chemical composition reaction** : When two elements or compounds react chemically to form a single new compound, the chemical reaction which takes place is called a chemical composition reaction or a chemical combination reaction.
- $$A + B \longrightarrow AB.$$
20. **Chemical decomposition reaction** : When a chemical compound decomposes on heating or absorbing some other kind of energy, so as to form two or more new substances (elements or compounds), then the chemical reaction which takes place is called a chemical decomposition reaction or a chemical decomposition reaction.
- $$AB \longrightarrow A + B$$

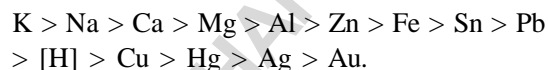
Chemical decomposition reaction can be further classified into three types.

- (a) **Thermal decomposition reaction** : When a chemical compound decomposes on heating so as to form one or more substances (elements or compounds), then the chemical reaction is called a thermal decomposition reaction.
- (b) **Photo-decomposition reaction** : When a chemical compound decomposes on absorbing light energy, so as to form two or more different substances, then the reaction which takes place is called a photo-decomposition reaction.
- (c) **Electrochemical reaction** : When a chemical compound in an aqueous or fused state decomposes into two different substances on the passage of electric current then the reaction is called an electrochemical reaction.

21. **Chemical displacement reaction** : When a more active element displaces a less active element from its aqueous ionic solution, the reaction which takes place is called a chemical displacement reaction.



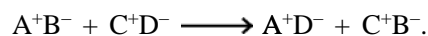
22. Metals arranged in tabular form in the order of their decreasing chemical activity is called **metal activity series**.



The above list constitutes the metal activity series in which potassium is the most active metal and gold is the least active metal.

23. **Chemical double displacement reaction** :

A chemical reaction in which two ionic compounds in their aqueous solutions, react by exchanging their ions/radicals, to form two new compounds is called a chemical double displacement reaction.



Chemical double displacement reaction can be further classified into two kinds.

- (a) **Precipitation reaction** : When aqueous solutions of two ionic compounds react by exchanging their ions/radicals, to form two or more compounds, such that one of the products formed is an insoluble salt, and hence, forms a precipitate, the double displacement reaction is said to be a precipitation reaction.
 - (b) **Neutralisation reaction** : When an aqueous solution of an acid reacts with a base (alkali) by exchanging their ions/radicals to form salt and water as the only products, the reaction which takes place is called a neutralisation reaction.
24. **Exothermic reactions** : A chemical reaction which proceeds with the release (evolution) of heat energy, is called an exothermic reaction.
25. **Endothermic reaction** : A chemical reaction which proceeds with the absorption of heat energy, is called an endothermic reaction.
26. **Oxidation reaction** : When a substance gains oxygen or loses hydrogen, the reaction taking place is called an oxidation reaction.

27. **Reduction reaction** : When a substance gains hydrogen or loses oxygen, the reaction taking place is called as reduction reaction.
28. **Corrosion of metals** : Formation of layers of undesired compounds, such as metallic oxides or hydroxides on the surface of metals is called a corrosion of metals.
29. **Rusting** : Slow conversion of iron into hydrated ferric oxide, in the presence of moisture and air is called rusting.

30. **Rust** : The flaky, non sticky brown powder formed on the surface of iron, when iron is exposed to moist air, is called rust.
31. **Conditions for rusting** : Iron should be exposed to : (i) water, (ii) air, at the same time.
32. **Rancidity** : The oxidation of food materials, so that they become stale and start smelling is called rancidity.

ASSIGNMENTS FOR SUMMATIVE ASSESSMENT

I. VERY SHORT ANSWER QUESTIONS

(1 Mark)

A. IMPORTANT QUESTIONS

- State your observations when a clean magnesium strip is held in a Bunsen flame for some time.
- Name the products formed when zinc granules are treated with dilute sulphuric acid.
- What do you observe when a matchstick flame is brought near a tube containing hydrogen gas?
- Write a balanced equation for chemical combination reaction in which a metal reacts with non-metal.
- Write a balanced chemical equation for a photo-decomposition reaction.
- Write a balanced chemical equation for chemical combination reaction in which two compounds react.
- When copper metal corrodes, a green deposit is formed on its surface. What is the chemical name and chemical formula of this green deposit?
- What kind of chemical reaction takes place when electric current is passed through fused lead bromide? Support your answer by a chemical equation.
- Write a balanced chemical equation for the chemical decomposition of copper carbonate.
- Write a balanced equation for chemical composition reaction in which two non-metals react.
- Why is aluminium called a self-protecting metal?
- What kind of reaction takes place between dilute sulphuric acid and potassium hydroxide? Write fully balanced equation.
- Write a chemical equation and state the kind of chemical reaction which takes place when ethane gas (C_2H_6) reacts with oxygen.
- $CuO_{(s)} + H_{2(g)} \xrightarrow{\text{heat}} Cu_{(s)} + H_2O$
In the above reaction which reactant is oxidised and which reactant is reduced?
- What kind of reaction takes place when sodium chloride solution is mixed with silver nitrate solution?
- Why does copper reacts with silver nitrate solution?
- Write a balanced equation for chemical combination reaction in which a compound reacts with an element.
- What kind of reaction takes place when aluminium metal is placed in zinc sulphate solution? Support your answer by a chemical equation.

B. QUESTIONS FROM CBSE EXAMINATION PAPERS

1. What change in colour is observed when white silver chloride is left exposed to sunlight? What type of chemical reaction is this? [2010 (T-I)]
2. Distinguish between an exothermic and an endothermic reaction. Amongst the following reactions, identify the exothermic reaction and the endothermic reaction.
 - (i) Heating coal in air to form carbon dioxide.
 - (ii) Heating limestone in a lime kiln to form quicklime. [2010 (T-I)]
3. Give an example of exothermic reaction. [2010 (T-I)]
4. What is meant by skeletal equation? [2010 (T-I)]
5. Why are bags of chips flushed with nitrogen gas?
6. What is thermite reaction? [2010 (T-I)]
7. What is the brown coloured gas evolved when lead nitrate crystals are heated in a dry test tube? [2010 (T-I)]
8. A compound is formed due to recrystallisation of sodium carbonate. Identify the compound and write its chemical formula. [2010 (T-I)]
9. Why do we apply paint on iron articles? [2010 (T-I)]
10. $\text{N}_2 + 3\text{H}_2 \longrightarrow 2\text{NH}_3$, name the type of reaction. [2010 (T-I)]
11. Give an example of double displacement reaction (only reaction with complete balanced equation). [2010 (T-I)]
12. Why are decomposition reaction called the opposite of combination reaction? Write equations for these reactions. [2010 (T-I)]
13. Write a balanced chemical equation to represent the following reaction.
Carbon monoxide reacts with hydrogen gas at 340 atm. to form methyl alcohol. [2010 (T-I)]
14. Complete and balance the reaction : [2010 (T-I)]
 $\text{Fe}_2\text{O}_3 + \text{Al} \longrightarrow$
15. Which one is a chemical change—fermentation of fruit juice or diluting fruit juice? [2010 (T-I)]
16. Which one is chemical change—Electrolysis of water or sodium chloride exposed in sunlight? [2010 (T-I)]
17. Which one is a chemical change—Rusting of iron or melting of iron. [2010 (T-I)]
18. Which one is a chemical change—Melting of iron or corrosion of iron. [2010 (T-I)]
19. Balance the chemical equations: [2010 (T-I)]
 $\text{Pb}(\text{NO}_3)_2 \xrightarrow{\text{heat}} \text{PbO} + \text{NO}_2 + \text{O}_2$
20. Balance the chemical equations : [2010 (T-I)]
 $\text{MnO}_2 + \text{HCl} \longrightarrow \text{MnCl}_2 + \text{H}_2\text{O} + \text{Cl}_2$
21. Define Rancidity. [2010 (T-I)]
22. Name a reducing agent that may be used to obtain manganese from manganese dioxide. [2009]
23. On what basis is a chemical equation balanced? [2008]
24. Balance the given chemical equations : [2008]
 $\text{Al} + \text{CuCl}_2 \longrightarrow \text{AlCl}_3 + \text{Cu}$
25. Balance the given chemical equation: [2008]
 $\text{FeSO}_4 \xrightarrow{\text{heat}} \text{Fe}_2\text{O}_3 + \text{SO}_2 + \text{SO}_3$
26. What happens chemically when quicklime is added to water? [2008]
27. Identify the type of reaction in the following example: [2008]
 $\text{Na}_2\text{SO}_4 + \text{BaCl}_2 \longrightarrow \text{BaSO}_4 + 2\text{NaCl}$
28. Identify the type of reaction in the following example: [2008]
 $\text{Fe} + \text{CuSO}_4 \longrightarrow \text{FeSO}_4 + \text{Cu}$
29. Identify the type of reaction in the following example: [2008]
 $2\text{H}_2 + \text{O}_2 \longrightarrow 2\text{H}_2\text{O}$
30. Classify the following reactions into slow and fast reactions. [2007]
 - (i) Reaction between an acid and a base
 - (ii) Rusting of iron

II. SHORT ANSWER QUESTIONS-I

(2 Marks)

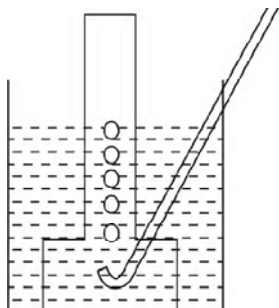
A. IMPORTANT QUESTIONS

- State two uses of chemical decomposition reaction in industry.
 - What kind of chemical reaction takes place during the digestion of food?
- Correct the formulae and balance the following equation.
$$K_{(s)} + H_{2(l)} \longrightarrow KOH_{(aq)} + H_{2(g)}$$
- Write fully balanced chemical equation and state the physical condition and physical state of the reactants in the following reaction.
Aluminium metal dissolves in aqueous copper sulphate solution with the formation of aluminium sulphate and copper.
 - What do you understand by the following terms used in a chemical equation :
 - reactants
 - products?
 - What does symbol () represent in a chemical equation?
- 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? [HOTS]
- 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. [HOTS]
- Which among the following are physical and chemical changes? [HOTS]
 - 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.
- Zinc and aluminium are very high in metal activity series, yet they resist corrosion to a great extent. Explain.
- Why are halides (chloride, bromide, and iodide) of silver kept in dark brown or black bottles? [HOTS]
- Why do fire flies glow at night? [HOTS]
- Give one example in case of following displacement reactions:
 - When a more active metal displaces a less active metal from its aqueous salt solution.
 - When an active metal displaces hydrogen from dilute acid.
- $Fe_{(s)} + ZnSO_{4(aq)} \longrightarrow FeSO_{4(aq)} + Zn_{(s)}$
 - $Mg_{(s)} + ZnSO_{4(aq)} \longrightarrow MgSO_{4(aq)} + Zn_{(s)}$Which amongst the above reaction will not proceed and why?
- Brightly polished iron nails are placed in copper nitrate solution. Describe all that you will observe after one hour.

B. QUESTIONS FROM CBSE EXAMINATION PAPERS

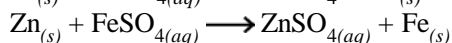
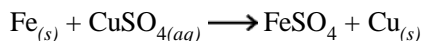
- When the powder of a common metal is heated in an open china dish, its colour turns black. However, when hydrogen is passed over the hot black substance so formed, it regains its original colour. Based on the above information answer the following questions:
 - What type of chemical reaction takes place in each of the two given steps?
 - Name the metal initially taken in the powder form. Write balanced chemical equations for both reactions. [2010 (T-I)]
- "Oxidation and reduction processes occur simultaneously." Justify this statement with the help of an example. [2010 (T-I)]
- "Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate"
 - Translate the above statement into a chemical equation.
 - State two types in which this reaction can be classified.
- "A solution of potassium chloride when mixed with silver nitrate solution, an insoluble white substance is formed".
 - Translate the above statement into a chemical equation.
 - State two types in which this reaction can be classified. [2010 (T-I)]
- Write the chemical name and formula of common salt. State how sodium hydroxide is

- prepared using this salt. [2010 (T-I)]
- Why do we store silver chloride in dark coloured bottle? Explain in brief. [2010 (T-I)]
 - What is meant by thermal decomposition reaction? Explain with an example. [2010 (T-I)]
 - An aluminium can is used to store ferrous sulphate solution. It is observed that in few days holes appeared in the can. Explain the observation and write chemical equation to support your answer. [2010 (T-I)]
 - Define photochemical reaction.
 - Write the balanced equation for the following reaction and identify the type of reaction.
Potassium bromide + Barium Iodide
Potassium iodide + Barium bromide
[2010 (T-I)]
 - Write balanced equations for the reaction of :
 - Iron with steam
 - Calcium with water. [2010 (T-I)]
 - What would you observe when zinc is added to a solution of iron (II) sulphate? Name the type of reaction and write the chemical equation.
[2010 (T-I)]
 - Write the balanced chemical equation for the following reaction and write the name of the reaction:
Barium chloride + Aluminium sulphate
Barium sulphate + Aluminium chloride.
[2010 (T-I)]
 - A metal A, which is used in thermite process, when heated with oxygen gives an oxide B, which is amphoteric in nature. Identify A and B. Write down the reactions of oxide B with HCl and NaOH. [2010 (T-I)]
 - Write one equation each for decomposition reactions where energy is supplied in the form of heat, light or electricity. [2010 (T-I)]
 - A metal is treated with dil. H_2SO_4 , the gas evolved is collected by the method shown in the figure. Answer the following : [2010 (T-I)]



- Name the gas.
 - Name the method of collection of the gas.
 - Is the gas soluble or insoluble in water?
 - Is the gas lighter or heavier than air?
- Crystals of a substance changed their colour on heating in a closed vessel but regained it after sometime, when they were allowed to cool down. [2010 (T-I)]
 - Name one such substance.
 - Explain the phenomenon involved.
 - A white solid when dropped in water produces a hissing sound. What the solid may be? Give the chemical reaction for above. Name the product formed. [2010 (T-I)]
 - Write observation with reaction for the following : [2010 (T-I)]
granulated zinc reacts with dil. sulphuric acid.
 - What happens when an iron nail is put inside copper sulphate solution? Write reaction with observation. [2010 (T-I)]
 - What do you see when pentahydrated copper sulphate crystals are heated? Give reaction too. [2010 (T-I)]
 - Give an example each for thermal decomposition and photochemical decomposition reactions. Write relevant balanced chemical equations also. [2010 (T-I)]
 - Write the balanced chemical equation for the chemical reaction between manganese dioxide and aluminium powder. What happens if manganese powder is heated with aluminium oxide? [2010 (T-I)]
 - With the help of suitable example, explain oxidation and reduction in terms of gain or loss of oxygen. [2010 (T-I)]
 - Define double displacement reaction with the help of an example. [2010 (T-I)]
 - Respiration is considered as exothermic reaction. Explain why? [2010 (T-I)]
 - What are exothermic and endothermic reaction? Explain with the help of one example each. [2010 (T-I)]
 - A shiny brown coloured element X on heating in air becomes black in colour. Name the element X and the black coloured compound formed. Write the chemical equation for the reaction. [2010 (T-I)]
 - Arrange iron, copper and zinc in increasing order

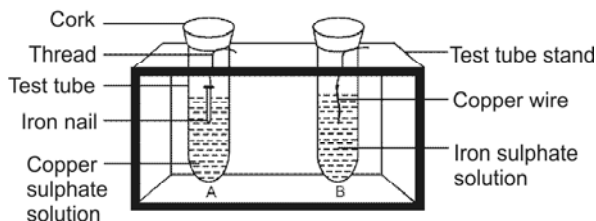
of reactivity on the basis of following reactions. Give reasons. [2010 (T-I)]



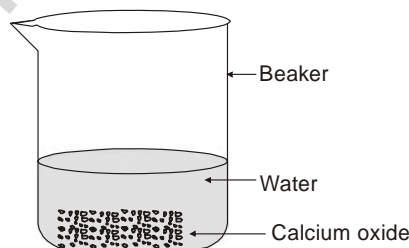
29. What is corrosion? Give two methods to protect iron articles from corrosion. [2010 (T-I)]
30. What is an oxidation reaction? Give an example of oxidation reaction. Is oxidation an exothermic or an endothermic reaction? [2009]
31. (a) What is the colour of ferrous sulphate crystals? How does this colour change after heating?
(b) Name the products formed on strongly heating ferrous sulphate crystals. What type of chemical reaction occur in this change? [2009]
32. Define a combination reaction. Give one example of a combination reaction which is also exothermic. [2009]
33. (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.
34. Crystals of copper sulphate are heated in a test tube for some time. What is the colour of copper sulphate crystals [2009]
(i) before heating, and (b) after heating?
35. What is a redox reaction? When a magnesium ribbon burns in air with a dazzling flame and forms a white ash, is magnesium oxidised or reduced? Why? [2009]
36. When magnesium ribbon burns in air or oxygen, a product is formed. State the type of chemical reaction and name the product formed in the reaction. Write balanced chemical equation of this reaction. [2009]
37. State any two observations in an activity which

may suggest that a chemical reaction has taken place. Give examples to support your answer. [2009]

38. Observe the two test tubes A and B in the diagram given below and answer the following questions: [2009]



- (a) In which test tube will the reaction takes place?
 - (b) Write a balanced equation of the reaction.
 - (c) Name the type of reaction.
39. Solid calcium oxide was taken in a container and water was slowly added to it. [2008]
(i) State the two observations made in the experiment.



- (ii) Write the name and chemical formula of the product formed.
40. What is an oxidation reaction? Identify in the following reaction :

$$\text{ZnO} + \text{C} \longrightarrow \text{Zn} + \text{CO}$$
 - (i) The substance oxidised and
 - (ii) The substance reduced [2008]
 41. Give an example of a decomposition reaction. Describe an activity to illustrate such a reaction by heating. [2008]

III. SHORT ANSWER QUESTIONS–II

(3 Marks)

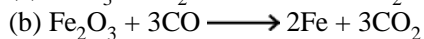
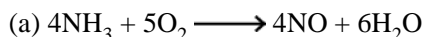
A. IMPORTANT QUESTIONS

1. What conclusions can be drawn from the chemical reaction between zinc and dilute sulphuric acid?
2. (i) What do you understand by chemical double displacement reaction?
(ii) By giving one chemical equation write :
(a) Precipitation reaction
(b) Neutralisation reaction
3. State the reactions, if any of the following metals react with lead nitrate solution. In case the

reaction takes place, support it by a chemical equation.

- (a) silver, (ii) zinc, (iii) copper, and (iv) iron.
- What is galvanised iron? How is galvanised iron protected from rust?
 - How will you show that iron is more reactive than copper?
 - On adding a drop of barium chloride solution to an aqueous solution of sodium sulphate, a white precipitate is obtained. **[HOTS]**
 - Write a balanced chemical equation of the reaction involved.
 - What other name can be given to this precipitation reaction?
 - On adding dilute hydrochloric acid to the reaction mixture the white precipitate disappears. Why?

- Identify the reducing agent in the following reactions. **[HOTS]**



- What happens when a piece of : **[HOTS]**

- 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 balanced chemical equation if the reaction occurs.

- Which among the following changes are exothermic or endothermic in nature? **[HOTS]**

- Decomposition of ferrous sulphate.
- Dissolution of sodium hydroxide in water
- Dissolution of ammonium chloride in water.

B. QUESTIONS FROM CBSE EXAMINATION PAPERS

- Name the products formed in each case when :
 - hydrochloric acid reacts with caustic soda.
 - granulated zinc reacts with caustic soda.
 - carbon dioxide is passed into lime water.

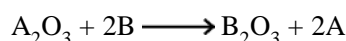
[2010 (T-I)]

- Design an activity to show a decomposition reaction in which light is used to decompose a reactant. Write chemical equation of the reaction and state its one use. **[2010 (T-I)]**

- Draw a labelled schematic diagram to show the electrolysis of water. Why is the amount of gas collected in one of the test tubes in this activity double of the amount collected in the other? **[2010 (T-I)]**

- Give three differences between displacement and double displacement reaction. **[2010 (T-I)]**

- A, B and C are three elements which undergo chemical reactions according to the following equations. **[2010 (T-I)]**



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?

- In the electrolysis of water;

- name the gas collected at the cathode and anode.
- why is the volume of gas collected at one electrode double the other?
- why is a few drops of dil H_2SO_4 added to the water? **[2010 (T-I)]**

- Describe an activity to show that rusting of iron requires air and water. **[2010 (T-I)]**

- Write the balanced equation involved, when :

- chlorine is passed over dry slaked lime.
- sodium bicarbonate reacts with dilute hydrochloric acid
- sodium bicarbonate is heated. **[2010 (T-I)]**

- Account for the following :

- Aluminium is more reactive than iron, but its corrosion is less than iron.
- Hydrogen gas is not evolved when zinc metal reacts with dil. HNO_3 .
- Carbon is not used for reducing aluminium from aluminium oxide. **[2010 (T-I)]**

- What is thermite reaction? How it is used in joining railway tracks and cracked parts of machines.

- How do we get stainless steel? **[2010 (T-I)]**

- Salt A commonly used in bakery products on heating gets converted into another salt B which

- itself is used for removal of hardness of water and a gas C is evolved. The gas C when passed through lime water, turns it milky. Identify A, B and C. Write balanced chemical equations for each step. [2010 (T-I)]
12. Write the balanced chemical equations for the following reactions : [2010 (T-I)]
- Sodium carbonate on reaction with hydrochloric acid in equal molar concentrations gives sodium chloride and sodium hydrogen carbonate.
 - Sodium hydrogen carbonate on reaction with hydrochloric acid gives sodium chloride, water and liberates carbon dioxide.
13. Take a small amount of calcium oxide or quick lime in a beaker and slowly add water to this:
- Is there any change in temperature?
 - What type of reaction is taking place?
- Write chemical equation for above reaction. [2010 (T-I)]
14. (a) Define 'water of crystallisation'.
(b) Give two examples of substances having water of crystallisation. Write their molecular formulae also. [2010 (T-I)]
15. Name the type of chemical reaction presented by the following equations. [2010 (T-I)]
- $\text{CaCO}_{3(s)} \xrightarrow{\text{heat}} \text{CaO}_{(s)} + \text{CO}_{2(g)}$
 - $\text{CaO}_{(s)} + \text{H}_2\text{O}_{(l)} \longrightarrow \text{Ca(OH)}_{2(aq)}$
 - $\text{Zn}_{(s)} + \text{H}_2\text{SO}_{4(aq)} \longrightarrow \text{ZnSO}_{4(aq)} + \text{H}_{2(g)}$
16. Identify the substances that are oxidised and that are reduced in the following reactions. [2010 (T-I)]
- $\text{ZnO} + \text{C} \longrightarrow \text{Zn} + \text{CO}$
 - $\text{CuO} + \text{H}_2 \longrightarrow \text{Cu} + \text{H}_2\text{O}$
 - $\text{MnO}_2 + 4\text{HCl} \longrightarrow \text{MnCl}_2 + 2\text{H}_2\text{O} + \text{Cl}_2$

IV. LONG ANSWER QUESTIONS

(5 Marks)

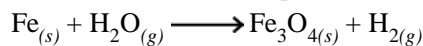
A. IMPORTANT QUESTIONS

- State the characteristics of a chemical reaction.
- State the limitations of a balanced chemical equation.
- Give examples of articles made from iron which are protected from rusting by :
 - Red lead paint
 - Paint
 - Enamelling
 - Plastic coating
 - Tinning
 - Electroplating
 - Galvanising
 - Tarring
 - Alloying
 - Oiling and greasing
- (i) On heating a blue coloured powder of copper (II) nitrate in a boiling tube, copper oxide (black), oxygen gas and a brown gas X is formed. [HOTS]
 - Write a balanced chemical equation of the reaction.
 - Identify the brown gas X evolved.
 - Identify the type of reaction.
 - What could be the pH range of the aqueous solution of gas X?
- (ii) Give the characteristic test for the following gas.
 - CO_2
 - SO_2
 - O_2

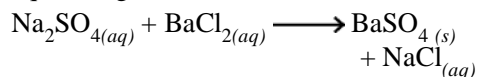
B. QUESTIONS FROM CBSE EXAMINATION PAPERS

- (i) Account for the following.
 - White silver chloride turn grey in sunlight.
 - Brown coloured copper powder on heating in air turns into black coloured substance.
- (ii) What do you mean by :
 - displacement reaction
 - reduction reaction
 - combination reaction? Write balanced chemical equation. [2010 (T-I)]
- (i) Solid calcium oxide was taken in a container and water was added slowly to it:
 - write the observation
 - write the chemical formula of the product formed.
- (ii) What happens when carbon dioxide gas is bubbled through lime water
 - in small amount
 - in excess [2010 (T-I)]
- (a) What happens chemically when quick lime is added to water?
(a) Balance the following chemical equation
 $\text{MnO}_2 + \text{HCl} \longrightarrow \text{MnCl}_2 + \text{Cl} + \text{H}_2\text{O}$
 (c) What is decomposition reaction? Explain it with suitable example. [2010 (T-I)]

4. (a) Balance the chemical equation



- (b) Identify the type of reaction in the equation given below.



- (c) You could have noted that when copper powder is heated in a china dish, the surface of copper powder becomes coated with black colour substance.

- (i) Why has this black coloured substance formed?

- (ii) What is the black substance?

- (iii) Write the chemical equation of the reaction take place. [2010 (T-I)]

5. A student dropped few pieces of marble in dilute hydrochloric acid, contained in a test tube. The evolved gas was then passed through lime water. What change would be observed in lime water. What will happen if excess of gas is passed through lime water. Write balanced chemical equations for all the changes observed.

[2010 (T-I)]

6. Four metals A, B, C and D are inturn added to the following solutions one by one. The observations made are tabulated below.

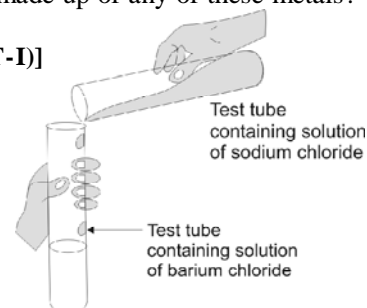
Metal	Iron (II) sulphate	Copper (II) sulphate	Zinc sulphate	Silver nitrate
A	No reaction	Displacement	—	—
B	Displacement	— —	No reaction	—
C	No reaction	No reaction	No reaction	Displacement
D	No reaction	No reaction	No reaction	No reaction

Answer the following questions based on the above information.

- Which is the most active metal and why?
- What would be observed if B is added to a solution of copper sulphate and why?
- Arrange the metals A, B, C and D in order of increasing reactivity.
- Container of which metal can be used to store both zinc sulphate solution and silver nitrate solution.
- Which of the above solutions can be easily stored in a container made up of any of these metals?

7. Observe the given figure and answer the following questions. [2010 (T-I)]

- Write the complete balanced reaction for the above.
- Type of reaction involved.
- Is there any precipitate formed?
- If any precipitate formed, write the colour of the precipitate.



ASSIGNMENTS FOR FORMATIVE ASSESSMENT

A. Experiments

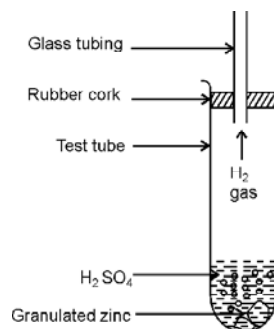
(To be demonstrated by the teacher or performed by the students)

1. Objective

To study the chemical reaction between zinc and dilute sulphuric acid.

Materials Required

Granulated zinc (2 small pieces), dilute sulphuric acid, a test tube, a cork fitting in a test tube provided with a small glass tubing, blue and red litmus papers,



Reaction of granulated zinc with dilute sulphuric acid

test tube, a candle, a match box.

Procedure

1. Place the granulated zinc pieces in the test tube.
2. Pour about 5 ml of dilute sulphuric acid in the test tube such that the test tube is 1/3 filled.

You will notice that tiny bubbles of a gas are formed on the surface of zinc, which gradually bubble out of dilute sulphuric acid.

3. Fix the cork with a glass tubing in the mouth of the test tube and perform the following tests. Record your observation in the observation table.

Observation Table

S.No.	Test	Activity	Observation
1.	Colour	Observe the colour of the gas and the colour of the reaction mixture	
2.	Smell	Fan the gas gently towards your nose with your left hand	
3.	Litmus test	Moisten red and blue litmus paper and bring them near the end of the gas tubing	
4.	Combustion test	Light the candle and bring its flame near the end of the glass tubing	

Precautions

1. The granulated zinc should have a clear surface. It should not be covered with a white powdery mass.
2. Perform the combustion test only after the reaction proceeds for 2 minutes.

Group Discussions

1. Which test proves that the gas is neutral towards litmus and why?
2. What product is formed during the combustion test?
3. Is hydrogen gas a combustible gas or a supporter of combustion? How do you arrive at the answer?
4. What kind of chemical reaction takes place? Explain, by writing a relevant equation.
5. Amongst the following metals which will liberate hydrogen with dilute sulphuric acid?
(i) magnesium (ii) iron (iii) copper (iv) aluminium (v) mercury (vi) tin

6. Which of the above metals will not react with dilute hydrochloric acid?

2. Objective

To study the chemical reaction between lead nitrate solution with (i) sodium sulphate solution (ii) sodium chloride solution (iii) sodium carbonate solution.

Materials required

10% solutions of lead nitrate, sodium sulphate, sodium chloride and sodium carbonate in glass bottles with droppers, a rack of 6 test tubes.

Procedure

1. Note the colour of each solution in the glass bottle.
2. Pour about 3 ml of lead nitrate solution in the test-tube with the help of a dropper.
3. Pour about 3 ml of sodium sulphate solution in lead nitrate solution. Make your observations and record it in the observation table. Leave the apparatus undisturbed for 5 minutes. Again make and record your observations.

Observation Table

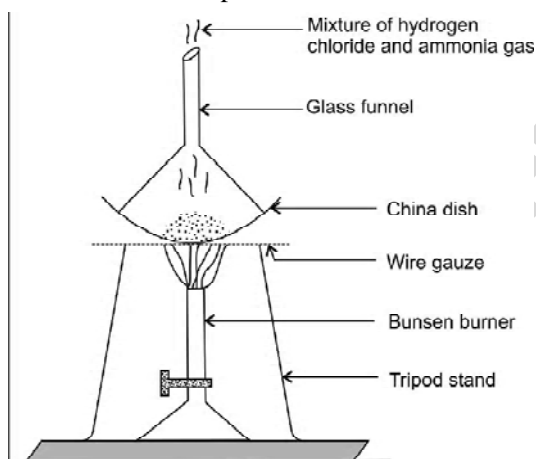
S.No.	Solution before reaction	Colour of solution	Observation just after the reaction	Observation after 5 minutes
1.	Sodium sulphate	—	—	—
2.	Sodium chloride	—	—	—
3.	Sodium carbonate	—	—	—

Group Discussion

1. Are the compounds in solutions in the above experiments ionic/covalent in nature? Discuss, if the answer is yes or no.
2. What kind of chemical reaction takes place in the above experiment?
3. Can these reactions be called precipitation reactions?
4. What is the difference between a precipitation reaction and a neutralisation reaction?
5. From the above experiment can we conclude that all salts of lead are insoluble in water? If no, which salt of lead is soluble in water.
6. Write fully balanced equations for the above reactions.
7. Are there any industrial applications of the type of reaction studied above?

3. Objective

To study thermal decomposition of ammonium chloride in an open container.



Heating of Ammonium Chloride on an open vessel Place the china dish over the wire gauze.

Materials required

Ammonium chloride (about 5 g), china dish, glass funnel, tripod stand, wire gauze, Bunsen burner, a strip of filter paper dipped in Nessler's reagent $[K_2HgI_4]$, blue litmus paper.

Procedure

1. Take the dry and clean china dish and place about 5 g of ammonium chloride in it.
2. Place a wire gauze over the tripod stand. Place the china dish over the wire gauze.
3. Place an inverted funnel over the china dish.
4. Heat the china dish on a Bunsen flame.
5. Check, if any liquid is formed during heating.
6. You will find that after a few minutes dense

white fumes start coming out from the neck of the funnel.

7. Bring the filter paper strip dipped in Nessler's reagent near the neck of the funnel. Observe any change in colour.

Bring the moist blue litmus paper near the tip of the funnel. Observe any change in colour.

Observation Table

S.No.	Activity	Observation	Conclusion
1.	Nessler's reagent test	—	—
2.	Moist blue litmus paper test	—	—

Group Discussions

1. As the Nessler's reagent changed its colour, the gas responsible for it is ammonia gas. Is ammonia gas acidic or basic in nature?
2. As the moist blue litmus paper changes to red colour, the gas responsible for it is acidic. Which is this gas?
3. What happens to ammonium chloride chemically on heating? Write a chemical equation.
4. The decomposition of ammonium chloride produces an acidic and a basic gas. Discuss why the mixture of these gases do not show neutral behaviour to litmus.
5. Ammonium chloride is used during tinning of copper or brass utensils. Discuss how does it helps in tinning.
6. Why are the gases not formed when ammonium chloride is heated by plugging the opening of the glass funnel firmly?

4. Objective

To measure the change in temperature during chemical reactions and to determine, whether the reaction is exothermic or endothermic.

Materials required

Sodium hydroxide solution, dilute hydrochloric acid, solid ammonium chloride (2g), solid barium hydroxide crystals (3.5 g), distilled water, 4 beakers labelled A, B, C and D, a thermometer (-10°C to 110°C), a glass rod, a measuring cylinder.

Procedure

1. (a) Pour 20 ml of sodium hydroxide solution in beaker A. Record its temperature.
(b) Pour 20 ml of dilute hydrochloric acid in beaker B. Record its temperature.

(c) Place 2 g of ammonium chloride in beaker C. Measure 20 ml of distilled water and pour it in the beaker. Stir the contents. Record the temperature of ammonium chloride solution.

- Pour the contents of beaker B (hydrochloric acid) in beaker A (NaOH solution) and immediately introduce the thermometer in the reaction mixture. Note the temperature. Stir the contents with glass rod gently and go on watching the temperature. When the temperature becomes steady at some point record the temperature.
- Pour the contents of beaker D [$\text{Ba}(\text{OH})_2$] into beaker C [NH_4Cl solution] and immediately introduce the thermometer in the reaction mixture.

ture. Note the temperature. Stir the contents with a glass rod gently and go on watching the temperature. When the temperature becomes steady at some point record the temperature.

Observations and Calculations

- Temperature of sodium hydroxide solution = _____ °C
- Temperature of dilute hydrochloric acid = _____ °C
- Temperature of ammonium chloride solution = _____ °C
- Temperature of barium hydroxide solution = _____ °C

S.No.	Solution before reaction	Initial temp. of reaction mixture t_1 (°C)	Final temp. of reaction mixture t_2 (°C)	Change in temperature during reaction ($t_2 - t_1$) °C
1.	—	—	—	—
2.	—	—	—	—

Group Discussions

- What kind of reaction occurs between sodium hydroxide and hydrochloric acid, with reference to change in temperature and why?
- What kind of reaction occurs between ammonium chloride and barium hydroxide solutions, with reference to change in temperature and why?
- Find out at least five more chemical reactions that proceed with the evolution of heat energy. Support your answer with balanced chemical equations.
- Find out at least five more chemical reactions that proceed with the release of heat energy. Support your answer with balanced chemical equations.
- Discuss whether endothermic or exothermic reactions take place during :
 - respiration
 - decomposition of limestone
 - burning of LPG in kitchen stoves
 - decaying of dung in biogas plant
 - decomposition of lead nitrate crystals
 - electrolysis of water.

B. Charts

- Make a chart showing types of chemical reactions, each reaction being supported by at least one chemical equation and its pictorial representation.

- Make a pictorial chart showing oxidation of copper to its oxide and reduction of copper oxide to copper. In each case show clearly by writing in the equation (i) which substance is oxidised, (ii) which substance is reduced.
- Make a pictorial chart showing various methods of preventing rusting of iron objects.

C. Visit

Limestone kilns are common near all big and small towns. Visit a limestone kiln and prepare a report on how it works and what kind of chemical reactions take place.

D. Practicals

To perform and observe the following reactions and classify them into :

- Combination reaction
- Decomposition reaction
- Displacement reaction
- Double displacement reaction
 - Action of water on quick lime.
 - Action of heat on ferrous sulphate crystals.
 - Iron nails kept in copper sulphate solution.
 - Reaction between sodium sulphate and barium chloride solutions.

**Question 1:**

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

Answer

Magnesium is very reactive metal. When stored it reacts with oxygen to form a layer magnesium oxide on its surface. This layer of magnesium oxide is quite stable and prevents further reaction of magnesium with oxygen. The magnesium ribbon is cleaned by sand paper to remove this layer so that the underlying metal can be exposed into air.

Question 2:

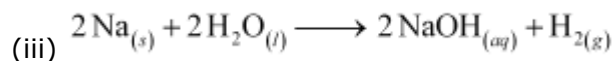
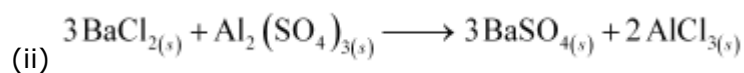
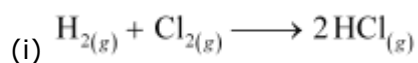
Write the balanced equation for the following chemical reactions.

(i) Hydrogen + Chlorine → Hydrogen chloride

(ii) Barium chloride + Aluminium sulphate → Barium sulphate + Aluminium chloride

(iii) Sodium + Water → Sodium hydroxide + Hydrogen

Answer

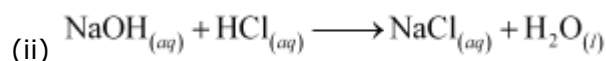
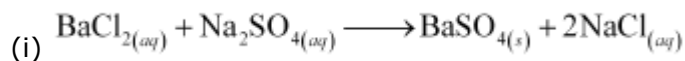
**Question 3:**

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.

Answer



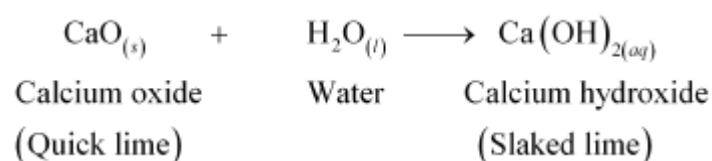
**Question 1:**

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.

Answer

- (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).

**Question 2:**

Why is the amount of gas collected in one of the test tubes in Activity 1.7 double of the amount collected in the other? Name this gas.

Answer

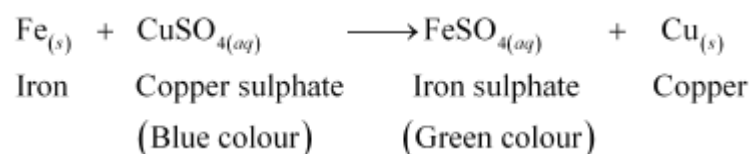
Water (H₂O) contains two parts hydrogen and one part oxygen. Therefore, the amount of hydrogen and oxygen produced during electrolysis of water is in a 2:1 ratio. During electrolysis, since hydrogen goes to one test tube and oxygen goes to another, the amount of gas collected in one of the test tubes is double of the amount collected in the other.

**Question 1:**

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

Answer

When an iron nail is placed in a copper sulphate solution, iron displaces copper from copper sulphate solution forming iron sulphate, which is green in colour.



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

Question 2:

Give an example of a double displacement reaction other than the one given in Activity 1.10.

Answer

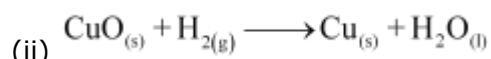
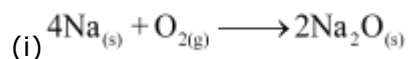
Sodium carbonate reacts with calcium chloride to form calcium carbonate and sodium chloride.



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

Question 3:

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



Answer

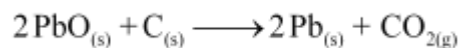
(i) Sodium (Na) is oxidised as it gains oxygen and oxygen gets reduced.



(ii) Copper oxide (CuO) is reduced to copper (Cu) while hydrogen (H_2) gets oxidised to water (H_2O).

**Exercise solution****Question 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

Answer

- (i)(a) and (b)

Question 2:

The above reaction is an example of a

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

Answer

- (d) The given reaction is an example of a displacement reaction.

Question 3:

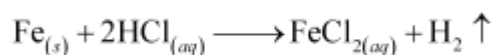
What happens when dilute hydrochloric acid is added to iron filings? Tick the correct answer.

- (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.



Answer

(a) Hydrogen gas and iron chloride are produced. The reaction is as follows:



Question 4:

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

Answer

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.

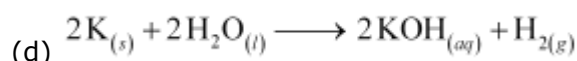
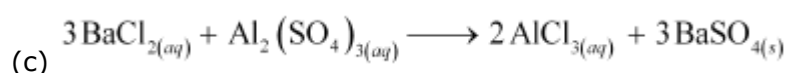
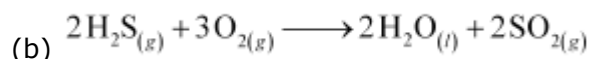
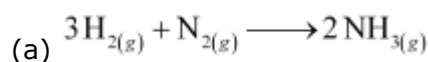
The law of conservation of mass states that mass can neither be created nor destroyed. Hence, in a chemical reaction, the total mass of reactants should be equal to the total mass of the products. It means that the total number of atoms of each element should be equal on both sides of a chemical equation.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

Question 5:

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

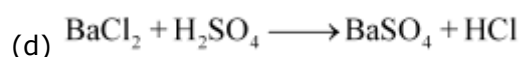
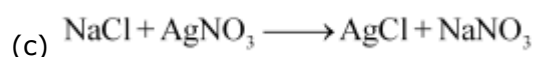
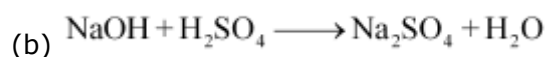
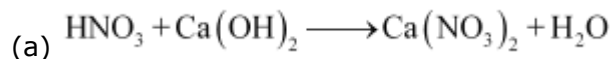
- (a) Hydrogen gas combines with nitrogen to form ammonia.
- (b) Hydrogen sulphide gas burns in air to give water and sulphur dioxide.
- (c) Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate.
- (d) Potassium metal reacts with water to give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

Answer

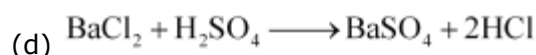
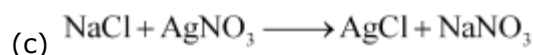
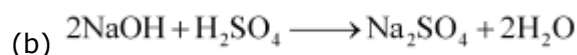
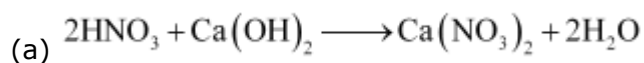


**Question 6:**

Balance the following chemical equations.



Answer

**Question 7:**

Write the balanced chemical equations for the following reactions.

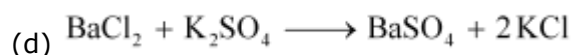
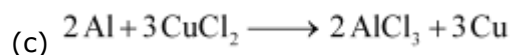
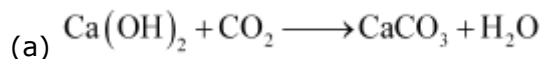
(a) Calcium hydroxide + Carbon dioxide → Calcium carbonate + Water

(b) Zinc + Silver nitrate → Zinc nitrate + Silver

(c) Aluminium + Copper chloride → Aluminium chloride + Copper

(d) Barium chloride + Potassium sulphate → Barium sulphate + Potassium chloride

Answer



**Question 8:**

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

(a) Potassium bromide $_{(aq)}$ + Barium iodide $_{(aq)}$ \rightarrow Potassium iodide $_{(aq)}$ + Barium bromide $_{(s)}$

(b) Zinc carbonate $_{(s)}$ \rightarrow Zinc oxide $_{(s)}$ + Carbon dioxide $_{(g)}$

(c) Hydrogen $_{(g)}$ + Chlorine $_{(g)}$ \rightarrow Hydrogen chloride $_{(g)}$

(d) Magnesium $_{(s)}$ + Hydrochloric acid $_{(aq)}$ \rightarrow Magnesium chloride $_{(aq)}$ + Hydrogen $_{(g)}$

Answer

(a) $2\text{KBr}_{(aq)} + \text{BaI}_{2(aq)} \longrightarrow 2\text{KI}_{(aq)} + \text{BaBr}_{2(s)}$; Double displacement reaction

(b) $\text{ZnCO}_{3(s)} \longrightarrow \text{ZnO}_{(s)} + \text{CO}_{2(g)}$; Decomposition reaction

(c) $\text{H}_{2(g)} + \text{Cl}_{2(g)} \longrightarrow 2\text{HCl}_{(g)}$; Combination reaction

(d) $\text{Mg}_{(s)} + 2\text{HCl}_{(aq)} \longrightarrow \text{MgCl}_{2(aq)} + \text{H}_{2(g)}$; Displacement reaction

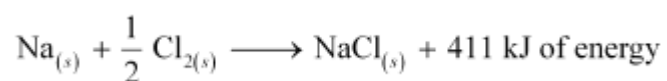
Question 9:

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

Answer

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

Example: Mixture of sodium and chlorine to yield table salt



In other words, combination reactions are exothermic.

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

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

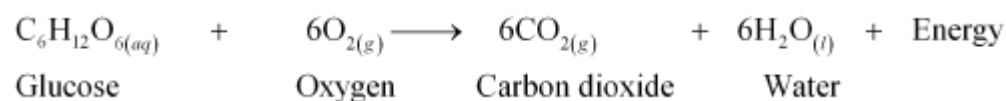


**Question 10:**

Why is respiration considered an exothermic reaction? Explain.

Answer

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

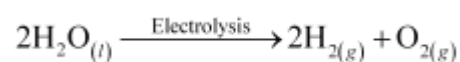
**Question 11:**

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

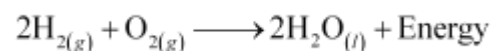
Answer

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

Decomposition reaction: $\text{AB} + \text{Energy} \longrightarrow \text{A} + \text{B}$



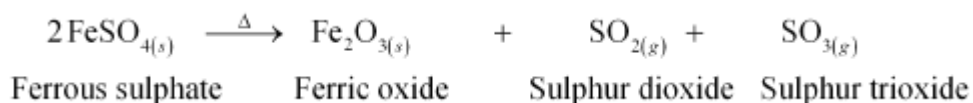
Combination reaction: $\text{A} + \text{B} \longrightarrow \text{AB} + \text{Energy}$

**Question 12:**

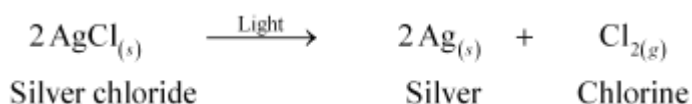
Write one equation each for decomposition reactions where energy is supplied in the form of heat, light or electricity.

Answer

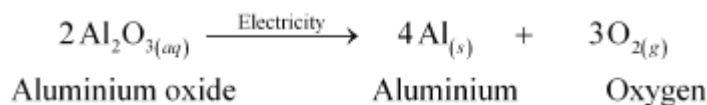
(a) Thermal decomposition:



(b) Decomposition by light:



(c) Decomposition by electricity:

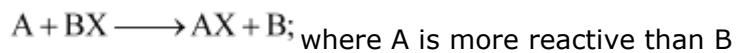


Question 13:

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

Answer

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



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

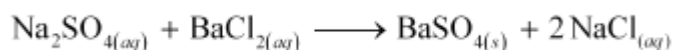


For example:

Displacement reaction:



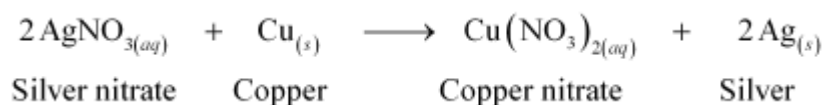
Double displacement reaction:



Question 14:

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

Answer

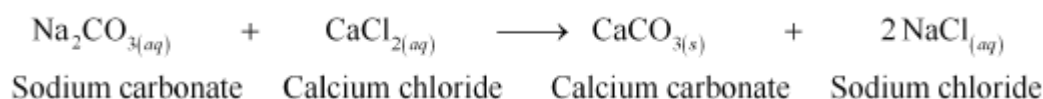
**Question 15:**

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

Answer

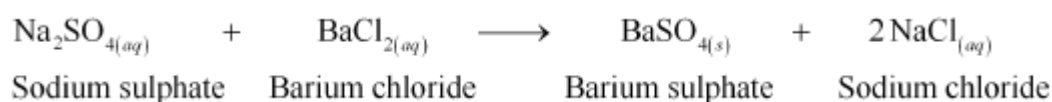
A reaction in which an insoluble solid (called precipitate) is formed is called a precipitation reaction.

For example:



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

Another example of precipitation reaction is:



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

Question 16:

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

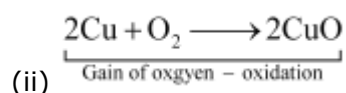
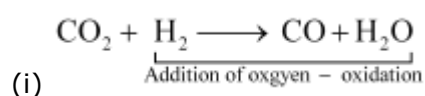
(a) Oxidation

(b) Reduction

Answer

(a) Oxidation is the gain of oxygen.

For example:

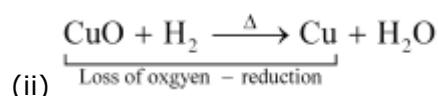
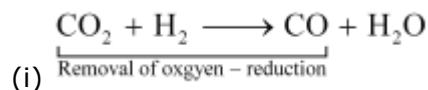


In equation (i), H_2 is oxidized to H_2O and in equation (ii), Cu is oxidised to CuO .

(b) Reduction is the loss of oxygen.



For example:



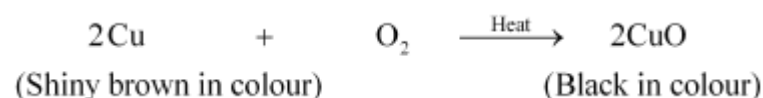
In equation (i), CO_2 is reduced to CO and in equation (ii), CuO is reduced to Cu .

Question 17:

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

Answer

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

**Question 18:**

Why do we apply paint on iron articles?

Answer

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

Question 19:

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

Answer

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

**Question 20:**

Explain the following terms with one example each.

(a) Corrosion

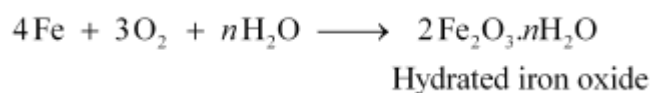
(b) Rancidity

Answer

(a) Corrosion:

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

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



This hydrated iron oxide is rust.

(b) Rancidity:

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

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

Rancidity can be avoided by:

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