

- Q1.** Write the balanced chemical equations for the following reactions and identify the type of reaction in each case.
- Nitrogen gas is treated with hydrogen gas in the presence of a catalyst at 773 K to form ammonia gas.
 - Sodium hydroxide solution is treated with acetic acid to form sodium acetate and water.
 - Ethanol is warmed with ethanoic acid to form ethyl acetate in the presence of concentrated H_2SO_4 .
 - Ethene is burnt in the presence of oxygen to form carbon dioxide, water and releases heat and light.
- Q2.** Write the balanced chemical equations for the following reactions and identify the type of reaction in each case.
- Thermit reaction, iron (III) oxide reacts with aluminium and gives molten iron and aluminium oxide.
 - Magnesium ribbon is burnt in an atmosphere of nitrogen gas to form solid magnesium nitride.
 - Chlorine gas is passed in an aqueous potassium iodide solution to form potassium chloride solution and solid iodine.
 - Ethanol is burnt in air to form carbon dioxide, water and releases heat.
- Q3.** Complete the missing components/variables given as x and y in the following reactions
- $\text{Pb}(\text{NO}_3)_2(\text{aq}) + 2\text{KI}(\text{aq}) \longrightarrow \text{PbI}_2(x) + 2\text{KNO}_3(y)$
 - $\text{Cu}(s) + 2\text{AgNO}_3(\text{aq}) \longrightarrow \text{Cu}(\text{NO}_3)_2(\text{aq}) + x(s)$
 - $\text{Zn}(s) + \text{H}_2\text{SO}_4(\text{aq}) \longrightarrow \text{ZnSO}_4(x) + \text{H}_2(y)$
 - $\text{CaCO}_3(s) \xrightarrow{x} \text{CaO}(s) + \text{CO}_2(g)$
- Q4.** Which among the following changes are exothermic or endothermic in nature?
- Decomposition of ferrous sulphate.
 - Dilution of sulphuric acid.
 - Dissolution of sodium hydroxide in water.
 - Dissolution of ammonium chloride in water.
- Q5.** Identify the reducing agent in the following reactions
- $4\text{NH}_3 + 5\text{O}_2 \longrightarrow 4\text{NO} + 6\text{H}_2\text{O}$
 - $\text{H}_2\text{O} + \text{F}_2 \longrightarrow \text{HF} + \text{HOF}$
 - $\text{Fe}_2\text{O}_3 + 3\text{CO} \longrightarrow 2\text{Fe} + 3\text{CO}_2$
 - $2\text{H}_2 + \text{O}_2 \longrightarrow 2\text{H}_2\text{O}$
- Q6.** Identify the oxidising agent (Oxidant) in the following reactions:
- $\text{Pb}_2\text{O}_4 + 8\text{HCl} \longrightarrow 3\text{PbCl}_2 + \text{Cl}_2 + 4\text{H}_2\text{O}$
 - $2\text{Mg} + \text{O}_2 \longrightarrow 2\text{MgO}$
 - $\text{CuSO}_4 + \text{Zn} \longrightarrow \text{Cu} + \text{ZnSO}_4$
 - $\text{V}_2\text{O}_5 + 5\text{Ca} \longrightarrow 2\text{V} + 5\text{CaO}$
 - $3\text{Fe} + 4\text{H}_2\text{O} \longrightarrow \text{Fe}_3\text{O}_4 + 4\text{H}_2$
 - $\text{CuO} + \text{H}_2 \longrightarrow \text{Cu} + \text{H}_2\text{O}$
- Q7.** Write the balanced chemical equations for the following reactions
- Sodium carbonate on reaction with hydrochloric acid in equal molar concentrations gives sodium chloride and sodium hydrogencarbonate.
 - Sodium hydrogencarbonate on reaction with hydrochloric acid gives sodium chloride, water and liberates carbon dioxide.
 - Copper sulphate on treatment with potassium iodide precipitates cuprous iodide (Cu_2I_2), liberates iodine gas and also forms potassium sulphate.

- Q8.** A solution of potassium chloride when mixed with silver nitrate solution, an insoluble white substance is formed. Write the chemical reaction involved and also mention the type of the chemical reaction?
- Q9.** Ferrous sulphate decomposes with the evolution of a gas having a characteristic odour of burning sulphur. Write the chemical reaction involved and identify the type of reaction.
- Q10.** Why do fire flies glow at night?
- Q11.** 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?
- Q12.** During the reaction of some metals with dilute hydrochloric acid, following observations were made.
- Silver metal does not show any change.
 - The temperature of the reaction mixture rises when aluminium (Al) is added.
 - The reaction of sodium metal is found to be highly explosive.
 - Some bubbles of a gas are seen when lead (Pb) is reacted with the acid.
- Explain these observations giving suitable reasons.
- Q13.** 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.
 - Curding of milk.
 - Sublimation of solid ammonium chloride.
- Q14.** 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.
- Q15.** 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.
- Q16.** Why do we store silver chloride in dark coloured bottles?
- Q17.** A magnesium ribbon is burnt in oxygen to give a white compound X accompanied by emission of light. If the burning ribbon is now placed in an atmosphere of nitrogen, it continues to burn and forms a compound Y.
- Write the chemical formulae of X and Y.
 - Write a balanced chemical equation, when X is dissolved in water.
- Q18.** Balance the following chemical equations and identify the type of chemical reaction.
- $\text{Mg(s)} + \text{Cl}_2(\text{g}) \longrightarrow \text{MgCl}_2(\text{s})$
 - $\text{HgO(s)} \xrightarrow{\text{Heat}} \text{Hg(l)} + \text{O}_2(\text{g})$
 - $\text{Na(s)} + \text{S(s)} \xrightarrow{\text{Fuse}} \text{Na}_2\text{S(s)}$
 - $\text{TiCl}_4(\text{l}) + \text{Mg(s)} \longrightarrow \text{Ti(s)} + \text{MgCl}_2(\text{s})$
 - $\text{CaO(s)} + \text{SiO}_2(\text{s}) \longrightarrow \text{CaSiO}_3(\text{s})$
 - $\text{H}_2\text{O}_2(\text{l}) \xrightarrow{\text{UV}} \text{H}_2\text{O(l)} + \text{O}_2(\text{g})$
- Q19.** Zinc liberates hydrogen gas when reacted with dilute hydrochloric acid, whereas copper does not. Explain why?

- Q20.** A silver article generally turns black when kept in the open for a few days. The article when rubbed with toothpaste again starts shining.
- Why do silver articles turn black when kept in the open for a few days? Name the phenomenon involved.
 - Name the black substance formed and give its chemical formula.
- Q21.** On adding a drop of barium chloride solution to an aqueous solution of sodium sulphite, white precipitate is obtained.
- 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, white precipitate disappears. Why?
- Q22.** 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.
- Q23.** 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.
- Q24.** Give the characteristic tests for the following gases
- CO_2
 - SO_2
 - O_2
 - H_2
- Q25.** 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
- 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 aqueous solution of the gas X?
- Q26.** 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?

- S1.** (a)
$$\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \xrightarrow[773 \text{ K}]{\text{Catalyst}} 2\text{NH}_3(\text{g})$$
 Combination reaction.
- (b)
$$\text{NaOH}(\text{aq}) + \text{CH}_3\text{COOH}(\text{aq}) \longrightarrow \text{CH}_3\text{COONa}(\text{aq}) + \text{H}_2\text{O}(\text{l})$$
 Double displacement reaction/Neutralisation reaction.
- (c)
$$\text{C}_2\text{H}_5\text{OH}(\text{l}) + \text{CH}_3\text{COOH}(\text{l}) \xrightarrow{\text{H}^+} \text{CH}_3\text{COOC}_2\text{H}_5(\text{l}) + \text{H}_2\text{O}(\text{l})$$
 Double displacement reaction/Esterification reaction.
- (d)
$$\text{C}_2\text{H}_4(\text{g}) + 3\text{O}_2(\text{g}) \longrightarrow 2\text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{g}) + \text{Heat} + \text{Light}$$
 Redox reaction/Combustion reaction.
- S2.** (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/Redox reaction.
- (b)
$$3\text{Mg}(\text{s}) + \text{N}_2(\text{g}) \longrightarrow \text{Mg}_3\text{N}_2(\text{s})$$
; Combination reaction.
- (c)
$$2\text{KI}(\text{aq}) + \text{Cl}_2(\text{g}) \longrightarrow 2\text{KCl}(\text{aq}) + \text{I}_2(\text{s})$$
; Displacement reaction.
- (d)
$$\text{C}_2\text{H}_5\text{OH}(\text{l}) + 3\text{O}_2(\text{g}) \longrightarrow 2\text{CO}_2(\text{g}) + 3\text{H}_2\text{O}(\text{l}) + \text{Heat}$$
; Redox reaction/Combustion reaction.
- S3.** (a) $x \longrightarrow (\text{s})$ (b) $x \longrightarrow 2\text{Ag}$ (c) $x \longrightarrow (\text{aq})$ (d) $x \longrightarrow \text{Heat}$
 $y \longrightarrow (\text{aq})$ $y \longrightarrow (\text{g})$
- S4.** (b) and (c) are exothermic as heat is released in these changes.
(a) and (d) are endothermic as heat is absorbed in these changes.
- S5.** (a) Ammonia (NH_3) (b) Water (H_2O) as F_2 is getting reduced to HF
(c) Carbon monoxide (CO) (d) Hydrogen
- Hint:** Reducing agents are those substances which have the ability of adding hydrogen or removing oxygen from the other substances.
- S6.** (a) Pb_2O_4 (b) O_2 (c) CuSO_4 (d) V_2O_5 (e) H_2O (f) CuO
- S7.** (a)
$$\text{Na}_2\text{CO}_3 + \text{HCl} \longrightarrow \text{NaCl} + \text{NaHCO}_3$$

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

(c)
$$2\text{CuSO}_4 + 4\text{KI} \longrightarrow \text{Cu}_2\text{I}_2 + 2\text{K}_2\text{SO}_4 + \text{I}_2$$
- S8.**
$$\text{KCl}(\text{aq}) + \text{AgNO}_3(\text{aq}) \longrightarrow \text{AgCl}(\text{s}) + \text{KNO}_3(\text{aq})$$

It is a double displacement and precipitation reaction.
- S9.**
$$2\text{FeSO}_4(\text{s}) \xrightarrow{\text{Heat}} \text{Fe}_2\text{O}_3(\text{s}) + \text{SO}_2(\text{g}) + \text{SO}_3(\text{g})$$

It is a thermal decomposition reaction.
- S10.** Fire flies have a protein which in the presence of an enzyme undergoes aerial oxidation. This is a chemical reaction which involves emission of visible light. Therefore, fire flies glow at night.
- S11.** Grapes when attached to the plants are living and therefore their own immune system prevents fermentation. The microbes can grow in the plucked grapes and under anaerobic conditions these can be fermented. This is a chemical change.

S12. Hint: (a) Silver metal does not react with dilute HCl.

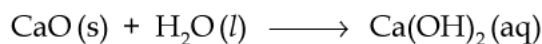
- (b) The temperature of the reaction mixture rises when aluminium is added because it is an exothermic reaction.
- (c) Reaction of sodium metal is found to be highly explosive because it is an exothermic reaction.
- (d) When lead is treated with hydrochloric acid, bubbles of hydrogen gas are evolved



S13. (a), (c) and (e) – are physical changes.

(b) and (d) are chemical changes.

S14. Calcium oxide



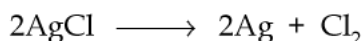
S15. (a) $\text{Pb}(\text{CH}_3\text{COO})_2 + 2\text{HCl} \longrightarrow \text{PbCl}_2 + 2\text{CH}_3\text{COOH}$; Double displacement reaction.

(b) $2\text{Na} + 2\text{C}_2\text{H}_5\text{OH} \longrightarrow 2\text{C}_2\text{H}_5\text{ONa} + \text{H}_2$; Displacement reaction.

(c) $\text{Fe}_2\text{O}_3 + 3\text{CO} \longrightarrow 2\text{Fe} + 3\text{CO}_2$; Redox reaction.

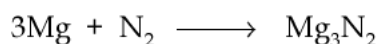
(d) $2\text{H}_2\text{S} + \text{O}_2 \longrightarrow 2\text{S} + 2\text{H}_2\text{O}$; Redox reaction.

S16. Silver chloride on exposure to sunlight may decompose as per the following reaction.



Therefore, it is stored in dark coloured bottles.

S17. $2\text{Mg} + \text{O}_2 \longrightarrow 2\text{MgO}$



(a) X is MgO; Y is Mg_3N_2



S18. (a) Balanced; Combination reaction.

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

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

(d) $\text{TiCl}_4(l) + 2\text{Mg}(s) \longrightarrow \text{Ti}(s) + 2\text{MgCl}_2(s)$; Decomposition reaction.

(e) Balanced; Combination reaction.

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

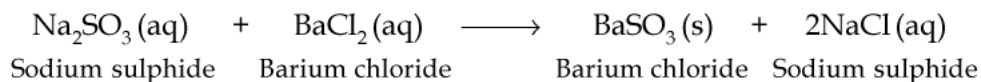
S19. Zinc is above hydrogen whereas copper is below hydrogen in the activity series of metals. That is why zinc displaces hydrogen from dilute hydrochloric acid, while copper does not.



S20. (a) Metals such as silver when attacked by substances around it such as moisture, acids, gases etc, are said to corrode and this phenomenon is called corrosion.

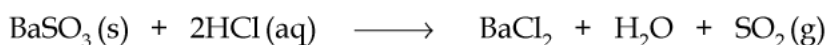
(b) The black substance is formed because silver (Ag) reacts with H_2S present in air. It forms thin black coating of silver sulphide (Ag_2S).

S21. (a) Balanced chemical equation



(b) This reaction is also known as double displacement reaction.

(c) BaSO_3 is a salt of a weak acid (H_2SO_3), therefore dilute acid such as HCl decomposes barium sulphite to produce sulphur dioxide gas which has the smell of burning sulphur.



White ppt.

BaCl_2 is soluble in water, hence white precipitate disappears.

S22. The reaction of Zn granules with

(a) Dilute H_2SO_4

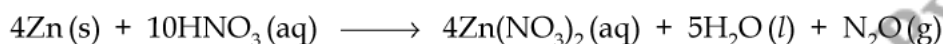


(b) Dilute HCl

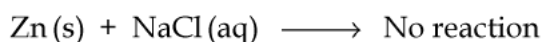


(c) Dilute HNO_3

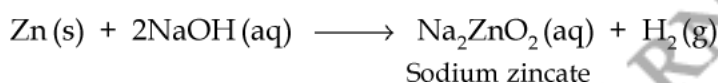
Reaction with dilute HNO_3 is different as compared to other acids because nitric acid is an oxidising agent and it oxidises H_2 gas evolved to H_2O .



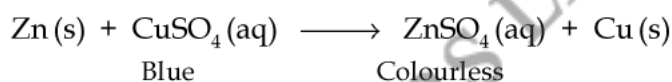
(d) NaCl solution



(e) NaOH solution

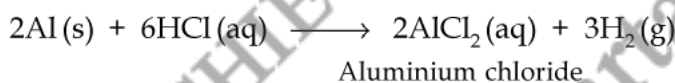


S23. (a) Zinc being more reactive than copper displaces copper from its solution and a solution of zinc sulphate is obtained

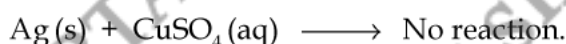


This is an example of displacement reaction.

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

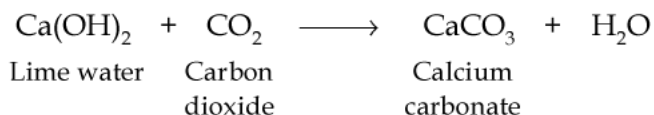


(c) Silver metal being less reactive than copper cannot displace copper from its salt solution. Therefore, no reaction occurs

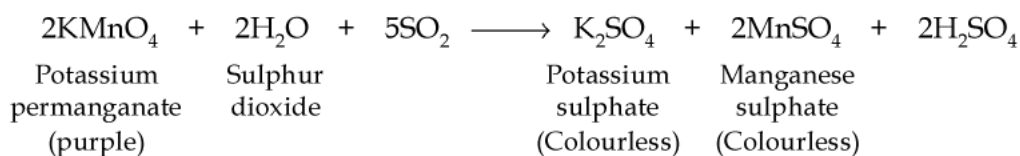


S24. The characteristic test for

- (a) Carbon dioxide (CO₂) gas turns lime water milky when passed through it due to the formation of insoluble calcium carbonate.



- (b) Sulphur dioxide (SO₂) gas when passed through acidic potassium permanganate solution (purple in colour) turns it colourless because SO₂ is strong reducing agent



Sulphur dioxide gas when passed through acidic dichromate solution (orange in colour) turns it to green because sulphur dioxide is a strong reducing agent.

- (c) The evolution of oxygen (O₂) gas during a reaction can be confirmed by bringing a burning candle near the mouth of the test tube containing the reaction mixture. The intensity of the flame increases because oxygen supports burning.
- (d) Hydrogen (H₂) gas burns with a pop sound when a burning candle is brought near it.

S25. (a) Balanced chemical equation



- (b) The brown gas X evolved is nitrogen dioxide (NO₂).
- (c) This is a decomposition reaction.
- (d) Nitrogen dioxide dissolves in water to form acidic solution because it is an oxide of non-metal. Therefore, pH of this solution is less than 7.

S26. (a) When solutions are kept in copper container

(i) Dilute HCl

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

(ii) Dilute HNO₃

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

(iii) ZnCl₂

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

(iv) H₂O

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

(b) When solutions are kept in aluminium containers

(i) Dilute HCl

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



(ii) Dilute HNO₃

Aluminium gets oxidised by dilute HNO₃ to form a layer of Al₂O₃ and can be kept.

(iii) ZnCl₂

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



(iv) H₂O

Aluminium does not react with cold or hot water. Therefore, water can be kept.

Aluminium is attacked by steam to form aluminium oxide and hydrogen

