CHAPTER 1

ANSWERS

Multiple Choice Questions

1. (d) **2.** (c)

3. (c) **Hint—** The substance which oxidises the other substances in a chemical reaction is known as an oxidising agent. Likewise, the substance which reduces the other substance in a chemical reaction is known as reducing agent.

4. (a) **5.** (c) **6.** (a) **7.** (b)

8. (a) **9.** (b) **10.** (d) **11.** (b)

12. (d)

13. (b) **Hint—** Lead sulphate being insoluble will not dissociate into Pb^{2+} ions.

14. (d) **15.** (a) **16.** (d) **17.** (d)

18. (d)

Short Answer Questions

19. (a) $N_2(g) + 3H_2(g) \xrightarrow[773\ K]{Catalyst} 2NH_3(g)$

Combination reaction

(b) $NaOH(aq) + CH_3COOH(aq) \longrightarrow CH_3COONa(aq) + H_2O(l)$

Double displacement reaction/Neutralisation reaction

(c) $C_2H_5OH(l) + CH_3COOH(l) \xrightarrow{H^+} CH_3COOC_2H_5(l) + H_2O(l)$

Double displacement reaction/Esterificaton reaction

(d) $C_2H_4(g) + 3O_2(g) \longrightarrow 2CO_2(g) + 2H_2O(g) + Heat + Light$

Redox reaction/Combustion reaction

20. (a) $Fe_2O_3(s) + 2Al(s) \longrightarrow Al_2O_3(s) + 2Fe(l) + Heat$

Displacement reaction/Redox reaction

(b) $3Mg(s) + N_2(g) \longrightarrow Mg_3N_2(s)$

Combination reaction

(c) $2KI(aq) + Cl_2(g) \longrightarrow 2KCl(aq) + I_2(s)$

Displacement reaction

(d) $C_2H_5OH(l) + 3O_2(g) \longrightarrow 2CO_2(g) + 3H_2O(l) + Heat$

Redox reaction/Combustion reaction

21. (a) $x \longrightarrow$ (s)

$y \longrightarrow$ (aq)

(b) $x \longrightarrow$ 2 Ag

(c) $x \longrightarrow$ (aq)

$y \longrightarrow$ (g)

(d) $x \longrightarrow$ Heat

22. (b) and (c) are exothermic as heat is released in these changes.

(a) and (d) are endothermic as heat is absorbed in these changes

23. (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.

24. (a) Pb_3O_4

(b) O_2

(c) $CuSO_4$

(d) V_2O_5

(e) H_2O

(f) CuO

25. (a) $Na_2CO_3 + HCl \longrightarrow NaCl + NaHCO_3$

(b) $NaHCO_3 + HCl \longrightarrow NaCl + H_2O + CO_2$

(c) $2CuSO_4 + 4KI \longrightarrow Cu_2I_2 + 2K_2SO_4 + I_2$

26. $KCl\ (aq) + AgNO_3\ (aq) \longrightarrow AgCl\ (s) + KNO_3\ (aq)$

It is a double displacement and precipitation reaction.

27. $2FeSO_4(s) \xrightarrow{Heat} Fe_2O_3(s) + SO_2(g) + SO_3(g)$

It is a thermal decomposition reaction

28. 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.

29. 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.

30. (a), (c) and (e) — are physical changes.

(b) and (d) are chemical changes

31. **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

$Pb + 2HCl \rightarrow PbCl_2 + H_2$

32. Calcium oxide

$CaO(s) + H_2O(l) \longrightarrow Ca(OH)_2(aq)$

33. (a) $Pb(CH_3COO)_2 + 2HCl \longrightarrow PbCl_2 + CH_3COOH$; Double displacement reaction

(b) $2Na + 2C_2H_5OH \longrightarrow 2C_2H_5ONa + H_2$; Displacement reaction

(c) $Fe_2O_3 + 3CO \longrightarrow 2Fe + 3CO_2$; Redox reaction

(d) $2H_2S + O_2 \longrightarrow 2S + 2H_2O$; Redox reaction

34. Silver chloride on exposure to sunlight may decompose as per the following rection.

$2AgCl \longrightarrow 2Ag + Cl_2$

Therefore, it is stored in dark coloured bottles.

35. (a) Balanced; Combination reaction

(b) $2HgO\ (s) \xrightarrow{Heat} 2Hg\ (l) + O_2\ (g)$; Decomposition reaction

(c) $2Na\ (s) + S\ (s) \xrightarrow{Fuse} Na_2S\ (s)$; Combination reaction

(d) $TiCl_4\ (l) + 2Mg\ (s) \longrightarrow Ti\ (s) + 2MgCl_2\ (s)$; Displacement reaction

(e) Balanced; Combination reaction

(f) $2H_2O_2\ (l) \xrightarrow{UV} 2H_2O\ (l) + O_2\ (g)$; Decomposition reaction

36. $2Mg + O_2 \longrightarrow 2MgO$

$3Mg + N_2 \longrightarrow Mg_3N_2$

(a) X is MgO; Y is Mg_3N_2

(b) $MgO + H_2O \longrightarrow Mg(OH)_2$

37. 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.

$Zn + HCl \longrightarrow ZnCl_2 + H_2$

$Cu + HCl \longrightarrow$ No reaction

38. (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).

Long Answer Questions

39. (a) Balanced chemical equation

$$2Cu(NO_3)_2(s) \xrightarrow{\text{Heat}} 2CuO\ (s) + O_2(g) + 4NO_2(g)$$

(b) The brown gas X evolved is nitrogen dioxide (NO_2)

(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

40. The characteristic test for

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

$Ca(OH)_2$	$+ CO_2$	$\rightarrow$	$CaCO_3 + H_2O$
Lime water	Carbon dioxide		Calcium carbonate

(b) 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

$2KMnO_4 + 2H_2O + 5SO_2 \rightarrow$		$K_2SO_4 +$	$2MnSO_4 + 2H_2SO_4$
Potasssium permanganate (Purple)	Sulphur dioxide	Potassium sulphate (Colourless)	Manganese sulphate (Colourless)

or

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 (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.

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

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

$Zn(s) + CuSO_4(aq) \rightarrow ZnSO_4(aq) + Cu(s)$

Blue Colourless

This is an example of displacement reaction

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

$2Al(s) + 6HCl\ (aq) \rightarrow 2AlCl_3(aq) + 3H_2(g)$

Aluminium chloride

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

$Ag\ (s) + CuSO_4\ (aq) \rightarrow$ No reaction

42. The reaction of Zn granules with

(a) Dilute H_2SO_4

$Zn(s) + H_2SO_4(aq) \rightarrow ZnSO_4(aq) + H_2(g)$

(b) Dilute HCl

$Zn(s) + 2HCl(aq) \rightarrow ZnCl_2(aq) + H_2(g)$

(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.

$4\ Zn(s) + 10HNO_3(aq) \rightarrow 4\ Zn(NO_3)_2\ (aq) + 5\ H_2O(l) + N_2O(g)$

(d) NaCl solution

$Zn(s) + NaCl\ (aq) \rightarrow$ No reaction

(e) NaOH solution

$Zn(s) + 2\ NaOH\ (aq) \rightarrow Na_2ZnO_2\ (aq) + H_2\ (g)$

Sodium zincate

43. (a) Balanced chemical equation

Na_2SO_3 (aq) + $BaCl_2$ (aq) → $BaSO_3$ (s) + 2 NaCl (aq)

Sodium sulphite	Barium chloride	Barium sulphite	Sodium chloride

(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.

$BaSO_3$ (s) + 2HCl (aq) → $BaCl_2$ + H_2O + SO_2 (g)

White ppt.

$BaCl_2$ is soluble in water, hence white precipitate disappears

44. (A) When solutions are kept in copper container

(a) Dilute HCl

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

(b) Dilute HNO_3

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

(c) $ZnCl_2$

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

(d) H_2O

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

(B) When solutions are kept in aluminium containers

(a) Dilute HCl

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

2 Al + 6HCl → 2 $AlCl_3$ + 3 H_2

(b) Dilute HNO_3

Aluminium gets oxidised by dilute HNO_3 to form a layer of Al_2O_3 and can be kept.

(c) $ZnCl_2$

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

2 Al + 3 $ZnCl_2$ → 2 $AlCl_3$ + 3Zn

(d) H_2O

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

2Al (s) + 3H_2O (g) → Al_2O_3 (s) + 3H_2 (g)