QUALITATIVE SALT ANALYSIS

PROBLEMS BASED ON GIVEN TOPICS

Tests for acid radicals

- Action of dilute acids
- Tests for CO_3^{2-} / HCO_3^- and SO_3^{2-} / HSO_3^- radicals
  - ➢ Distinction between carbonate and bicarbonate
  - ➢ Distinction of carbonate and bicarbonate when both are present together
  - ➢ Distinction between sulphide and bisulphite
  - ➢ Some other tests for SO_3^{2-} ions
- Tests for sulphide (S^{2-}) radical
- Tests for thiosulphate ($S_2O_3^{2-}$) radical
- Tests for nitrite (NO_2^-) radical
- Tests for Acetate, Formate and Oxalate radicals
  - ➢ Specific test for acetate (cacodyl oxide test)
  - ➢ Specific test for formate (mercury (II) formate test)
  - ➢ Specific test for oxalate
- Tests for Halide (Cl^-, Br^-, I^-) radicals
  - ➢ Specific test for Cl^- (chromyl chloride test)
  - ➢ Specific test for Br^- and I^- (layer test)
  - ➢ Other test for Br^-
  - ➢ Other test for I^-
- Tests for nitrate (NO_3^-) radical
- Tests for sulphate (SO_4^{2-}) radical
- Tests for borate (BO_3^{3-}) radical
- Tests for phosphate (PO_4^{3-}) radical
- Tests for chromate (CrO_4^{2-}) and dichromate (CrO_7^{2-}) radicals
- Tests for permagnate (MnO_4^-) and magnate (MnO_4^{2-}) radicals

Tests for basic radical

- Dry tests for basic radical
  - ➢ Heating effect on the dry sample
  - ➢ Flame test
  - ➢ Borax bead test
  - ➢ Sodium carbonate bead test
- Wet tests for basic radicals
  - ➢ Classification of cations (group analysis)
- Some general test for cations
  - ➢ Test for group V cations
  - ➢ Test for group VI and zero group cations
- **Specific tests for some cations**

Heating effect

CHAPTER 4

Qualitative Salt Analysis

EXERCISE # I

❑ **Only one correct answer :**

1. Which of the following compound(s) slowly disappears with prolonged passage of CO_2 in aqueous solution ?

(*a*) $BaCO_3$ (*b*) $CaCO_3$

(*c*) Both (*a*) and (*b*) (*d*) None of these

2. (I) Salt of 'X' + $CaCl_2$(excess) → 'Y' + Filtrate

(II) Filtrate + NH_3 → 'Y'

(III) Filtrate + Boiling → 'Y'

Here salt 'X' is :-

(*a*) mixure of HCO_3^- and CO_3^{2-}

(*b*) only CO_3^{2-}

(*c*) only HCO_3^-

(*d*) None of these

3.

$$(C) \xleftarrow{Hg_2(NO_3)_2} (A) \xrightarrow{dil.H_2SO_4} (B)$$

yellow ppt. (Salt) Odourless gas

$\downarrow CaCl_2$ sol.

(D)

White ppt.

Salt 'A' is :

(*a*) Na_2CO_3 (*b*) Na_2SO_3

(*c*) $Na_2C_2O_4$ (*d*) Na_2SO_4

4. What colour of ppt. is formed when $KHCO_3$ reacts with excess $AgNO_3$ followed by boiling ?

(*a*) white (*b*) green

(*c*) brown (*d*) none of these

5. Which of the following does not form volatile product with conc. H_2SO_4 ?

(*a*) CO_3^{2-} (*b*) SO_4^{2-}

(*c*) Cl^- (*d*) NO_3^-

6. Black (A) + H_2SO_4 ⟶

(B) (smell of rotten egg) + (C)

(C) + $K_3[Fe(CN)_6]$ ⟶ Blue (D)

A would be

(*a*) HgS (*b*) FeS

(*c*) Bi_2S_3 (*d*) $CuSO_3$

7. (I) Salt 'A' + dil. H_2SO_4 ⟶ 'B' gas ['B' has suffocating order.]

(II) Salt 'A' + $Pb(OAc)_2$ ⟶ $C(\downarrow) \xrightarrow{\Delta/O_2}$ 'D'($\downarrow$) ['C' & 'D' both have white ppt.]

Have 'A' and 'D' are :-

(*a*) HSO_3^-, $PbSO_4$ (*b*) SO_3^{2-}, $PbSO_3$

(*c*) SO_3^{2-}, $PbSO_4$ (*d*) CO_3^{2-}, $PbSO_3$

8. Aqueous solution of a gas 'X' decolourises an acidified $K_2Cr_2O_7$ solution and on passing H_2S, the solutions gives white turbidity 'Y'. Here 'X' and 'Y' are :-

(*a*) SO_2 & S (*b*) CO_2 & S

(*c*) SO_2 & $Cr(OH)_3$ (*d*) CO_2 & $Cr(OH)_3$

9. $Na_2S_2O_3 \xrightarrow{dil.\ H_2SO_4} Na_2SO_4 + S(\downarrow) + 'B'\ (gas)$

$'B' + Ba(OH)_2 \longrightarrow 'C'(\downarrow) + H_2O$

(white ppt.)

$\downarrow$ 'B'

Clear solution 'D'

Here 'B' and 'D' are :-

(*a*) H_2S & $BaSO_3$

(*b*) SO_2 & $BaSO_3$

(*c*) H_2S & $Ba(HSO_3)_2$

(*d*) SO_2 & $Ba(HSO_3)_2$

4.4 QUALITATIVE SALT ANALYSIS

10. The sulphide ion gives purple colour with sodium nitroprusside. The purple colour is due to the formation of :-

(*a*) $Na_2[Fe(CN)_3(NOS)_3]$

(*b*) $Na_4[Fe(CN)_4(NOS)_2]$

(*c*) $Na_4[Fe(CN)_5(NOS)]$

(*d*) $Na_4[Fe(NOS)_6]$

11. Which of the following statement is correct, about "on passing H_2S gas through acidified $K_2Cr_2O_7$ solution"?

(*a*) White turbidity is due to SO_3^{2-}

(*b*) White turbidity is due to SO_4^{2-}

(*c*) White turbidity is due to S

(*d*) White turbidity is due to Cr^{3+}

12. 'X" + $CuSO_4 \rightarrow I_2$ + White ppt. [Y]

$\downarrow Na_2S_2O_3$

NaI + [Z] colourless compound.

Here compound [Z] is -

(*a*) $Cu_2S_2O_3$ (*b*) Cu_2I_2

(*c*) $Na_2S_4O_6$ (*d*) $Na_4[Cu_6(S_2O_3)_5]$

13. $FeCl_3$ + 'X'(salt solution) $\longrightarrow$ 'Y' (dark violet colouration)

$\downarrow$ on standing

[colour disappears]

Here 'X' and 'Y' are -

(*a*) $Na_2S_2O_3$ & FeS_4O_6

(*b*) $Na_2S_2O_3$ & $[Fe(S_2O_3)_2]^-$

(*c*) Na_2SO_3 & $FeSO_4$

(*d*) Na_2S & (FeS + S)

14. Which of the following compound is insoluble in water ?

(*a*) KNO_2 (*b*) $AgNO_2$

(*c*) $Ba(NO_2)_2$ (*d*) $NaNO_2$

15. Why few drops conc. HNO_3 is added to IInd group filterate before proceding for IIIrd group radicals?

(*a*) Because it oxidises the dissolved H_2S to colloidal sulphur

(*b*) Because it oxidises Fe^{2+} to Fe^{3+} so that Fe^{3+} can be completely precipitated as its hydroxide

(*c*) Because precipitation of cations belonging to IIIrd group by group reagent takes place only in presence of conc. HNO_3

(*d*) None of these

16. Sodium nitroprusside produces violet coloration when react with Na_2S due to :-

(*a*) Oxidation of Fe^{2+} to Fe^{3+}

(*b*) Reduction of Fe^{2+} to Fe^{1+}

(*c*) Formation of soluble complex without changing oxidation state of iron

(*d*) Precipitation of iron sulphide from sodium nitroprusside

17. Which of the following reagent is preferred to give vinegar-like odour on warming with acetate ion?

(*a*) dil. H_2SO_4

(*b*) conc. CH_3CO_2H

(*c*) (conc. $H_2SO_4 + C_2H_5OH$)

(*d*) conc. HNO_3

18. Anion that can not decolorise acidic solution of $KMnO_4$.

(*a*) HCO_3^- (*b*) HSO_3^-

(*c*) SO_3^{2-} (*d*) S^{2-}

19. Aq. solution of 'A' $\xrightarrow[\text{solution}]{Na_2S_2O_3}$ white ppt.

which is not 'A' from the following :-

(*a*) $Pb(OAc)_2$ (*b*) dil. HCl

(*c*) $[Ni(en)_3](NO_3)_2$ (*d*) $CuSO_4$

20. Which of the following reagent is used with KI solution to give pure HI ?

(*a*) conc. H_2SO_4 (*b*) dil. H_2SO_4

(*c*) conc. H_3PO_4 (*d*) dil. HCl

21. When 'A' salt solution is added carefully to a saturated solution of Fe(II) sulphate acidified with dilute H_2SO_4 a brown ring is formed at the junction of two liquids. The compound A is

(*a*) $NaNO_3$ (*b*) $NaNO_2$

(*c*) NaCl (*d*) All of these

22. An inorganic salt solution 'M' gives white precipitate with $Pb(OAC)_2$ solution. The ppt. dissolves on warming but becomes needle like crystal on cooling. The anionic part of salt 'M' is :-

(*a*) Chloride (*b*) Bromide

(*c*) Iodide (*d*) Sulphite

23. The mixture of salts NaCl, NaBr, NaI on adding conc. H_2SO_4 and followed by warming gives gases respectively.

(*a*) Cl_2, Br_2, I_2 (*b*) HCl, HBr, HI

(*c*) HCl, Br_2, I_2 (*d*) CrO_2Cl_2, Br_2, I_2

24. A metal Mand its compound can give the following observable changesin a consequence of reactions

$$\xrightarrow[HNO_3]{\text{dilute}} \begin{bmatrix}\text{Colourless}\\ \text{solution}\end{bmatrix} \xrightarrow[NaOH]{\text{aqueous}} \begin{bmatrix}\text{White}\\ \text{precipitate}\end{bmatrix}$$

$$\xrightarrow[NaOH(aq)]{\text{excess}} \begin{bmatrix}\text{Colourless}\\ \text{soluton}\end{bmatrix} \xrightarrow[NaOH(aq.)]{H_2S} \begin{bmatrix}\text{White}\\ \text{precipitate}\end{bmatrix}$$

(*a*) Mg (*b*) Pb

(*c*) Zn (*d*) Sn

25. Salt 'A' + dil. H_2SO_4 ⟶ No action

Salt 'A' + conc. H_2SO_4 ↓

['B']

Brown fumes gas

Salt 'A' and gas 'B' are :-

(*a*) $NaNO_2$ and NO_2 (*b*) $NaNO_3$ and NO_2

(*c*) NaBr and HBr (*d*) NaCl and Cl_2

26. $NaNO_3(s)$ + conc. H_2SO_4 + Cu. turning

↓ on heating

Brown fumes of 'X' + Blue colour of 'Y'

Here 'Y' is :-

(*a*) NO_2 (*b*) $Cu(NO_3)_2$

(*c*) Ag_2SO_4 (*d*) Na_2SO_4

27. Which of the following ion gives white precipitate with ferric chloride solution ?

(*a*) F^-

(*b*) $S_2O_3^{2-}$

(*c*) CO_3^{2-}

(*d*) CH_3COO^-

28. Silver is not produced when :

(*a*) $AgNO_3$ solution is treated with Cu rod

(*b*) $AgNO_3$ (ammoniacal solution) reacts with glucose

(*c*) $AgNO_3$ solution + excess KCN is reacted with Zn dust

(*d*) $AgNO_3$ solution is treated with $Na_2S_2O_3$ & followed by heating

29. Which of the following compound(s) give black precipitate with ammonia solution ?

(*a*) Hg_2Cl_2 (*b*) AgCl

(*c*) $PbCl_2$ (*d*) None of these

30. Which of the following cation gives black precipitate with H_2S gas as well as soluble with excess yellow sodium disulphide ?

(*a*) Hg_2^{2+} (*b*) Ag^+

(*c*) Cd^{2+} (*d*) Both (*a*) & (*b*)

31. Salt solution ['X'] $\xrightarrow{\text{dil. HCl}}$ white ppt. ['Y']

↓

ppt. is washed by decantation and dilute ammonia is added.

↓

white ppt. [Z]

Here white ppt. of [Y] is :-

(*a*) $PbCl_2$ (*b*) AgCl

(*c*) $Pb(OH)_2$ (*d*) Hg_2Cl_2

32. With ammonium sulphide $(NH_4)_2S$, Al^{3+} gives :-

(*a*) White precipitate of Al_2S_3

(*b*) White precipitate of $Al(OH)_3$

(*c*) White precipitate of $Al(OH)_2(CH_3CO_2)$

(*d*) None

33. A white powder (A) on heating gave a non combustible gas and a white residue.The residue on heating turns yellow. The residue dissolve in dil HCl and the solution gives a white ppt with $K_4[Fe(CN)_6]$. A would be

(*a*) $CaCO_3$ (*b*) $ZnCO_3$

(*c*) $CaSO_3$ (*d*) $CuCO_3$

4.6 QUALITATIVE SALT ANALYSIS

34. Which of the following compound is not coloured yellow :-

(*a*) $(NH_4)_3[As(Mo_3O_{10})_4]$

(*b*) $BaCrO_4$

(*c*) $Zn_2[Fe(CN)_6]$

(*d*) $K_3[Co(NO_2)_6]$

35. 3% H_2O_2 on heating converts :-

(*a*) Black precipitate PbS into yellow precipitate $PbSO_4$

(*b*) Black precipitate PbS into white precipitate $PbSO_4$

(*c*) Black precipitate PbS into colorless solution $PbSO_4$

(*d*) White precipitate PbS into colorless solution $PbSO_4$

36. Thr color of BiI_3 precipitate is :-

(*a*) Blue (*b*) Brownish

(*c*) Black (*d*) White

37. Sodium carbonate when reacts with mercuric chloride then

(*a*) reddish brown precipitate is formed.

(*b*) yellow precipitate is formed.

(*c*) white precipitate is formed.

(*d*) black precipitate is formed.

38.
$$NO \xrightarrow{O_2} A \rightleftharpoons D$$
$$\downarrow NaOH$$
$$B+C$$

A,B,C,D are respectively :-

(*a*) NO_2, N_2O_3, $NaNO_2$, $NaNO_3$

(*b*) N_2O_3, NO_2, NaN_3 , $NaNO_3$

(*c*) NO_2, $NaNO_2$, $NaNO_3$, N_2O_4

(*d*) NO_2, N_2O_4, $NaNO_2$, $NaNO_3$

39. $K_2[Ni(CN)_4]$ solution on treatment with sodium hydroxide and bromine water followed by heating gives a black residue (A). The compound A is

(*a*) NiO

(*b*) NaCN

(*c*) Ni_2O_3

(*d*) None of these

40. What colour is observed when phenol phthalein indicator is added to soluble carbonate

(*a*) White (*b*) Blue

(*c*) Pink (*d*) Green

41. $ZnCl_2$ reacts with excess of NH_3 solution to produce

(*a*) a precipitate on $Zn(OH)_2$

(*b*) a complex ion $[Zn(NH_3)_4]^{2+}$ with tetrahedral geometry

(*c*) a complex ion $[Zn(NH_3)_4]^{2+}$ with linear geometry

(*d*) a complex ion $[Zn(NH_3)_4]^{2+}$ with square planar geometry

42. Which of the following compound(s) turns brownish - black precipitate, on boiling with Na_2CO_3 to their respectively aqueous salt solution ?

(*a*) $Pb(OH)_2.2PbCO_2$ (*b*) Hg_2CO_3

(*c*) Ag_2CO_3 (*d*) $(NH_4)_2CO_3$

43. One of the product formed, when Bi_2O_3 is added to an alkaline solution of sodiun hypochlorite, is

(*a*) $Bi(OH)_3$ (*b*) BiO_3^-

(*c*) BiOCl (*d*) Bi_2Cl_3

44. A salt on treatment with dil HCl gives a pugent smelling gas and a yellow ppt. The salt gives green fame when burnt. The salt solution gives a yellow ppt. with potassium chromate. The salt is

(*a*) BaS_2O_3 (*b*) PbS_2O_3

(*c*) $CuSO_4$ (*d*) $NiSO_4$

45. A light blue coloured compound (*a*) on heating gives a black compound (*b*) which reacts with glucose to give red compound (*c*). (*a*), (*b*) and (*c*) are respectively.

(*a*) $CuSO_4.5H_2O$

(*b*) $Cu(OH)_2$, Cu_2O,CuO

(*c*) $Cu(OH)_2$, CuO, Cu_2O

(*d*) $[Cu(NH_3)]SO_4$, CuO, Cu_2O

46. Which of the following oxide gives hydrogen peroxide on reaction with a dilute acid :-

(*a*) PbO_2 (*b*) Na_2O_2

(*c*) MnO_2 (*d*) TiO_2

47. $A + HCl \longrightarrow \underset{ppt.}{B} + HNO_3$ precipitate B is soluble in hot water (33.4 gl^{-} at 100°C)
$A + KI \longrightarrow$ Yellow ppt. Identify 'A'

(*a*) $Pb(NO_3)_2$ (*b*) $AgNO_3$
(*c*) $Hg_2(NO_3)_2$ (*d*) None of these

48. $M + N_2 \rightarrow$ Nitride $\xrightarrow{H_2O} NH_3$ in above reaction metal M may be :-

(*a*) only Li (*b*) only Mg
(*c*) only Cs (*d*) Li and Mg both

49. On the electrolysis of HCl, hydrogen gets liberated at :-

(*a*) Anode (*b*) Cathode
(*c*) In air (*d*) Cannot be defined

50. A + moderately concentrated (8M) $HNO_3 \longrightarrow B + NO + S + H_2O$;
$B + NH_4OH \longrightarrow$ Deep blue solution; Identify 'B'

(*a*) $Pb(NO_3)_2$ (*b*) $Bi(NO_3)_3$
(*c*) $Cu(NO_3)_2$ (*d*) $Cd(NO_3)_2$

51. Which of the following thermal decomposition yields a basic as well as an acidic oxide :-

(*a*) Na_2CO_3 (*b*) $CaCO_3$
(*c*) $NaNO_3$ (*d*) All the correct

52. $CaCO_3(s) + AcOH \xrightarrow{Na_2C_2O_4 \text{ solution}}$
Comment on the product of this reaction :-

(*a*) $CaCO_3$ remains unaffected
(*b*) CaC_2O_4 will be precipitated as white ppt.
(*c*) $Ca(OAc)_2$ will be precipitated as white ppt.
(*d*) Clear solution

53. HCO_2^- and $CH_3CO_2^-$ ion can be distinguished by :-

(*a*) Ethanol in conc. H_2SO_4
(*b*) $HgCl_2$
(*c*) $FeCl_3$
(*d*) $AgNO_3$

54. Addition of $SnCl_2$ to $HgCl_2$ gives ppt. of :-

(*a*) Black turning to white silky
(*b*) White silky turning to greyish black
(*c*) White silky turning to red
(*d*) Black silky turning to green

55. A metal ion 'X' reacts with NaOH to gives a white ppt. Precipitate can be oxidised by 4-6 drops of conc. H_2O_2, when yellowish brown colour solution is formed. The metal ion 'X' is :-

(*a*) Hg^{2+} (*b*) Bi^{3+}
(*c*) Cu^{2+} (*d*) Pb^{2+}

56. Which of the following metal sulphide is soluble in both hot and conc. HNO_3 and KCN :-

(*a*) CuS (*b*) CdS
(*c*) Ag_2S (*d*) PbS

57. Which of the following metal cation gives yellow ppt. with pyrogallol (10% freshly prepared) :-

(*a*) Pb (*b*) Cu^{2+}
(*c*) Bi^{+3} (*d*) All the correct

58. Mixing of which will result in a white ppt. which turns blue on oxidation :-

(*a*) $CuSO_4 + HgCl_2$
(*b*) $MgCl_2 + Cu$
(*c*) $Fe_2(SO_4)_3$, $K_3[Fe(CN)_6]$
(*d*) $FeSO_4$, $K_4[Fe(CN)_6]$

59. With 'X' cation $[Fe(CN)_6]^{4-}$ gives Prussian blue colouration due to the formation of ferr-ferro cyanide, $Fe_4[Fe(CN)_6]_3$, while with NH_4SCN, 'X' cation gives .....

(*a*) Deep red, $[Fe(H_2O)_5(SCN)]^{2+}$
(*b*) Blue, $Fe_4[Fe(CN)_6]_3$
(*c*) Brown, $[Fe(H_2O)_5(NO)]^{2+}$
(*d*) Green, $[Cr(NH_3)_6]^{3+}$

60. Turnbull's blue is formed when Fe^{+2} ions are added to $K_3[Fe(CN)_6]$. Turnbull's blue is :-

(*a*) $K_2Fe[Fe(CN)_6]$
(*b*) $Fe_3[Fe(CN)_6]_2$
(*c*) $Fe_2[Fe(CN)_6]$
(*d*) All of these

61. Find the ion that can be precipitated by the reagents NH_4Cl and aqueous NH_3/NH_4OH.

(*a*) Ca^{2+}
(*b*) Al^{3+}
(*c*) Mg^{2+}
(*d*) Zn^{2+}

4.8 QUALITATIVE SALT ANALYSIS

62. Anion (A_1) / Acid radical — conc. H_2SO_4 → Gas I

Cation (B_1) / Basic radical — NaOH → Gas II

Gas I and Gas II reacts to give white fume.

A_1 and B_1 are respectively :-

(*a*) SO_3^{2-}, Ca^{2+} (*b*) S^{2-}, Ba^{2+}

(*c*) I^-, Ag^+ (*d*) Cl^-, NH_4^+

63. Idenfity wrong statement with $CuSO_4$:-

(*a*) $CuSO_4$ reacts with KI to give violet vapour I_2 which further reacts with I_2 to give brown solution of KI_3.

(*b*) $CuSO_4$ on heating give CuO

(*c*) $CuSO_4$ reacts with KCl to give greenish yellow vapour Cl_2

(*d*) It's tartarate complex reacts with NaOH and glucose to give reddish brown precipitate of Cu_2O.

64. A white powder (*a*) when strongly heated it gives off a colourless, odourless gas (*b*) which turns lime water milky (*c*). A on strong heating give solid residue (*e*) which is yellow when hot but turns white on cooling A is :-

(*a*) Ag_2CO_3 (*b*) $PbCO_3$

(*c*) $HgCO_3$ (*d*) $ZnCO_3$

65. When can produce Rinmann's green colour with cobalt nitrate $Co(NO_3)_2$ solution :-

(*a*) ZnO (*b*) $ZnSO_4$

(*c*) $3Zn(OH)_2 . ZnCO_3$ (*d*) All

66. A yellow solid (*a*) is soluble in water. Its aqueous solution turns blue litmus red. Aqueous solution of A in strong heating gives a dark brown residue (*b*) and a compound C which gives white fumes with NH_3 gas. When dry Cl_2 gas is passed over a heated mixture of (*b*) and carbon, compound D is formed. D absorbs water vapours to give compound A. A is :-

(*a*) $FeCl_2$

(*b*) $AlCl_3$

(*c*) $FeCl_3 . 6H_2O$

(*d*) $Fe_2O_3 . H_2O$

67. $X + H_2S \xrightarrow{HCl} \underset{ppt.}{Y}$; $Y + \underset{(YAS)}{(NH_4)_2S_2} \rightarrow$ Soluble;

'X' may contain

(i) As^{3+} (ii) Sb^{3+}

(iii) Sn^{2+} (iv) Cd^{2+}

(*a*) Only (iv) (*b*) (ii) or (iv)

(*c*) (i), (ii) or (iii) (*d*) Any of the four

68. $A + CH_3COOH \longrightarrow \underset{(soluble)}{B} + CO_2 + H_2O$;

$B + (NH_4)_2C_2O_4 \longrightarrow$ White ppt.

A and B may contain

(*a*) Ni^{2+} (*b*) Ba^{2+}

(*c*) Sr^{2+} (*d*) Ca^{2+}

69. Which of the following oxide of lead satisfy the observation?

(1) It is an oxidising agent

(2) It is insolule in acid

(3) In ice cold medium when conc.HCl is added to the oxide, yellow hexa-chloroplumbate (IV) ion$[PbCl_6]^{-2}$ is formed.

(*a*) PbO (*b*) PbO_2

(*c*) Pb_2O_3 (*d*) PbO_3

70. Arrange the following hydroxy compound in order of increasing acid strength

$CrO_2(OH)_2$(I) ; $Cr(OH)_2$ (II); $Cr(OH)_3$(III)

(*a*) I < II < III (*b*) II < III < I

(*c*) III < II < I (*d*) III < I < II

71. A mixture contains maganous sulphide and cobalt sulphide.Dilute hydrochloric acid is added. Which of the following statement is correct?

(*a*) Both are soluble in dil HCl

(*b*) Both are insoluble in dil HCl

(*c*) MnS is soluble in HCl while CoS is insoluble

(*d*) CoS is soluble in HCl while MnS is insoluble

72. To a solution containing metal cations A and B, K_2CrO_4 is added separately when A gives red coloured precipitate while B gave a yellow precipitate. A and B are

(*a*) Cu^{+2}, Pb^{+2} (*b*) Ag^+,Ba^{+2}

(*c*) Zn^{+2},Cu^{+2} (*d*) $Pb^{+2}Cu^{+2}$

73. KI gives a precipitate with all the cations given below. Choose the cation

(*a*) $Ag^{+}, Hg_2^{2+}, Pb^{+2}$ (*b*) $Cu^{+2}, Zn^{+2}, Ni^{+2}$

(*c*) Na^{+}, Ca^{+2}, Mg^{+2} (*d*) Ag^{+}, Ca^{+2}, Sr^{+2}

74. NH_4SCN can be used to test,one or more out of Fe^{+3}, Co^{+2} and Cu^{+2}

(*a*) Fe^{+3} only (*b*) Co^{+2}, and Cu^{+2}

(*c*) Fe^{+3}, Cu^{+2} (*d*) all

75. A light coloured crystalline solid A has 27.55% H_2O. A gives the following reactions.

(i) $A \xrightarrow[\text{Solution}]{BaCl_2}$ white precipitate insoluble in conc. HNO_3

(ii) $A \xrightarrow[\text{Solution}]{K_3[Fe(CN)_6]}$ a dark- blue precipitate

(iii) $A \xrightarrow[NaOH]{K_2HgI_4}$ Brown precipitate

Identify A

(*a*) $Fe_2(SO_4)_3\,(NH_4)_2SO_4.8H_2O$

(*b*) $FeSO_4(NH_4)_2SO_4.6H_2O$

(*c*) $(NH_4)_2FeSO_4.6H_2O$

(*d*) $FeSO_4(NH_4)_2SO_4.\,5H_2O$

76. Which of the following compounds change the salmon-coloured precipitate of zinc nitroprusside into red ?

(*a*) Na_2CO_3 (*b*) $NaHCO_3$

(*c*) Moist-SO_2 (*d*) Moist-CO_2

77. The sulphide which isinsoluble in both ammonium sulphide and HNO_3 is

(*a*) Bi_2S_3 (*b*) CuS

(*c*) HgS (*d*) FeS

78. To an acidified $Cr_2O_7^{2-}$solution,Na_2O_2 is added,a blue colour is observed. The blue colour changes to green when $H_2SO_4$is added.What are these blue and green coloured compounds?

(*a*) Cr_2O_3,$Cr_2(SO_4)_3$ (*b*) CrO_3,$CrO(O_2)_2$

(*c*) CrO_3,$Cr_2(SO_4)_3$ (*d*) $CrO(O_2)_2$, $Cr_2(SO_4)_3$

79. A colourless solution contains a metal nitrate. A little solution of sodium chloride is added to it when a cloudy white precipitate appears.Idenfity the precipitate

(*a*) $PbCl_2$ (*b*) AgCl

(*c*) Hg_2Cl_2 (*d*) any of the three

80. In the previous question, further if the precipitate turns black with NH_4OH, it is

(*a*) $PbCl_2$ (*b*) AgCl

(*c*) Hg_2Cl_2 (*d*) (*b*) or (*c*)

81. Iron is precipitated as $Fe(OH)_3$ in the third group and not as $Fe(OH)_2$ because

(*a*) $Fe(OH)_2$ is light green

(*b*) $Fe(OH)_3$ is reddish brown

(*c*) $Fe(OH)_2$ is partialy soluble and is not completely precipitated

(*d*) $Fe(OH)_2$ is oxidant

82. Cu^{2+} ions will be reduced to Cu^{+} ion by addition of an aqueous solution of

(*a*) KF (*b*) KCl

(*c*) KI (*d*) KOH

83. Which of the following gives black precipitate on passing H_2S through it

(*a*) acidfied zinc nitrate solution

(*b*) ammoniacal barium chloride solution

(*c*) magnesium nitrate solution

(*d*) copper nitrate solution

84. A mixture containing Cu^{2+} and Ni^{2+} can be separated for identification by

(*a*) passing H_2S in acid medium

(*b*) passing H_2S in alkaline medium

(*c*) passing H_2S in neutral medium

(*d*) all

85. Identify the correct order of solubility of Na_2S,CuS and ZnS in aqueous medium.

(*a*) CuS > ZnS > Na_2S

(*b*) ZnS > Na_2S > CuS

(*c*) Na_2S > CuS > ZnS

(*d*) Na_2S > ZnS > CuS

86. Which of the following reagent cause the separation of precipitate of $Fe(OH)_3$ and $Cr(OH)_3$ in III[rd] group analysis ?

(*a*) dil H_2SO_4

(*b*) Aq.NH_3

(*c*) NaOH +O_2

(*d*) NaOH/H_2O

87. In the qualitative analysis,NH_4Cl is added before NH_4OH to

(*a*) decrease OH^- ions conc.

(*b*) increase OH^- ion conc.

(*c*) form HCl

(*d*) form complexes of group II radicals

88. Mercurous ions is represent as

(*a*) Hg^+ (*b*) Hg^{2+}

(*c*) Hg^{3+} (*d*) Hg_2^{2+}

89. Mark the correct statement

(*a*) I group basic radical precipitate as chlorides

(*b*) IV group basic radical precipitate as sulphides

(*c*) V group basic radical precipitate as carbonates

(*d*) all the above statements are corect

90. Which of the following is not precipitated as sulphides by passing H_2S in presence of conc. HCl?

(*a*) Copper (*b*) Arsenic

(*c*) Chromium (*d*) Lead

91. The cation present in slightly acidic solution are Fe^{3+}, Ni^{2+} and Cu^{2+} . Which reagent, when added excess to this solution will identify and separate Fe^{3+} in one step

(*a*) 2M HCl (*b*) 6 M NH_3

(*c*) 6 MNaOH (*d*) H_2S gas

92. During analysis of basic radicals of a mixture contaning cations of group V, if a solution of $NaHCO_3$ is added instead of Na_2CO_3 along with NH_4OH this would result in formation of

(*a*) white ppt (*b*) yellow ppt

(*c*) brick red ppt (*d*) no ppt at all

93. The metal whose salts do not give the borax bead test is -

(*a*) Cr (*b*) Ni

(*c*) Pb (*d*) Mn

94. In qualitative analysis of group I radicals, a white precipitate is formed which is insoluble in boiling water but when treated with NH_4OH it turns black, the precipitate may be.

(*a*) $PbCl_2$ (*b*) AgCl

(*c*) $HgCl_2$ (*d*) Hg_2Cl_2

95. On passing H_2S gas in II group, sometimes the solution turns milky. Itindcates the presence of

(*a*) oxidizing agent (*b*) acdic salt

(*c*) thiosulphate (*d*) reducing agent

96. Sodium sulphide react with sodium nitropruside to form a purple coloured compound.During the reaction,the oxidation state of iron

(*a*) change from+ 2 to + 3

(*b*) changes from +3 to +2

(*c*) change from +2 to +4

(*d*) remain unchanged

97. An inorganic salt when heated evolves coloured gas which bleaches moist litmus paper. The evolved gas is

(*a*) NO_2 (*b*) Cl_2

(*c*) N_2O (*d*) I_2

98. When hot and concentraed KOH reacts with Cl_2, the product is

(*a*) KClO (*b*) $KClO_4$

(*c*) $KClO_3$ (*d*) None of these

99. In the reaction

$$2KI + H_2O + O_3 \longrightarrow 2KOH + O_2 + A$$

the compound A is:

(*a*) KIO_3 (*b*) I_2O_5

(*c*) HIO_3 (*d*) I_2

100. An aqueous solution contains Hg^{2+}, Hg_2^{2+}, Pb^{2+} and Cd^{2+}. The addition of 2(M) HCl will precipitate

(*a*) Hg_2Cl_2 only.

(*b*) $PbCl_2$ and $CdCl_2$

(*c*) $PbCl_2$ and $HgCl_2$

(*d*) $PbCl_2$, Hg_2Cl_2 and $HgCl_2$

101. White precipitate (X) + O_2 → Brown precipitate (Hydroxide)

(X) is -

(*a*) $Mn(OH)_2$

(*b*) $Fe(OH)_2$

(*c*) $Ni(OH)_2$

(*d*) $Cr(OH)_3$

102. Green precipitate (X) + H_2O_2 + OH^- → Yellow solution (Hydroxide)
(X) is-
(*a*) $Mn(OH)_2$ (*b*) $Fe(OH)_2$
(*c*) $Ni(OH)_2$ (*d*) $Cr(OH)_3$

103. Green precipitate $\xrightarrow{[O]}$ Black precipitate (X) (Hydroxide)
(X) is-
(*a*) $Mn(OH)_2$ (*b*) $Fe(OH)_2$
(*c*) $Ni(OH)_3$ (*d*) $Fe(OH)_3$

104. Which ion gives yellow precipitate on addition of KNO_2 solution ?
(*a*) Ni^{2+} (*b*) Zn^{2+}
(*c*) Mn^{2+} (*d*) Co^{2+}

105. In a mixture containing Al^{3+}, Ba^{2+}, Mg^{2+}, Cr^{3+}; if NH_4Cl is added in ammonical medium, the ion pair get precipitated is
(*a*) Ba^{2+}, Cr^{3+} (*b*) Al^{3+}, Mg^{2+}
(*c*) Al^{3+}, Cr^{3+} (*d*) Mg^{2+}, Cr^{3+}

106. Correct K_{sp} value of alkaline earth sulphate
(*a*) $BaSO_4 > SrSO_4 > CaSO_4$
(*b*) $SrSO_4 > CaSO_4 > BaSO_4$
(*c*) $BaSO_4 > CaSO_4 > SrSO_4$
(*d*) $CaSO_4 > SrSO_4 > BaSO_4$

107. Chromate of which metal ion is most soluble -
(*a*) $BaCrO_4$ (*b*) $CaCrO_4$
(*c*) $SrCrO_4$ (*d*) All

108. Oxalate of which metal ion is least soluble -
(*a*) BaC_2O_4 (*b*) CaC_2O_4
(*c*) SrC_2O_4 (*d*) All

109. $Ni^{2+} + NH_3 \rightarrow$ product(soluble)
Product is -
(*a*) Brown solution
(*b*) sp^3d^2 hybridised
(*c*) Inner orbital octahedral complex
(*d*) Diamagnetic

110. $Zn^{2+} + NH_3 \rightarrow$ product(soluble)
Product is -
(*a*) Colourless solution (*b*) sp^3 hybridised
(*c*) Diamagnetic (*d*) All

111. Passing H_2S gas in a solution mixture containing Co^{2+}, Zn^{2+}, Pb^{2+}, Cu^{2+} in an acidified solution precipitates -
(*a*) CoS, PbS (*b*) ZnS, CoS
(*c*) PbS, CuS (*d*) CuS, ZnS

112. Aqueous solution of Ni^{2+} + HCl(excess) → P_1
Aqueous solution of Zn^{2+} + HCl(excess) → P_2
P_1 and P_2 differs in -
(*a*) Shape (*b*) Magnetic moment
(*c*) Hybridisation (*d*) Colour

113. A metal ion $\xrightarrow{(NH_4)_2S}$ Pink precipitate
Metal ion can be -
(*a*) Mn^{2+} (*b*) Ni^{2+}
(*c*) Co^{2+} (*d*) both (B) and (C)

114. A metal ion $\xrightarrow{(NH_4)_2S}$ Black precipitate
Metal ion can be -
(*a*) Mn^{2+} (*b*) Ni^{2+}
(*c*) Co^{2+} (*d*) both (B) and (C)

115. A compound gives scarlet red precipitate with KI solution. The compound may have -
(*a*) Fe^{2+} (*b*) Bi^{3+}
(*c*) Hg^{2+} (*d*) Hg_2^{2+}

116. A compound gives green precipitate with KI solution. The compound may have -
(*a*) Fe^{2+} (*b*) Bi^{3+}
(*c*) Hg^{2+} (*d*) Hg_2^{2+}

117. Which metal ion gives green precipitate with KCN solution -
(*a*) Fe^{2+}
(*b*) Ag^+
(*c*) Hg^{2+}
(*d*) Ni^{2+}

118. $FeCl_3$ + sodium acetate solution → deep red colouration (X_1)
X_1 is -
(*a*) $Fe(OH)_2CH_3CO_2$
(*b*) $[Fe(OH)_2(CH_3CO_2)_4]^{3-}$
(*c*) $[Fe_3(OH)_2(CH_3CO_2)_6]^{+1}$
(*d*) $[Fe(OH)(CH_3CO_2)]^{+1}$

119. $FeCl_3$ + sodium acetate solution →

deep red colouration (X_1)

$X_1 \xrightarrow{\text{boiling}} X_2$ (reddish brown precipitate)

X_2 is -

(*a*) $Fe(OH)_2CH_3CO_2$

(*b*) $[Fe(OH)_2(CH_3CO_2)_4]^{3-}$

(*c*) $[Fe_3(OH)_2(CH_3CO_2)_6]^{+1}$

(*d*) $[Fe(OH)(CH_3CO_2)]^{+1}$

120. Red colouration is not observed when Fe^{2+} reacts with -

(*a*) NH_4SCN (*b*) DMG

(*c*) 2,2'-bipyridyl (*d*) 1,10-phenanthrolin

EXERCISE # II

❑ **One or More Than One Correct Answer :**

1. Which of the following compound gives 'X' gas with addition of dilute HCl. The gas 'X', is passed into lime water or baryta water , turns turbidity.

(*a*) Na_2CO_3 (*b*) Na_2SO_3

(*c*) $Na_2S_2O_3$ (*d*) $BaCO_3$

2. Which of the following anion(s) gives white ppt. with $CaCl_2$ in aqueous solution?

(*a*) CO_3^{2-} (*b*) S^{2-}

(*c*) SO_3^{2-} (*d*) $CHCOO^-$

3. Which of the following acid is/are used to evolve CO_2 gas from carbonate salt?

(*a*) dil. HCl (*b*) dil. CH_3COOH

(*c*) dil. HCN (*d*) dil. H_3BO_3

4. Which of the following reagent(s) form ppt. with Na_2CO_3 ?

(*a*) $BaCl_2$ (*b*) $CuSO_4$

(*c*) $AgNO_3$ (*d*) $HgCl_2$

5. The precipitate of Ag_2CO_3 dissolve in

(*a*) dil. HNO_3 (*b*) KCN solution

(*c*) NH_3 solution (*d*) None of these

6. Which of the following interfering radical form volatile product wich conc. H_2SO_4 ?

(*a*) PO_4^{3-} (*b*) F^-

(*c*) $C_2O_4^{2-}$ (*d*) CO_3^{2-}

7. When salt solution 'A' is treated with dilute HCl, it gives off gas 'B' which is passed through a filter paper, moistened with potassium iodate and starch solution turns deep blue colouration. The correct statement about 'A' and 'B' is /are :-

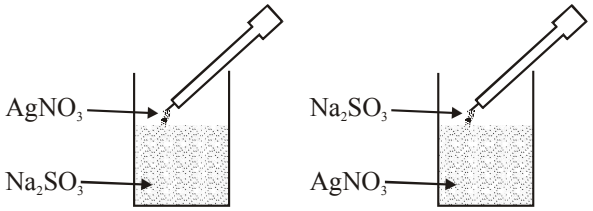
(*a*) A = Na_2SO_3 & B = SO_2

(*b*) A = Na_2SO_3 & B = CO_2

(*c*) A = Na_2S & B = H_2S

(*d*) A = $NaHSO_3$ & B = SO_2

8. Observe the following experiment :-



The correct statement about set up (I) and (II) are :-

(*a*) In set up (I) initially no precipitate is formed but on addition of excess of reagent and followed by boiling gives greyish back ppt.

(*b*) In set up (II) initially white precipitate is formed as well as on boiling gives greyish back ppt.

(*c*) In set up (II) the precipitate is soluble is dilute nitric acid , and gives gas with suffocating smell of burning sulphur which turns lime water milky.

(*d*) In set up (I) the precipitate is formed with excess $AgNO_3$ which is soluble in ammonia solution.

9. Which of the following compounds(s) gives green solution, when treated with $K_2Cr_2O_7$ and dilute H_2SO_4 ?

(*a*) KNO_3 (*b*) Na_2S

(*c*) $NaHCO_3$ (*d*) Na_2SO_3

10. CO_2 & SO_2 gas can be distinguished by

(*a*) $KMnO_4$, H^+ (*b*) $Ca(OH)_2$ solution

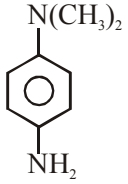
(*c*) Baryta water (*d*) $K_2Cr_2O_7$, H^+

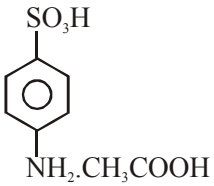
11. Which of the following compounds give precipitate with sulphide solution ?

(*a*) $BaCl_2$ (*b*) KI_3

(*c*) Silver nitrate (*d*) $Cd(OAc)_2$

12. Which of the following(s) is /are required to give water soluble dye stuff, methylene blue in strongly acid solution with H_2S.

(*a*) 

(*b*) 

(*c*) $FeCl_3$ (*d*) $FeCl_2$

13. Which of the following reagents are used to give blue ring test of solution of $Na_2S_2O_3$?

(*a*) $(NH_4)_2MoO_4$ (*b*) $CuSO_4$

(*c*) conc. H_2SO_4 (*d*) $[Ni(en)_3](NO_3)_2$

14. Which of the following statement is / are correct ?

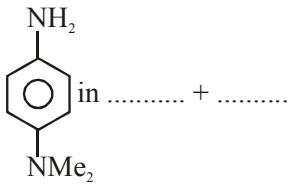
(*a*) In presence of sulphate, sulphite can be detected by treating dil. HCl

(*b*) Both sulphite and sulphate form white precipitate with $BaCl_2$

(*c*) Both sulphite and carbonate can be detected by treating acidified $KMnO_4$

(*d*) Both sulphite and carbonate can be detected by treating acidified $K_2Cr_2O_7$

15. Methylene blue is an indicator widely used in acid-base titration, it is formed on mixing :-



(*a*) Na_2SO_3 (*b*) Na_2S

(*c*) $Fe_2(SO_4)_3$ (*d*) $FeSO_4$

16. Select the correct statements :-

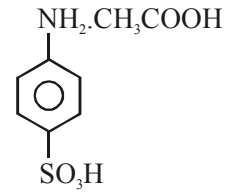
(*a*) The hydrogen carbonates of the alkali metal are soluble in water, but are less soluble than the corresponding normal carbonates.

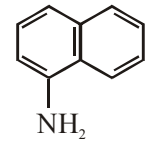
(*b*) Solution of carbonate forms reddish brown precipitate basic mercury(II) carbonate ($3HgO.HgCO_3$) when react with Mercury(II) chloride.

(*c*) When $AgNO_3$ react with sulphate ion no visible change occurs initially because of the formation of soluble sulphitoargentate ion.

(*d*) On standing the precipitate $BaSO_3$ is slowly oxidised to the sulphate.

17. Which of the following compounds give red azo dye with HNO_2

(*a*) 

(*b*) 

(*c*) ($KMnO_4$ + dil. H_2SO_4)

(*d*) ($FeSO_4$ + dil. CH_3COOH)

18. The addition of dilute HCl acid to a solid nitrite in cold yields a transient, pale-blue liquid is obtained due to presence of following compound(s) :-

(*a*) free nitrous acid

(*b*) anhydride of nitrous acid

(*c*) free nitric acid

(*d*) condensed form of N_2O_5 & NO_2

19. Which is the following reagent(s) are used to distuinguish nitrite and nitrate salt solution ?

(*a*) Ag^+ solution (*b*) $FeSO_4$ + dil. H_2SO_4

(*c*) $KMnO_4$ (*d*) sulphamic acid

20. Which of following reagent(s) make distinction of acetate from oxalates and formates ?

(*a*) $BaCl_2$ (*b*) $CaCl_2$

(*c*) $HgCl_2$ (*d*) $FeCl_3$

21. Salt solution 'X" + $FeCl_3$(aq.) $\rightarrow$

'Y'(deep red colouration) + $2H^+$

$\downarrow$ Δ/on boiling

'Z' (Brownish red ppt.)

Correct statement(s) about the above experiment is / are :-

(*a*) Aqueous solution of 'X' salt gives deep red coluration, with $FeCl_3$ owing to formation of a complex ion 'Y' is $[Fe_3(OH)_2(CH_3COO)_6]^+$.

(*b*) Z is $Fe(OH)_2(CH_3CO_2)$

(*c*) On boiling the red solution of 'Y' gets decomposed into brownish red precipitate of 'Z' is basic iron (III) acetate.

(*d*) Z is $Fe(OH)_3$.

22. Which of the following ions interfere chromyl chloride test :-

(*a*) NO_3^- (*b*) Br^-

(*c*) I^- (*d*) NO_2^-

23. $KI(solid) + conc.\ H_2SO_4(variable\ concentration)$

↓ On warming

'X" + K_2SO_4 / $KHSO_4$ + H_2O

Here 'X' may be -

(*a*) KI_3 (I_2 + KI) (*b*) H_2S

(*c*) S (*d*) SO_2

24. Cl^-(salt solution) + conc. H_2SO_4

↓ On warming

only 'X' (gas) + ...

The correct statement about 'X' gas is :-

(*a*) It is recognized by its pungent odour and production of white fumes, on blowing across the mouth of the test tube.

(*b*) It is recognized by formation of white clouds of ammonia chloride when a glass rod moistened with ammonia solution is held near the mouth of the test tube.

(*c*) It is recognised by turning litmus paper blue.

(*d*) 'X' gas is Cl_2 with greenish yellow fumes.

25. Which of the following compound gives white precipitate with silver nitrate solution ?

(*a*) NaCl (*b*) Na_2CO_3

(*c*) Na_2SO_3 (*d*) $Na_2S_2O_3$

26. Which of the following salts show chromyl chloride test ?

(*a*) KCl (*b*) $CrCl_3$

(*c*) $HgCl_2$ (*d*) $FeCl_3$

27. When mixture of $CuCO_3$. $Cu(OH)_{2(s)}$ and $Pb(NO_3)_{2(s)}$ is added in dil. HCl solution -

(*a*) Produces coloured precipitate and colourless solution.

(*b*) Produce coloured solution & white ppt.

(*c*) Evolve CO_2 gas

(*d*) Evolve NO_2 gas

28. When solid NaF is treated with conc. H_2SO_4 in a test tube and followed by warming, then dimeric form of gas 'M' is evolved, by which the test tube acquires a greasy appearance on its walls after hydrolysis which of the following compounds is /are fomrmed.

(*a*) SiF_4 (*b*) H_2SiF_6

(*c*) $SiO_2.H_2O$ (*d*) H_2SiO_3

29. Salt soluton of 'X' + $FeCl_2$(aq.)

↓

'Y' complex ion (deep red solution)

↓ on boiling

'Z' [Brownish - red ppt.]

The correct statement(s) about the flow diagram is/are :-

(*a*) CH_3COONa is the salt solution 'X'

(*b*) 'Y' is the $[Fe(H_2O)_5(SCN)^{2+}]$ ion

(*c*) 'Z' is the basic acetate of iron (III)

(*d*) Oxidation state of iron in 'Y' and 'Z' remains constant.

30. Which of the following compounds give white precipitate with dilute HCl ?

(*a*) $Pb(NO_3)_2$ (*b*) $AgNO_3$

(*c*) $Na_2S_2O_3$ (*d*) CH_3COONa

31. Which of the following anionic radicals give white precipitate with magnesium nitrate reagent or magnesia mixture ?

(*a*) HPO_4^{2-} (*b*) CO_3^{2-}

(*c*) CH_3COO^- (*d*) NO_3^-

32. Which of the following compound(s) give white precipitate with silver nitrate solution ?

(*a*) Na_2CrO_4 (*b*) KSCN

(*c*) KCN (*d*) $Na_2S_2O_3$

33. An aqueous solution of a substance gives a white precipitate on treatment with NaCl solution. Which dissolves on heating. When H_2S gas is passed through the hot acidic solution, a black precipitate is obtained. The cations which are not associated to this test.

(*a*) Mg^{2+} (*b*) Ag^+

(*c*) Hg_2^{2+} (*d*) Pb^{2+}

34. Depict correct flame colouration through cobalt glass for different ions.

(*a*) For K^+ : Crimson colour

(*b*) For Ca^{2+} : Light green colour

(*c*) For Sr^{2+} : Purple colour

(*d*) For Ba^{2+} : Bluish green colour

35. Select the correct statement(s) :-

(*a*) Alkaline solution of potassium tetra-iodomercurate(II) gives brown ppt. with ammonium chloride solution.

(*b*) On warming mixture of NH_4Cl and NaOH solution, evolved gas form deep blue complex with $CuSO_4$.

(*c*) On warming mixture of NH_4Cl and NaOH solution, evolved gas turns $Hg(NO_3)_2$ solution black.

(*d*) $NH_4^+ + NaOH \xrightarrow{\Delta}$ only gas 'X' ; evolved gas 'X' turns moistened blue litmus paper red.

36. Which of the following reagents give white precipitate with $MgSO_4$ solution , but readily soluble in ammonium salts ?

(*a*) NaOH

(*b*) $(NH_4)_2CO_3$

(*c*) Na_2CO_3

(*d*) Na_2HPO_4

37. Which of the following reaction is / are represented correctly ?

(*a*) $Pb(OAc)_2 + \text{dil. } H_2SO_4 \longrightarrow \underset{\text{(white ppt.)}}{\text{'A'}\downarrow} \longrightarrow$ soluble in hot and conc. H_2SO_4

(*b*) $Hg(NO_3)_2 + Na_2CO_{3(aq)} \longrightarrow \underset{\text{(yellow ppt.)}}{\text{'B'}\downarrow} \xrightarrow{\Delta}$ black ppt.

(*c*) $2AgNO_3 + 2NH_3(aq.) \xrightarrow{+H_2O} \underset{\text{(brown ppt.)}}{\text{'C'}\downarrow} \longrightarrow$ soluble in NH_3

(*d*) $4[Ag(NH_3)_2]^+ + N_2H_4 . H_2SO_4 \longrightarrow$ 4'D' ($\downarrow$) + $N_2(\uparrow)$ + $6NH_4^+ + 2NH_3 + SO_4^{2-}$ $\longrightarrow$ 'D' soluble in conc. HNO_3

38. Following observation are given :-

Unknown salt [X]

$\downarrow$ NaOH

White ppt.[Y]

$\downarrow$ excess NaOH

Soluble complex of [Y]

H_2O_2 / $S_2O_8^{2-}$

Black precipitate [Z]

The correct statement is / are :-

(*a*) White precipitate of Y is $Pb(OH)_2$

(*b*) The precipitate [Y] dissolves in excess NaOH and forms tetrahdroxido plumbate(II) ion

(*c*) Soluble complex of [Y] gets oxidised by H_2O_2 into black ppt.(Z) of PbO_2

(*d*) Black precipitate of [Z] is (Hg + HgO)

39. Which of the following cations form precipitate with $K_4[Fe(CN)_6]$?

(*a*) Zn^{2+}

(*b*) Cu^{+2}

(*c*) Cd^{2+}

(*d*) Al^{3+}

40. How many of the following reactions produce blue coluration or blue ppt.

(*a*) $CuSO_4$ solution $\xrightarrow[\text{excess}]{NH_3 \text{ in}}$

(*b*) $CuSO_4 \xrightarrow{K_4[Fe(CN)_6]}$

(*c*) $NiCl_2$ solution $\xrightarrow[NH_4OH]{\text{excess}}$

(*d*) $FeSO_4 \xrightarrow{K_3[Fe(CN)_6]}$

41. The correct statement about Cr^{2+} and Mn^{3+} is /are

(*a*) Cr^{2+} is a reducing agent

(*b*) Mn^{3+} is an oxidising agent

(*c*) Both Cr^{2+} and Mn^{3+} exhibits d^4 configuration

(*d*) When Cr^{2+} is used an reducing agent, the Cr^{3+} attains d^5 electronic configuration

42. Which of the following statements is/are incorrect?

(*a*) In thiourea test for nitrite, a green coloured soluton is obatined.

(*b*) It is not necessary to carry out the chromyl chloride test in a dry test tube.

(*c*) In $Pb(NO_3)_2$, the brown ring test can be performed with its water extract.

(*d*) Suspension of $CdCO_3$ gives black precipitate with sodium sulphide solution.

43. Which of the following salt(s) produces red coloration on flame :-

(*a*) $BaCl_2$ (*b*) $SrCl_2$

(*c*) NaCl (*d*) LiCl

44. HgS is insoluble in :-

(*a*) Water

(*b*) Hot dilute nitric acid

(*c*) Alkali hydroxides

(*d*) Ammonium sulphide (colourless)

45. Which of the following ppt. is soluble in both aqua regia and sodium disulphide (yellow) :-

(*a*) (Hg + HgS) (*b*) HgS

(*c*) CuS (*d*) Ag_2S

46. Using ammonia solution we can distinuish :-

(*a*) Cu^{2+}. Bi^{3+} (*b*) Cu^{2+}. Cd^{2+}

(*c*) Bi^{3+}. Cd^{2+} (*d*) Ba^{2+}. Ca^{2+}

47. Compound ['P'] + KI

↓

Precipitate of 'Q"

↓ excess KI

Soluble complex of 'R'

Compound 'P' may be :-

(*a*) $CuSO_4$ (*b*) $Hg(NO_3)_2$

(*c*) $Bi(NO_3)_3$ (*d*) $CdSO_4$

48. Which of the following reaction(s) give(s) blue precipitate ?

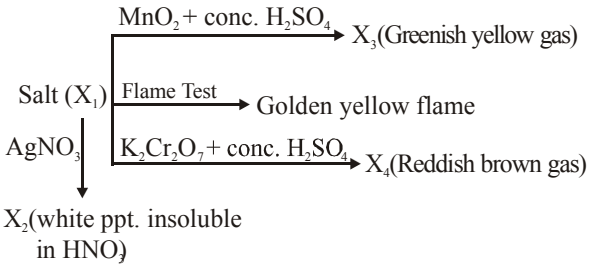
(*a*) $Hg^{2+} + Co^{2+} + 4SCN^-(aq.) \rightarrow$

(*b*) CuSO + excess $NH_3 \rightarrow$

(*c*) $CuSO_4$ + excess NaOH $\rightarrow$

(*d*) Cu^{2+} + KSCN $\rightarrow$

49.



Correct statements are :-

(*a*) X_2 is AgBr (*b*) X_3 is Cl_2

(*c*) X_1 is NaCl (*d*) X_4 is Br_2

50. Which of the following pair of species can be separated by HCl ?

(*a*) $Hg(NO_3)_2$ and $Hg_2(NO_3)_2$

(*b*) $AgNO_3$ and $Hg(NO_3)_2$

(*c*) $Fe(OH)_3$ and $Al(OH)_3$

(*d*) HgS and MnS

51. In which reaction(s) blood red coloration is observed in product :-

(*a* $FeSO_4 \xrightarrow{H_2O_2} ..... \xrightarrow{KCN}$ Product)

(*b* $Na_2S_2O_3 \xrightarrow{KCN} ..... \xrightarrow{Fe^{3+}}$ Product)

(*c*) $NH_4SCN \xrightarrow[\text{alum}]{\text{Ferric}}$ Product

(*d*) $NO_2^- \xrightarrow{\text{thiourea}} ..... \xrightarrow{Fe^{2+}}$ Product

52. Which is dissolved by HCl ?

(*a*) ZnS (*b*) MnS

(*c*) $BaSO_3$ (*d*) $BaSO_4$

53. When H_2S gas is passed through HCl containing aqueous solution of $CuCl_2$, $HgCl_2$, $BiCl_3$, and $CoCl_2$, it precipitate out :-

(*a*) CuS

(*b*) HgS

(*c*) Bi_2S_3

(*d*) CoS

54. An aqueous solution of $FeSO_4$. $Al_2(SO_4)_3$ and chrome alum is heated with excess of Na_2O_2 and filtered. Which can be obtained as product :-

(*a*) Green filtrate

(*b*) Green Residue

(*c*) Yellow filtrate

(*d*) Brown residue

55. Acidified Chromate solution + H_2O_2

$\xrightarrow[\text{or organic solvent}]{\text{In presence}}$ Product (P)

Correct option :-

(*a*) P is permanent deep blue coloured compound

(*b*) Oxidation state of Cr in product P is +3

(*c*) Oxidation state of Cr in product P is +6

(*d*) Product has peroxy linkage

56. How many reactions, products are correctly given :-

(*a*) $RCH_2OH \xrightarrow[\text{in conc.}H_2SO_4]{CrO_3} RCO_2H$

(*b*) $RCH_2OH \xrightarrow{PCC} RCH=O$

(*c*) $R_2CHOH \xrightarrow[H_2CrO_4]{} R_2C=O$

(*d*) $R_3COH \xrightarrow[H_2CrO_4]{} R_2C=O + ROH$

57. For which of the ammonium salt, when they undergo heating , non redox reaction can take place :-

(*a*) $(NH_4)_2CO_3$ (*b*) NH_4NO_3

(*c*) $(NH_4)_2Cr_2O_7$ (*d*) $CH_3CO_2NH_4$

58. Which reactions are not applicable for obtaining greenish yellow colour Cl_2 :-

(*a*) $NaCl + \text{conc. } H_2SO_4 \rightarrow$

(*b*) $NH_3 + HCl \rightarrow$

(*c*) $NaCl + MnO_2 + H_2SO_4 \rightarrow$

(*d*) $Au + H^+ + NO_3^- + Cl^- \rightarrow$

59. The equilbrium $Al(OH)_3 + OH^- \rightleftharpoons [Al(OH)_4]^-$ in aqueous medium shifts towards the left in the presence of :

(*a*) NH_4Cl

(*b*) dilute H_2SO_4 (not in excess)

(*c*) NaOH

(*d*) carbon dioxide gas

60. Correct statements are :-

(*a*) The compound formed in the borax bead test of Cu^{2+} ion in oxidising flame is $Cu(BO_2)_2$

(*b*) NH_4NO_3 leaves no residue on heating

(*c*) Mg when burnt in air and the ash on moistening smells of ammonia

(*d*) $CuSO_4$ decolourises on addition of excess KCN, the product is $[Cu(CN)_4]^{3-}$

61. n-factor of the metal centre in aqueous permanganate solution

(*a*) 3 in neutral medium (*b*) 5 in neutral medium

(*c*) 3 in alkaline medium (*d*) 5 in acidic medium

62. $2Cr^{3+} + 3O\overset{\Theta}{Br} + 10OH^- \rightarrow 2CrO_4^{2-} + 3Br^- + 5H_2O$

Which element change its oxidation state in this reaction

(*a*) Cr in Cr^{3+} (*b*) O in OH^-

(*c*) O in OBr^- (*d*) Br in OBr^-

63. At 25°C, stability order

(*a*) $CuCl > CuCl_2$

(*b*) $CuSCN > Cu(SCN)_2$

(*c*) $CuCN > Cu(CN)_2$

(*d*) $Cu_2(NO_3)_2 > Cu(NO_3)_2$

64. Which ion gives colourless solution with excess NH_4OH solution ?

(*a*) Ag^+ (*b*) Cu^{2+}

(*c*) Ni^{2+} (*d*) Cd^{2+}

65. $Ni^{2+} + CN^- \rightarrow$ Product (soluble)
(excess)

Product is -

(*a*) Yellow colour solution

(*b*) Square planar

(*c*) dsp^2 hybridisation of central atom

(*d*) Diamagnetic

EXERCISE # III

❑ **Linked Comprehension Type :**

Paragraph for Q.1 to Q.3

'X' + $AgNO_3 \longrightarrow$ 'Y' (white ppt.)

'Y' is soluble in nitric acid and ammonia. The ppt. becomes yellowish brown upon addition of excess reagent owing to the formation of 'Z'.

If aqueous suspension of 'Y' is boiled then it gives same product 'Z'.

1. Here 'X' and 'Y' are :-

(*a*) CO_3^{2-} & Ag_2O (*b*) CO_3^{2-} & Ag_2CO_3

(*c*) HCO_3^- & Ag_2CO_3 (*d*) HCO_3^- & Ag_2O

2. Here 'Z' is

(*a*) Ag_2CO_3 (*b*) Ag

(*c*) Ag_2O (*d*) All of these

Paragraph for Q.3 to Q.4

$$\underset{(16.8gm)}{\text{Solid(A)}} \xrightarrow{\Delta} \underset{(4.4gm)}{\text{Acidic gas(B)}} + \underset{(1.8gm)}{\text{Neutral liquid(C)}} + \text{Solid (D)}$$

$$\text{Aqueous solution of (D)} \xrightarrow[\text{in excess}]{BaCl_2 \text{ sol.}} \text{(Solid 'E' of 19.7 gm)}$$

3. Identify 'A' ?

(*a*) $KHCO_3$ (*b*) $NaHCO_3$

(*c*) K_2CO_3 (*d*) Na_2CO_3

4. Identify 'E' ?

(*a*) $BaCO_3$ (*b*) Na_2CO_3

(*c*) $CaCO_3$ (*d*) K_2CO_3

Paragraph for Q.5 to Q.7

Step-(I) : Salt 'A' + Zn + dil $H_2SO_4 \rightarrow$ 'X'(g) (Rotten egg's smell)

Step-(II) : 'X' (gas) + (filter paper moistened with $Pb(OAc)_2$) $\rightarrow$ 'Y' (Black colour)

Step-(III) : 'X'(gas) + $H_2SO_4 \rightarrow$ 'Z' (white turbidity)

5. Salt 'A' and gas 'X' may be?

(*a*) Na_2SO_3 and SO_2 (*b*) Na_2S and SO_2

(*c*) Na_2SO_3 and H_2S (*d*) $NaHSO_3$ and SO_2

6. Here 'Y' & 'Z' are

(*a*) PbS & $PbSO_4$

(*b*) PbS & S

(*c*) ZnS & $PbSO_4$

(*d*) ZnS & $ZnSO_4$

7. The incorrect statement about the above experimental observation is/are :-

(*a*) In step-1, salt 'A' gets reduced to 'X' gas which turns lime water milky.

(*b*) 'X' gas also turns filter paper moistened with cadmium acetate to yellow coloration spot.

(*c*) 'Y' is insoluble in water but with O_3 it gets completely oxidised and changed to white colour precipitate.

(*d*) In step-3, white turbidity is formed due to redox reaction (comproportionation) of 'X' gas & H_2SO_3

Paragraph for Q.8 to Q.10

Step-I : $Na_2CO_3(aq.) \xrightarrow{\text{excess } SO_2}$ 'A' $\xrightarrow{Na_2CO_3}$ 'B'

Step-II : 'B' $\xrightarrow{BaCl_2}$ 'D' $\xrightarrow{\Delta/O_2}$ 'E'

'B' $\xrightarrow{KMnO_4/H^+}$ 'C' $\xrightarrow{BaCl_2}$ 'E'

8. Compound 'E' and 'B' are

(*a*) $NaHCO_3$ and Na_2CO_3

(*b*) $NaHCO_3$ and Na_2SO_3

(*c*) $NaHSO_3$ and Na_2SO_3

(*d*) $NaHSO_3$ and Na_2CO_3

9. Here 'e' is insoluble in dilute HCl will be

(*a*) $BaCO_3$ (*b*) $BaSO_3$

(*c*) $BaSO_4$ (*d*) BaS_2O_3

10. The compound 'D' treated with dilute H_2SO_4 gives gas with pungent smell and turns lime water milky turbidity. The compound 'D' is -

(*a*) $BaCO_3$ (*b*) $BaSO_3$

(*c*) $BaSO_4$ (*d*) Na_2SO_3

Paragraph for Q.11 to Q.12

SO_3^{-2} + (A) $\xrightarrow{\text{boil}}$ (B)

Br_2 water ↓ (D) $\xrightarrow{\text{carbon}}$ (E)

dil. HCl ↓ (C) gas + (A)

dil. HCl ↓ (F) gas $\xrightarrow{C(gas)}$ (A)

11. Identify type of reaction between $F_{(gas)}$ with $C_{(gas)}$:-

(*a*) Ion exchange

(*b*) Disproportionation

(*c*) Comproportionation

(*d*) None of these

12. Identify D

(*a*) S^{-2}

(*b*) SO_3^{-2}

(*c*) $S_2O_3^{-2}$

(*d*) SO_4^{-2}

Paragraph for Q.13 to Q.15

Salt solution 'A' + KCN $\longrightarrow$ KSCN + 'B' (solution)

$\downarrow Fe^{3+}$

Blood red colouration (C)

$\downarrow F^-$ (excess)

Colourless (D)

13. Identify 'A' and 'B' :-

(*a*) SO_3^{2-} & $(S + SO_4^{2-})$ (*b*) $S_2O_3^{2-}$ & SO_3^{2-}

(*c*) S^{2-} & $S_2O_3^{2-}$ (*d*) S^{2-} & SO_3^{2-}

14. The magnetic moment of complex 'C' is

(*a*) 1.7 B.M. (*b*) 3.87 B.M.

(*c*) 2.83 B.M. (*d*) 5.92 B.M.

15. The compound 'D' is

(*a*) $Na_3[FeF_6]$ (*b*) $[Fe(H_2O)_5(SCN)]^{2+}$

(*c*) $Na_3[Fe(CN)_3F_3]$ (*d*) FeS_4O_6

Paragraph for Q.16 to Q.17

(I) $(Na_2S + I_2 + Na_2SO_3) \xrightarrow[\text{boil}]{}$ Compound [A] + 2NaI

(II) A(aq.) + $AgNO_3$ $\longrightarrow$ white ppt. [B] (unstable)

$\downarrow$ turning dark on standing

Black compound (C)

(III) A(aq.) + $FeCl_3$ $\longrightarrow$ dark-violet colouration [E]

$\downarrow$

[F] colour disappears on standing

16. Compound 'A' is :-

(*a*) Na_2SO_4 (*b*) $Na_2S_2O_3$

(*c*) $Na_2S_4O_6$ (*d*) Na_2SO_3

17. The correct statement about the above observation is / are :-

(*a*) Aqueous solution of 'A' on treatment with $AgNO_3$ gives 'B' white ppt. of $Ag_2S_2O_3$

(*b*) Aqueous solution of 'A' on treatment with $AgNO_3$ gives white ppt. of Ag_2SO_3

(*c*) Compound 'C' is Ag_2S which is black in colour

(*d*) The violet coloration of compound [E] is $[Fe(S_2O_3)_2]^-$, which turns into Fe^{2+} and $S_4O_6^{2-}$.

Paragraph for Q.18 to Q.19

The compound 'A' is colourless solid. It gives following tests.

Step-I : The addition of compound 'A' solution of KI, followed by acidification with dilte H_2SO_4, result in the liberation of compound 'B', which may be identified by blue colour produced with starch paste.

Step-II : The acidified $KMnO_4$ solution decolourized, by a solution of compound 'A', but no gas is evolved.

18. Compound 'A' and 'B' are

(*a*) $Na_2S_2O_3$ & S (*b*) $NaNO_2$ & NO

(*c*) $NaNO_2$ & NO_2 (*d*) $Na_2S_2O_3$ & I_2

19. Which of the following reaction(s) is / are incorrectly matched about step-I and step-II.

(*a*) $2NaNO_3 + 3KI + 2H_2SO_4 \longrightarrow KI_3 + 2NO + 2H_2O + 2SO_4^{2-} + 2K^+ + 2Na^+$

(*b*) $5NaNO_2 + 2KMnO_4 + 3H_2SO_4 \longrightarrow 5NaNO_3 + 2MnSO_4 + K_2SO_4 + 3H_2O$

(*c*) Step-(I) & Step-(II) both give redox reation

(*d*) Step-(I) & Step-(II) both give precipitation reation

Paragraph for Q.20 to Q.21

Observe the following experiment

'A' [Salt solution] (Set-I) $\xrightarrow{\text{dil. HCl}}$ S($\downarrow$) + 'B' (acid) (Set-II)

$\downarrow$ on warming

'C' (gas) $\xrightarrow[\text{brought filter paper moistened with } K_2Cr_2O_7/H^+]{}$ 'D'(green)

20. The incorrect statement about set-II is / are :-

(*a*) The acidified liquid soon becomes turbide owing to formation of sulphur and H_2SO_4.

(*b*) The sulphur first forms a colloidal solution, which is gradually coagulated by free acid present side reactions also occur giving rise to thionic acids.

(*c*) On warming the solution of set up-II, the 'C' gas evolved is H_2S. Which is recognised by its action upon filter paper moistened with acidified $K_2Cr_2O_7$.

(*d*) On warming the solution of set up-II, the 'C' gas evolved is SO_2. Which is recognised by its action upon filter paper moistened with acidified $K_2Cr_2O_7$.

21. Which of the following reaction is / are correctly matched about set up - I and set up -II.

(*a*) $Na_2S_2O_3 + 2HCl \longrightarrow S(\downarrow) + H_2SO_3 + 2NaCl$

(*b*) $Na_2S_2O_3 + 2HCl \xrightarrow{\Delta} S(\downarrow) + SO_2(\uparrow) + 2NaCl + H_2O$

(*c*) $3SO_2 + Cr_2O_7^{2-} + 2H^+ \rightarrow 2Cr^{3+} + 3SO_4^{2-} + H_2O$

(*d*) $S + H_2SO_3 \xrightarrow{\Delta} H_2S_2O_3$

Paragraph for Q.22 to Q.23

Solid 'X' salt + MnO_2 (solid)

↓ conc. H_2SO_4 added dropwise and on warming

'Y' (coloured gases)

↓ + [KI - starch paper]

[Turns KI-starch paper blue]

22. Here salt 'X' may be :-

(*a*) NaCl (*b*) NaBr

(*c*) NaI (*d*) None of these

23. Which of the following statement(s) are correct ?

(*a*) MnO_2 oxidizes halides ions into dihalgon

(*b*) Reducing nature of halides ions follow the order, $F^- < Cl^- < Br^- < I^-$

(*c*) 'Y' gas can be I_2, which turns KI-starch paper into blue colour.

(*d*) 'Y' gas can be Cl_2 and Br_2 which oxidises of KI to I_2 & turns starch paper blue.

Paragraph for Q.24 to Q.25

X^- (salt solution) + $AgNO_3$ → 'Y' ppt. $\xrightarrow{Na_3AsO_3}$ 'Z' (yellow ppt.)

↓ Soluble in NH_4 and $Na_2S_2O_3$

24. 'X' salt is :-

(*a*) NaCl

(*b*) NaBr

(*c*) Na_2CO_3

(*d*) Na_2SO_3

25. The incorrect statement about above experiment is

(*a*) 'Y' is AgCl and soluble in dil. HNO_3

(*b*) 'Z' is Ag_3AsO_3

(*c*) 'Y' is soluble in $Na_2S_2O_3$ and forms $Na_3[Ag(S_2O_3)_2]$

(*d*) AgCl forms fulminating silver (Ag_3N) with NH_3 on standing for a long time

Paragraph for Q.26 to Q.27

(I) Borax + conc. $H_2SO_4 \xrightarrow{\Delta}$ 'A' (white fumes)

↓ conc. HCl → [A] (↓) (white ppt.)

(II) Borax + conc. H_2SO_4 + CH_3OH

↓ on ignition in porcelain basin

['B' burns with green edge flames]

26. Compound 'A' is :-

(*a*) HCl (*b*) H_3BO_3

(*c*) SO_2 (*d*) B_2O_3

27. Correct statement about 'B' is / are :-

(*a*) green edge flame occurs due to formation of methyl borate

(*b*) 'B' is $B(OCH_3)_3$

(*c*) On burning , the paste of borax + CaF_2 and conc. H_2SO_4 on bunsen flame, gives same green edged flame.

(*d*) Borax gets hydrolysed into boric acid in acidic medium and then form ester of methyl borate with methyl alcohol.

Paragraph for Q.28 to Q.29

$KMnO_4$ + 'X' salt solution

↓ $BaCl_2$ (aq.) is added

('Y' pink ppt. + pink solution)

↓ H_2O_2 is added

('Z' pink ppt. + colourless solution)

28. The compound of 'X' and 'Y' are :-

(*a*) Na_2SO_3, $BaSO_4$

(*b*) Na_2SO_4, $BaSO_4$

(*c*) $Na_2S_2O_3$, $MnO(OH)_2$

(*d*) Na_2SO_4, ($BaSO_4$ + $MnO(OH)_2$)

29. Which of the following statement is / are incorrect about of 'Y' and 'Z' ?

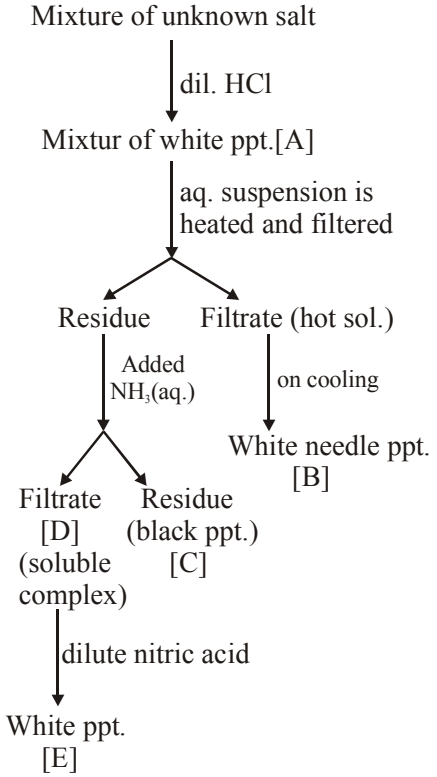
(*a*) The pink colour is due to adsorption of $KMnO_4$ on $BaSO_4$ surface

(*b*) H_2O_2 can not reduce adsorbed $KMnO_4$ on $BaSO_4$ surface

(*c*) The compound 'Y' also formed when $BaSO_3$ is exposed to air and product is added in $KMnO_4$ solution

(*d*) 'Y' and 'Z' are nonidentical precipitate

Paragraph for Q.30 to Q.32



30. Mixture of white ppt. [A] may contain.

(I) $PbCl_2$ (II) AgCl

(III) Hg_2Cl_2

(*a*) Only I (*b*) Only II, III

(*c*) Only III (*d*) I, II and III

31. Compound 'B' is

(*a*) $PbCl_2$ (*b*) AgCl

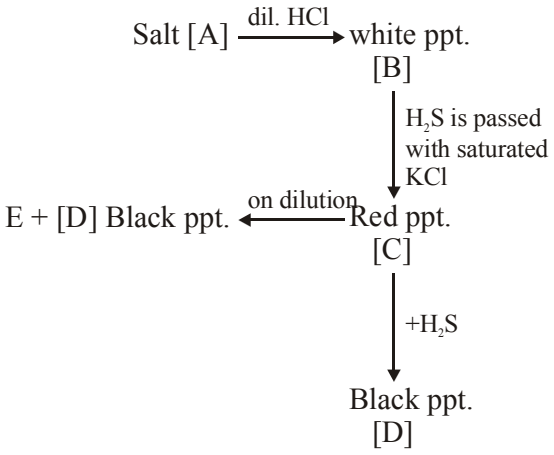
(*c*) Hg_2Cl_2 (*d*) $(Hg + HgCl_2)$

32. Co-ordination number of central metal ion in filtrate (soluble complex) 'D' is -

(*a*) 4 (*b*) 2

(*c*) 6 (*d*) 5

Paragraph for Q.33 to Q.34



33. Compound 'D' is :-

(*a*) $(Hg + HgS)$ (*b*) Ag_2S

(*c*) PbS (*d*) Pb_2SCl_2

34. The correct statement about [C] is -

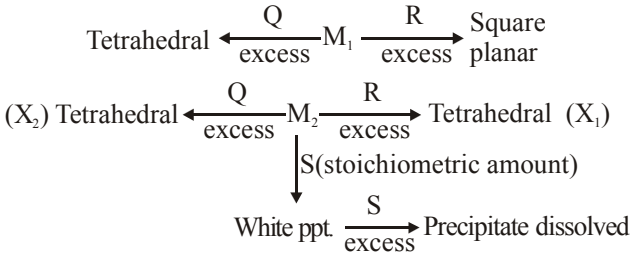
(*a*) Red precipitate is formed due to formation of ead sulphochloride

(*b*) Red precipitate is formed due to formation of lead sulphochloride

(*c*) Red precipitate is formed due to formation of lead sulphochloride

(*d*) Red precipitate is formed due to formation of lead sulphochloride

Paragraph for Q.35 to Q.37



35. M_1 , Q & R respectively are :-

(*a*) Zn^{2+}, KCl, KCN (*b*) Ni^{2+}, KCl, KCN

(*c*) Ni^{2+}, KCN, HCl (*d*) Zn^{2+}, KCN, KCl

36. M_2 , X_1 & X_2 respectively are :-

(*a*) $Zn^{2+}, Zn(CN)_4^{2-}, ZnCl_4^{2-}$

(*b*) $Ni^{2+}, Ni(CN)_4^{2-}, BiCl_4^{2-}$

(*c*) $Zn^{2+}, ZnCl_4^{2-}, Zn(CN)_4^{2-}$

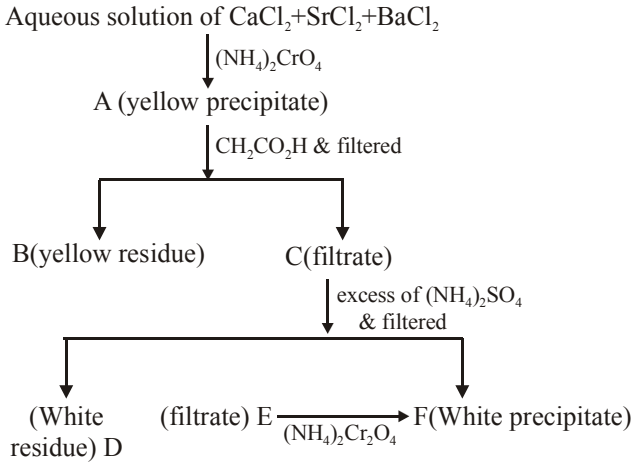
(*d*) $Ni^{2+}, NiCl_4^{2-}, Zn(CN)_4^{2-}$

37. S is :-

(*a*) H_2S (*b*) NaOH

(*c*) HNO_3 (*d*) KI

Paragraph for Q.38 to Q.40



38. Yellow precipitate A contains :-

(*a*) $BaCrO_4$ only (*b*) $BaCrO_4$ + $SrCrO_4$

(*c*) $CaCrO_4$ only (*d*) $CaCrO_4$ + $BaCrO_4$

39. E(aq.) is :-

(*a*) $(NH_4)_2[CaSO_4]$ (*b*) $(NH_4)_2[Ca(SO_4)_2]$

(*c*) $(NH_4)_2[Ca(SO_4)_4]$ (*d*) $Ca(SO_4)_2$

40. D gives :-

(*a*) Apple green colour in flame test

(*b*) Brick red colour in flame test

(*c*) Golden yellow colour in flame test

(*d*) Crimson red colour in flame test

Paragraph for Q.41 to Q.43

The elements Mg, Cr, Sr and Ba react with hydrogen to form hydrides 'MH_2'. Beryllium hydride is difficult to prepare and less stable than the others.

41. Hydride, which act as a reducing agent :-

(*a*) CaH_2 (*b*) SrH_2

(*c*) BaH_2 (*d*) All

42. Which of the following hydride is polymeric and covalent in nature in solid ?

(*a*) BeH_2 (*b*) SrH_2

(*c*) BaH_2 (*d*) All

43. On hydrolysis with water and dilute acids, alkaline earth metal hydrides produces :-

(*a*) O_2 gas

(*b*) H_2 gas

(*c*) O_3 gas

(*d*) CO_2 gas

Paragraph for Q.44 to Q.46

The trends in properties of alkaline earth metal salts can be explained by using Fajan's rule. It is associated with incorporation of covalent character in ionic bond. It states that smaller cations form more covalent compound and ionic character explains the solubility, thermal stability, hydrolysis and other properties of these salts. Some exceptions are also there and are explained by change in lattice energy.

44. Correct order of increasing thermal stability of alkaline earth metal sulphates is :-

(*a*) $SrSO_4 < CaSO_4 < MgSO_4 < BeSO_4$

(*b*) $BeSO_4 < MgSO_4 < CaSO_4 < SrSO_4$

(*c*) $CaSO_4 < BeSO_4 < MgSO_4 < SrSO_4$

(*d*) $MgSO_4 < BeSO_4 < CaSO_4 < SrSO_4$

45. Which salts does not show hydrolysis at all ?

(*a*) $MgCl_2$ (*b*) $BeCl_2$

(*c*) $AlCl_3$ (*d*) $BaCl_2$

46. Whcih alkaline earth metal form superoxide ?

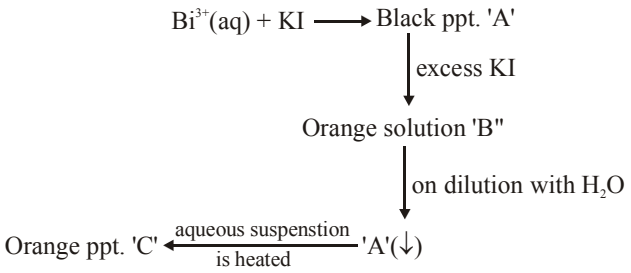
(*a*) Be

(*b*) Mg

(*c*) Ca

(*d*) None

Paragraph for Q.47 to Q.48



47. Orange solution 'B' is due to formation of :-

(*a*) BiI_3

(*b*) $[BiI_4]^-$

(*c*) $Bi(OH)_2I$

(*d*) BiOI

48. Compound 'C' is :-

(*a*) BiI_3

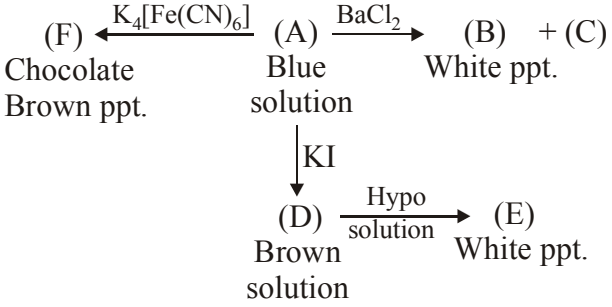
(*b*) BiOI

(*c*) $Bi(OH)_2I$

(*d*) $[BiI_4]^-$

Paragraph for Q.49 to Q.51

Following observations are given :



49. Correct statement :-

(*a*) Compound F is $Cu_2Fe(CN)_6$

(*b*) Compound E is CuI

(*c*) Both (A) & (B)

(*d*) None of these

50. Brown color solution is due to presence of :-

(*a*) $Cu_2[Fe(CN)_6]$ (*b*) Cu_2I_2

(*c*) KI_3 (*d*) $CuSO_4$

51. The incorrect statement(s) about above flow diagram is / are :-

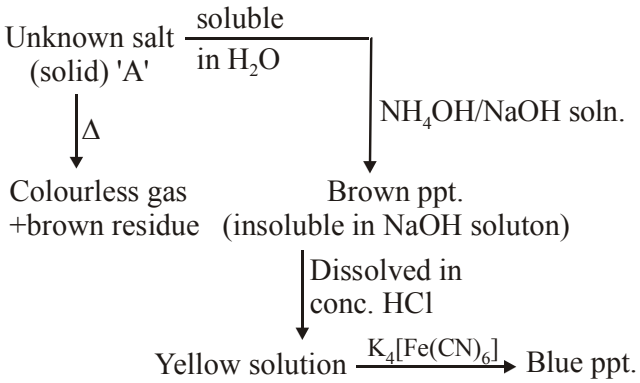
(*a*) Adding an excess of hyposolution to the brown solution, 'd' is reduced to colourless solution and white precipitate becomes visible.

(*b*) F is $Cu_3[Fe(CN)_6]_2$

(*c*) The reduction of hyposolution yield tetrathionate ions

(*d*) The co-ordination number of iron in the chocolate brown ppt.(F) is changed than the $K_4[Fe(CN)_6]$

Paragraph for Q.52 to Q.53



52. Identify A :-

(*a*) $FeSO_4$ (*b*) $Fe_2(SO_4)_3$

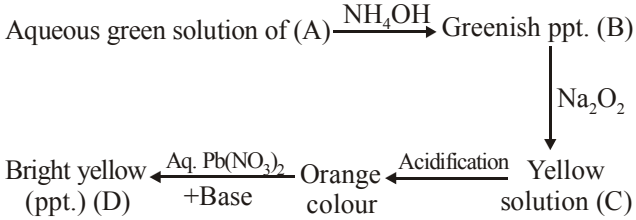
(*c*) $FeCl_3$ (*d*) $CrCl_3$

53. What is the formula of brown ppt. :-

(*a*) $Cr(OH)_3$ (*b*) $Fe(OH)_2$

(*c*) $FeCl_3$ (*d*) $Fe(OH)_3$

Paragraph for Q.54 to Q.55



54. Identify A :-

(*a*) $AlCl_3$ (*b*) $Cr(OH)_3$

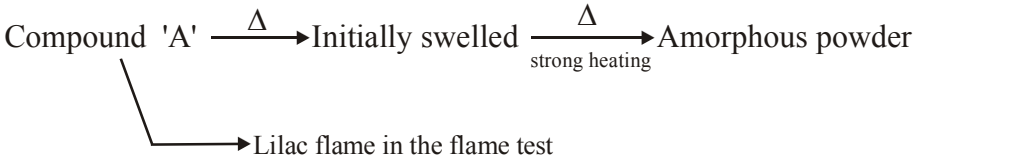
(*c*) $CrCl_3$ (*d*) $FeCl_3$

55. Identify D :-

(*a*) Na_2CrO_4 (*b*) $PbCrO_4$

(*c*) Na_2MnO_4 (*d*) $Fe(OH)_3$

Paragraph for Q.56 to Q.58



Compound 'A' (in aq. solution) $\xrightarrow{\text{excess NaOH}}$ 'B' (No change in colour) $\xrightarrow{H_2O_2}$ 'C' (Yellow solution)

56. Compound 'A' is having water of crystallization by the number of

(*a*) 10 (*b*) 20

(*c*) 24 (*d*) 36

57. The compound 'B' is having oxidation state of

(*a*) Zero (*b*) II

(*c*) III (*d*) IV

58. The hybridization 'B' of compound 'C' is

(*a*) sp^3 (*b*) sp^3d

(*c*) d^2sp^3 (*d*) d^3s

Paragraph for Q.59 to Q.62

Light green colour compound (A) $\xrightarrow{\Delta}$ white residue (B)

(B) $\xrightarrow[\text{temp}]{\text{high}}$ C + D + E

D and E are acidic in nature. When A is passed through $HgCl_2$, yellow precipitate is observed. D is passed through H_2S , white turbidity is obtained :-

59. D and E are :-

(*a*) SO_2 , SO_3 (*b*) SO_2 , CO_2

(*c*) CO_2 , CO (*d*) SO_2 , CO

60. Yellow precipitate is :-

(*a*) HgO

(*b*) Basic Hg (I) sulphate

(*c*) Basic Hg (II) sulphate

(*d*) HgI_2

61. C is soluble in :-

(*a*) conc. HCl (*b*) dil. H_2SO_4

(*c*) AcOH (*d*) Na_2CO_3

62. Number of water of crystallization in A is :-

(*a*) 0 (*b*) 2

(*c*) 7 (*d*) 5

Paragraph for Q.63 to Q.64

An aqueous solution of a mixture of two inorganic salts , when treated with dilute HCl, gave a precipitate (P) and a filtrate (Q). The precipitate (P) was found to dissolve in hot water. The filtrate (Q) remained unchanged, when treated with H_2S in a acidic medium. However, it gave a precipitate (R) with H_2S in an ammonical medium. The precipitate (R) gave a coloured solution (S), when treated with H_2O_2 in an aqueous NaOH medium.

63. The precipitate P contain :-

(*a*) Pb^{2+} (*b*) Hg_2^{2+}

(*c*) Ag^+ (*d*) Hg^{2+}

64. The colour solution S contains :-

(*a*) $Fe_2(SO_4)_3$ (*b*) $CuSO_4$

(*c*) $ZnSO_4$ (*d*) Na_2CrO_4

Paragraph for Q.65 to Q.68

(I) (X) $\xrightarrow{\Delta}$ glassy transparent bead (Y) on platinum wire

(Y) + $CuSO_4$ $\longrightarrow$ coloured bead (Z)

(II) (X) + conc. H_2SO_4 + CH_3CH_2OH $\xrightarrow{\text{ignite}}$ green flame (W)

(III) Aqueous solution of (X) is alkaline.

65. X is :-

(*a*) $NaNH_4HPO_4 . 4H_2O$

(*b*) $Na_2B_4O_7 . 10H_2O$

(*c*) $CuSO_4 . 5H_2O$

(*d*) None of these

66. Y is :-

(*a*) $NaPO_3$ (*b*) $NaBO_2$

(*c*) $NaBO_2 + B_2O_3$ (*d*) None of these

67. Z is :-

(*a*) $Cu_3(PO_4)_2$ (*b*) $CuSO_4$

(*c*) $Cu(BO_2)_2$ (*d*) None of these

68. W is :-

(*a*) $(CH_3)_3BO_3$ (*b*) $(C_2H_5)_3BO_3$

(*c*) H_3BO_3 (*d*) None of these

Paragraph for Q.69 to Q.71

Microcosmic salt is used to detect different metal ions. Microcosmic salt is first heated to give glassy bead of X. X when reacts with different metal oxide, different colour is observed.

69. Microcosmic salt is :-

(*a*) $Na(NH_4)HPO_4.4H_2O$

(*b*) $Na_2HPO_4.4H_2O$

(*c*) $Na_3PO_4.4H_2O$

(*d*) $Na(NH_4)HPO_4.2H_2O$

70. The correct statement about microcosmic salt :-

(*a*) It is sodium ammonium hydrogen phosphate tetrahydrate

(*b*) It gives canary yellow precipitate with ammonium molybdate solution

(*c*) Both (A) and (B)

(*d*) None of these

71. Microcosmic salt $\xrightarrow{NaOH/\Delta}$ Basic gas (Z) :-

Aqueous solution of Z gives :-

(*a*) Blue colour precipitate with $CuSO_4$ solution

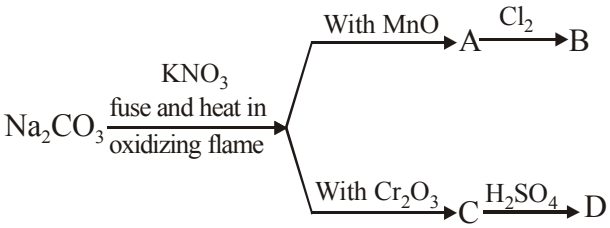
(*b*) Brown precipitate which is called iodide of millons base with $K_2[HgI_4]$

(*c*) White precipitate with $ZnCl_2$ which is dissolved when Z is added in excess

(*d*) All of these

Paragraph for Q.72 to Q.75

Identification of cations can also be done using a dry test called sodium carbonate bead test which is similar to borax - bead test :-



72. The hybridisation and colour of A with molecular formula ?

(*a*) Na_2MnO_4 , d^3s , Green

(*b*) $NaMnO_4$, sp^3 , Purple

(*c*) Mn_2O_7 , d^3s , Red

(*d*) $Na_2Cr_2O_7$, d^3s , Orange

73. The hybridisation and colour of B with molecular formula ?

(*a*) Na_2MnO_4 , d^3s , Green

(*b*) $NaMnO_4$, sp^3 , Purple

(*c*) Mn_2O_7 , d^3s , Red

(*d*) $Na_2Cr_2O_7$, d^3s , Orange

(*d*) None of these

74. C and its colour is :-

(*a*) Na_2CrO_4 , orange

(*b*) $Na_2Cr_2O_7$, orange

(*c*) $Na_2Cr_2O_7$, yellow

(*d*) Na_2CrO_4 , yellow

75. D and number of unpaired electron in D are :-

(*a*) Na_2CO_3 , 1

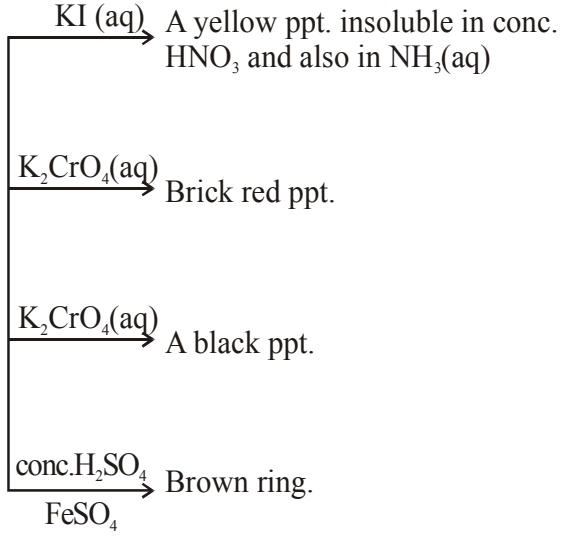
(*b*) $NaMnO_4$, 2

(*c*) $Na_2Cr_2O_7$, 0

(*d*) Na_2CrO_4 , 0

Paragraph for Q.76 to Q.78

Crysalline salt (A) $\xrightarrow[\text{in water}]{\text{Dissolved}}$



76. Crystalline salt A is

(*a*) $AgNO_3$ (*b*) $Pb(NO_3)_2$

(*c*) $AgNO_2$ (*d*) $Hg(NO_3)_2$

77. Black ppt. and yellow ppt. are respectivly

(*a*) PbS, PbI_2 (*b*) HgS, HgI_2

(*c*) Ag_2S, AgI (*d*) (Hg + HgS), Hg_2I_2

78. Which of the following options are correct regarding A?

(*a*) A turns our skin black

(*b*) A gives white precipitate with NaOH which produces silver mirror with glucose solution

(*c*) A gives white precipitate with KCN which is soluble in excess KCN

(*d*) All

Paragraph for Q.79 to Q.81

A white salt (A) does not dissolve in water, but dissolve in dilute nitric acid solution. Passing H_2S gas through acidic solution of A, a black precipirate A_1 was produced which was insoluble in water, dilute HNO_3 and alkali but sdissolved in concentrated solution of Na_2S as well as in aqua-regia. Adding $SnCl_2$-dropwise to the solution of A, gave a white , silky precipitate (B), which turned into black precipitate (C) on adding excess reagent. Addition of KI to the acidified solution of A gave a red coloured precipirate (D) in the beginning, which is dissolved in excess reagent.

79. A is called

(*a*) Calomel (*b*) Corrosive sublimate

(*c*) Brine solution (*d*) Rock salt

80. The formula of B and D are respectively

(*a*) Hg_2Cl_2, HgI_2 (*b*) $HgCl_2, HgI_2$

(*c*) Pb_2Cl_2, PbI_2 (*d*) Hg_2Cl_2, Hg_2I_2

81. Black ppt. A_1 and black ppt. C are respectively

(*a*) Ag_2S, Ag (*b*) HgS, Hg

(*c*) Hg_2S, Hg (*d*) PbS, Pb

Paragraph for Q.82 to Q.84

An inorganic compound (A), transparent like glass is a strong reducing agent. Its hydrolysis in water gives white turbidity (). Aqueous solution of (A) gives white precipitate (C) with NaOH (aq) which is soluble in excess NaOH.(A) also reduce I_2 and gives chromyl chloride test.

A+ corrosive sublimate $\rightarrow$ Grey mass + D.

82. Grey mass and D are respectively

(*a*) Hg and $SnCl_2$ (*b*) Ag and Cu_2Cl_2

(*c*) Hg and $SnCl_4$ (*d*) Hg and Cu_2Cl_2

83. What is the correct option regarding A.

(*a*) A reduces auric chloride to produce purple of cassius.

(*b*) A reduces ferric chloride to iron.

(*c*) A reduces cupric chloride to red deposit copper

(*d*) All

84. A is

(*a*) $CdCl_2$ (*b*) $CuCl_2$

(*c*) $SnCl_2$ (*d*) $SnCl_4$

Paragraph for Q.85 to Q.87

A mixture consists of an yellow salt (A) and a white salt (B), both anhydrous. Salt mixture was dissolved in water and few drops of HCl was added to obtain a clear, yellow coloured soluton. The solution was then treated with NH_3/NH_4Cl solution when a reddish-brown precipirate (C), insoluble in NaOH solution, was produced. Solution was filtred off and filtrate was treated with aqueous NaOH solution when a white precipirate (D), soluble in excess reagent was formed.

Extract solution in concentrated H_2SO_4 when mixture mixed with $K_2Cr_2O_7$, gave a dense brown fumes on boiling, that turned aqueous NaOH solution yellow. Extract solution when treated with $Hg(NO_3)_2$ a yellw precipitate (E) was formed.

85. The acidic radical present in the mixture

(*a*) A consists of Cl^-, B consists of SO_3^{2-}

(*b*) A consists of Br^-, B consists of SO_3^{2-}

(*c*) A consists of Cl^-, B consists of SO_4^{2-}

(*d*) A consists of Cl^-, B consists of CO_3^{2-}

86. Yellow precipitate is

(*a*) $Hg(OH)_2.HgCO_3$ (*b*) HgO

(*c*) $HgSO_4.2HgO$ (*d*) $HgCl_2$

87. The basic radical present in the mixture

(*a*) A consists of Fe^{3+}, B consists of Pb^{2+}

(*b*) A consists of Fe^{2+}, B consists of Pb^{2+}

(*c*) A consists of Fe^{3+}, B consists of Zn^{2+}

(*d*) A consists of Fe^{2+}, B consists of Zn^{2+}

Paragraph for Q.88 to Q.90

Substance (A) is a yellowish-white deliquescent oslid whihc sublimes and has a vapour density of 133. (A) reacted violently with water forming solution (B). A sample of (B) gave a curdy white precipitate (C) on addition of diliute HNO_3 and $AgNO_3$ solution, but is readily dissolved on the addition of dilute NH_4OH, thourhg a geleatinous white precipirate was formed in its place. (D) was filtered off and dissolved in excess NaOH, forming a clear solution (E). When CO_2 was passed into (E), comound (D) was reprecipitated.

Qualitative analysis of solution (B) gave a white gelationous precipitate in Group III. When 0.1333 g of (A) was dissolved in water and treated with 8-hydroxyquinoline. 0.4594 g of precipirate was obtained.

88. A is

(*a*) $FeCl_3$ (*b*) $CrCl_3$

(*c*) $ZnCl_2$ (*d*) $AlCl_3$

89. The coordination number of metal ion in E

(*a*) 1 (*b*) 2

(*c*) 3 (*d*) 4

90. The same galetinous white precipitate was formed when (A) reacts with

(*a*) $(NH_4)_2S$ (*b*) Na_2S

(*c*) Na_2CO_3 (*d*) All

Paragraph for Q.91 to Q.93

A white powder turns yellow (B) on heating and evolves a gas which turns lime water milky, as well as water vapour. The yellow residue turns white on cooling but turns yellow again when heated B reats with dilute sulphuric acid to give a colourless solution (C). If dilute NaOH is added to C, a white precipitate (D) is formed initialy, which dissolves on adding excess base. With dilute ammonia soluton C gives a white precipitate which dissolves in excess ammonia, giving a clear solution (E) due to complex formation.

91. A is

(*a*) $PbCO_3$ (*b*) $CaCO_3$

(*c*) $ZnCO_3$ (*d*) $NiCO_3$

92. The cordination number of metal ion in the complex is

(*a*) 2 (*b*) 4

(*c*) 6 (*d*) 5

93. The shape of the complex is

(*a*) Square planer

(*b*) Tetrahedral

(*c*) Inner orbital Octahedral

(*d*) Outer orbital Octahedral

Paragraph for Q.94 to Q.95

A solid mixture consists of a reddish brown metal oxide (A) and a white hydrated salt B. The mixture was dissolved in dilute HNO_3 and a portion of this solution was treated with NH_3 solution, just to make the solution neutral and then finally treated with NH_3/NH_4Cl buffer solution when a reddish brown gelatinous precipitate (C) was obtaind. C was then dissolved in dilute HCl and few drops of NH_4SCN solution was added when a deep blood red colouration was observed. Filtrate obtained after removal of C was then treated with excess of $(NH_4)_2S$ solution when a pink coloured precipitate (D) was formed. D was then dissolved in dilute HNO_3 and treated with $NaBiO_3$ solution. A deep purple coloured solution was formed.

In a separate experiment a pinch of original salt mixture was mixed with solid $K_2Cr_2O_7$ and then dissolved in concentrated H_2SO_4 and finally boilled. A deep red fumes of (E) was obtained which made aqueous solution of NaOH yellow, when passed through it.

94. C and D are respectively :-

(*a*) $Fe(OH)_3$, CoS (*b*) $Fe(OH)_3$, MnS

(*c*) $Fe(OH)_2$, CoS (*d*) $Fe(OH)_2$, MnS

95. The anion present in B -

(*a*) NO_3^- (*b*) Br^-

(*c*) Cl^- (*d*) NO_2^-

Paragraph for Q.96 to Q.97

Three black powder A, B and C have to be identified. A dissolves in dilute HCl to give a blue solution which becomes deep blue with the addition of excess of NH_4OH. The solution of A in dilute HNO_3, on evaporation yields blue crystals which, on strong heating reagents A. B dissolves completely, on boiling with concentrated HNO_3 yielding coious brown fumes. The resulting solution after proper dilution yields no positive test for any cation. C does not dissolve in dilute HCl, but goes into solution on boiling with concentrated HCl and a crystal of $KClO_3$. Evaporation of this solution yields colourless crystals which dissolve in water. The solution yields a scarlet precipitate when a little KI solution in added but redissolves in excess of KI solution.

96. A & B is -

(*a*) Hg_2O, Copper (*b*) CuO, Coke powder

(*c*) Ag , Hg (*d*) Cu, Hg

97. C is -

(*a*) PbS (*b*) HgS

(*c*) Ag_2S (*d*) Bi_2S_3

Paragraph for Q.98 to Q.100

A yellow deliquescent solid (*a*) is soluble in water, alcohol and ether . Its aqueous solution turns blue litmus red. (*a*) gives following reactons :

(i) On strong heating it gives a dark brown residue (*b*) water and a compound, (*c*) which gives white fumes with NH_3 gas. Compound (*c*) in aqueous solution decomposes carbonates to evolve CO_2 gas.

(ii) When dry chlorine gas is passed over a heated mixture of (*b*) and carbon , one another compound (*d*) is formed. The colour of solid (*d*) is black red. It dissolves in water giving a yellow solution.

(iii) When aqueous solution of (*d*) is heated, a brown precipitate (*e*) is formed. The hydrolysis can be checked by the addition of HCl to aqueous solution.

(iv) (*d*) absorbs water vapours to give compound (*a*). (*d*) also absorbs NH_3 gas to form an addition compound (F).

(v) A solution of (*d*) reacts with ammonium thicoyanate to produce a red colour of compound (G).

(vi) A solution of (*d*) reacts with $K_4[Fe(CN)_6]$ solution to give a deep blue colour (H). A solution of (*d*) liberated iodine form KI solution. H_2S is oxidized to free sulphur and SO_2 to sulphuric acid.

98. A is -

(*a*) $FeCl_3$ (*b*) $AlCl_3$

(*c*) $FeCl_3$ (*d*) $SbCl_3$

99. Red colour compound (G) and deep blue colour (H) are respectively -

(*a*) $[Fe(H_2O)_5SCN]^{2+}$, $Fe_4[Fe(CN)_6]_3$

(*b*) $[Fe(H_2O)_5SCN]^{1+}$, $Fe_3[Fe(CN)_6]_2$

(*c*) $[Fe(SCN)_2]$, $Fe_2[Fe(CN)_6]$

(*d*) $[Sb(SCN)_3]$, $Fe_4[Fe(CN)_6]_3$

100. Brown precipitate (E) and addition compound F are -

(*a*) $Fe(OH)_3$, $[Fe(NH_3)_6]^{3+}$

(*b*) $Fe(OH)_2$, $[Fe(NH_3)_6]^{2+}$

(*c*) $Fe(OH)_3$, $[Fe(NH_3)_6]^{2+}$

(*d*) $Fe(OH)_2$, $[Fe(NH_3)_6]^{3+}$

Matrix Match Type :

101. Match the column-I with column-II :-

Column - I (Reactants)	**Column - II (Products)**
(*a*) $Zn + dil.\ H_2SO_4$	(P) Metallic salt
(*b*) $Fe + dil.\ HNO_3$	(Q) SO_2
(*c*) $Zn + conc.\ H_2SO_4$	(R) Oxyacid
(*d*) $P + conc.\ H_2SO_4$	(S) N_2O
	(T) H_2 or H_2O

102. Match the column-I with column-II :-

Column - I (Reactant)	**Column - II (Product)**
(*a*) $Ag + conc.\ H_2SO_4$	(P) Acidic oxide
(*b*) $Ag + conc.\ HNO_3$	(Q) Metal nitrate
(*c*) $As + conc.\ H_2SO_4$	(R) Metal sulphate
(*d*) $Sn + conc.\ HNO_3$	(S) Oxy acid
	(T) Water

103. Match the column-I with column-II :-

Column - I (Reagents)	**Column - II (Compound)**
(*a*) Catalytic test $[NaN_3 + KI_3]$	(P) Na_2S
(*b*) Sodium nitroprusside test	(Q) $Na_2S_2O_3$
(*c*) Blood red colour with $FeCl_3$	(R) NaSCN
(*d*) Black ppt. with $AgNO_3$ at room temperature	(S) Na_2CO_3
	(T) Na_2SO_3

104. Match the column-I with column-II :-

Column - I (Acidic radical)	**Column - II (Observations)**
(*a*) NO_2^-	(P) Gives brown ring test
(*b*) NO_3^-	(Q) Gives brown ppt. with Nesslar's reagent
(*c*) NH_4^+	(R) Gives bloor red colouration with KSCN
(*d*) Fe^{3+}	(S) Gives red colouration with CH_3COONa
	(T) Radical is reduced to ammonia with Zn + conc. NaOH

105. Match the column-I with column-II :-

Column - I

(Acidic radical)

(*a*) Cl^- salt solution

(*b*) Br^- salt solution

(*c*) I^- salt solution

(*d*) NO_2^- salt solution

Column - II

(Observations)

(P) Gives positive layer test (with chlorine water)

(Q) Yellow color with excess chlorine water in organic layer

(R) Brown fumes with conc. H_2SO_4

(S) Ppt. formed with conc. $AgNO_3$

(T) Coloured gas with $K_2Cr_2O_7$ + conc. H_2SO_4

106. Match the column-I with column-II :-

Column - I (Reagents)	**Column - II (Anion gives ppt. change in colour)**
(*a*) $FeCl_3$(aq.)	(P) SO_4^{2-}(aq.)
(*b*) $BaCl_2$(aq.)	(Q) CH_3COO^-(aq.)
(*c*) $AgNO_3$(aq.)	(R) PO_4^{3-}(aq.)
(*d*) $(NH_4)_2MoO_4$(aq.)	(S) $S_2O_3^{2-}$(aq.)

107. Column-I lists some of group reagents, give characteristics colour / precipitate mentioned cation in column-II. Match each entry of column-I with those given in column-II :-

Column - I (Group reagents)	**Column - II (Cations)**
(*a*) H_2S in NH_4OH(aq.)	(P) Bi^{3+}(aq.)
(*b*) H_2S in HCl(aq.)	(Q) Pb^{2+}(aq.)
(*c*) $(NH_4)_2CO_3$ in NH_4Cl(aq.)	(R) Ca^{2+}(aq.)
(*d*) NH_4OH in NH_4Cl	(S) Mn^{2+}(aq.)
	(T) Al^{3+}(aq.)

108. Match the coloum of precipitate listed in Column-I with the reagent(s) listed in column-II.

Column - I (Observations)

(*a*) Ag^+ gives black / brown ppt. with

(*b*) Hg_2^{2+} gives black ppt. with

(*c*) Pb^{2+} gives yellow ppt. with

(*d*) Mg^{2+} gives pink mass

Column - II (Reagents)

(P) $Co(NO_3)_2$ in charcoal cavity

(Q) KI

(R) H_2S (saturated in H_2O)

(S) K_2CrO_4 solution

(T) NaOH solution

109. Match the coloum :-

Column - I (Basic radical)

(*a*) Cu^{2+}

(*b*) Fe^{3+}

(*c*) Cd^{2+}

(*d*) Ag^+

Column - II (Property / Test)

(P) Produces soluble complex with excess of KCN without any change of oxidation state of metal ion

(Q) Produces coloured soluble complex with excess of KCN

(R) Produces no ppt. with excess of KI

(S) Produces coloured ppt. with NaOH

(T) Produces colourless soluble complex with excess of NH_4OH

110. Match the column-I with column-II :-

Column - I (Basic radical)	**Column - II (Property / Test)**
(*a*) Fe^{3+}	(P) Produces white ppt. with $K_4[Fe(CN)_6]$
(*b*) Zn^{2+}	(Q) Produces soluble complex in excess of NaOH solution.
(*c*) Cr^{3+}	(R) Give redox reaction with $Na_2S_2O_3$ solution.
(*d*) Al^{3+}	(S) Produces corresponding hydroxide with aqueous Na_2S
	(T) Produces reddish brown ppt. with $CH_3CO_2^-$ solution

111. Match the column-I with column-II :-

Column - I (Reagent)	**Column - II (Name of product / colour)**
(*a*) $CH_3CO_2^- + As_2O_3$	(P) Thenard Blue
(*b*) Na-K tartarate+$CuSO_4$	(Q) Tollens reagent
(*c*) $NH_4OH + AgNO_3$	(R) Fehling solution
(*d*) $Al_2O_3 + Co(NO_3)_2$	(S) Cacodyl oxide - Extremely nauseating odour

112. Match the column-I with column-II :-

Column - I (Decolourise acidic $KMnO_4$ solution)	**Column - II (Given salt)**
(*a*) Only acidic radical	(P) $Sn(NO_3)_2$
(*b*) Only basic radical	(Q) KNO_2
(*c*) Both radical	(R) FeC_2O_4
(*d*) Neither acidic nor basic radical	(S) Na_2CO_3
	(T) $BaSO_3$

113. Match the column-I with column-II :-

Column - I **Color of the sublimate**	**Column - II** **Compound present**
(*a*) White	(P) $NH_4^+, HgCl_2, Hg_2Cl_2$
(*b*) Yellow	(Q) As_2O_3
(*c*) Orange	(R) Sb_2O_3
(*d*) Black	(S) HgS

114. Match the column-I with column-II :-

Column - I **(Anion)**	**Column - II** **(Property)**
(*a*) Peroxides	(P) Diamagnetic
(*b*) Superoxides	(Q) Paramagnetic
(*c*) Oxides	(R) Bond order is 1.5
(*d*) Hydroxides	(S) Total number of electrons are 17
	(T) Total number of electrons are 18

115.

Column - I **Precipitate**	**Column - II** **Dissolving solution**
(*a*) Black CuS	(P) NaOH solution
(*b*) White AgCl	(Q) Sodium peroxide solution
(*c*) Green $Cr(OH)_3$	(R) 50% HNO_3
(*d*) White $Zn(OH)_2$	(S) Excess NH_3 solution
	(T) KCN solution

116. Column - I (Compound of same metal with different oxidation state)

(*a*) $\overset{+2}{Cu}(SCN)_2, \overset{+1}{Cu}SCN$

(*b*) $Cu(CN)_2$, CuCN

(*c*) HgI_2 , Hg_2I_2

(*d*) HgO, Hg_2O

Column - II (Colour of the ppt)

(Q) Yellow, white

(R) Red, Green

(P) Black, white

(S) Yellow, Black

117. Match the colour of ppt. listed in column-I with the reagent(s) in column-II :-

Column - I (Observation/Test)

(*a*) Bi^{3+} gives black ppt. with

(*b*) Cu^{2+} gives black ppt. with

(*c*) Cd^{2+} gives white ppt. / bluish - white pp. with

(*d*) Ag^+ gives black ppt. with

Column - II (Reagents)

(P) Saturated solution of H_2S in H_2O

(Q) KSCN(aq.)

(R) $K_4[Fe(CN)_6]$ (aq.)

(S) dil. HCl

(T) NaH (aq.)

118.

Column - I **Pair of Same colour precipitate**	**Column - II** **Colour**
(*a*) CdS, SnS_2	(P) Brownish red
(*b*) PbS, $Ni(OH)_3$	(Q) Black
(*c*) $Fe(OH)_3$, Ag_3AsO_4	(R) Yellow
(*d*) $Ni(OH)_2$, $Cu_3[Fe(CN)_6]_2$	(S) Green

119. Match the column-I with column-II :-

Column - I **(Effect on heating)**	**Column - II** **(Metal)**
(*a*) Amphoteric metal oxide	(P) Pb
(*b*) Metal acetate $\xrightarrow{\Delta}$ acetone + metal carbonate	(Q) Zn
(*c*) Metal carbonate $\xrightarrow{\Delta}$ metal oxide+$CO_2\uparrow$	(R) Na
(*d*) Metal nitrate $\xrightarrow{\Delta}$ metal oxide+$NO_2\uparrow + O_2\uparrow$	(S) Li

120. Which of anions in the column-I shows one ore more observatons from the column-II :-

Column - I **(Radical)**	**Column - II** **(Characteristic feature)**
(*a*) S^{2-}	(P) White ppt. with $AgNO_3$
(*b*) NO_2^-	(Q) Evolution of pungent smell gas with (Al + conc. NaOH)
(*c*) SO_3^{2-}	(R) Brown fumes with conc. H_2SO_4 (hot)
(*d*) CH_3COO^-	(S) Decolourises acidified $KMnO_4$

121. Match the column-I with column-II :-

Column - I

(*a*) $\mu = \sqrt{15}$ B.M.

(*b*) O.N. of metal = +2

(*c*) Octahedral complex

(*d*) d^2sp^3 hybridised metal ion

Column - II

(P) Schweizer's salt

(Q) Potassium ferrocyanide

(R) Potassium ferricyanide

(S) Brown ring complex

(T) Sodium nitroprusside

122. Match the column-I with column-II :-

Column - I (Group reagent)

(*a*) $NH_4Cl + NH_4OH$

(*b*) $NH_4Cl + NH_4OH + (NH_4)_2CO_3$

(*c*) HCl.(dil.) + H_2S

(*d*) $NH_4Cl + NH_4OH + H_2S$

Column - II (Group ion precipitated)

(P) IInd group

(Q) IIIrd group

(R) IVth group

(S) Vth group

123. Match the column-I with column-II :-

Column - I (Colour of precipitate)

(*a*) Black ppt.

(*b*) Canary yellow ppt.

(*c*) Brick red ppt.

(*d*) White ppt.

Column - II(Reactions)

(P) $Bi(OH)_3 + [Sn(OH)_4]^{2-} \rightarrow$

(Q) $Na_2S + Hg(NO_3)_2 \rightarrow$

(R) $Na_3PO_4 + (NH_4)_2 MoO_4 \rightarrow$

(S) $AgNO_3 + K_2CrO_4 \rightarrow$

(T) $HC \equiv CH + AgNO_3 + NH_4OH \rightarrow$

124. Match the column-I with column-II :-

Column - I Colour of borax bead test(cold)		**Column - II Metal present**
Oxidising flame	**Reducing flame**	
(*a*) Green	Green	(P) Cu
(*b*) Violet	Colourless	(Q) Fe
(*c*) Yellow	Green	(R) Mn
(*d*) Blue	Red	(S) Cr

125. Match the column-I with column-II :-

Column - I Colour of borax bead test(cold)		**Column - II Metal present**
Oxidising flame	**Reducing flame**	
(*a*) Blue	Blue	(P) Co
(*b*) Colourless	Blue	(Q) Ti
(*c*) Brown	Grey	(R) Ni
(*d*) Amethyst	Colourless	(S) Mn

EXERCISE # IV

❑ **Integer Type :**

1. Find the number of reagent(s) which form white ppt. with CO_3^{2-} ion.

$BaCl_2$, $CuSO_4$, Hg_2Cl_2, $Pb(CH_3COO)_2$, $CaCl_2$

2. Find the number of reagent(s) which oxidises HCO_3^- ion solution.

MnO_4^- / H^+, $Cr_2O_7^{2-} / H^+$, Cl_2 water, Br_2 water, I_2 water

3. Find the number of carbonate having K_{sp} value greater than Li_2CO_3

Na_2CO_3, K_2CO_3, Rb_2CO_3, Cs_2CO_3

4. Find out the number of anions that can not decolorise acidic solution of $KMnO_4$.

NO_2^-; NO_3^-; Cl^-; I^-; $C_2O_4^{2-}$; HCO_2^-; CO_3^{2-}; S^{2-}; SO_3^{2-}

5. Find out the total number of acidic radical, to which if dilute HCl is added then volatile gases are evolved. CO_3^{2-}, SO_3^{2-}, S^{2-}, $S_2O_3^{2-}$, NO_3^-, CN^-

6. Among the following, how many compound(s) destroye nitrite solution and N_2 gas is evolved.

$AgNO_3$, NH_4Cl, (NH_2CONH_2 + dil. HCl), Sulphamic acid, (thiourea + dil. CH_3COOH), ($FeSO_4$ + dil. CH_3COOH) ; MnO_4^- + H^+

7. How many compounds of Mn^{2+} are **pink precipitate** :-

MnS ; $MnO(OH)_2$; $Mn(NH_4)PO_4$; $KMnO_4$, $Mn(OH)_2$

8. How many of the following reagents can be used to distinguish between SO_2 and CO_2 ?

$Ca(OH)_2$, (starch + KIO_3), ($K_2Cr_2O_7$ + H_2SO_4), ($KMnO_4$ + H_2SO_4), $Ba(OH)_2$, H_2O_2, $FeCl_3$, $Zn[Fe(CN)_5(NO)]$

9. The total reagents are used to distinguish between sulphite and bisulphite acidic radical.

Litmus paper, $AgNO_3$, $Pb(OAc)_2$, $CaCl_2$, $SrCl_2$, $BaCl_2$, ($K_2Cr_2O_7$ + H_2SO_4), ($KMnO_4$ + H_2SO_4), (H_2O_2 followed by litmus paper)

10. Find the total number of acidic radical, to which if conc. H_2SO_4 is added then volatile gases are evolved with specific odour. CO_3^{2-}, SO_3^{2-}, HCO_2^-, $CH_3CO_2^-$.

11. Find the total number of metals , which makes a thin protective layer of its oxide on treatment with conc. HNO_3.

Al, Zn, Sn, Cu, Pt, Cr, Au, Ag

12. The total number of anionic species gives coloured gas with conc. H_2SO_4.

CO_3^{2-}, HCO_3^-, SO_3^{2-}, NO_3^{2-}, $S_2O_3^{2-}$, NO_2^-, CH_3COO^-, SO_4^{2-}

13. Among the following find out the total number of incorrect statement(s) -

(1) BO_3^{3-}, PO_4^{3-}, F^- & SiO_4^{4-} anions are called as interfering radicals,

(2) $HgCl_2$ reacts with carbonate ion and gives basic mercuty(II) carbonate which does not give test with bicarbonate.

(3) SO_3^{2-} and HSO_3^- can be distinguished by addition of neutral H_2O_2 solution against litmus paper.

(4) Zinc and sulphuric acid oxidized sulphite to sulphate.

(5) $AgNO_3$ oxidizes suspension of sulphite solution to sulphate.

(6) Bromine water oxixises $BaSO_3$ to $BaSO_4$.

14. Salt solutution 'A' + dil. HCl $\longrightarrow$ only 'B' gas (suffocating odour of burning sulphur)

$\downarrow BaCl_2$

'C' [white ppt.] $\longrightarrow$ soluble in dil. HCl and gives 'B' gas

$\downarrow$ Reagent 'M'

white ppt. of [D] (insoluble in dil. HCl)

Find the total number of reagents 'M' :

(conc. HNO_3), O_2 , H_2O_2 , N_2 , NH_3 , (Br_2 + H_2O)

15. In $Ni(DMG)_2$; how many following statements are correct ?

(a) $Ni(DMG)_2$ is red in colour

(b) Both 6 and 5 membered chelation takes place

(c) H bonding is present which is intramolecular

(d) It is diamagnetic

(e) Ni(+2) has coordination no. 4

(f) In (DMG), N is the donor site

16. Observe the following reaction,

$[Ni(en)_3](NO_3)_2$ + 'X'(aq) $\xrightarrow[\text{alk. medium}]{\text{slightly}}$ 'Y'($\downarrow$) violet ppt.

Among the following , how many compounds decompose the nickel ethylenediamine nitrate reagent with the precipitation of NiS.

Na_2SO_3 , Na_2SO_4 , $Na_2S_2O_3$, $Na_2S_4O_6$, H_2S, $(NH_4)_2S$, NaSCN

17. $Na_2S_2O_3$ + Reagent [A] $\longrightarrow$ white ppt. of [B]

on warming $\swarrow$ [Black ppt. of metal sulphite]

+excess $Na_2S_2O_3$ $\searrow$ [Soluble complex of [B]

Among the following how many reagents 'A' are used to give black precipitate of metal sulphide ?

$AgNO_3$, $BaCl_2$, $Pb(OAC)_2$, $HgCl_2$, $CaCl_2$, $CuSO_4$, $FeCl_3$

18. Among the following how many compound(s) destroy nitrite solution and does not form traces of nitrate ?

$AgNO_3$, NH_4Cl, (NH_2CONH_2 + dil. HCl), sulphamic acid, (thiourea + dil. CH_3COOH), ($FeSO_4$ + dil. CH_3COOH)

19. Salt of iron $\underset{(X)}{\xrightarrow{Na_2S_2O_3}}$ Violet complex $\underset{(Y)}{\xrightarrow{\text{On standing}}}$ Green solution $\underset{(Z)}{}$

Write oxidation number of Fe in (Z).

20. Find the number of cation when treated with aq. solution with aq. solution of Na_2CO_3 , ppt. of carbonate formed ,

Hg^{+2} , Ba^{+2} , Cu^{+2} , Ag^{+} , Pb^{+2}

21. Among the following compounds insoluble in water is/are

PbI_2, HgI_2, Hg_2OCl_2, NaCl, KI, AgCl

22. The total number of following ions which interfere with the brown ring test for NO_3^- is /are

Br^-, I^-, CO_3^{2-}, NO_2^-, ClO_3^-, CrO_4^{-2}

23. 'X' (s) (salt) + $K_2Cr_2O_7$ (s) + conc. H_2SO_4 → on heating → 'Y' (gas only) $\xrightarrow{+NaOH}$ 'Z' (yellow solution)

The maximum number of difference in oxidation state between central atom of 'Y' and 'Z' is :-

24. Among the following total number of compounds, which give(s) white precipitate with calcium chloride solution.

$Na_2S_2O_3$; Na_2CO_3 ; $Na_2C_2O_4$; NaBr ; NaI

25. The total number of reagent(s) give white precipitate with solution of sodium oxalates.

($MnO(OH)_2$ + H_2SO_4), $CaCl_2$, $AgNO_3$, $BaCl_2$, $KMnO_4$, ($K_2Cr_2O_7$ + H_2SO_4)

26. Among the following total number of anions, which decolourise the potassium paramagnate solution in acid medium.

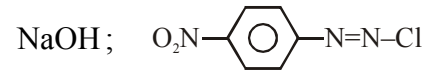
$C_2O_4^{2-}$; NO_2^- ; ($BaCl_2$ + SO_4^{2-}) ; SO_3^{2-}, NO_3^-

27. Find out the total number of compounds, which can be dissolved by both dil. HNO_3 and NaOH.

$PbSO_3$; $[PbCO_3.Pb(OH)_2]$; $PbCrO_4$; AgCl ; Ag_2S ; Ag_2O

28. Among the following , total number of reagent(s) which gives yellow precipitate with ammonium chloride solution.

$Na_3[Co(NO_2)_6]$; $H_2[PtCl_6]$; ($NaH.C_4H_4O_6$) ;

$NaClO_4$; NaOH ; 

29. Colourless salt (A) NaOH(excess) $\xrightarrow{\Delta}$ Gas(B) giving white fumes with HCl + solution (C)

(C) + Zn $\xrightarrow{+NaOH}$ (B)

(A) $\xrightarrow{\Delta}$ Gas(D) + liquid (E)

D, E both are triatomic

(*a*) – NH_4NO_3 ;

(*b*) – NH_3 ;

(*c*) – ($NaNO_3$ + NaOH) ;

(*d*) – N_2O ;

(*e*) – H_2O

A to E compounds are given. How many are correctly given ?

30. Read the following reaction carefully :

(A) $Cu + HNO_4(dil.) \longrightarrow NO + A$

(B) $Pb(NO_3)_2 \xrightarrow{heat} PbO + B$

(C) $CuSO_4 + NH_4OH(excess) \longrightarrow C$

(D) $AgCl + NH_4OH \longrightarrow D$

A,B,C,D are mixture of compounds which are given as follows :-

(*a*) – $Cu(NO_3)_2$, H_2O ;

(*b*) – NO_2 , O_2 ;

(*c*) – $[Cu(NH_3)_4]SO_4 + H_2O$;

(*d*) – $Ag(NH_2)_2Cl + H_2O$

How many are correctly given ?

31. How many hydroxides are white precipitate ?

(i) $Zn(OH)_2$ (ii) $Cd(OH)_2$

(iii) $Mn(OH)_2$ (iv) $Al(OH)_3$

(v) $Ni(OH)_2$ (vi) $Co(OH)_2$

(vii) $Pb(OH)_2$ (viii) $Fe(OH)_3$

(ix) $Cu(OH)_2$

32. How many hydroxide precipitate are soluble in excess NaOH ?

(i) $Zn(OH)_2$ (ii) $Cd(OH)_2$
(iii) $Mn(OH)_2$ (iv) $Al(OH)_3$
(v) $Ni(OH)_2$ (vi) $Co(OH)_2$
(vii) $Pb(OH)_2$ (viii) $Fe(OH)_3$
(ix) $Cu(OH)_2$

33. How many hydroxide precipitate are soluble in excess NH_4OH ?

(i) $Zn(OH)_2$ (ii) $Cd(OH)_2$
(iii) $Mn(OH)_2$ (iv) $Al(OH)_3$
(v) $Ni(OH)_2$ (vi) $Co(OH)_2$
(vii) $Pb(OH)_2$ (viii) $Fe(OH)_3$
(ix) $Cu(OH)_2$

34. $NaCl + \text{Solid } K_2Cr_2O_7 + \text{conc. } H_2SO_4 \text{(few drops)} \longrightarrow X \text{(Reddish-brown fumes)}$

How many statements are correct regarding X :-

(i) No axial d-orbitals is involved in hybridization of X
(ii) One s-orbital is involved in hybridization of X
(iii) The complex does not have any unpaired electron.
(iv) Three non axial d-orbitals are involved in hybridization of X
(v) Magnetic moment of X is zero

35. A solution containing several unknown cations is treated with dil. HCl and no ppt. forms. The ppt. is filtered and the filterate at pH 1.0 is treated with H_2S, no ppt. forms. At pH 8.0 H_2S causes the formation of a ppt., the filterate form which gives no ppt. on treatment with Na_2CO_3. Which group of cations are present in the original solution.

36. When NaOH is added to $K_2Cr_2O_7$ solution , it becomes yellow. The change in oxidaton state of Cr in this phenomenon is .....

37. Amongst the following, the total number of compounds soluble in concentrated NH_3 solution is :

$BaSO_4$, $Ni(OH)_2$, $Zn_3(PO_4)_2$, Ag_2CrO_4, $PbSO_3$, $Al(OH)_3$, $Mn(OH)_2$, $Bi(OH)_2NO_3$, $Cu(OH)_2.CuSO_4$

38. Ni^{2+} $\xrightarrow{Cl^-\text{(excess)}}$ P ; $\xrightarrow[NH_3\text{(excess)}]{}$ Q

Coordination number of Ni^{2+} in P and Q are respectively a and b. Find out b – a :-

39. How many of the following will dissolve in concentrated NaOH as well as in concentrated HCl.

$Fe(OH)_2$; $Fe(OH)_3$; $Cr(OH)_3$; $Al(OH)_3$; $Zn(OH)_2$; $Sn(OH)_2$

40. In how many of the following reactions, one of the products is obtained as a yellow precipitate?

$Ba^{2+} + CrO_4^{2-} \rightarrow$ Product

$Hg^{2+} + Co^{2+} + 4SCN^- \rightarrow$ Product

$BI^3 + C_6H_3(OH)_3 \rightarrow$ Product

$Mn(OH)_2 \downarrow + O_2 \rightarrow$ Product

$Zn^{2+} + 2H\,PO_4^{2-} \rightarrow$ Product

$NH_4^+ + [PtCl_6]^{2-} \rightarrow$ Product

41. $Na_2S + Na_2[Fe(CN)_5NO] \longrightarrow X$ (Purple color)

How many statements are correct regarding X :-

(i) Six ligands are present in compound X
(ii) Ambidentate ligand is present in X
(iii) Two d-orbitals are involved in hybridization of X
(iv) Magnetic moment of X is zero
(v) Two axial d-orbitals are involved in hybridization of X
(vi) The total possible linkage isomer of X is four

42. How many of the following pair of ions can be separated by H_2S in dilute HCl.

Mn^{2+}, Cd^{2+} ; Cr^{3+}, Cu^{2+} ; As^{3+}, Sn^{2+} ; Sb^{3+}, Pb^{2+}; Bi^{3+}, Sn^{4+} ; Hg^{2+}, Fe^{3+}

43. Find the number compounds which are producing the oxides of their metal on thermal decomposition

Mg_3N_2 , $Mg(OH)_2$, $SrCO_3$, $Ba(NO_3)_2$, $KClO_3$

44. Among the following , total number of cations tend to form soluble complex with excess NH_4OH(aq.) and excess NaCN(aq).

Pb^{2+} ; Cd^{2+} ; Hg^{2+} ; Bi^{3+} ; Cu^{2+} ; Ag^+

45. Among the following , find out the total numebr of black metal sulphides :-

CuS ; NiS ; CoS ; ZnS ; As_2S_3

46. Find the number of reagents in which Ag_2S is insoluble :-

hot conc. HNO_3 ; $(NH_4)_2S$; NH_3 ; KCN ; $Na_2S_2O_3$

47. Among the following , total number of compound(s) reduce(s) the yellow solution of $FeCl_3$.

Tin(II) chloride; Potassium iodide; Hydroxylamine; Hydrazin sulphate; Ascorbic acid; Hydrogen sulphide;

Sulphur dioxide; Potassium dichromate; Cconc. nitric acid

48. Find out the total number of reagent(s) which converts chromium(III) ion to chromate ion :-

H_2O_2 solution; $(NaBO_3 . 4H_2O + H_2O_2)$; NaOBr; $FeSO_4$; NaOH; $K_2S_2O_8$

49. How many reagents are used to identify chromium after oxidation to chromate ion ?

$BaCl_2$; $CaCl_2$; (Acidified H_2O_2 - Amyl alcohol); $AgNO_3$

50. Find total number of reagents in which oxidation of Fe^{2+} ion to Fe^{3+} takes place :

(a) On exposure to air

(b) On reaction with $SnCl_2$

(c) On reaction with MnO_4^- / H^+

(d) On reaction with $Cr_2O_7^{2-} / H^+$

(e) On addition of concentrated HNO_3

(f) On addition with H_2O_2

(g) On reaction with KI

EXERCISE # V(A) (JEE-MAIN)

1. How do we differentiate between Fe^{3+} and Cr^{3+} in qualitative analysis gp. III :- **[AIEEE - 2002]**

(*a*) By taking excess of NH_4OH

(*b*) By increasing NH_4^+ ion concentration

(*c*) By decreasing OH^- ion concentration

(*d*) Both (*b*) and (*c*)

2. Which products are expected from the disproportionation of hypochlorous acid :- **[AIEEE - 2002]**

(*a*) $HClO_3$ and Cl_2O (*b*) $HClO_2$ and HClO

(*c*) HCl and Cl_2O (*d*) HCl and $HClO_3$

3. A metal M readily forms its sulphate MSO_4 which is water soluble. It forms oxide MO which becomes inert on heating. It forms insoluble hydroxide which is soluble in NaOH. The metal M is :- **[AIEEE - 2002]**

(*a*) Mg (*b*) Ba

(*c*) Ca (*d*) Be

4. Which statement is correct ? **[AIEEE - 2003]**

(*a*) Fe^{3+} ions give deep green precipitate with $K_4[Fe(CN)_6]$

(*b*) On heating K^+, Ca^{2+} and HCO_3^- ions, we get a precipitate of $K_2[Ca(CO_3)_2]$

(*c*) Manganese salts give a voilet borax bead test in reducing flame

(*d*) From a mixed precipitate of AgCl and AgI ammonia solution dissolves only AgCl.

5. What would happen when a solution of potassium chromate is treated with an excess of dilute nitric acid :- **[AIEEE - 2003]**

(*a*) Cr^{3+} and $Cr_2O_7^{2-}$ are formed

(*b*) $Cr_2O_7^{2-}$ and H_2O are formed

(*c*) $Cr_2O_7^{2-}$ is reduced to +3 state of Cr

(*d*) $Cr_2O_7^{2-}$ is oxidised to +7 state of Cr

6. Ammonia forms the complex in $[Cu(NH_3)_4]^{2+}$ with copper ions in alkaline solutions but not in acidic solution. What is the reason for it :- **[AIEEE - 2003]**

(*a*) In acidic solutions hydration protects copper ions

(*b*) In acidic solutions protons coordinate with ammonia molecules forming NH_4^+ ion and NH_3 molecules are not available.

(*c*) In alkaline solutions insoluble $Cu(OH)_2$ is precipitated which is soluble in excess of any alkali

(*d*) Copper hydroxide is an amphoteric substance

7. Excess of KI reacts with $CuSO_4$ solution and then $Na_2S_2O_3$ solutions is added to it. Which of the statement is incorrect for this reaction :-

(*a*) Evolved I_2 is reduced **[AIEEE - 2004]**

(*b*) CuI_2 is formed

(*c*) $Na_2S_2O_3$ is oxidised

(*d*) Cu_2I_2 is formed

8. Calomel on reation with NH_4OH gives :- **[AIEEE - 2004]**

(*a*) $HgNH_2Cl$ (*b*) $NH_2 - Hg - Hg - Cl$

(*c*) Hg_2O (*d*) HgO

9. One mole of magnesium nitride on reaction with excess of water gives :- **[AIEEE - 2004]**

(*a*) Two mole of HNO_3 (*b*) Two mole of NH_3

(*c*) 1 mole of NH_3 (*d*) 1 mole of HNO_3

10. The products obtained on heating $LiNO_3$ will be :- **[AIEEE - 2004]**

(*a*) $LiNO_2 + O_2$ (*b*) $Li_2O + NO_2 + O_2$

(*c*) $Li_3N + O_2$ (*d*) $Li_2O + NO + O_2$

11. What is the best description of the change that occurs when $Na_2O(s)$ is dissolved in water ? **[AIEEE - 2011]**

(*a*) Oxidation number of sodium decreases

(*b*) Oxide ion accepts sharing in a pair of electrons

(*c*) Oxide ion donates a pair of electron

(*d*) Oxidation number of oxygen increases

12. Which of the following on thermal - decomposition yields a basic as well as an acidic oxide.

(*a*) NH_4NO_3 **[AIEEE - 2012]**

(*b*) $NaNO_3$

(*c*) $KClO_3$

(*d*) $CaCO_3$

13. The correct statement for the molecule, CsI_3, is :- **[Jee(Main) - 2014]**

(*a*) It contains Cs^{3+} and I^- ions

(*b*) It contains Cs^+ , I^- and lattice I_2 molecule

(*c*) It is a covalent molecule

(*d*) It contains Cs^+ and I_3^- ions

14. Fire extinguishers contain H_2SO_4 and which one of the following :-

(*a*) $CaCO_3$ **[Jee(Main)-2012, Online_P-1]**

(*b*) $NaHCO_3$ and Na_2CO_3

(*c*) Na_2CO_3

(*d*) $NaHCO_3$

15. Copper wire test for halogens is known as :- **[Jee(Main)-2012, Online_P-2]**

(*a*) Duma's Test (*b*) Beilstein's Test

(*c*) Lassigne's Test (*d*) Liebig's Test

16. The standard potentials of Ag^+ / Ag, $Hg_2^{2+} / 2Hg$, Cu^{2+} / Cu and Mg^{2+} / Mg electrodes are 0.80, 0.79, 0.34 and –2.37 V, respectively. An aqueous solution which contains one mole per litre of the salts of each of the four metals is electrolyzed. With increasing voltage , the correct sequence of deposition of the metals at the cathode is :- **[Jee(Main)-2012, Online_P-3]**

(*a*) Cu, Hg, Ag only

(*b*) Mg, Cu, Hg, Ag

(*c*) Ag, Hg, Cu only

(*d*) Ag, Hg, Cu, Mg

17. Beilstein test is used for estimation of which one of following elements :- **[Jee(Main)-2012, Online_P-3]**

(*a*) S (*b*) Cl

(*c*) C and H (*d*) N

18. In the following balanced reaction, $XMnO_4^- + YC_2O_4^{2-} + ZH^+ = XMn^{2+} + 2YCO_2 + \frac{Z}{2}H_2O$ the values of X, Y and Z respectively are :- **[Jee(Main)-2012, Online_P-4]**

(*a*) 8, 2, 5 (*b*) 5, 2, 16

(*c*) 2, 5, 16 (*d*) 5, 8, 4

19. A metal M on heating in nitrogen gas gives Y. Y on treatment with H_2O gives a colourless gas which when passed through $CuSO_4$ solution gives a blue colour , Y is :- **[Jee(Main)-2012, Online_P-4]**

(*a*) NH_3 (*b*) MgO

(*c*) Mg_3N_2 (*d*) $Mg(NO_3)_2$

20. Electrode potential (E°) are given below :-

$Cu^+ / Cu = + 0.52$ V, $Fe^{3+} / Fe^{2+} = +0.77$ V,

$\frac{1}{2} I_2(s) / I^- = + 0.54$ V, $Ag^+ / Ag = +0.88$ V.

Based on the above potential , strongest oxidizing agent will be :- **[Jee(Main)-2013, Online_P-1]**

(*a*) Cu^+ (*b*) Fe^{3+}

(*c*) Ag^+ (*d*) I_2

21. Potassium dichromate when heated with concentrated sulphuric acid and a soluble chloride , gives brown red vapours of :-

[Jee(Main)-2013, Online_P-1]

(*a*) CrO_3 (*b*) Cr_2O_3

(*c*) $CrCl_3$ (*d*) CrO_2Cl_2

22. Given : **[Jee(Main)-2013, Online_P-1]**

$X\ Na_2HAsO_3 + Y\ NaBrO_3 + ZHCl \rightarrow$

$NaBr + H_3AsO_4 + NaCl$

The values of X, Y and Z in the above redox reaction are respectively :-

(*a*) 2,1,3 (*b*) 3,1,6

(*c*) 2,1,2 (*d*) 3,1,4

23. Sodium carbonate cannot be used in place of $(NH_4)_2CO_3$ for the identification of Ca^{2+}, Br^{2+} and Sr^{2+} ion (in group V) during mixture analysis because :- **[Jee(Main)-2013, Online_P-1]**

(*a*) Sodium ions will react with acid radicals

(*b*) Concentration of CO_3^{2-} ions is very low

(*c*) Mg^{2+} ions will also be precipitated

(*d*) Na^+ ions will interfere with the detection of Ca^{2+}, Ba^{2+}, Sr^{2+} ions :-

24. Which of the following statement is incorrect :-

[Jee(Main)-2013, Online_P-2]

(*a*) Fe^{2+} ion also gives blood red colour with SCN^- ions

(*b*) Cupric ion reacts with excess of ammonia solution to give deep blue colour of $[Cu(NH_3)_4]^{2+}$ ion

(*c*) Fe^{3+} ion gives blood red colour with SCN^- ion

(*d*) On passing H_2S into Na_2ZnO_2 solution , a white ppt of ZnS is formed

25. Values of dissociation constant , K_a are given as follows :- **[Jee(Main)-2013, Online_P-2]**

Acid	K_a
HCN	6.2×10^{-10}
HF	7.2×10^{-4}
HNO_2	4.0×10^{-4}

Correct order of increasing base strength of the base CN^-, F^- and NO_2^- will be

(*a*) $NO_2^- < CN^- < F^-$ (*b*) $F^- < CN^- < NO_2^-$

(*c*) $NO_2^- < F^- < CN^-$ (*d*) $F^- < NO_2^- < CN^-$

26. Identify incorrect statement :-

[Jee(Main)-2013, Online_P-3]

(*a*) Copper (I) compounds are colourless except where colour result from charge transfer

(*b*) Copper (I) compounds are diamagnetic

(*c*) Cu_2S is black

(*d*) Cu_2O is colourless

27. Given :- **[Jee(Main)-2013, Online_P-3]**

$E^o_{1/2Cl_2/Cl^-} = 1.36V, E^o_{Cr^{3+}/Cr} = -0.74V$;

$E^o_{Cr_2O_7^{2-}/Cr^{3+}} = 1.33V, E^o_{MnO_4^-/Mn^{2+}} = 1.51V$

The correct order of reducing power of the species (Cr, Cr^{3+}, Mn^{2+} and Cl^-) will be :-

(*a*) $Mn^{2+} < Cl^- < Cr^{3+} < Cr$

(*b*) $Cr^{3+} < Cl^- < Mn^{2+} < Cr$

(*c*) $Cr^{3+} < Cl^- < Cr < Mn^{2+}$

(*d*) $Mn^{2+} < Cr^{3+} < Cl^- < Cr$

28. Which one of the following cannot function as an oxidising agent ? **[Jee(Main)-2013, Online_P-4]**

(*a*) $NO_3^-(aq)$

(*b*) I^-

(*c*) $Cr_2O_7^{2-}$

(*d*) S(s)

29. Which of the following statement about Na_2O_2 is not correct :- **[Jee(Main)-2014, Online_P-2]**

(*a*) Na_2O_2 oxidises Cr^{3+} to CrO_4^{2-} in acid medium

(*b*) It is diamagnetic in nature

(*c*) It is the super oxide of sodium

(*d*) It is a derivative of H_2O_2

30. Given :- **[Jee(Main)-2014, Online_P-2]**

$Fe^{3+}(aq) + e^- \rightarrow Fe^{2+}(aq)$; $E° = +0.77$ V

$Al^{3+}(aq) + 3e^- \rightarrow Al(s)$; $E° = -1.66$ V

$Br_2(aq) + 2e^- \rightarrow 2Br^-(aq)$; $E° = +1.09$ V

Considering the electrode potentials, which of the following represents the correct order of reducing power ?

(*a*) $Al < Fe^{2+} < Br^-$ (*b*) $Al < Br^- < Fe^{2+}$

(*c*) $Fe^{2+} < Al < Br^-$ (*d*) $Br^- < Fe^{2+} < Al$

31. Consider the following equilibrium :-

$AgCl\downarrow + 2NH_3 \rightleftharpoons [Ag(NH_3)_2]^+ + Cl^-$

White precipitate of AgCl appears on adding which of the following ? **[Jee(Main)-2014, Online_P-2]**

(*a*) NH_3 (*b*) Aqueous NaCl

(*c*) Aqueous NH_4Cl (*d*) Aqueous HNO_3

32. Copper becomes green when exposed to moist air for a long period. This is due to :-

[Jee(Main)-2014, Online_P-3]

(*a*) the formation of a layer of cupric oxide on the surface of copper

(*b*) the formation of basic copper sulphate layer on the surface of the metal

(*c*) the formation of a layer of cupric hydroxide on the surface of copper

(*d*) the formation of a layer of basic carbonate of copper on the surface of copper

33. When one of the following exhibits the largest number of oxidation states ?

[Jee(Main)-2014, Online_P-3]

(*a*) Mn(25) (*b*) V(23)

(*c*) Cr(24) (*d*) Ti(22)

34. Hydrogen peroxide acts both as an oxidising and as a reducing agent depending upon the nature of the reacting species. In which of the following cases H_2O_2 acts as a reducing agent in acidic medium ? **[Jee(Main)-2014, Online_P-3]**

(*a*) MnO_4^-

(*b*) SO_3^{2-}

(*c*) KI

(*d*) $Cr_2O_7^{2-}$

35. Consider the reaction :-

$H_2SO_{3(aq)} + Sn^{4+}_{(aq)} + H_2O_{(l)} \rightarrow Sn^{2+}_{(aq)} + HSO_4^-{}_{(aq)} + 3H^+_{(aq)}$

Which of the following statement is correct :-

[Jee(Main)-2014, Online_P-3]

(*a*) H_2SO_3 is the reducing agent because it undergoes oxidation

(*b*) H_2SO_3 is the reducing agent because it undergoes reduction

(*c*) Sn^{4+} is the reducing agent because it undergoes oxidation

(*d*) Sn^{4+} is the oxidizing agent because it undergoes oxidation

36. How many electrons are involved in the following redox reaction :- **[Jee(Main)-2014, Online_P-4]**

$Cr_2O_7^{2-} + Fe^{2+} + C_2O_4^{2-} \rightarrow Cr^{3+} + Fe^{3+} + CO_2$ (Unbalanced)

(*a*) 3

(*b*) 4

(*c*) 5

(*d*) 6

37. Amongst the following , identify the species with an atom in +6 oxidation state :-

(*a*) $[MnO_4]^-$ **[Jee(Main)-2014, Online_P-4]**

(*b*) $[Cr(CN)_6]^{3-}$

(*c*) Cr_2O_3

(*d*) CrO_2Cl_2

EXERCISE # V(B) (JEE-ADVANCED)

1. Which of the following statement(s) is (are) correct with reference to the ferrous and ferric ions : **[Jee 1998]**

(*a*) Fe^{3+} gives brown colour with potassium ferricyanide

(*b*) Fe^{2+} gives blue precipitate with potassium ferricyanide

(*c*) Fe^{3+} gives red colour with potassium thiocyanate

(*d*) Fe^{2+} gives brown colour with ammonium thiocyanate

2. Which of the following statements(s) is / are correct. When a mixture of NaCl and $K_2Cr_2O_7$ is gently warmed with conc. H_2SO_4? **[Jee 1998]**

(*a*) A deep red vapours is evolved

(*b*) The vapours when passed into NaOH solution gives a yellow solution Na_2CrO_4

(*c*) Chlorine gas is evolved

(*d*) Chromyl chloride is formed

3. An aqueous solution of a substance gives a white precipitate on treatment with dilute hydrochloric acid, which dissolves on heating. When hydrogen sulphide is passed through the hot acidic solution, a black precipitate is obtained. The substance is a : **[Jee 2000]**

(*a*) Hg_2^+ salt (*b*) Cr^{2+} salt

(*c*) Ag^+ salt (*d*) Pb^{2+} salt

4. A gas 'X' is passed through water to form a saturated solution. The aqueous solution on treatment with silver nitrate gives a white precipitate. The saturated aqueous solution also dissolves magnesium ribbon with evolution of a colourless gas 'Y'. Identify 'X' and 'Y' : **[Jee 2002 (Mains)]**

(*a*) $X = CO_2, Y = Cl_2$ (*b*) $X = Cl_2, Y = CO_2$

(*c*) $X = Cl_2, Y = H_2$ (*d*) $X = H_2, Y = Cl_2$

5. $[X] + H_2SO_4 \rightarrow [Y]$ a colourless gas with irritating smell :- **[Jee-2003]**

$[Y] + K_2Cr_2O_7 + H_2SO_4 \rightarrow$ green solution

[X] and [Y] are :-

(*a*) SO_3^{2-}, SO_2 (*b*) Cl^-, HCl

(*c*) S^{2-}, H_2S (*d*) CO_3^{2-}, CO_2

6. A sodium salt of an unknown anion when treated with $MgCl_2$ give white precipitate only on boiling. The anion is :- **[Jee 2004]**

(*a*) SO_4^{2-} (*b*) HCO_3^-

(*c*) CO_3^{2-} (*d*) NO_3^-

7. $(NH_4)_2Cr_2O_7$ on heating gives a gas which is also given by :- **[Jee 2004]**

(*a*) hating NH_4NO_2 (*b*) heating NH_4NO_3

(*c*) $Mg_3N_2 + H_2O$ (*d*) $NaNO_2 + H_2O_2$

8. A metal nitrate reacts with KI to give a black precipitate which on addition of excess of KI convert into orange colour solution. The cation of metal nitrate is :- **[Jee 2005]**

(*a*) Hg^{2+} (*b*) Bi^{3+}

(*c*) Pb^{2+} (*d*) Cu^{2+}

9. A solution when diluted with H_2O and boiled , it gives a white precipitate. On addition of excess NH_4Cl / NH_4OH, the volume of precipitate decreases leaving behinde a white gelatinous precipitate. Identify the precipitate which dissolves in NH_4OH / NH_4Cl? **[Jee 2006]**

(*a*) $Zn(OH)_2$ (*b*) $Al(OH)_3$

(*c*) $Mg(OH)_2$ (*d*) $Ca(OH)_2$

10. $CuSO_4$ decolorises on addition of KCN, the product is **[Jee 2006]**

(*a*) $[Cu(CN)_4]^{2-}$

(*b*) Cu^{2+} get reduced to form $[Cu(CN)_4]^{3-}$

(*c*) $Cu(CN)_2$

(*d*) CuCN

11. Consider a titration of potassium dichromate solution with acidified Mohr's slat solution using diphenylamine as indicator. The number of moles of Mohr's salt required per mole of dichromate is **:-** **[Jee - 2007]**

(*a*) 3 (*b*) 4

(*c*) 5 (*d*) 6

12. The species present in solution when CO_2 is dissolved in water are? **[JEE - 2007]**

(*a*) $CO_2, H_2CO_3, HCO_3^-, CO_3^{2-}$

(*b*) H_2CO_3, CO_3^{2-}

(*c*) CO_3^{2-}, HCO_3^-

(*d*) CO_2, H_2CO_3

13. Sodium fusion extract , obtained from anilione , on treatment with iron (II) sulphate and H_2SO_4 in presence of air gives a Prussian blue precipitate. The blue colour is due to the formation of :- **[Jee 2007]**

(*a*) $Fe_4[Fe(CN)_6]_3$

(*b*) $Fe_3[Fe(CN)_6]_2$

(*c*) $Fe_4[Fe(CN)_6]_2$

(*d*) $Fe_3[Fe(CN)_6]_3$

14. **Column - I** **Column - II** **[Jee 2007]**

(A) $O_2^- \rightarrow O_2 + O_2^{2-}$ (P) Redox reaction

(B) $CrO_4^{2-} + H^+ \rightarrow$ (Q) One of the products has trigonal structure

(C) $MnO_4^- + NO_2^- + H^+ \rightarrow$ (R) Dimeric bridged tetrahedral metal ion

(D) $NO_3^- + H_2SO_4 + Fe^{2+} \rightarrow$ (S) Disproportionation

15. A solution of a metal ion when treated with KI gives a red precipitate which dissolves in excess KI to give a colourless solution. Moreover , the solution of metal ion on treatment with a solution of cobalt (II) thiocyanate gives rise to a deep blue crystalline precipitate. The metal ion is :- **[Jee 2007]**

(*a*) Pb^{2+} (*b*) Hg^{2+}

(*c*) Cu^{2+} (*d*) Co^{2+}

16. A solution of colourless salt H on boiling with excess NaOH produces a non-flammable gas. The gas evolution cases after sometime. Upon addition of Zn dust to the same solution, the gas evolution restarts. The colourless salt(s) H is (are) :- **[Jee 2007]**

(*a*) NH_4NO_3 (*b*) NH_4NO_2

(*c*) NH_4Cl (*d*) $(NH_4)_2SO_4$

Passage for Q. 17 to 19

p-Amino-N, N-dimethylaniline is added to a strongly acidic solution of X. The resulting solution is treated with a few drops of aqueous solution of Y to yield blue coloration due to the formation of methylene blue. Treatment of the aqueous solution of Y with the reagent potassium hexacyanoferrate(II) leads to the formation of an intense blue precipitate. The precipitate dissolves on excess addition of the reagent. Similarly, treatment of the solution of Y with the solution of potassium hexacyanoferrate(II) leads to a brown coloration due to the formation of Z. **[JEE-2009]**

18. The compound Y is :-

(*a*) $MgCl_2$ (*b*) $FeCl_2$

(*c*) $FeCl_3$ (*d*) $ZnCl_2$

19. The compound Z is :-

(*a*) $Mg_2[Fe(CN)_6]$ (*b*) $Fe[Fe(CN)_6]$

(*c*) $Fe_4[Fe(CN)_6]_3$ (*d*) $K_2Zn_3[Fe(CN)_6]_2$

20. Match each of the reactions given column I with the corresponding product(s) given in column II :- **[JEE-2009]**

Column-I	**Column-II**
(A) $Cu + dil.\ HNO_3$	(P) NO
(B) $Cu + conc.\ HNO_3$	(Q) NO_2
(C) $Zn + dil.\ HNO_3$	(R) N_2O
(D) $Zn + conc.\ HNO_3$	(S) $Cu(NO_3)_2$
	(T) $Zn(NO_3)_2$

21. Passing H_2S gas into a mixture of Mn^{2+}, Ni^{2+}, Cu^{2+} and Hg^{2+} ions in an acidified aqueous solution precipitates :- **[JEE-2011]**

(*a*) CuS and HgS (*b*) MnS and CuS

(*c*) MnS and NiS (*d*) NiS and HgS

22. Reduction of the metal centre in aqueous permangante ion involves **[JEE-2011]**

(*a*) 3 electrons in neutral medium

(*b*) 5 electrons in neutral medium

(*c*) 3 electrons in alkaline medium

(*d*) 5 electrons in acidic medium

23. The equilibrium :- **[JEE-2011]**

$$2Cu^{I} \rightleftharpoons Cu^{\circ} + Cu^{II}$$

in aqueous medium at 25° shifts towards the left in the presence of :-

(*a*) NO_3^- (*b*) Cl^-

(*c*) SCN^- (*d*) CN^-

Passage for Q. 24 to 26

When a metal rod M is dipped into an aqueous colourless concentrated solution of compound N, the solution turns light blue. Addition of aqueous NaCl to te blue solution gives a white precipitate O. Addition of aqueous NH_3 dissolves O and gives in intense blue solution. **[JEE-2011]**

24. The metal rod M is :-

(*a*) Fe (*b*) Cu

(*c*) Ni (*d*) Co

25. The compound N is :-

(*a*) $AgNO_3$ (*b*) $Zn(NO_3)_2$

(*c*) $Al(NO_3)_3$ (*d*) $Pb(NO_3)_2$

26. The final solution contains :-

(*a*) $[Pb(NH_3)_4]^{2+}$ and $[CoCl_4]^{2-}$

(*b*) $[Al(NH_3)_4]^{3+}$ and $[Cu(NH_3)_4]^{2+}$

(*c*) $[Ag(NH_3)_4]^{2+}$ and $[Cu(NH_3)_4]^{2+}$

(*d*) $[Ag(NH_3)_2]^{2+}$ and $[Ni(NH_3)_6]^{2+}$

27. Which of the following hydrogen halides react(s) with $AgNO_3$(aq) to give a precipitate that dissolves in $Na_2S_2O_3$(aq) :- **[JEE-2012]**

(*a*) HCl (*b*) HF

(*c*) HBr (*d*) HI

28. The reaction of white phosphorus with aqueous NaOH gives phosphine along with another phosphorus containing compound. The reaction type : the oxidation states of phosphorus in phosphine and the other product are respectively : **[JEE-2012]**

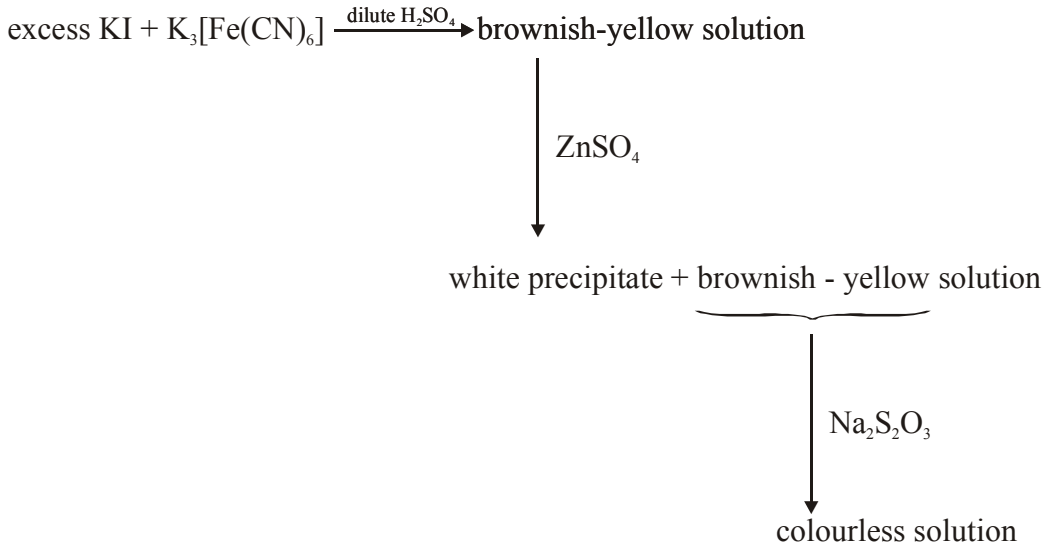
(*a*) redox reaction : –3 and –5

(*b*) redox reaction : +3 and +5

(*c*) disproportionation reaction : –3 and –5

(*d*) disproportionation reaction : –3 and +3

29. For the given aqueous reactions, which of the statement(s) is (are) true :- **[JEE-2012]**



(*a*) The first reaction is a redox reaction (*b*) White precipitate is $Zn_3[Fe(CN)_6]_2$

(*c*) Addition of filtrate to starch solution gives blue colour (*d*) White precipitate is soluble in NaOH solution

30. Upon treatment with ammonical H_2S , the metal ion that precipitate as a sulfide is **[JEE-2013]**

(*a*) Fe(III) (*b*) Al(III)

(*c*) Mg(II) (*d*) Zn(II)

Passage for Q. 31 & 32

An aqueous solution of a mixture of two inorganic salts, when treated with dilute HCl, gave a precipitate (P) and a filtrate (Q). The precipitate (P) was found to dissolve in hot water. The filtrate (Q) remained unchanged , when treated with H_2S in a dilute mineral acid medium. However, it gave a precipitate (R) with H_2S in an ammonical medium. The precipitate R gave a coloured solution (S), when treated with H_2O_2 in an aqueous NaOH medium.

31. The coloured solution (S) contains :- **[JEE-2013]**

(*a*) $Fe_2(SO_4)_3$ (*b*) $CuSO_4$

(*c*) $ZnSO_4$ (*d*) Na_2CrO_4

32. The precipitate (P) contains :- **[JEE-2013]**

(*a*) Pb^{2+} (*b*) Hg_2^{2+}

(*c*) Ag^+ (*d*) Hg^{2+}

33. Consider the following list of reagents :- **[JEE-ADV.2014]**

Acidified $K_2Cr_2O_7$, alkaline $KMnO_4$, $CuSO_4$, H_2O_2, Cl_2, O_3, $FeCl_3$, HNO_3 and $Na_2S_2O_3$

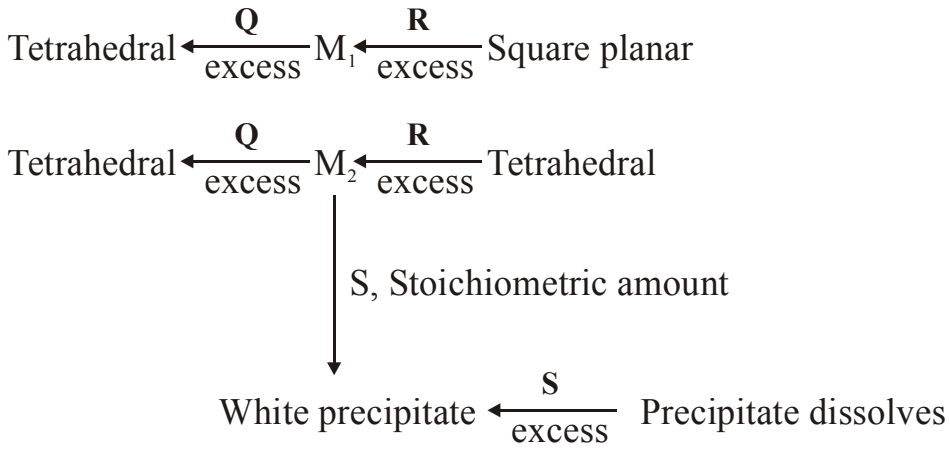
The total number of reagents that can oxidise aqueous iodide to iodine is :

34. Among PbS, CuS, HgS, MnS, Ag_2S, NiS, CoS, Bi_2S_3 and SnS_2 the total number of black coloured sulphide is. **[JEE-ADV. 2014]**

Passage for Q. 35 & 36

An aqueous solution of metal ion M_1 reacts separately with reagent Q and R in excess to give tetrahedral and square planar complexes , respectively . An aqueous solution of another metal ion M_2 always forms tetrahedral complex with these reagents. Aqueous solution of M_2 on reaction with reagent S gives white precipitate which dissolves in excess of S. The reaction are summarized in the sheme given below : **[JEE-ADV.2014]**

SCHEME :



35. M_1, Q and R respectively are :-

(*a*) Zn^{2+}, KCN and HCl (*b*) Ni^{2+}, HCl and KCN

(*c*) Cd^{2+}, KCN and HCl (*d*) Co^{2+}, HCl and KCN

36. Reagent S is :-

(*a*) $K_4[Fe(CN)_6]$ (*b*) Na_2HPO_4

(*c*) K_2CrO_4 (*d*) KOH

37. Fe^{3+} is reduced to Fe^{2+} by using :- **[JEE-Adv.-2015]**

(*a*) H_2O_2 in presence of NaOH (*b*) Na_2O_2 in water

(*c*) H_2O_2 in presence of H_2SO_4 (*d*) Na_2O_2 in presence of H_2SO_4

38. The paris of ions where BOTH the ions are precipitated upon passing H_2S gas in presence of dilute HCl, is (are) :- **[JEE-ADV.2015]**

(*a*) Ba^{2+}, Zn^{2+} (*b*) Bi^{3+}, Fe^{3+}

(*c*) Cu^{2+}, Pb^{2+} (*d*) Hg^{2+}, Bi^{3+}

■■

CH-4 QUALITATIVE SALT ANALYSIS

EXERCISE # I

1. (*c*)	**2.** (*a*)	**3.** (*a*)	**4.** (*c*)	**5.** (*b*)	**6.** (*b*)	**7.** (*c*)	**8.** (*a*)	**9.** (*d*)	**10.** (*c*)
11. (*c*)	**12.** (*c*)	**13.** (*b*)	**14.** (*b*)	**15.** (*b*)	**16.** (*c*)	**17.** (*a*)	**18.** (*a*)	**19.** (*c*)	**20.** (*c*)
21. (*b*)	**22.** (*a*)	**23.** (*c*)	**24.** (*c*)	**25.** (*b*)	**26.** (*b*)	**27.** (*a*)	**28.** (*d*)	**29.** (*a*)	**30.** (*a*)
31. (*a*)	**32.** (*b*)	**33.** (*b*)	**34.** (*c*)	**35.** (*b*)	**36.** (*c*)	**37.** (*a*)	**38.** (*c*)	**39.** (*c*)	**40.** (*c*)
41. (*b*)	**42.** (*c*)	**43.** (*b*)	**44.** (*a*)	**45.** (*c*)	**46.** (*b*)	**47.** (*a*)	**48.** (*d*)	**49.** (*b*)	**50.** (*c*)
51. (*b*)	**52.** (*b*)	**53.** (*d*)	**54.** (*b*)	**55.** (*b*)	**56.** (*a*)	**57.** (*c*)	**58.** (*d*)	**59.** (*a*)	**60.** (*b*)
61. (*b*)	**62.** (*d*)	**63.** (*c*)	**64.** (*d*)	**65.** (*d*)	**66.** (*c*)	**67.** (*c*)	**68.** (*d*)	**69.** (*b*)	**70.** (*b*)
71. (*c*)	**72.** (*b*)	**73.** (*a*)	**74.** (*c*)	**75.** (*b*)	**76.** (*c*)	**77.** (*c*)	**78.** (*d*)	**79.** (*a*)	**80.** (*c*)
81. (*c*)	**82.** (*c*)	**83.** (*d*)	**84.** (*d*)	**85.** (*d*)	**86.** (*b*)	**87.** (*a*)	**88.** (*d*)	**89.** (*d*)	**90.** (*c*)
91. (*c*)	**92.** (*d*)	**93.** (*c*)	**94.** (*d*)	**95.** (*a*)	**96.** (*d*)	**97.** (*b*)	**98.** (*c*)	**99.** (*c*)	**100.** (*c*)
101. (*a*)	**102.** (*d*)	**103.** (*c*)	**104.** (*d*)	**105.** (*c*)	**106.** (*d*)	**107.** (*b*)	**108.** (*b*)	**109.** (*b*)	**110.** (*d*)
111. (*c*)	**112.** (*b*)	**113.** (*a*)	**114.** (*d*)	**115.** (*c*)	**116.** (*d*)	**117.** (*d*)	**118.** (*c*)	**119.** (*a*)	**120.** (*a*)

EXERCISE # II

1. (*a*,*b*,*c*,*d*)	**2.** (*a*,*c*)	**3.** (*a*,*b*)	**4.** (*a*,*b*,*c*,*d*)	**5.** (*a*,*b*,*c*)
6. (*b*,*c*)	**7.** (*a*,*c*,*d*)	**8.** (*a*,*b*,*c*,*d*)	**9.** (*b*,*d*)	**10.** (*a*,*d*)
11. (*b*,*c*,*d*)	**12.** (*a*,*c*)	**13.** (*a*,*c*)	**14.** (*a*,*b*)	**15.** (*b*,*c*)
16. (*a*,*b*,*c*,*d*)	**17.** (*a*,*b*)	**18.** (*a*,*b*)	**19.** (*a*,*b*,*c*,*d*)	**20.** (*a*,*b*,*c*)

21. (*a*,*b*,*c*) **22.** (*a*,*b*,*c*,*d*) **23.** (*a*,*b*,*c*,*d*) **24.** (*a*,*b*) **25.** (*a*,*b*,*c*,*d*)
26. (*a*,*b*,*d*) **27.** (*b*,*c*) **28.** (*c*,*d*) **29.** (*a*,*c*,*d*) **30.** (*a*,*b*,*c*)
31. (*a*,*b*) **32.** (*b*,*c*,*d*) **33.** (*a*,*b*,*c*) **34.** (*a*,*b*,*c*,*d*) **35.** (*a*,*b*,*c*)
36. (*a*,*b*,*c*) **37.** (*a*,*b*,*c*,*d*) **38.** (*a*,*b*,*c*) **39.** (*a*,*b*,*c*) **40.** (*a*,*c*,*d*)
41. (*a*,*b*,*c*) **42.** (*a*,*b*,*c*,*d*) **43.** (*b*,*d*) **44.** (*a*,*b*,*c*,*d*) **45.** (*a*,*b*)
46. (*a*,*b*,*c*) **47.** (*b*,*c*) **48.** (*a*,*c*) **49.** (*b*,*c*) **50.** (*a*,*b*,*d*)
51. (*a*,*b*,*c*,*d*) **52.** (*a*,*b*,*c*) **53.** (*a*,*b*,*c*) **54.** (*b*,*d*) **55.** (*a*,*c*,*d*)
56. (*a*,*b*,*c*) **57.** (*a*,*d*) **58.** (*a*,*b*,*c*) **59.** (*a*,*b*,*d*) **60.** (*a*,*b*,*c*,*d*)
61. (*a*,*c*,*d*) **62.** (*a*,*d*) **63.** (*a*,*b*,*d*) **64.** (*a*,*d*) **65.** (*a*,*b*,*c*,*d*)

EXERCISE # III

1. (*b*) **2.** (*c*) **3.** (*b*) **4.** (*a*) **5.** (*b*,*c*) **6.** (*b*) **7.** (*a*) **8.** (*c*) **9.** (*c*) **10.** (*b*)
11. (*c*) **12.** (*d*) **13.** (*b*) **14.** (*d*) **15.** (*a*) **16.** (*b*) **17.** (*a*,*c*,*d*) **18.** (*b*) **19.** (*d*) **20.** (*a*,*c*)
21. (*a*,*b*,*c*,*d*) **22.** (*a*,*b*,*c*) **23.** (*a*,*b*,*c*,*d*) **24.** (*a*) **25.** (*a*) **26.** (*b*) **27.** (*a*,*b*,*c*,*d*)
28. (*b*) **29.** (*d*) **30.** (*d*) **31.** (*a*) **32.** (*b*) **33.** (*c*) **34.** (*c*) **35.** (*b*) **36.** (*a*) **37.** (*b*)
38. (*b*) **39.** (*b*) **40.** (*d*) **41.** (*d*) **42.** (*a*) **43.** (*b*) **44.** (*b*) **45.** (*d*) **46.** (*d*) **47.** (*b*)
48. (*b*) **49.** (*c*) **50.** (*c*) **51.** (*a*) **52.** (*b*) **53.** (*d*) **54.** (*c*) **55.** (*b*) **56.** (*c*) **57.** (*c*)
58. (*d*) **59.** (*a*) **60.** (*c*) **61.** (*a*) **62.** (*c*) **63.** (*a*) **64.** (*d*) **65.** (*b*) **66.** (*c*) **67.** (*c*)
68. (*b*) **69.** (*a*) **70.** (*c*) **71.** (*d*) **72.** (*a*) **73.** (*b*) **74.** (*d*) **75.** (*c*) **76.** (*a*) **77.** (*c*)
78. (*d*) **79.** (*b*) **80.** (*a*) **81.** (*b*) **82.** (*c*) **83.** (*a*) **84.** (*c*) **85.** (*c*) **86.** (*c*) **87.** (*c*)
88. (*d*) **89.** (*d*) **90.** (*d*) **91.** (*c*) **92.** (*b*) **93.** (*b*) **94.** (*b*) **95.** (*c*) **96.** (*b*) **97.** (*b*)
98. (*a*) **99.** (*a*) **100.** (*a*)

Matrix Match Type :

	(*a*)	(*b*)	(*c*)	(*d*)		(*a*)	(*b*)	(*c*)	(*d*)
101.	P,T ;	P,S,T ;	P,Q,T ;	Q,R,T	**102.**	P,R,T ;	P,Q,T ;	P,S,T ;	P,S,T
103.	P,Q,R ;	P ;	R ;	P	**104.**	P,T;	P,T;	Q;	R,S
105.	S,T;	P,Q,R,S,T;	P,S,T;	R,S	**106.**	Q,R,S;	P,R,S;	P,Q,R,S;	R,S
107.	S;	P,Q;	R;	T	**108.**	R,T;	R,T;	Q,S;	P
109.	S;	P,Q,R,S;	P,R,T;	P,S,T	**110.**	R,T;	P,Q;	Q,S;	Q,S
111.	S;	R;	Q;	P	**112.**	Q,T;	P;	R;	S
113.	P;	Q;	R;	S	**114.**	P,T;	Q,R,S;	P;	P
115.	Q,R,T;	P,T;	P,Q,R,S;	P,R,S	**116.**	P;	Q;	R;	S
117.	P;	P,Q;	R,T;	Q,R,S	**118.**	R;	Q;	P;	S
119.	P.Q;	R ;	P,Q,S;	P,Q,S	**120.**	S;	P,Q,R,S;	P,S;	P
121.	S;	P,Q,T;	Q,R,S,T;	Q,R,T	**122.**	Q;	S;	P;	R
123.	P.Q;	R;	S;	T	**124.**	S;	R;	Q;	P

125. P; Q; R; S

EXERCISE # IV

1. (3) **2.** (0) **3.** (0) **4.** (7) **5.** (3) **6.** (5) **7.** (2) **8.** (5) **9.** (7) **10.** (3)
11. (2) **12.** (2) **13.** (2) **14.** (4) **15.** (6) **16.** (2) **17.** (4) **18.** (1) **19.** (2) **20.** (5)
21. (4) **22.** (5) **23.** (0) **24.** (2) **25.** (3) **26.** (3) **27.** (3) **28.** (2) **29.** (5) **30.** (3)
31. (5) **32.** (3) **33.** (5) **34.** (5) **35.** (4) **36.** (0) **37.** (4) **38.** (2) **39.** (4) **40.** (3)
41. (6) **42.** (3) **43.** (3) **44.** (3) **45.** (4) **46.** (4) **47.** (7) **48.** (4) **49.** (3) **50.** (5)

EXERCISE # V(A) JEE-MAIN

1. (*d*) **2.** (*d*) **3.** (*d*) **4.** (*d*) **5.** (*b*) **6.** (*b*) **7.** (*b*) **8.** (*a*) **9.** (*b*) **10.** (*b*)
11. (*c*) **12.** (*d*) **13.** (*d*) **14.** (*d*) **15.** (*b*) **16.** (*c*) **17.** (*b*) **18.** (*b*) **19.** (*c*) **20.** (*c*)
21. (*d*) **22.** (*b*) **23.** (*c*) **24.** (*a*) **25.** (*d*) **26.** (*d*) **27.** (*a*) **28.** (*b*) **29.** (*c*) **30.** (*d*)
31. (*d*) **32.** (*d*) **33.** (*a*) **34.** (*a*) **35.** (*a*) **36.** (*d*) **37.** (*d*)

EXERCISE # V(B) JEE-ADVANCED

1. (*a*,*b*,*c*) **2.** (*a*,*b*,*d*) **3.** (*d*) **4.** (*c*) **5.** (*a*) **6.** (*b*) **7.** (*a*) **8.** (*b*) **9.** (*a*) **10.** (*d*)
11. (*d*) **12.** (*a*) **13.** (*a*) **14.** A→P,S ; B→R ; C→P,Q ; D→P **15.** (*b*) **16.** (*a*,*b*) **17.** (*d*)
18. (*c*) **19.** (*b*) **20.** A→P,S; B→Q,S; C→R,T; D→Q,T **21.** (*a*) **22.** (*a*,*c*,*d*) **23.** (*b*,*c*,*d*)
24. (*b*) **25.** (*a*) **26.** (*c*) **27.** (*a*,*c*,*d*) **28.** (*c*) **29.** (*a*,*c*,*d*) **30.** (*d*) **31.** (*d*)
32. (*a*) **33.** (7) **34.** (6) **35.** (*b*) **36.** (*d*) **37.** (*a*,*b*) **38.** (*c*,*d*)