CHEMISTRY – MODULE 12 – SINGLE CHOICE SOLUTIONS
Salt Analysis & D-Block

1. d) 4
Reaction i, iii, v & vi give yellow precipitates, $BaCrO_4$, AgBr, PbI_2, $(NH_4)_2[PtCl_6]$.

2. d) FeS or NiS or CoS or CuS or PbS
Group IV cation sulphides have higher k_{sp} than Gp – II sulphides.
If group IV cations are expected to precipitate, the cations of previous groups will also do the same.

3. c) $S_2O_3^{2-}$
$SO_3^{2-} + S^{2-} + I_2 \rightarrow S_2O_3^{2-} + 2I^-$

4. d) Zn^{2+}, Cu^{2+}
Fe^{3+} : Blood red, Co^{2+} : *Blue*

5. d) $X = CuS; Y = Cu(NO_3)_2; Z = K_3[Cu(CN)_4]$

6. c) Chlorine gas is evolved
$$K_2Cr_2O_7 + 6NaCl + H_2SO_4 \xrightarrow{\Delta} 2KHSO_4 + 2NaHSO_4 + \underset{\text{chromyl chloride vapour}}{2CrO_2Cl_2\uparrow} + 2H_2O$$
$$\underset{\text{deep red orange}}{CrO_2Cl_2} + 2NaOH \longrightarrow \underset{\text{yellow}}{Na_2CrO_4} + 2HCl$$

7. b) 6 M NH_3
$$Fe^{3+} + Zn^{2+} + Cu^{2+} \xrightarrow[6M]{NH_3} \underset{\text{Brown ppt}}{Fe(OH)_3\downarrow} + \underset{\text{soluble}}{[Zn(NH_3)_4]^{2+}} + \underset{\text{soluble}}{[Cu(NH_3)_4]^{2+}}$$

8. b) KI
$HgCl_2 + KI \rightarrow HgI_2 \xrightarrow{KI} K_2[HgI_4]$ Nesslers Reagent (with NH_3, brown ppt.)

9. c) 4
$PbS + 4\ O_3 \rightarrow PbSO_4 + 4\ O_2$

10. d) It neither confirms the presence of Cl^- , nor Br^- ions unless it is passed through NaOH solution
$$4Cl^- + Cr_2O_7^{-2} + 6H^+ \rightarrow \underset{\text{Reddish brown}}{2CrO_2Cl_2\uparrow} + 3H_2O$$
$$\xrightarrow{NaOH} \underset{\text{(Brown soln)}}{CrO_4^{-2}}$$

$$6Br^- + Cr_2O_7^{-2} + H^+ \rightarrow 3Br_2 \uparrow + Cr^{3+} + 7H_2O$$

$$\xrightarrow{NaOH} \underset{\text{(colourless soln.)}}{NaBr} + NaOBr$$

11. a) Mg^{2+}

12. b) $ZnSO_4.6H_2O$
Conceptual

13. d) All
Conceptual

14. b) dil $HCl + H_2S$
Conceptual

15. b) MgS
Conceptual

16. a) Br_2 is liberated which leaves the NaOH solution Colourless
Conceptual

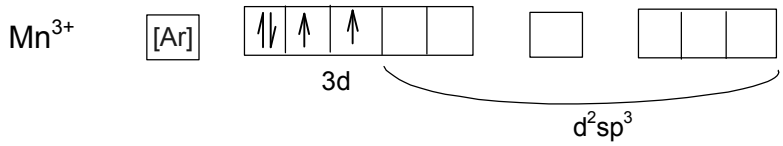
17. a) $[Mn(H_2O)_6]^{4+}$
Conceptual

18. d) High density of the period 6 elements

19. a) I, II, III

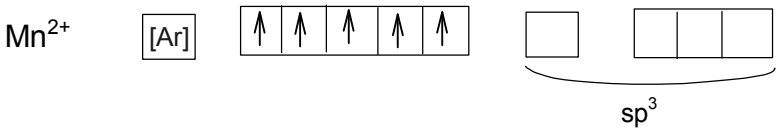
20. a) Very high ionization energy

21. c) d^2sp^3, octahedral and sp^3, tetrahedral
HINT: The magnetic moment of $[Mn(CN)_6]^{3-}$ indicates that it is having two unpaired electrons. Thus Mn^{3+} would have the following electronic configuration,



The hybridization likely to be d^2sp^3

$[MnBr_4]^{2-}$ is having the magnetic moment 5.9 BM. Hence the no. of unpaired electrons is 5.
∴ The electronic configuration of Mn^{2+} is



The hybridization is likely to be sp^3.

22. d) The possession of an oxidation state of +1

23. c) square planar
Coordination number 4 with geometrical isomerism.

24. d) 50

Hybridisation of Ni^{2+} in is dsp^2
The 'p' character is, 2 out of 4

25. c) 6 : 41

Let numbers of the Fe^{3+} ions is x and Fe^{2+} ions is y
Conservation of Fe atoms for 100 'O' atoms, x + y = 94
Conservation of charges, 3x + 2y = 200
Hence, x = 12 and y = 82

26. c) $\sqrt{15}$
Conceptual

27. b) sp^3, tetrahedral

Fe is in $-2_{\text{state}} \Rightarrow 3d^8 4s^2$, This complex is changes to

$3d^{10}\underbrace{4s^0 4P_x^0 4P_y^0\ 4P_z^0}_{sp^3}$, tetrahedral geometry

28. b) $[Ni(CO_4)]$; μ = 0.0 B.M.

$Mn^{3-}: 4_S^0\, 3d^4$

In $[Mn(C_2O_4)_3]^{3-}$

There are 4 unpaired electrons.

$\therefore \mu = \sqrt{4(4+2)} = \sqrt{24} = 4.90$

(b) $[Ni(CO)_4]^2$ has no unpaired electrons, therefore, $\mu = 0$, it is correctly matched.

(c) $[Ni(CN)_4]^{2-}$ has no unpaired electrons, therefore, $\mu = 0$, it is not correctly matched.

(d) $\left[FeCl_6\right]^{3-}$ has five unpaired electrons, $\mu = 5.9$, it is not correctly matched.

29. c) Tetraamminenickel (II)tetrachloronickelate (II)
Conceptual

30. a) $\left[Cu(CN)_4\right]^{3-}$

$Cu^{2+} \xrightarrow{KCN(excess)} \left[Cu(CN)_4\right]^{3-}$

$Cd^{2+} \xrightarrow{KCN} \left[Cd(CN)_4\right]^{2-}$

CHEMISTRY MODULE-12 – MULTIPLE CHOICE SOLUTIONS

Salt Analysis & D-Block

1. d) Mg^{2+}

$$Al_2O_3 + 2NaOH \longrightarrow 2NaAlO_2 + H_2O$$
$$ZnO + 2NaOH \longrightarrow Na_2ZnO_2 + H_2O$$
$$SnO_2 + 2NaOH \longrightarrow Na_3SnO_3 + H_2O$$
$$PbO_2 + 2NaOH \longrightarrow Na_2PbO_3 + H_2O$$

2. c) $HgCl_2$
   d) $SnCl_4$
   Covalent chlorides do not respond to chromyl chloride test, e.g., $SnCl_4$, $HgCl_2$

3. b) $K_2Cr_2O_7$
   c) H_2SO_4
   d) NaOH
   Conceptual

4. b) Sr^{+2}
   d) Ca^{+2}
   Conceptual

5. a) Cl_2
   b) Br_2
   c) I_2
   d) F_2
   Conceptual

6. a) Mg^{+2}
   c) Ca^{+2}
   Conceptual

7. a) $Zn(OH)_2$
   b) $Al(OH)_3$
   c) $Sn(OH)_2$
   Conceptual

8. b) Cr^{+3}
   c) Cu^{2+}
   d) Co^{2+}

$$Zn(OH)_2 + 2NaOH \longrightarrow Na_2ZnO_2 + 2H_2O$$
$$Al(OH)_3 + NaOH \longrightarrow NaAlO_2 + 2H_2O$$
$$Sn(OH)_2 + 2NaOH \longrightarrow Na_2SnO_2 + 2H_2O$$

9. a) $Be(OH)_2$

b) $Al(OH)_3$

c) $Zn(OH)_2$

d) CrO_3

Conceptual

10. a) $Pb(CH_3COO)_2$

d) $AgNO_3$

A, B and C form beryllate, aluminate and zincate. D is acidic oxide and reacts with NaOH forming chromate.

11. a,b,c,d or a,b,d

a) Dil HCl

b) dil $HCl + H_2S$

c) $H_2S + NH_4OH$

d) $NH_4OH + NH_4Cl$

$$Pb^{2+} + S_2O_3^{2-} \longrightarrow \underset{\text{white ppt}}{PbS_2O_3} \xrightarrow{H_2O} \underset{\text{Black ppt}}{PbS}$$

Similarly

$$Ag^{+} + S_2O_3^{2-} \longrightarrow \underset{\text{white ppt}}{Ag_2S_2O_3} \longrightarrow H_2O \longrightarrow \underset{\text{Black ppt}}{Ag_2S}$$

12. a) MnO_2 dissolves in conc HCl but does not from M_n^{4+} conc

c) Is strongly oxidizing and state only in very strong alkali. In Dilute alkali water or acidic solutions it disproportionate

13. b) Compounds in oxidation state x are ionic if $x < y$

c) Compounds in oxidation state y are converted if $x < y$

14. a) Here CO acts as a Lewis base as well as Lewis acid

b) Here metal acts as Lewis base as well as Lewis acid

c) Here $d\pi - p\pi$ back bonding takes place

Conceptual

15. a) en

b) DMG

d) Glycinate

(A) *is* $H_2N-CH_2-CH_2-NH_2$

(B) *Dimethylglyoxime is a bidentate lisand*

(D) $H_2NCH_2COO^-$ *is bidentate ligand*

(C) *EDTA is hexadentate ligand*

16. a) duralumin

b) aluminium bronze

c) german silver

Al, Cu, Mn and Mg in duralumin
Cu and Al in aluminium bronze
Cu, Ni and Zn in german silver
Ni, Fe and Cr in nichrome

17. b) $Na_2S_2O_3$ (excess)

c) KCN(excess)

d) NH_4OH(excess)

Fact

18. (a), (b) and (c) Explanation : Ligand CO, CN^-, NO^+ have 14 electrons with an empty π orbital.

$$\underbrace{\sigma 1s^2, \sigma^* 1s^2, \sigma 2s^2, \sigma^* 2s^2, \sigma 2p_z^2, \pi 2p_x^2, \pi 2p_y^2, \pi^* 2p_x, \pi^* 2p_y}_{\text{Empty}}$$

The empty antibondig π-orbital have correct symmetry to overlap with t_{2g} orbital of metal

forming π-bond.

∴ (a), (b) and (c) are correct answer while (d) is incorrect answer.

19. a) Four bonds around Pt

b) It is called Zeise's salt

d) It is π bonded complex like Ferrocene & Dibenzene chromium

Conceptual

20. c) $\left[CO(NH_3)_5NCS\right]^{+2}$ and $\left[CO(NH_3)_5SCN\right]^{+2}$

d) $\left[Pt(NH_3)_3NO_2\right]^{+}$ and $\left[Pt(NH_3)_3ONO\right]^{+}$

I. CN^- and NC^-

II. NO_2^- and ONO^- form linkage isomers.

CHEMISTRY MODULE 12 - PARAGRAPH TYPE SOLUTION

Salt Analysis & D-Block

1. d) sodium carbonate
   a) $PbSO_4$
   Bottle 1 $Pb(NO_3)_2$
   Bottle 2 HCl
   Bottle 3 Na_2CO_3
   Bottle 4 $CuSO_4$

2. $ZnS + H_2SO_4 \longrightarrow ZnSO_4 + H_2S$
   (A) (C) (B)
   $3H_2S + K_2Cr_2O_7 + 4H_2SO_4 \longrightarrow K_2SO_4 + Cr_2(SO_4)_3 + 3S + 7H_2O$
   (B) (D)
   $S + O_2 \longrightarrow SO_2$
   (D) (E)
   $2H_2S + SO_2 \longrightarrow 2H_2O + 3S$
   $ZnSO_4 + 2NaOH \longrightarrow Na_2SO_4 + Zn(OH)_2$

3. b) ZnS
   Bottle 4 contains blue solutin $\Rightarrow$ copper II sulphate.
   Bottle 3 + Bottle 4 – Blue ppt
   Suggests bottle 3 contains sodium carbonate
   It gets confirmed the observation.
   Bottle 2 + bottle 3 $\rightarrow$ colourless gas $\rightarrow$ CO_2

4. c) H_2S
   Hence, Bottle 3 – sodium carnoate

5. a) $[Ni(H_2O)_6]^{2+}$

   Aqueous Ni^{2+} is green.

6. c) 38

   EAN = (28 – 2) + (6 × 2) = 38.

CHEMISTRY MODULE-12 – MATRIX MATCH SOLUTIONS

Salt Analysis & D-Block

1. Conceptual

(A)	**PS**	(B)	**PQ**	(C)	**QR**	(D)	**RS**

2. Conceptual

(A)	**PQR**	(B)	**PQS**	(C)	**PQ**	(D)	**ST**

3. Conceptual

(A)	**PQS**	(B)	**QRS**	(C)	**P**	(D)	**PQ**

CHEMISTRY MODULE-12 – INTEGERS TYPE QUESTIONS

Salt Analysis & D-Block

1. 2
   Cu^{+2} and Cd^{+2} in excess NH3 form soluble complexes.

2. 5
   HgS, PbS, CuS — Black
   Bi_2S_3 — Yellow Orange
   CdS — Yellow

3. 2
   Conceptual

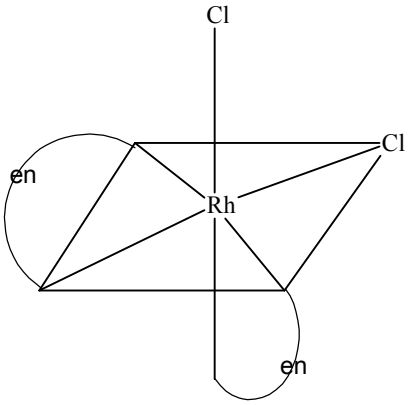
4. 0
   $Cl - K_2Cr_2O_7 \xrightarrow{conc\ H_2SO_4} CrO_2Cl_2$

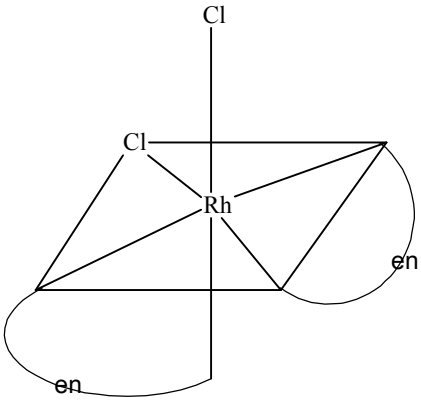
5. 2
   $CoZnO_2$ – Rinmann's green

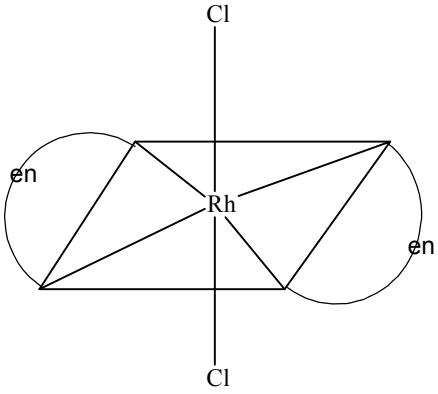
6. 3
   HINT: AgCl, $Zn(OH)_2$, $Cu(OH)_2$ will dissolve in excess of NH_4OH.

7. 0
   German silver = Cu + Zn + Ni

8. 3
   Cis form is optically active (1 + 1) and one trans form ∴ total isomers = 3







9. 2

$Eu-63-[Xe]4f^{7}6s^{2}$

$Gd-64-[Xe]4f^{7}5d^{1}6s^{2}$

10. 0

$K_2[HgI_4]-$ *Nesslers reagent*

86 – 86 = 0