DPP - Daily Practice Problems

Chapter-wise Sheets

Date : ☐ **Start Time :** ☐ **End Time :** ☐

CHEMISTRY CC23

SYLLABUS : Coordination Compounds

Max. Marks : 180 **Marking Scheme :** + 4 for correct & (–1) for incorrect **Time : 60 min.**

INSTRUCTIONS : This Daily Practice Problem Sheet contains 45 MCQ's. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.

1. The compounds $[PtCl_2(NH_3)_4]Br_2$ and $[PtBr_2(NH_3)_4]Cl_2$ constitutes a pair of
(a) coordination isomers (b) linkage isomers
(c) ionization isomers (d) optical isomers

2. Which of the following species is not expected to be a ligand?
(a) NO (b) NH_4^+
(c) $NH_2CH_2CH_2NH_2$ (d) Both (a) and (b)

3. In which of the following complexes of the Co (At. no. 27), will the magnitude of Δ_o be the hightest?
(a) $[Co(CN)_6]^{3-}$ (b) $[Co(C_2O_4)_3]^{3-}$
(c) $[Co(H_2O)_6]^{3+}$ (d) $[Co(NH_3)_6]^{3+}$

4. Which of the following carbonyls will have the strongest C – O bond ?
(a) $Mn(CO)_6^+$ (b) $Cr(CO)_6$
(c) $V(CO)_6^-$ (d) $Fe(CO)_5$

5. A square planar complex is formed by hybridisation of which atomic orbitals?
(a) s, p_x, p_y, d_{yz} (b) $s, p_x, p_y, d_{x^2-y^2}$
(c) s, p_x, p_y, d_{z^2} (d) s, p_y, p_z, d_{xy}

6. The type of isomerism present in Pentamminenitrochromium (III) chloride is
(a) optical (b) linkage
(c) ionisation (d) polymerisation.

7. In the silver plating of copper, $K[Ag(CN)_2]$ is used instead of $AgNO_3$. The reason is
(a) a thin layer of Ag is formed on Cu
(b) more voltage is required
(c) Ag^+ ions are completely removed from solution
(d) less availability of Ag^+ ions, as Cu cannot displace Ag from $[Ag(CN)_2]^-$ ion.

RESPONSE GRID	1. ⓐⓑⓒⓓ	2. ⓐⓑⓒⓓ	3. ⓐⓑⓒⓓ	4. ⓐⓑⓒⓓ	5. ⓐⓑⓒⓓ
	6. ⓐⓑⓒⓓ	7. ⓐⓑⓒⓓ			

Space for Rough Work

8. The spin only magnetic moment value (in Bohr magneton units) of $Cr(CO)_6$ is

(a) 0 (b) 2.84 (c) 4.90 (d) 5.92

9. Low spin complex of d^6-cation in an octahedral field will have the following energy :

(a) $\frac{-12}{5}\Delta_0 + P$ (b) $\frac{-12}{5}\Delta_0 + 3P$

(c) $\frac{-2}{5}\Delta_0 + 2P$ (d) $\frac{-2}{5}\Delta_0 + P$

(Δ_0 = Crystal Field Splitting Energy in an octahedral field, P = Electron pairing energy)

10. An example of double salt is

(a) Bleaching powder (b) $K_4[Fe(CN)_6]$

(c) Hypo (d) Potash alum

11. The ionisation isomer of $[Cr(H_2O)_4Cl(NO_2)]Cl$ is

(a) $[Cr(H_2O)_4(O_2N)]Cl_2$

(b) $[Cr(H_2O)_4Cl_2](NO_2)$

(c) $[Cr(H_2O)_4Cl(ONO)]Cl$

(d) $[Cr(H_2O)_4Cl_2(NO_2)].H_2O$

12. $[Co(NH_3)_4(NO_2)_2]Cl$ exhibits

(a) linkage isomerism, ionization isomerism and geometrical isomerism

(b) ionization isomerism, geometrical isomerism and optical isomerism

(c) linkage isomerism, geometrical isomerism and optical isomerism

(d) linkage isomerism, ionization isomerism and optical isomerism

13. The IUPAC name of $K_3[Ir(C_2O_4)_3]$ is

(a) potassium trioxalatoiridium (III)

(b) potassium trioxalatoiridate (III)

(c) potassium tris (oxalato) iridium (III)

(d) potassium tris (oxalato) iridate (III)

14. Consider the following complex $[Co(NH_3)_5CO_3]ClO_4$. The coordination number, oxidation number, number of *d*-electrons and number of unpaired *d*-electrons on the metal are respectively

(a) 6,3, 6,[illegible] (b) 7,2, 7, 1 (c) 7, 1, 6,4 (d) 6,2, 7, 3

15. Which of the following species represent the example of dsp^2 - hybridisation ?

(a) $[Fe(CN)_6]^{3-}$ (b) $[Ni(CN)_4]^{2-}$

(c) $[Ag(CN)_2]^-$ (d) $[Co(CN)_6]^{3-}$

16. When $AgNO_3$ is added to a solution of $Co(NH_3)_5Cl_3$, the precipitate of AgCl shows two ionisable chloride ions. This means :

(a) Two chlorine atoms satisfy primary valency and one secondary valency

(b) One chlorine atom satisfies primary as well as secondary valency

(c) Three chlorine atoms satisfy primary valency

(d) Three chlorine atoms satisfy secondary valency

17. The value of the 'spin only' magnetic moment for one of the following configurations is 2.82 B.M. The correct one is

(a) d^5 (in strong ligand field)

(b) d^3 (in weak as well as in strong fields)

(c) d^4 (in weak ligand fields)

(d) d^4 (in strong ligand fields)

18. Consider the following complex ions, P, Q and R.

$P = [FeF_6]^{3-}$, $Q = [V(H_2O)_6]^{2+}$ and $R = [Fe(H_2O)_6]^{2+}$

The correct order of the complex ions, according to their spin-only magnetic moment values (in B.M.) is

(a) $R < Q < P$ (b) $Q < R < P$

(c) $R < P < Q$ (d) $Q < P < R$

19. Which of the following is organo-metallic compound ?

(a) $Ti(C_2H_4)_4$ (b) $Ti(OC_2H_5)_4$

(c) $Ti(OCOCH_3)_4$ (d) $Ti(OC_6H_5)_4$

20. Which of the following statements is correct ?

(Atomic number of Ni = 28)

(a) $Ni(CO)_4$ is diamagnetic and $[NiCl_4]^{2-}$ and $[Ni(CN)_4]^{2-}$ are paramagnetic

(b) $Ni(CO)_4$ and $[Ni(CN)_4]^{2-}$ are diamagnetic and $[NiCl_4]^{2-}$ is paramagnetic

(c) $Ni(CO)_4$ and $[NiCl_4]^{2-}$ are diamagnetic and $[Ni(CN)_4]^{2-}$ is paramagnetic

(d) $[NiCl_4]^{2-}$ and $[Ni(CN)_4]^{2-}$ are diamagnetic and $Ni(CO)_4$ is paramagnetic

RESPONSE GRID	8. ⓐⓑⓒⓓ	9. ⓐⓑⓒⓓ	10. ⓐⓑⓒⓓ	11. ⓐⓑⓒⓓ	12. ⓐⓑⓒⓓ
	13. ⓐⓑⓒⓓ	14. ⓐⓑⓒⓓ	15. ⓐⓑⓒⓓ	16. ⓐⓑⓒⓓ	17. ⓐⓑⓒⓓ
	18. ⓐⓑⓒⓓ	19. ⓐⓑⓒⓓ	20. ⓐⓑⓒⓓ		

Space for Rough Work

21. The correct order for the wavelength of absorption in the visible region is :

(a) $[Ni(NO_2)_6]^{4-} < [Ni(NH_3)_6]^{2+} < [Ni(H_2O)_6]^{2+}$

(b) $[Ni(NO_2)_6]^{4-} < [Ni(H_2O)_6]^{2+} < [Ni(NH_3)_6]^{2+}$

(c) $[Ni(H_2\bullet)_6]^{2+} < [Ni(NH_3)_6]^{2+} < [Ni(N\bullet_2)_6]^{4-}$

(d) $[Ni(NH_3)_6]^{2+} < [Ni(H_2O)_6]^{2+} < [Ni(NO_2)_6]^{4-}$

22. The compound which is not coloured is

(a) $K_4Fe(CN)_6$ (b) $K_3Fe(CN)_6$

(c) Na_2CdCl_4 (d) Na_2CuCl_4

23. Which is not π - bonded complex ?

(a) Zeise's salt (b) Ferrocene

(c) Dibenzene chromium (d) Tetraethyl lead

24. Which of the following are inner orbital complex (i.e., involving d^2sp^3 hybridisation) and is paramagnetic in nature?

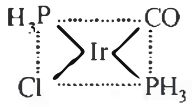
(a) $[Mn(CN)_6]^{3-}$, $[Fe(CN)_6]^{3-}$, $[Co(C_2O_4)_3]^{3-}$

(b) $[MnCl_6]^{3-}$, $[FeF_6]^{3-}$, $[CoF_6]^{3-}$

(c) $[Mn(CN)_6]^{3-}$, $[Fe(CN)_6]^{3-}$

(d) $[MnCl_6]^{3-}$, $[Fe(CN)_6]^{3-}$, $[Co(C_2O_4)_3]^{3-}$

25. Give name of the complex, name should specify the position of ligands.



(a) bistransphosphinecarbonylchloroiridium (II)

(b) carbonylchlorobistransphosphineiridium (III)

(c) carbonylchlorobistransphosphineiridium (I)

(d) chlorocarbonylbistransphosphineiridium (I)

26. Which of the following coordination compounds would exhibit optical isomerism?

(a) pentamminenitrocobalt(III) iodide

(b) diamminedichloroplatinum(II)

(c) trans-dicyanobis (ethylenediamine) chromium (III) chloride

(d) tris-(ethylendiamine) cobalt (III) bromide

27. An excess of $AgNO_3$ is added to 100 mL of a 0.01 M solution of dichlorotetraaquachromium (iii) chloride. The number of moles of AgCl precipitated would be :

(a) 0.002 (b) 0.003 (c) 0.01 (d) 0.001

28. The most stable complex among the following is

(a) $K_3[Al(C_2O_4)_3]$ (b) $[Pt(en)_2]Cl$

(c) $[Ag(NH_3)_2]Cl$ (d) $K_2[Ni(EDTA)]$

29. Which one of the following has largest number of isomers ?

(a) $[Ir(PR_3)_2H(CO)]^{2+}$ (b) $[Co(NH_3)_5Cl]^{2+}$

(c) $[Ru(NH_3)_4Cl_2]^+$ (d) $[Co(en)_2Cl_2]^+$

(R = alkyl group, en = ethylenediamine)

30. Which of the following statements related to crystal field splitting in octahedral coordination entities is incorrect?

(a) The $d_{x^2-y^2}$ and d_{z^2} orbitals has more energy as compared to d_{xy}, d_{yz} and d_{xz} orbitals.

(b) Crystal field spitting energy (Δ_o) depends directly on the charge of the metal ion and on the field produced by the ligand.

(c) In the presence of Br^- as a ligand the distribution of electrons for d^4 configuration will be t_2^3g, e_g^1,

(d) In the presence of CN^- as a ligand $\Delta_o < P$.

31. Calculate the value of log K_3 when log values of K_2, K_1, K_4 and β_4 respectively are 2.0, 3.20, 4.0 and 11.9 ?

(a) 2.0 (b) 2.7 (c) 3.0 (d) 2.5

32. Which of the following does **not** have a metal- carbon bond?

(a) $Al(OC_2H_5)_3$ (b) C_2H_5MgBr

(c) $K[Pt(C_2H_4)Cl_3]$ (d) $Ni(CO)_4$

33. In $Fe(CO)_5$, the Fe – C bond possesses

(a) ionic character (b) σ-character only

(c) π-character (d) both σ and π characters

34. The geometry of $Ni(CO)_4$ and $Ni(PPh_3)_2Cl_2$ are

(a) both square planar

(b) tetrahedral and square planar

(c) both tetrahedral

(d) None of these

RESPONSE GRID	21.ⓐⓑⓒⓓ	22.ⓐⓑⓒⓓ	23.ⓐⓑⓒⓓ	24.ⓐⓑⓒⓓ	25.ⓐⓑⓒⓓ
	26.ⓐⓑⓒⓓ	27.ⓐⓑⓒⓓ	28.ⓐⓑⓒⓓ	29.ⓐⓑⓒⓓ	30.ⓐⓑⓒⓓ
	31.ⓐⓑⓒⓓ	32.ⓐⓑⓒⓓ	33.ⓐⓑⓒⓓ	34.ⓐⓑⓒⓓ	

Space for Rough Work

35. The crystal field splitting energy for octahedral (Δ_0) and tetrahedral (Δ_t) complexes is related as

(a) $\Delta_t = -\frac{1}{2}\Delta_0$ (b) $\Delta_t = -\frac{4}{9}\Delta_0$

(c) $\Delta_t = -\frac{3}{5}\Delta_0$ (d) $\Delta_t = -\frac{2}{5}\Delta_0$

36. Match the columns.

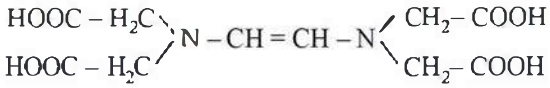
	Column-I		**Column-II**
A.	$[Ni(CN)_4]^{2-}$	I.	Ti^{4+}
B.	Chlorophyll	II.	sp^3; paramagnetic
C.	Ziegler - Natta catalyst	III.	Non-planar
D.	$[NiCl_4]^{2-}$	IV.	Mg^{2+}
E.	Deoxyhaemoglobin	V.	Planar
		(VI)	dsp^2; diamagnetic

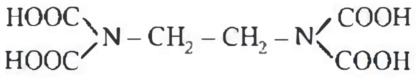
(a) A – VI; B – IV; C – I; D – II; E – III
(b) A – II; B – IV; C – I; D – VI; E – III
(c) A – II; B – IV; C – I; D – VI; E – V
(d) A – VI; B – IV; C – I; D – II; E – V

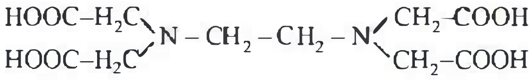
37. If magnetic moment of $[MnBr_4]^{2-}$ is 5.9 BM. Predict the number of electrons?

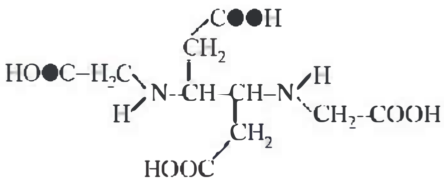
(a) 2 (b) 3 (c) 6 (d) 5

38. The correct structure of ethylenediaminetetraacetic acid (EDTA) is

(a)


(b)


(c)


(d)


39. The hypothetical complex chloro-diaquatriammine cobalt (III) chloride can be represented as

(a) $[CoCl(NH_3)_3(H_2O)_2]Cl_2$
(b) $[Co(NH_3)_3(H_2O)Cl_3]$
(c) $[Co(NH_3)_3(H_2O)_2Cl]$
(d) $[Co(NH_3)_3(H_2O)_3]Cl_3$

40. Which of the following is incorrect regarding spectrochemical series?

(a) $NH_3 > H_2O$ (b) $F^- > C_2O_4^{2-}$

(c) $NCS^- > SCN^-$ (d) en > $EDTA^{4-}$

41. Which of the following is the limitation of crystal field theory?

(i) Ligands are assumed as point charges.
(ii) It does not accounts for the covalent character of bonding between the ligand and the central atom.
(iii) It does not explain how colour of coordination compounds depends on ligand attached to central metal atom/ion.

(a) (i) and (ii) (b) (ii) and (iii)

(c) (ii) only (d) (i), (ii) and (iii)

42. For $[Co_2(CO)_8]$, what is the total number of metal – carbon bonds and number of metal–metal bonds.

(a) 10, 1 (b) 8,2 (c) 8, 1 (d) 10,0

43. Which will give a white precipitate with $AgNO_3$ in aqueous solution

(a) $[Co(NH_3)_5Cl](NO_2)_2$ (b) $[Pt(NH_3)_6]Cl_4$

(c) $[Pt(en)Cl_2]$ (d) $[Cu(NH_3)_4]SO_4$

44. $[NiCl_2\{P(C_2H_5)_2(C_6H_5)\}_2]$ exhibits temperature dependent magnetic behaviour (paramagnetic/diamagnetic). The coordination geometries of Ni^{2+} in the paramagnetic and diamagnetic states are respectively

(a) tetrahedral and tetrahedral
(b) square planar and square planar
(c) tetrahedral and square planar
(d) square planar and tetrahedral

45. Which one of the following coordination compounds is used to inhibit the growth of tumours?

(a) Trans-platin (b) EDTA complex of calcium

(c) $[(Ph_3P)_3RhCl]$ (d) Cis-platin

RESPONSE GRID					
	35. ⓐⓑⓒⓓ	36. ⓐⓑⓒⓓ	37. ⓐⓑⓒⓓ	38. ⓐⓑⓒⓓ	39. ⓐⓑⓒⓓ
	40. ⓐⓑⓒⓓ	41. ⓐⓑⓒⓓ	42. ⓐⓑⓒⓓ	43. ⓐⓑⓒⓓ	44. ⓐⓑⓒⓓ
	45. ⓐⓑⓒⓓ				

Space for Rough Work

1. **(c)** $[PtCl_2(NH_3)_4]Br_2$ and $[PtBr_2(NH_3)_4]Cl_2$ are ionisation isomers
2. **(b)**
3. **(a)** In octahedral complex the magnitude of Δ_o will be highest in a complex having strongest ligand. Out of the given ligands CN^- is strongest. So, Δ_o will be highest for $[Co(CN)_6]^{3-}$. Thus option (a) is correct.
4. **(a)** As + vecharge on the central metal atom increases, the less readily the metal can donate electron density into the π^* orbitals of CO ligand to weaken the C – O bond. Hence, the C – O bond would be strongest in $Mn(CO)_6^+$.
5. **(b)**
6. **(b)** The chemical formula of Pentamminenitrochromium (III) chloride is

$$\left[Cr(NH_3)_5NO_2\right]Cl_2$$

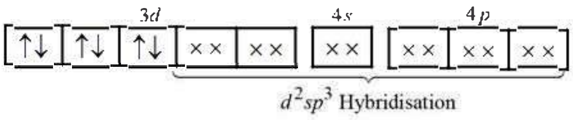
It can exist in following two structures

$$\left[Cr(NH_3)_5NO_2\right]Cl_2 \text{ and}$$

$$\left[Cr(NH_3)_5ONO\right]Cl_2$$

Therefore the type of isomerism found in this compound is linkage isomerism as nitro group is linked through N as $-NO_2$ or through O as $-ONO$.

7. **(d)** In silver plating $K[Ag(CN)_2]$ is used which provides constant and required supply of Ag^+ ions as $Ag(CN)_2^-$ is very stable. But if $AgNO_3$ is used concentration of $[Ag^+]$ in solution will be very large. In that case Ag will be deposited at faster rate without any uniformity.
8. **(a)** Chromium in $Cr(CO)_6$ is in zero oxidation state and has $[Ar]^{18}3d^54s^1$ as the electronic configuration. However, CO is a strong ligand, hence pairing up of electrons takes place leading to following configuration in $Cr(CO)_6$.



Since the complex has no unpaired electron, its magnetic moment is zero.

9. **(b)** $d^6 - t_{2g}^{2,2,2}\ eg^{0,0}$ (in low spin)

$$CFSE = -0.4 \times 6\Delta_0 + 3P$$

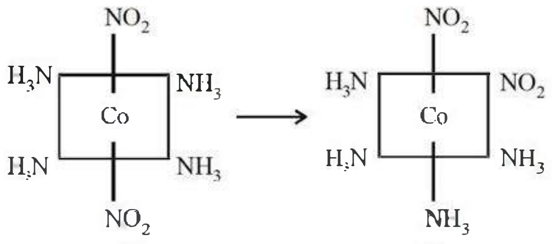
$$= -\frac{12}{5}\Delta_0 + 3P$$

10. **(d)** $K_2SO_4 . Al_2(SO_4)_3 . 24H_2O$
11. **(b)** Ionisation isomer of $[Cr(H_2O)_4Cl(NO_2)]Cl$ is $[Cr(H_2O)_4Cl_2]NO_2$.
12. **(a)** The given compound may have linkage isomerism due to presence of NO_2 group which may be in the form $-NO_2$ or $-ONO$.

It may have ionisation isomerism due to presence of two ionisable group $-NO_2$ & $-Cl$. It may have geometrical isomerism in the form of *cis-trans* form as follows :

$[Co(NH_3)_4Cl(NO_2)]NO_2$ and $[Co(NH_3)(NO_2)_2]Cl$
—— ionisation isomers.

$[Co(NH_3)_5(NO_2)_2]Cl$ and $[Co(NH_3)_5(ONO)_2Cl$
——Linkage isomers



trans-form *cis-form*

Geometrical isomers

13. **(b)** IUPAC name of $K_3[Ir(C_2O_4)_3]$ is potassium trioxalato iridate (III)
14. **(a)** $[Co(NH_3)_5CO_3]ClO_4$ Six monodentate ligands are attached to Co hence C. N. of Co = 6;

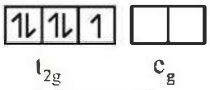
O. N. = x + 5 × (0) + 1 × (–2) + 1 × (–1) = 0 ∴ x = +3 ; electronic configuration of $Co^{3+}[Ar]\ 3d^64s^0$ hence number of d electrons is 6. All d-electrons are paired due to strong ligand hence unpaired electron is zero.

15. **(b)**
16. **(a)** Since the precipitate of AgCl shows two ionisable chloride ion the complex must have the structure.

$$[Co(NH_3)_5Cl]Cl_2 + 2AgNO_3 \rightarrow$$
$$[Co(NH_3)_5Cl](NO_3)_2 + 2AgCl$$

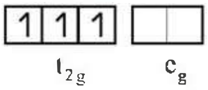
Hence two chlorine atoms satisfy the primary valency and one secondary valency.

17. **(d)** d_5 —— strong ligand field



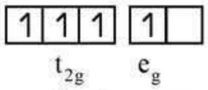
$$\mu = \sqrt{n(n+2)} = \sqrt{3} = 1.73\text{ B.M.}$$

d^3— in weak as well as in strong field



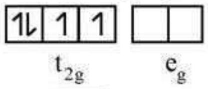
$$\mu = \sqrt{3(5)} = \sqrt{15} = 3.87\text{B.M.}$$

d^4– in weak ligand field



$\mu = \sqrt{4(6)} = \sqrt{24} = 4.89$ B.M.

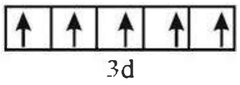
d^4– in strong ligand field



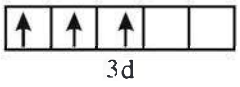
$\mu = \sqrt{2(4)} = \sqrt{8} = 2.82$ B.M.

18. **(b)** The electronic configuration of central metal ion in complex ions P, Q and R are

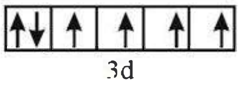
$P = [FeF_6]^{3-}$; Fe^{3+}:



$Q = [V(H_2O)_6]^{2+}$; V^{2+}



$R = [Fe(H_2O)_6]^{2+}$; Fe^{2+}



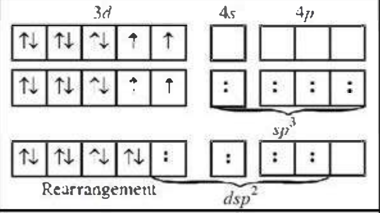
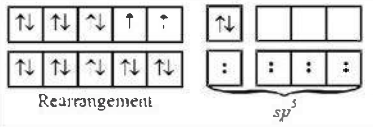
Higher the no. of unpaired electron(s), higher will be magnetic moment.

Thus the correct order of spin only magnetic moment is

$Q < R < P$

19. **(a)** $Ti(C_2H_4)_4$ is an organometallic compound due to Ti directly attached to C- atom

20. **(b)**

Atom/Ion Complex	Configuration	No. of unpaired electrons	Magnetic nature
Ni^{2+} (d^8)		2	Paramagnetic
$[NiCl_4]^{2-}$		2	Paramagnetic
$[Ni(CN)_4]^{2-}$		0	Diamagnetic
Ni (d^8s^2)		2	Paramagnetic
$[Ni(CO)_4]$		0	Diamagnetic

21. **(a)** For any metal cation, the magnitude of Δ_0 depends upon the nature of ligand. Higher the value of Δ_0, lower will be the wave length absorbed. Δ_0 is crystal field stabilisation energy.

The value of Δ_0 for legands varies as follows

$H_2O < NH_3 < NO_2^-$

So, the wavelength absorbed will vary in reverse order

$NO_2^- < NH_3 < H_2O$

22. **(c)** In Na_2CdCl_4, Cd has oxidation state +2.

So, its electronic configuration is $4d^{10}4s^0$.

All the 4d orbitals are fully filled.

Hence, there will not be d-d transition resulting in colour.

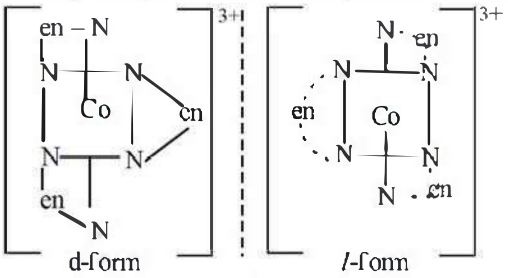
So, it is colourless.

23. **(d)** Tetraethyl lead $Pb(C_2H_5)_4$ is not π bonded complex. It is σ bonded organometallic compound.

24. **(c)** $[Mn(CN)_6]^{3-}$ and $[Fe(CN)_6]^{3-}$ are inner orbital complexes and paramagnetic while $[Co(C_2O_4)_3]^{3-}$ is diamagnetic in nature.

25. **(c)** Naming should be done alphabetically. Hence 'carbonyl' is followed by 'chloro' and then 'phosphine'. bis used to denote two same groups and trans denotes the position. 'CO', and 'PH_3' are neutral ligands. Only Cl^- is charged. Hence oxidation state of Ir is (+I) only. Thus correct IUPAC name of given complex is carbonylchlorobistransphosphineiridium (I).

26. **(d)** The optical isomers are pair of molecules which are non super imposable mirror images of each other



Enantiomers

The two optically active isomers are collectivity called enantiomers.

27. **(d)** $[Cr(H_2O)_4Cl_2]Cl + AgNO_3 \longrightarrow AgCl + [Cr(H_2O)_4Cl_2]NO_3$

$$\text{Molarity} = \frac{\text{wt}}{\text{mol. mass}} \times \frac{1000}{\text{vol.}}$$

$$\frac{\text{wt}}{\text{mol. mass}} = \text{molarity} \times \frac{\text{vol.}}{1000} = \frac{0.01 \times 100}{1000}$$

$$= 0.001$$

28. **(d)** $K_2[Ni(EDTA)]$. Since EDTA is hexadentate and chelating and coordinates from six sides forming more stable complex

29. **(d)** isomers

$\underset{\text{cis and trans}}{[Ru(NH_3)_4Cl_2]^+}, \underset{\text{none}}{[Co(NH_3)_5Cl]^{2+}},$

$\underset{\text{cis and trans}}{[Ir(PR_3)_2H(CO)]^{2+}}, \underset{\text{cis and trans and optical isomers}}{[Co(en)_2Cl_2]^+}$

30. **(d)** CN^- is a strong field ligand and form low spin complexes thus $\Delta_o > P$.

31. **(b)** $\beta = K_1K_2K_3K_4$

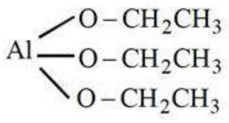
$\log \beta = \log(K_1 K_2 K_3 K_4)$

$\log \beta = \log K_1 + \log K_2 + \log K_3 + \log K_4$

$\log K_3 = 11.9 - (3.20 + 2.0 + 4.0)$

$\log K_3 = 2.7$

32. **(a)** Triethoxyaluminium has no Al – C linkage



33. **(d)** Due to some backbonding by sidewise overlapping between d-orbitals of metal and p-orbital of carbon, the Fe – C bond has σ and π character.

34. **(c)**

	$Ni(CO)_4$	$Ni(PPh_3)_2Cl_2$
O.S.	Ni^0	Ni^{2+}
E.C.	$[Ar]3d^84s^2$	$[Ar]3d^84s^0$
	Pairing of e^-	No pairing of e^-
Hybridization	sp^3 (tetrahedral)	sp^3 (tetrahedral)

35. **(b)** The crystal field splitting in tetrahedral complexes is lower than that in octahedral complexes, and

$$\Delta_t = -\frac{4}{9}\Delta_0.$$

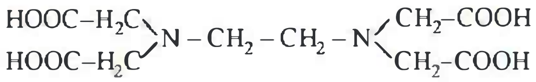
36. **(a)** $[NiCl_4]^{2-}$ is sp^3 hybridised and paramagnetic in nature $[Ni(CN)_4]^{2-}$ is square planar and diamagnetic. Chlorophyll contains Mg^{2+}, Ziegler – Natta catalyst contains Ti^{4+}, Deoxyhaemoglobin is nonplanar and oxyhaemoglobin planar.

37. **(d)** Magnetic moment can be calculated by using the relation $\sqrt{n(n+2)}B.M.$ Where n = number of electrons and B.M. is Bohr magneton.

$$\therefore\ 5.9 = \sqrt{n(n+2)}$$

$$\therefore\ n = 5$$

38. **(c)** The correct structure of EDTA is



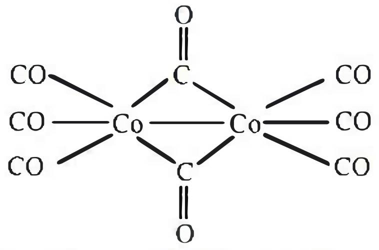
$$\begin{matrix} HOOC{-}H_2C \\ HOOC{-}H_2C \end{matrix}\!\!>N-CH_2-CH_2-N\!\!<\!\begin{matrix} CH_2{-}COOH \\ CH_2{-}COOH \end{matrix}$$

39. **(a)** The complex chlorodiaquatriamminecobalt (III) chloride can have the structure $[CoCl(NH_3)_3(H_2O)_2]Cl_2$

40. **(b)** According to spectrochemical series $C_2O_4^{2-} > F^-$.

41. **(a)**

42. **(a)** Structure of $[Co_2(CO)_8]$

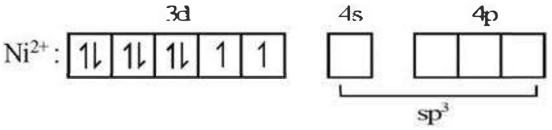


Total M – C bonds = 10, Total M – M bonds = 1

43. **(b)** $\left[Pt(NH_3)_6\right]Cl_4 \rightleftharpoons \left[Pt(NH_3)_6\right]^{4+} + 4Cl^-$;

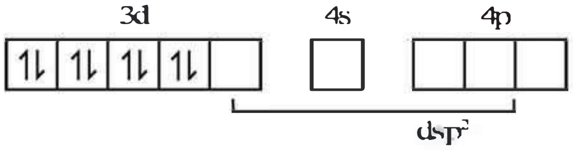
$Ag^+ + Cl^- \rightarrow AgCl$ (ppt)

44. **(c)** In both states (paramagnetic and diamagnetic) of the given complex, Ni exists as Ni^{2+} whose electronic configuration is $[Ar]\ 3d^84s^0$.



In the above paramagnetic state the geometry of the complex is sp^3 giving tetrahedral geometry.

The diamagnetic state is achieved by pairing of electrons in 3*d* orbital.



Thus the geometry of the complex will be dsp^2 giving square planar geometry.

45. **(d)**