CHEMISTRY

Coordination Compounds

Speed TEST 51 Chapter-wise

No. of Questions	Maximum Marks	Time
45	180	1 Hour

GENERAL INSTRUCTIONS

- This test 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.
- You have to evaluate your Response Grids yourself with the help of solutions provided at the end of this book.
- Each correct answer will get you 4 marks and 1 mark shall be deduced for each incorrect answer. No mark will be given/ deducted if no bubble is filled. Keep a timer in front of you and stop immediately at the end of 60 min.
- The sheet follows a particular syllabus. Do not attempt the sheet before you have completed your preparation for that syllabus.
- After completing the sheet check your answers with the solution booklet and complete the Result Grid. Finally spend time to analyse your performance and revise the areas which emerge out as weak in your evaluation.

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.

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)

RESPONSE GRID				
1. (a)(b)(c)(d)	2. (a)(b)(c)(d)	3. (a)(b)(c)(d)	4. (a)(b)(c)(d)	5. (a)(b)(c)(d)
6. (a)(b)(c)(d)	7. (a)(b)(c)(d)	8. (a)(b)(c)(d)	9. (a)(b)(c)(d)	

Space for Rough Work

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, 0 (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) $Ti(C_2H_5)_4$ (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

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

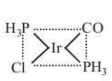
RESPONSE GRID					
	10. (a)(b)(c)(d)	**11.** (a)(b)(c)(d)	**12.** (a)(b)(c)(d)	**13.** (a)(b)(c)(d)	**14.** (a)(b)(c)(d)
	15. (a)(b)(c)(d)	**16.** (a)(b)(c)(d)	**17.** (a)(b)(c)(d)	**18.** (a)(b)(c)(d)	**19.** (a)(b)(c)(d)
	20. (a)(b)(c)(d)	**21.** (a)(b)(c)(d)	**22.** (a)(b)(c)(d)		

Space for Rough Work

23. Which is not π - bonded complex ?
(a) Zeise's salt (b) Ferrocene
(c) Dibenzene chromiun (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) pentammineni trocobalt(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_{2g}^3, 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

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) $\Delta_t = -\frac{2}{5}\Delta_0$

RESPONSE GRID					
	23. ⓐⓑⓒⓓ	**24.** ⓐⓑⓒⓓ	**25.** ⓐⓑⓒⓓ	**26.** ⓐⓑⓒⓓ	**27.** ⓐⓑⓒⓓ
	28. ⓐⓑⓒⓓ	**29.** ⓐⓑⓒⓓ	**30.** ⓐⓑⓒⓓ	**31.** ⓐⓑⓒⓓ	**32.** ⓐⓑⓒⓓ
	33. ⓐⓑⓒⓓ	**34.** ⓐⓑⓒⓓ	**35.** ⓐⓑⓒⓓ		

Space for Rough Work

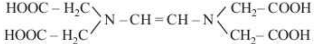
36. Match the columns.

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

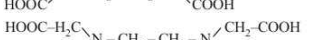
(a) A – VI; B – IV; C – I; D – II; E – III
(b) A – II; B – IV; C – I; D – VI; E – III
(c) A – II; B – IV; C – I; D – VI; E – V
(d) A – VI; B – IV; C – I; D – II; E – V

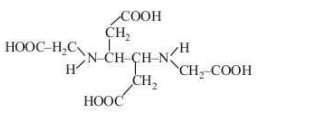
37. If magnetic moment of $[MnBr_4]^{2-}$ is 5.9 BM. Predict the number of electrons?
(a) 2 (b) 3 (c) 6 (d) 5

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

(a) 

(b) 

(c) 

(d) 

39. The hypothetical complex chloro-diaquatriamminecobalt (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				
36. ⓐⓑⓒⓓ	**37.** ⓐⓑⓒⓓ	**38.** ⓐⓑⓒⓓ	**39.** ⓐⓑⓒⓓ	**40.** ⓐⓑⓒⓓ
41. ⓐⓑⓒⓓ	**42.** ⓐⓑⓒⓓ	**43.** ⓐⓑⓒⓓ	**44.** ⓐⓑⓒⓓ	**45.** ⓐⓑⓒⓓ

CHEMISTRY CHAPTERWISE SPEED TEST-51			
Total Questions	45	Total Marks	180
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	39	Qualifying Score	64
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

Space for Rough Work