ULTIMATE KCET CRASH COURSE 2026

CHEMISTRY

DPP: 1

Coordination compounds

Q1 The coordination number of element E in the complex $[E(en)_2(C_2O_4)]NO_2$ is

(A) 6 (B) 5

(C) 4 (D) 3

Q2 Due to the presence of ambidentate ligands coordination compounds show isomerism. Palladium complexes of the type $[Pd(C_6H_5)_2(SCN)_2]$ and $[Pd(C_6H_5)_2(NCS)_2]$ are

(A) linkage isomers

(B) coordination isomers

(C) ionisation isomers

(D) geometrical isomers

Q3 Among the following complexes, which one has a magnetic moment of 5.9 BM ?

$Ni(CO)_4$, $[Fe(H_2O)_6]^{2+}$, $[Co(NH_3)_6]^{3+}$, $[MnBr_4]^{2-}$

(A) $Ni(CO)_4$

(B) $[Fe(H_2O)_6]^{2+}$

(C) $[Co(NH_3)_6]^{3+}$

(D) $[MnBr_4]^{2-}$

Q4 Which one of the following complexes is not expected to exhibit isomerism ?

(A) $[Ni(en)_3]^{2+}$

(B) $[Ni(NH_3)_4(H_2O)_2]^{2+}$

(C) $[Pt(NH_3)_2Cl_2]$

(D) $[Ni(NH_3)_2Cl_2]$

Q5 Indicate the complex ion which shows geometrical isomerism.

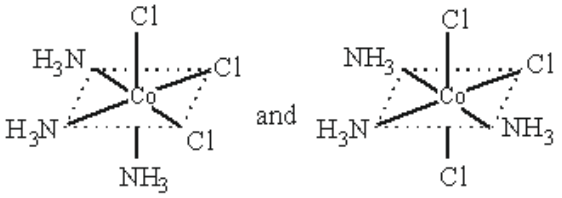
(A) $[Cr(H_2O)_4Cl_2]^+$

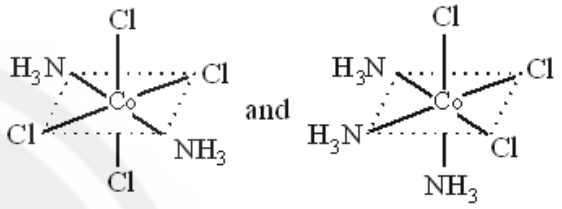
(B) $[Pt(NH_3)_3Cl]$

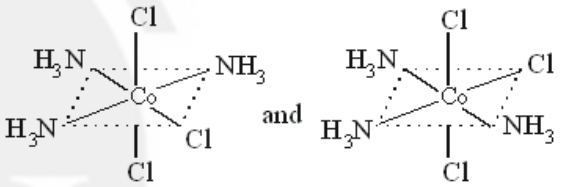
(C) $[Co(NH_3)_6]^{3+}$

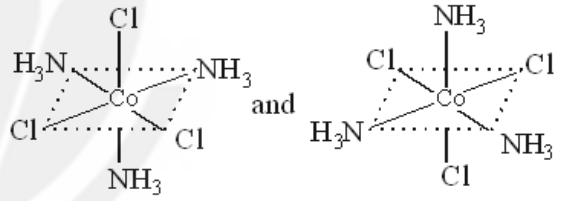
(D) $[Co(CN)_5(NC)]^{3-}$

Q6 Which of the following pairs of structures represent facial and meridional isomers (geometrical isomers) respectively?

(A) 

(B) 

(C) 

(D) 

Q7 Which of the following option is having maximum number of unpaired electrons –

(A) A tetrahedral d6 ion

(B) $[Co(NH_3)_6]^{3+}$

(C) A square planar d^7 ion

(D) A co-ordination compound with magnetic moment of 5.92 B.M.

Q8 Which of the following is the most likely structure of $CrCl_3.6H_2O$, if $\frac{2}{3}$ of total chlorine of the compound is precipitated by adding $AgNO_3$ to its aqueous solution ?

(A) $CrCl_3 \cdot 6H_2O$

(B) $[Cr(H_2O)_3Cl_3](H_2O)_3$

(C) $[CrCl_2(H_2O)_4]Cl.2H_2O$

(D) $[CrCl(H_2O)_5]Cl_2\ H_2O$

Q9 The hybridization involved in the complex $[Ni(CN)_4]^{2-}$ is

(At. No. of Ni = 28)

(A) d^2sp^2 (B) d^2sp^3

(C) dsp^2 (D) sp^3

Q10 According to CFT, Δ_o is called

(A) Pairing energy

(B) Crystal field excitation energy

(C) Crystal field splitting energy

(D) Resonance energy

Q11 The crystal field stabilization energy for high spin d^4 octahedral complex is

(A) – 1.8 Δ_0

(B) – 1.6 Δ_0 + P

(C) – 1.2 Δ_0

(D) – 0.6 Δ_0

Q12 Which of the following molecules is not tetrahedral?

(A) $[Pt(en)_2]^{2+}$

(B) $[Ni(CO)_4]$

(C) $[Zn(NH_3)_4]^{2+}$

(D) $[NiCl_4]^{2-}$

Q13 Hybridisation of $[Ni(NH_3)_6]^{2+}$ and $[Zn(NH_3)_6]^{2+}$ are

(A) Both d^2sp^3

(B) Both sp^3d^2

(C) d^2sp^3 and sp^3d^2 respectively

(D) sp^3d^2 and d^2sp^3 respectively

Q14 Which of the following complex ions is not expected to absorb visible light?

(A) $[Ni(CN)_4]^{2-}$

(B) $[Cr(NH_3)_6]^{3+}$

(C) $[Fe(H_2O)_6]^{2+}$

(D) $[Ni(H_2O)_6]^{2+}$

Q15 Low spin tetrahedral complexes are not formed because

(A) for tetrahedral complexes, the CFSE is lower than pairing energy

(B) for tetrahedral complexes, the CFSE is higher than pairing energy

(C) electrons do not go to e complexes e_g in case of tetrahedral

(D) tetrahedral complexes are formed by weak field ligands only

Q16 Correct increasing ordet for the wavelengths of absorption in the visible region for the complexes of Co^{3+} is

(A) $[Co(en)_3]^{3+}, [Co(NH_3)_6]^{3+}, [Co(H_2O)_6]^{3+}$

(B) $[Co(H_2O)_6]^{3+}, [Co(en)_3]^{3+}, [Co(NH_3)_6]^{3+}$

(C) $[Co(H_2O)_6]^{3+}, [Co(NH_3)_6]^{3+}, [Co(en)_3]^{3+}$

(D) $[Co(NH_3)_6]^{3+}, [Co(en)_3]^{3+}, [Co(H_2O)_6]^{3+}$

Q17 According to the postulates of Werner's theory of coordination compounds

(A) primary valency is ionisable

(B) secondary valency is ionisable

(C) primary and secondary valencies both are non-ionisable

(D) only primary valency is non-ionisable.

Q18 What are the correct oxidation state, coordination number, configuration, magnetic character and magnetic moment of $K_4[Mn(CN)_6]$?

(A) +6 6 t_{2g}^5 Diamagnetic 0

(B) +4 6 $t_{2g}^4 e_g^1$ Paramagnetic 1.732 B.M.

(C) +2 6 $t_{2\ g}^5$ Paramagnetic 1.732 B.M.

(D) +4 6 $t_{2g}^3 e_g^2$ Diamagnetic 0

Q19 Given the molecular formula of the hexacoordinate complexes

(A) $CoCl_3.6NH_3$

(B) $CoCl_3.5NH_3$

(C) $CoCl_3.4NH_3$

If the number of coordinated NH_3 molecules in A, B and C respectively are 6, 5 and 4, the primary valency in (A), (B) and (C) are

(A) 3, 3, 3 (B) 0, 1, 2

(C) 3, 2, 1 (D) 6, 5, 4

Q20 A transition metal ion exists in its highest oxidation state. It is expected to behave as :

(A) A chelating agent

(B) A central metal in a coordination compound

(C) An oxidising agent

(D) A reducing agent

Q21 Which of the following statement is false?

(A) Complex of Pt(+II) and Au(+III) are square planar - including with weak field ligands such as halide ions.

(B) In the tetrahedral complex, the t_{2g} orbitals are nearer to the direction of the ligands.

(C) For d^0, d^5 and d^{10} arrangements the CFSE is zero in both octahedral and tetrahedral complexes with weak field ligands.

(D) None of these

Q22 Match the complex species given in Column - I with the isomerism exhibited in Column-II and assign the correct code:

Column – I (Complex species)		Column – II (Isomerism)	
(A)	$[Co(NH_3)_4Cl_2]^+$	(i)	Optical
(B)	cis $-[Co(en)_2Cl_2]^+$	(ii)	Ionisation
(C)	$[Co(NH_3)_5(NO_2)]Cl_2$	(iii)	Coordination
(D)	$[Co(NH_3)_6]$ $[Cr(CN)_6]$	(iv)	Geometrical

(A) A - (iv), B - (i), C - (ii), D - (iii)

(B) A - (i), B - (iii), C - (ii), D - (iv)

(C) A - (ii), B - (iv), C - (i), D - (iii)

(D) A - (i), B - (iii), C - (iv), D - (ii)

Q23 Match the metal ions given in Column I with the spin magnetic moments of the ions given in Column II and assign the correct code

Column 1		Column II	
(A)	Co^{3+}	(i)	√8 BM
(B)	Cr^{3+}	(ii)	√35 BM
(C)	Fe^{3+}	(iii)	√3 BM
(D)	Ni^{2+}	(iv)	√24 BM
		(v)	√15 BM

(A) A B C D iv v ii i
(B) iii v i ii
(C) i ii iii iv
(D) Iv i ii iii

Q24 Which of the following complexes formed by Cu^{2+} ions is most stable ?

(A) $Cu^{2+} + 4NH_3 \rightleftharpoons [Cu(NH_3)_4]^{2+}, \quad \log K = 11.6$

(B) $Cu^{2+} + 4CN^- \rightleftharpoons [Cu(CN)_4]^{2-}, \quad \log K = 27.3$

(C) $Cu^{2+} + 2en \rightleftharpoons [Cu\,(en)_2]^{2+}, \quad \log K = 15.4$

(D) $Cu^{2+} + 4H_2O \rightleftharpoons [Cu(H_2O)_4]^{2+}, \quad \log K = 8.9$

Q25 The coordination number of Fe in $[Fe(CN)_6]^{4-}$ $[Fe(CN)]^{3-}$ and $[FeCl_4]^-$ are respectively.

(A) 2, 3, 3 (B) 6, 6, 4
(C) 6, 3, 3 (D) 6, 4, 6

Answer Key

Q1	A
Q2	A
Q3	D
Q4	D
Q5	A
Q6	A
Q7	D
Q8	D
Q9	C
Q10	C
Q11	D
Q12	A
Q13	B
Q14	A
Q15	A
Q16	D
Q17	A
Q18	C
Q19	A
Q20	C
Q21	D
Q22	A
Q23	A
Q24	B
Q25	B

Hints & Solutions

Note: scan the QR code to watch video solution

Q1 Text Solution:

In the given complex, $\left[E(en)_2(C_2O_4)\right]NO_2$, ethylenediamine is a bidentate ligand and $C_2O_4^{2-}$, is also bidentate ligand. Therefore, coordination number of the complex is 6 i.e., it is an octahedral complex.

Video Solution:

Q2 Text Solution:

linkage isomers

Video Solution:

Q3 Text Solution:

$\mu = \sqrt{n(n+2)}$

In $[MnBr_4]^{2-}$ oxidation state of Mn = 2

$\therefore Mn^{2+}$

$\rightarrow 1s^2 2s^2 2p^6 3s^2 3p^6 3d^5$ unpaired electrons

$\therefore \mu = \sqrt{5(5+2)} = \sqrt{35} = 5.9 \text{ B.M.}$

Video Solution:

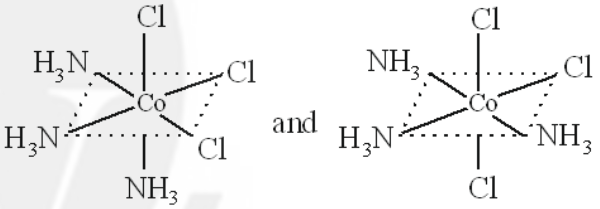
Q4 Video Solution:

Q5 Text Solution:

$[Cr(H_2O)_4Cl_2]^+$

Video Solution:

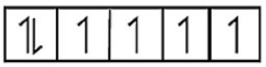
Q6 Text Solution:



Video Solution:

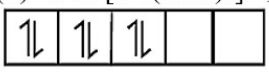
Q7 Text Solution:

(a) For tetrahedral d^6 ion,

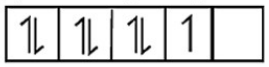


4 unpaired electrons

(b) For $[Co(NH_3)_6]^{3+}$,



(c) For square planar d^7 ion,



1 unpaired electrons

(d) $B.M = \sqrt{n(n+s)}$

n=5 unpaired electrons

Video Solution:

Q8 Text Solution:

$[CrCl(H_2O)_5]Cl_2\ H_2O$

Video Solution:

Q9 Text Solution:

dsp^2

Video Solution:

Q10 Text Solution:

$\Delta_o = C.F.S.E$

Video Solution:

Q11 Text Solution:

d^4 high spin

 eg

 t2g

$CFSE = -0.4(X) + 0.6(Y)\ \Delta_0$

where x = no of electrons in t2g orbital and Y=no of electrons in eg orbital

$CFSE = -0.4(3) + 0.6(1)\ \Delta_0 = -1.2 + 0.6 = -0.6\Delta_0$

Video Solution:

Q12 Text Solution:

$[Pt(en)_2]^{2+}$ is square planar

Video Solution:

Q13 Text Solution:

NH_3 act as weak field ligand with Ni and Zn. Coordination number of both complexes are 6, so both have sp^3d^2.

Video Solution:

Q14 Text Solution:

A transition metal complex absorbs visible light only if it has unpaired electrons.

Video Solution:

Q15 Text Solution:

Crystal field stabilisation energy for tetrahedral complexes is less than pairing energy hence they do not pair up to form low spin complexes.

Video Solution:

Q16 Video Solution:

Q17 Text Solution:

According to Werner theory, primary valencies are ionisable and secondary valencies are non-ionisable

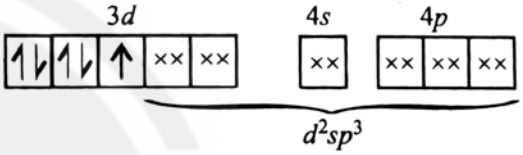
Video Solution:

Q18 Text Solution:

O.S. = + 2, C.N. = 6, configuration= t_{2g}^5

$Mn^{2+} = 4s^0, 3d^5$

$[Mn(CN)_6]^{4-}$:



It has one unpaired electron and hence it is paramagnetic in nature.

$\mu = \sqrt{1(1+2)} = \sqrt{3} = 1.732 \text{ B.M.}$

Video Solution:

Q19 Text Solution:

Co has six coordination number hence formulae for Compound A, B and C should be

(A) $[Co(NH_3)_6]Cl_3$; Primary valency i.e., oxidation state = +3

(B) $[CoCl(NH_3)_3]Cl_2$; Primary valency i.e., oxidation state = +3

(C) $[CoCl_2(NH_3)_4]Cl$; Primary valency, i.e., oxidation state = +3

Video Solution:

Q20 Text Solution:

A transition metal ion exists in its highest oxidation state. It is expected to behave as an oxidizing agent.

Video Solution:

Q21 Text Solution:

None of these

Video Solution:

Q22 Text Solution:

A - (iv), B - (i), C - (ii), D - (iii)

Video Solution:

Q23 Video Solution:

Q24 Text Solution:

Higher value of K = higher stability of product

Video Solution:

Q25 Text Solution:

The number of ligands attached to the central metal ion is called the coordination number.

So, coordination numbers of Fe in $\left[Fe(CN)_6\right]^{4-}$ $[Fe(CN)]^{3-}$ and $[FeCl_4]^-$ are 6, 6 and 4 respectively.

Video Solution: