G Ordinary Thinking Objective Questions

Basic Terms

1. In $K_4 Fe(CN)_6$

7.

	(a) (CN) are linked with pr	imary valency
	(b) (CN) are linked with see	condary valency
	(c) K are linked with secon	dary valency
	(d) K are linked with non-i	onic valency
2.	The co-ordination number	of copper in cuprammonium
	sulphate is	[KCET 1991, 92]
	(a) 2	(b) 6
	(c) 4	(d) – 4
3.	Which of the following a	cts as a bidentate ligand in
	complex formation	
	(a) Acetate	(b) Oxalate
	(c) Thiocyanate	(d) EDTA
4.	The co-ordination numbe	r of cobalt in the complex
	$[Co(en)_2 Br_2]Cl_2$ is	
	(a) 2	(b) 6
	(c) 5	(d) 4
5.	Which of the following ligan	ds forms a chelate
		[MP PET/PMT 1998]
	(a) Acetate	(b) Oxalate
	(c) Cyanide	(d) Ammonia
6.	According to Werner's theor	'Y
		[MP PMT 2000, 02]
	(a) Primary valency can be	ionized
	(b) Secondary valency can	be ionized

- (c) Primary and secondary valencies both cannot be ionized
- (d) Only primary valency cannot be ionized
- Which of the following is not true for ligand-metal complex

[MP PET 1993]

- (a) Larger the ligand, the more stable is the metal-ligand bond
- (b) Highly charged ligand forms strong bond
- (c) Larger the permanent dipole moment of ligand, the more stable is the bond
- (d) Greater the ionization potential of central metal, the stronger is the bond
- 8. What is the co-ordination number of the metal in $[Co(en)_2 Cl_2]^+$

	(a) 4 ((c) 6 (b) 5 d) 3
9.	Bidentate ligand is	
	(a) CN^{-} (b) Ethylene diammine (en)
	(c) SCN^{-}	d) EDTA
10	The accordination number of	p_{i} in $\left[p_{i}(NH)\right] \subset I^{++}$ ion
10.		$Pt \text{ III } \left[Pt(NH_3)_4 Ct_2 \right] \text{IOII}$
	18	[MD DET 100=]
	(a) 2	b) 4
	(c) 6	(d) 8
11.	Which is the example of hexa	lentate ligand
	(a) 2, 2—dipyridyl	-
	(b) Dimethyl glyoxime	
	(c) Aminodiacetate ion	
	(d) Ethylene diammine tetra	acetate ion [EDTA]
12.	The coordination number of approximation number of app	of a metal in coordination
	(a) Same as primary valency	5; KCE1 (Engg./Med.) 1999]
	(b) Sum of primary and second	ndary valencies
	(c) Same as secondary valence	cy
	(d) None of these	
13.	Ligand in a complex salt are	[KCET 1992]
	(a) Anions linked by coordin atom or ion	ate bonds to a central metal
	(b) Cations linked by coordination	nate bonds to a central metal
	(c) Molecules linked by coo	ordinate bonds to a central
	(d) Ions or molecules linked	l by coordinate bonds to a
	central metal atom or ion	-
14.	A group of atoms can function	as a ligand only when
	[KCEI 1989 (a) It is a small molecule	; DCE 1999; MP PMT 2000]
	(b) It has an unshared electro	on pair
	(c) It is a negatively charged	ion
	(d) It is a positively charged i	on
15.	Which of the following comp	lexes show six coordination
	number	[RPET 2000]
	(a) $[Zn(CN)_4]^{2-}$ (b) $[Cr(H_2O)_6]^{3+}$
	(c) $[Cu(CN)_4]^{2-}$ ((d) $[Ni(NH_3)_4]^{2+}$
16.	The number of ions form sulphate is dissolved in water	is [KCET 1993]
	(a) 1 (b) 2
	(c) 4 (d) Zero
17.	The coordination numbe $[Cu(H_2O)_4]^{++}$ is	r of <i>Cu</i> in complex
	(a) 4 (b) 3
	(c) 2 ((d) 1
18.	The primary valence of the m	etal ion in the co-ordination
	compound $K_2[Ni(CN)_4]$ is	
	(a) Four	b) Zero
	(c) Two (d) Six
19.	The metal which does not form	n a polynuclear carbonyl is
	(a) <i>Mn</i> (b) Co
	(c) <i>Cr</i> ((d) Fe

20.	Which one of the following forms with an excess of CN^-
	(Cyanide) a complex having coordination number two

[AIIMS 2004]

(c)	Ni ²⁺			(d)	$Fe^{2\pi}$	
	2.				2	
(a)	Cu^+			(b)	Ag^+	

- 21. According to Lewis the ligands are [MP PMT 2002](a) Acidic in nature
 - (b) Basic in nature
 - (c) Neither acidic nor basic
 - (d) Some are acidic and others are basic
- **22.** The coordination number of a central metal atom in a complex is determined by [AIEEE 2004]
 - (a) The number of ligands around a metal ion bonded by sigma and pi-bonds both.
 - (b) The number around a metal ion bonded by pi-bonds
 - (c) The number of ligands around a metal ion bonded by sigma bonds
 - (d) The number of only anionic ligands bonded to the metal ion
- In the extraction of which of the following, complex ion forms [MP PET 1989]

(a)	Си	(b)	Ag	

- (c) *Fe* (d) *Na* Potassium ferrocyanide is a
- 24.Potassium ferrocyanide is a
(a) Normal salt
(c) Double salt[AFMC 2000](a) Normal salt
(b) Mixed salt
(d) Complex salt
- (c) Double salt25. A monodentate ligand has
 - (a) One co-ordinate site
 - (b) Two co-ordinate sites
 - (c) Any number of co-ordinate sites
 - (d) No capacity to co-ordinate
- 26. EDTA has coordination number
 [AFMC 2004]

 (a) 3
 (b) 4

 (c) 5
 (d) 6
- **27.** Among the properties (a) reducing (b) oxidising (c) complexing, the set of properties shown by CN^- ion towards metal species is [AIEEE 2004]
 - (a) c, a (b) b, c (c) a, b (d) a, b, c
- **28.** That ion or molecule which forms a complex compound with transitional metal ion is called
 - (a) Recipient (b) Ligand
 - (c) Coordinate ion (d) No special name

29. Coordination number of *Zn* in *ZnS* (zinc blende) is

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[Orissa JEE 2004]
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 $\begin{bmatrix} (a) & 6 \\ (b) & 4 \\ (c) & 8 \end{bmatrix}$ (b) 4 (d) 12

- **30.** Wilkinson's catalyst used as a homogeneous catalyst in the hydrogenation of alkenes contains
 - (a) Iron (b) Aluminium
 - (c) Rhodium (d) Cobalt
- Given the molecular formula of the hexa coordinated complexes (A) CoCl₃.6NH₃ (B) CoCl₃.5NH₃ (C) CoCl₃.4NH₃. If the number of co-ordinated NH₃ molecules in A, B and C respectively are 6, 5 and 4, the primary valency in (A), (B) and (C) are: [DCE 2003] (a) 6, 5, 4 (b) 3, 2, 1

	(c) 0, 1, 2 (d) 3, 3, 3
32.	Generally, a group of atoms can function as a ligand if
	[MP PET 1996]
	(a) They are positively charged ions (b) They are free radicals
	(c) They are either neutral molecules or negatively
	charged ions
	(d) None of these
33.	The ligand in potassium ferricyanide is
	(a) K^+ (b) CN^-
	(c) Fe^{3+} (d) $(CN)_6$
34 .	Co-ordination number of aluminum is [MHCET 2004]
	(a) 8 (b) 6
	(c) 12 (d) 4 In $K E_1(CM)$ Existing the form of
35.	In $K_4 Fe(CN)_6$, Fe is in the form of
	(a) An atom (b) An ion (c) Cationic complex (d) Anionic complex
36.	Which of the following ligands is expected to bidentate
30.	[CBSE PMT 1994]
	(a) Br (b) $C_2 O_4^{2-}$
	(c) $CH_2 NH_2$ (d) $CH_2 C \equiv N$
97	In the compound lithium tetrahydroaluminate the ligand
3/•	is
	[AIIMS 1997]
	(a) H^+ (b) H^-
_	(c) <i>H</i> (d) None of these
38.	Which of the following is the odd one out [MP PET 1996]
	(a) Potassium ierrocyanide (b) Ferrous ammonium sulphate
	(c) Potassium ferricvanide
	(d) Tetrammine copper (II) sulphate
39.	The basic ligand is
	(a) NH_3 (b) CN^-
	(c) F^- (d) All
40.	The negative ligand is
•	(a) Aqua (b) Sulphato
	(c) Carboxyl (d) Nitro sodium
41.	Which has yellow colour
	(a) Potassium cobaltinitrite (b) Potassium hovanitra aphaltata (III)
	(c) Fischer's salt
	(d) All the above
42.	Ligands, in complex compounds [MP PMT 2003]
	(a) Accept e^- -pair
	(b) Donate e^- -pair
	(c) Neither accept e^{-} -pair nor donate
	(d) All of these happen
43 .	Which of the following is a common donor atom in
	ligands
	[BHU 2001]
	(c) Oxygen (d) Roth (h) and (c)
44.	Trunbull's blue is a compound
	L -

[KCET 1993](a) Ferricyanide(b) Ferrous ferricyanide

	(c) Ferrous cyanide	(d)	Ferriferrocyanide
45 .	Tollen's reagent is		[KCET 1990]
	(a) $[Ag(NH_3)_2]^+$	(b)	Ag_2O
	(c) $[Cu(OH)_{4}]^{2-}$	(d)	Cu_2O
46.	Finely divided iron combine	s witl	n <i>CO</i> to give
•			[UPSEAT 2002]
	(a) $Fe(CO)_5$	(b)	$Fe_2(CO)_9$
	(c) $Fe_2(CO)_{12}$	(d)	$Fe(CO)_6$
47.	In a complex, the highest po	ssible	e coordination number is
	(a) 6	(b)	12
	(c) 4	(d)	8
48.	The number of neutral m	ioleci	iles or negative groups
	attached to the central me	tal at	com in a complex ion is
	(a) Atomic number	ക്ര	Effective atomic number
	(c) Coordination number	(d)	Primary valency
49.	EDTA combines with cation	s to fo	orm
••	(a) Ion-exchange resins	(b)	Chelates
	(c) Clathrates	(d)	Polymers
50.	An example of a double salt	is	[MP PET 2001]
	(a) Bleaching powder	(b)	Нуро
	(c) $K_4[Fe(CN)_6]$	(d)	Potash alum
51.	In complex compounds, me	tal lig	and bond is
	(a) Coordinate bond	(b)	Hydrogen bond
	(c) Ionic bond	(d)	Covalent bond
52	Ammonia forms the com	plex	ion $[Cu(NH_3)_4]^{2+}$ with
5		·	2 ()/43
<u>.</u>	copper ions in alkaline solution. What is the reason	soluti for it	ons but not in acidic [AIEEE 2003]
	copper ions in alkaline solution. What is the reason (a) In acidic solutions hydr	soluti for it ation	ons but not in acidic [AIEEE 2003] protects copper ions
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58.	What is the co-ordi $Co(NH_3)_3Cl_3$	nation number of cobalt [MP PET 19]	in 94]
	(a) 3	(b) 4	
	(c) 5	(d) 6	
59.	The formula of alum is	[Pb. CET 20	02]
	(a) $K_2 SO_4 . Al_2 (SO_4)_3 . 24$	H_2O	
	(b) $K_4[Fe(CN)_6]$		
	(c) $K_2 SO_4 . Al_2 (SO_4)_3 . 6R_4$	H_2O	
	(d) $Na_2CO_3.10H_2O$		
60.	Number of ions present	in $K_4[Fe(CN)_6]$ [Pb. CET 20	00]
	(a) 2	(b) 10	
	(c) 3	(d) 5	
61.	CH_3MgI is an organome	etallic compound due to	
		[DCE 20	02]
	(a) $Mg-I$ bond	(b) $C-I$ bond	
	(c) $C - Mg$ bond	(d) $C - H$ bond	
62.	What is the EAN of nicke	el in $Ni(CO)_4$ [BVP 20]	03]
	(a) 34	(b) 35	
	(c) <u>32</u>	(d) 36	

Nomenclature, Oxidation state and EAN number

1.	How many ions	are	produced	in	aqueous	solution	of
	$[Co(H_2O)_6]Cl_2$				[]	RPMT 200)2]
	(a) 2		(b)	3			
	(c) 4		(d)	6			

IUPAC name of $[Pt(NH_3)_3(Br)(NO_2)Cl]Cl$ is 2.

[CBSE PMT 1998]

[CBSE PMT 1997]

- (a) Triamminechlorobromonitroplatinum (IV) chloride
- (b) Triamminebromonitrochloroplatinum (IV) chloride
- (c) Triamminebromochloronitroplatinum (IV) chloride
- (d) Triamminenitrochlorobromoplatinum (IV) chloride

3. Oxidation state of nitrogen is incorrectly given for

		[UPSEAT 20	00, 01]
Сот	mpound	Oxidation state	
(a)	$[Co(NH_3)_5 Cl]Cl_2$	0	
(b)	NH ₂ OH	-1	
(c)	$(N_2H_5)_2SO_4$	+2	
(d)	Mg_3N_2	-3	
The	formula of diablana h	ia (umaa) aannam (II) ia	

- The formula of dichloro bis (urea) copper (II) is 4.
 - (a) $[Cu\{O = C(NH_2)_2\}Cl_2]$
 - (b) $[CuCl_2 \{ O = C(NH_2)_2 \}_2]$
 - (c) $\left[Cu\{O = C(NH_2)_2\}Cl\right]Cl$
 - (d) $[CuCl_2]{O = C(NH_2)_2H_2}$
- The IUPAC name of the complex $\left[Pt(NH_3), Cl_2\right]$ is 5.
 - (a) Platinum (II) diammino dichloride

(c) Bis (ammino) dichloro platinum (IV) (d) Dichloro diammine platinum (II) Correct formula of diammine silver (I) chloride is 6. (a) $Ag(NH_3)Cl$ (b) $Ag(NH_2)Cl$ (c) $\left[Ag(NH_3)_2\right]Cl$ (d) $\left[Ag(NH_2)_2\right]Cl$ The formula of sodium nitroprusside is [AIIMS 1992] (a) $Na_4[Fe(CN)_5 NOS]$ (b) $Na_2[Fe(CN)_5 NO]$ (c) $NaFe[Fe(CN)_{\epsilon}]$ (d) $Na_2[Fe(CN)_6 NO_2]$ The correct name of $[Pt(NH_3)_4 Cl_2][PtCl_4]$ is 8. [MP PET 2003] (a) Tetraammine dichloro platinum (iv) tetrachloro platinate (ii) (b) Dichloro tetra ammine platinium (iv) tetrachloro platinate (ii) (c) Tetrachloro platinum (ii) tetraammine platinate (iv) (d) Tetrachloro platinum (ii) dichloro tetraammine platinate (iv) Correct formula of potassium ferrocyanide is [CBSE PMT 1988] (a) $K_4 \left[Fe(CN)_6 \right]$ (b) $K_2[Fe(CN)_6]H_2O$ (c) $K_3[Fe(CN)_6]$ (d) None of these The IUPAC name of $[Co(NH_3)_3(NO_2)_3]$ is 10. (a) Trinitrotriammine cobalt (III) (b) Trinitrotriammine cobalt (II)

(b) Diammino dichloro platinate (IV)

7.

9.

11.

- (c) Trinitrotriammine cobalt (III) ion
- (d) Trinitritriammine cobaltate (III)
- In $K_4[Fe(CN)_6]$, the E.A.N. of Fe is
- (a) 33
- Which of the following pairs is not correctly matched 12. [MP PET 1993]
 - (a) Effective atomic number of Pt in $[PtCl_6]^{2-} = 84$
 - (b) Absorption peak for $\left[Cr^{III}(NH_3)_6\right]^{+3} = 21680 cm^{-1}$
 - (c) Crystal field stabilization energy of d^2 in weak ligand field = $(-)0.8\Delta_0$
 - (d) Example of weak ligand field for d^5 configuration $= \left[M n^{II} F_{\epsilon} \right]^{-4}$
- The oxidation number of chromium in sodium tetrafluoro 13. oxochromate complex is
 - (b) IV (a) II
 - (c) VI (d) III
- The IUPAC name of $K_4[Fe(CN)_6]$ is 14.

[CBSE PMT 1990; MP PET 1992;

- MP PMT 1995, 97; Kurukshetra CET 2002]
- (a) Potassium hexacyanoferrate (II)
- (b) Potassium ferrocyanide
- (c) Tetrapotassium hexacyanoferrate (II)
- (d) Tetrapotassium ferroushexacyanide (II)

- (c) 36 (d) 26
- [DCE 2000]
- (b) 35

15.	The IUPAC name of [Ni(CO)	4] is	[RPET 1999]
	(a) Tetra carbonyl nickel (II)	
	(b) Tetra carbonyl nickel (0))	
	(c) Tetra carbonyl nickelate	(II)	
	(d) Tetra carbonyl nickelate	(0)	
16.	The correct nomenclature for	$Fe_4[Fe(CN)]$	$[5]_3$ is
			[MP PMT 1994]
	(a) Ferroso-ferric cyanide		
	(b) Ferric-ferrous hexacyan	ate	
	(c) Iron (III) hexacyanoferr	ate (II)	
	(d) Hexacynoferrate (III-II)		
17.	The IUPAC name of compou	nd $Na_3[Co(O_1)]$	NO_{6} will be
		ſ	MP PMT 2000]
	(a) Hexanitritocobalt (III) s	odium	-
	(b) Sodium cobalt nitrite		
	(c) Sodium hexanitrocobalt	ate (III)	
	(d) Sodium hexanitritocoba	ltate (III)	
18.	In which of the following of	complexes oxi	dation state of
	metal is zero		[MP PET 1997]
	(a) $[Pt(NH_3)_2 Cl_2]$	(b) $[Cr(CO)_6]$	J
	(c) $[Cr(NH_3)_3 Cl_3]$	(d) $[Cr(en)_2]$	Cl_2]
19.	The oxidation number of Cr	in $[Cr(NH_3)_6]$	Cl_3 is
		[C]	BSE PMT 2001]
	(a) 8	(b) 6	-
	(c) 4	(d) 3	
20.	In $[Ni(NH_3)_4]$ SO ₄ , the E.A.	N. of Ni is	
	(a) 34	(b) 35	
	(c) 36	(d) 37	
21.	IUPAC name of [Co(ONO)(N	$(H_3)_5 Cl_2$ is	
		5.5 2	[AMU 2002]
	(a) Pentaammine nitro coba	lt (III) chlorid	le
	(b) Pentaammine nitrito col	oalt (III) chlor	ide
	(c) Pentaammine nitroso co	balt (III) chlo	ride
	(d) Pentaammine oxo-nitro	cobalt (III) ch	loride
22.	The oxidation number of <i>Pt</i>	in $[Pt(C_2H_4)]$	Cl ₃] [−] is
			[MNR 1993]
	(a) $+1$	(b) + 2	
	(c) + 3	(d) + 4	
23.	The oxidation state of coba	lt in the com	plex compound
	$[Co(NH_3)_6]Cl_3$ is		
	(a) $+3$	(b) + 6	
	(c) $+5$	(d) + 2	no oblovido io
24.	(a) Potassium copper (I) tet	potassium cup rachloride	rocmoride is
	(b) Potassium tetrachlorocu	prate (I)	
	(c) Tetrachloropotassium cu	iprate (I)	
	(d) Tetrachlorocopper (I) po	otassiate	
25.	The effective atomic numb	er of cobalt i	in the complex
	$[Co(NH_3)_6]^{3+}$ is		[MP PET 2003]
	(a) 36	(b) 33	
	(c) 24	(d) 30	
26.	IUPAC name of $K_3 Fe(CN)_6$	is	

Г 1999]		[MP PMT 1993; MP PET 1997]
		(a) Potassium ferrocyanide (II)
		(b) Potassium hexaferrocyanate (III)
		(c) Potassium ferrohexacyanate (II)
		(d) Potassium hexacyanoferrate (III)
	27.	The EAN of iron in potassium ferricyanide is
		[Pb. CET 2000]
Г 1994]		(a) 18 (b) 54
	- 0	(c) 35 (d) 23
	28.	In the coordination compound, $K_4[Ni(CN)_4]$ oxidation
		state of nickel is [AIEEE 2003]
		(a) -1 (b) o
ill be		(c) $+1$ (d) $+2$
2000]	29.	According to IUPAC nomenclature sodium nitroprussied
2000]		(a) Sodium pontaguanonitrosul formato (III)
		(a) Sodium pentacyanomitosyi terrate (111) (b) Sodium nitroferrievanide
		(c) Sodium nitroferrocyanide
		(d) Sodium pentacyanonitrosyl ferrate (II)
tata of	30.	Pick out the complex compound in which the central
Γ 1997]	0	metal atom obeys EAN rule strictly [KCET 2003]
/ / /]		(a) $K_4[Fe(CN)_6]$ (b) $K_3[Fe(CN)_6]$
		(c) $[Cr(H_2O)_c]Cl_2$ (d) $[Cu(NH_2)_b]SO_b$
	91	Which of the following is wrong statement [BHI 2002]
	31.	(a) $Ni(CO)$, has oxidation number + 4 for Ni
[²⁰⁰¹]		(b) $N_{i}^{i}(CQ)$ has zero ovidation number for N_{i}^{i}
		(b) $M(CO)_4$ has zero oxidation number for M
		(d) CO is gas
	99	(u) CO is gas Ovidation state of Eq in $K [E_d(CN)]$ [PPMT 2002]
	32.	$\begin{bmatrix} \mathbf{K} & \mathbf{M} & \mathbf{Z} & \mathbf{U} \\ \mathbf{K} & \mathbf{K} & \mathbf{K} \\ \mathbf{K} \\ \mathbf{K} & \mathbf{K} \\ \mathbf{K} \\ \mathbf{K} & \mathbf{K} \\ \mathbf{K} $
		$ \begin{array}{c} (a) & 2 \\ (b) & 3 \\ (c) & c \\ (c) & c \\ (d) & None of these \\ (d) & None (d) \\ (d) & None \\ (d) & None (d) \\ (d) & None (d) $
	99	Which complexes have zero oxidation state
1	55.	(a) Carbonyl (b) Ferrocyanide
2002]		(c) Amine (d) Cvanide
	34.	The proper name for $K_2[PtCl]_6$ is [MH CET 2002]
	01	(a) Potassium platinum hexachloride
		(b) Potassium hexachloro platinum IV
		(c) Potassium hexachloro platinate IV
		(d) Potassium hexachloro platinum
R 1993]	35.	IUPAC name of $K_3[Al(C_2O_4)_3]$ is called
		[MP PMT 1993, 02, 03]
		(a) Potassium alumino oxalato
npound		(b) Potassium aluminium (III) trioxalate
		(c) Potassium trioxalato aluminate (III)
		(d) Potassium trioxalato aluminate (IV)
. .	36.	The I.U.P.A.C. name of $K_3[Ir(C_2O_4)_3]$ is
1e 1s		[MP PMT 2001]
		(a) Potassium tri oxalato iridium (III)
		(b) Potassium tri oxalato iridate (III)
		(c) Potassium tris (oxalato) iridium (III)
omplex		(d) Potassium tris (oxalato) iridate (III)
2003]	37.	The charge on $[Ag(CN)_2]^-$ complex is [AIIMS 2001]
01		
	0/1	(a) -1 (b) $+1$

(a) -1 (b) +1(c) +2 (d) +3

- 38. The IUPAC name of $[Co(NH_3)_6]Cl_3$ is [IIT-JEE 1994]
 - (a) Hexammine cobalt (III) chloride
 - (b) Hexammine cobalt (II) chloride
 - (c) Triammine cobalt (III) trichloride
 - (d) None of these
- IUPAC name of $[C_0(NH_3)_2(H_2O)_2Cl]$ Cl₂ is 39.

[MP PET 1994]

- (a) Diaguachlorodiammine cobalt (III) chloride
- (b) Triamminediaquachloro cobalt (III) chloride
- (c) Chlorodiamminediaqua cobalt (III) chloride
- (d) Diamminediaquachloro cobalt (II) chloride
- Dichloro diammine platinum (II) complex has the 40. formula

[MP PMT 1997]

(a)
$$Pt[Cl_2(NH_3)_2]$$
 (b) $Pt[R.(NH_2)_2]Cl_2$

(c) $[PtCl_2(NH_3)_2]$ (d) $[Pt.R.(NH_2)_2]Cl_2$

41. The formula of potassiumdicyano bis (oxalato) nickelate (II) is ٦

(a)
$$K_4[Ni(CN)_2(Ox)_2]$$
 (b) $K_3[Ni_2[Ni_2(CN)_2(Ox)_2]]$
(c) $K[Ni(CN)(Ox)_2]$ (d) $K_2[Ni(CN)_2(Ox)_2]$

- The value of x which appears in the complex $[Ni(CN)_4]^x$ is 42.
 - (a) +2(b) -2
 - (c) o (d) 4
- Pick the correct name of $[Co(NH_3)_5 Cl]Cl_2$ [AMU 2001] **43**.
 - (a) Chloropentammine cobalt (III)
 - (b) Pentammine cobalt (III) chloride
 - (c) Chloropentammine cobalt (III) chloride
 - (d) Chloropentammine cobalt (II) chloride
- The valency of cuprammonium ion is 44.
 - (a) + 4 (b) + 2
 - (c) -2(d) - 4
- In which of the following compounds transition metal has 45. zero oxidation state [CBSE PMT 1999]
 - (a) CrO_5 (b) $NH_2.NH_2$
 - (c) $NOClO_4$ (d) $[Fe(CO)_5]$
- The complex chlorocompound diaquatriammine cobalt (III) 46. chloride is represented as [CBSE PMT 2002]
 - (a) $[Co(NH_3)_3(H_2O)_3]Cl_2$
 - (b) $[Co(NH_2)_3 (H_2O)_2]Cl_2$
 - (c) $[CoCl(NH_3)_3 (H_2O)_2]Cl_3$
 - (d) $[CoCl(NH_3)_3 (H_2O)_2]Cl_2$

The complex compound $[C_0(NH_3)_3 NO_2 ClCN]$ is named 47. [MP PMT 1996] as

[UPSEAT 1999, 01]

- (a) Chlorocyanonitrotriammine cobalt (III)
- (b) Nitrochlorocyanotriammine cobalt (III)
- (c) Cyanonitrochlorotriammine cobalt (III)
- (d) Triamminenitrochlorocyano cobalt (III)
- 48. The oxidation number of *Pt* in $[Pt(C_2H_4)Cl_3]^-$ is

(a)	+1	(b)	+2
(c)	+3	(d)	+4

- What is the structural formula of lithium 49. tetrahydridoaluminate [MP PMT 2003]
 - (a) $Al[LiH_4]$ (b) $Al_2[LiH_4]_3$
 - (c) $Li[AlH_4]$ (d) $Li[AlH_4]_2$
- IUPAC name for $K[Ag(CN)_2]$ is 50.
 - (a) Potassium argentocyanide
 - (b) Potassium silver cyanide
 - (c) Potassium dicyanoargentate (I)
 - (d) Potassium dicyanosilver (II)
- The oxidation state of *Co* in $[Co(H_2O)_5 Cl]^{2+}$ is 51.
- 52. The chemical formula of diammine silver (I) chloride is
 - (b) $[Ag(NH_3)_2]Cl$
- 53. IUPAC name of $[Co(NH_3)_5 NO_2]Cl_2$ [Pb. CET 2000]

 - (d) None of these
- in the highest possible oxidation state is

[IIT-JEE (Screening) 2004]

- (a) $[Fe(CN)_6]^{3-}, [Co(CN)_6]^{3-}$
- (b) CrO_2Cl_2, MnO_4^-
- (c) TiO_3 , MnO_2
- (d) $[Co(CN)_6]^{3-}, MnO_3$
- The IUPAC name of $[Cr(NH_3)_6]^{3+}$ is 55. [Pb. CET 2001]
 - (a) Hexamminechromium (VI) ion
 - (b) Hexamminechromium (III) ion
 - (c) Hexamminechromium (II) ion
 - (d) Hexamminechloride
- The IUPAC name of $K_2[Cr(CN)_2O_2(O)_2(NH_3)]$ is 56.
 - [DCE 2003]
 - (a) Potassium ammine dicvano dioxoperoxochromate (VI)
 - (b) Potassium ammine cvano peroxo dioxo chromium (VI)
 - (c) Potassium ammine cyano peroxo dioxo chromiun (VI)
 - (d) Potassium ammine cyano peroxo dioxo chromatic (IV)
- The IUPAC name of the coordination compound 57. $K_3[Fe(CN)_6]$ is [AIEEE 2005]
 - (a) Potassium hexacyanoferrate (II)
 - (b) Potassium hexacyanoferrate (III)
 - (c) Potassium hexacyanoiron (II)
 - (d) Tripotassium hexacyanoiron (II)
- Which compound is zero valent metal complex [KCET 2005] 58. (a) $[Cu(NH_3)_4]SO_4$ (b) $[Pt(NH_3)_2Cl_2]$

(a)
$$+2$$
 (b) $+3$
(c) $+1$ (d) $+4$

$$(C) + 1 \qquad (C) + 4$$

- [BHU 2004]
- (a) $[Ag(NH_3)]Cl$
- (c) $[Ag(NH_3)_2]Cl$ (d) $[Ag(NH_4)_2]Cl$
- - (a) Pentamminenitrocobalt (III) chloride
 - (b) Pentamminenitrosocobalt (III) chloride
 - (c) Pentamminenitrocobalt (II) chloride

The pair of the compounds in which both the metals are 54.

(c) $[Ni(CO)_4]$ (d) $K_3[Fe(CN)_6]$

Isomerism and magnetic properties

- 1. Which one of the following octahedral complexes will not show geometric isomerism (A and B are monodentate ligands) [CBSE PMT 2003] (a) $[MA_5B]$ (b) $[MA_2B_4]$ (d) $[MA_4B_2]$ (c) $[MA_3B_3]$ The number of unpaired electrons in the complex ion 2. $[CoF_6]^{3-}$ is (Atomic no. of Co = 27) [CBSE PMT 2003] (a) Zero (b) 2 (c) 3 (d) 4 Which would exhibit co-ordination isomerism 3. (a) $[Cr(NH_3)_6][Co(CN)_6]$ (b) $[Co(en)_2 Cl_2]$ (c) $\left[Cr(NH_3)_{6}\right]Cl_3$ (d) $[Cr(en), Cl_2]^+$ and $[Co(NH_3)_5(ONO)]Cl_2$ $[Co(NH_3), NO_2]Cl_2$ 4. are related to each other as (a) Geometrical isomers (b) Optical isomers (c) Linkage isomers (d) Coordination isomers $\left[Co(NH_3)_5 SO_4\right]Br$ $\left[Co(NH_3)_5 Br\right] SO_4$ and are 5. examples of which type of isomerism [MP PMT 1993, 94, 95; MP PET 1997; MP PET/PMT 1998] (a) Linkage (b) Geometrical (c) Ionization (d) Optical $[Co(NH_3)_4 Cl_2]NO_2$ and $[Co(NH_3)_4 Cl.NO_2]Cl$ are 6. [MP PMT 1993; MP PET 1995, 2001] isomers (b) Optical (a) Geometrical (c) Linkage (d) Ionization Which would exhibit ionisation isomerism [MP PET 1997] 7. (a) $\left[Cr(NH_3)_6\right]Cl_3$ (b) $\left[Co(NH_3)_5 Br\right] SO_4$ (d) $\left[Cr(en)_3 Cl_3\right]$ (c) $\left[Cr(en)_2 Cl_2\right]$ $[Ti(H_2O)_6]^{+3}$ is paramagnetic in nature due to **[RPMT 2002]** 8. (a) One unpaired e^- (b) Two unpaired e^{-} (d) No unpaired e^{-} (c) Three unpaired e^{-} Coordination isomerism is caused by the interchange of 9. ligands between the [UPSEAT 2002] (a) Cis and Trans structure (b) Complex cation and complex anion (c) Inner sphere and outer sphere (d) Low oxidation and higher oxidation states Which one of the following will not show geometrical 10. [MP PMT 2002] isomerism (a) $[Cr(NH_3)_4 Cl_2]Cl$ (b) $[Co(en)_2 Cl_2]Cl$ (c) $[Co(NH_3)_5 NO_2]Cl_2$ (d) $[Pt(NH_3), Cl_2]$ Paramagnetic co-ordination compounds contain 11. electrons (a) No (b) Both paired and unpaired (c) Paired

- Which of the following isomeric pairs shows ionization 12. [MP PET 1993] isomerism (a) $[Co(NH_3)_6][Cr(CN)_6]$ and $[Cr(NH_3)_6][Co(CN)_6]$
 - (b) $[Cr(H_2O)_6]Cl_3$ and $[Cr(H_2O)_5Cl]Cl_2.H_2O$
 - (c) $\left[Pt(NH_3), Cl_2\right]$ and $\left[Pt(NH_3), PtCl_4\right]$
 - (d) $[Co(NH_3)_5 Br]SO_4$ and $[Co(NH_3)_5 SO_4]Br$
- Among the following ions which one has the highest 13. paramagnetism [IIT 1993; UPSEAT 2002]
 - (a) $[Cr(H_2O)_6]^{3+}$ (b) $[Fe(H_2O)_6]^{2+}$

(c)
$$[Cu(H_2O)_6]^{2+}$$
 (d) $[Zn(H_2O)_6]^{2+}$

Amongst $Ni(CO)_4$, $[Ni(CN)_4]^{2-}$ and $[NiCl_4]^{2-}$ [IIT 1991] 14.

- (a) $Ni(CO)_4$ and $[NiCl_4]^{2-}$ are diamagnetic and $[Ni(CN)_{4}]^{2-}$ is paramagnetic
- $Ni(CO)_4$ is paramagnetic
- $[NiCl_4]^{2-}$ is paramagnetic
- (d) $Ni(CO)_4$ is diamagnetic and $[NiCl_4]^{2-}$ and $[Ni(CN)_4]^{2-}$ are paramagnetic
- $[Co(NH_3)_4 Cl_2]^+$ exhibits 15.

(a) $\left[Cu(NH_3)_{4}\right]Cl_{3}$

(c) *NO*

(c) Bonding isomerism

(a) Geometrical isomerism	(b)	Optical	isomerism
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The compound which does not show paramagnetism is

(d) Ionisation isomerism

(b) $\left[Ag(NH_3), Cl\right]$

(d) NO_2

[IIT 1992]

16.

(c) Ionization 21.

(d) Unpaired

- The number of geometrical isomers for $[Pt(NH_3)_2Cl_2]$ is 17. [CBSE PMT 1995]
 - (a) Two (b) One (c) Three (d) Four

The pair of complex compounds $[Cr(H_2O)_6 Cl_3]$ and 18. $[Cr(H_2O)_5 Cl]Cl_2H_2O$ are an example of [MP PMT 1997] (b) Ionisation isomerism (a) Linkage isomerism

- (c) Coordination isomerism (d) Hydrate isomerism
- The number of geometrical isomers of the complex 19. $[Co(NO_2)_2(NH_3)_2]$ is [CBSE PMT 1997]
- (a) 2 (b) 3 (d) o (c) 4 The type of isomerism present in nitropentamine 20. chromium (III) chloride is [AIEEE 2002] (a) Optical (b) Linkage (d) Polymerisation Which of the following compounds exhibits linkage isomerism [MP PMT 2001]
 - (a) $[Co(en)_3]Cl_3$ (b) $[Co(NH_3)_6[Cr(CN)_6]]$
 - (c) $[Co(en)_2 NO_2 Cl]Br$ (d) $[Co(NH_3)_5 Cl]Br_2$

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

22.	Pick out from the following complex compounds, a poor electrolytic conductor in solution [MP PMT 1994] (a) $K_2[PtCl_6]$ (b) $[Co(NH_3)_3(NO_2)_3]$	34.
	(c) $K_4[Fe(CN)_6]$ (d) $[Cu(NH_3)_4]SO_4$	
23.	The possible number of optical isomers in $[Co(en)_2 Cl_2]^+$	
	are [MP PET 2003]	35.
	(a) 2 (b) 3 (c) 4 (d) 6	
24.	Magnetic moment of $[Cu(NH_3)_4]^{2+}$ ion is [RPET 2003]	
•	(a) 1.414 (b) 1.73	36.
	(c) 2.23 (d) 2.38	
25.	What is true for $[Fe(CN)_6]^{3-}$ and $[FeF_6]^{3-}$ [RPET 1999]	
	(a) Both are paramagnetic	
	(b) Only $[Fe(CN)_6]^{3-}$ is paramagnetic	37.
	(c) Only $[FeF_6]^{3-}$ is paramagnetic	
	(d) Both are diamagnetic	
26.	Which of the following is paramagnetic [AFMC 1997]	
	(a) $[Ni(CO)_4]$ (b) $[Co(NH_3)_6]^{3+}$	
	(c) $[Ni(CN)_4]^{2-}$ (d) $[NiCl_4]^{2-}$	38.
27.	The total number of possible isomers for the complex	
	compound $\left[Cu^{II}(NH_3)_4\right]\left[Pt^{II}Cl_4\right]$ are	
	[CBSE PMT 1998; DPMT 2004; J & K CET 2005]	
	(a) 3 (b) 4 (c) $= (d) 6$	39.
28.	Which one of the following shows maximum	
	paramagnetic character [AIIMS 1998]	
	paramagnetic character [AIIMS 1998] (a) $[Cr(H_2O)_6]^{3+}$ (b) $[Fe(CN)_6]^{4-}$	40.
	paramagnetic character [AIIMS 1998] (a) $[Cr(H_2O)_6]^{3+}$ (b) $[Fe(CN)_6]^{4-}$ (c) $[Fe(CN)_6]^{3-}$ (d) $[Cu(H_2O)_6]^{2+}$	40.
29.	paramagnetic character [AIIMS 1998] (a) $[Cr(H_2O)_6]^{3+}$ (b) $[Fe(CN)_6]^{4-}$ (c) $[Fe(CN)_6]^{3-}$ (d) $[Cu(H_2O)_6]^{2+}$ The complexes $[Co(NH_3)_6][Cr(C_2O_4)_3]$ and	40.
29.	paramagnetic character [AIIMS 1998] (a) $[Cr(H_2O)_6]^{3+}$ (b) $[Fe(CN)_6]^{4-}$ (c) $[Fe(CN)_6]^{3-}$ (d) $[Cu(H_2O)_6]^{2+}$ The complexes $[Co(NH_3)_6][Cr(C_2O_4)_3]$ and $[Cr(NH_3)_6][Co(C_2O_4)_3]$	40.
29.	paramagnetic character [AIIMS 1998] (a) $[Cr(H_2O)_6]^{3+}$ (b) $[Fe(CN)_6]^{4-}$ (c) $[Fe(CN)_6]^{3-}$ (d) $[Cu(H_2O)_6]^{2+}$ The complexes $[Co(NH_3)_6][Cr(C_2O_4)_3]$ and $[Cr(NH_3)_6][Co(C_2O_4)_3]$ [AMU 2002] (a) Linkage isomerism (b) Geometrical isomerism	40.
29.	paramagnetic character [AIIMS 1998] (a) $[Cr(H_2O)_6]^{3+}$ (b) $[Fe(CN)_6]^{4-}$ (c) $[Fe(CN)_6]^{3-}$ (d) $[Cu(H_2O)_6]^{2+}$ The complexes $[Co(NH_3)_6][Cr(C_2O_4)_3]$ and $[Cr(NH_3)_6][Co(C_2O_4)_3]$ [AMU 2002] (a) Linkage isomerism (b) Geometrical isomerism (c) Coordination isomerism (d) Ionisation isomerism	40. 41.
29. 30.	paramagnetic character [AIIMS 1998] (a) $[Cr(H_2O)_6]^{3+}$ (b) $[Fe(CN)_6]^{4-}$ (c) $[Fe(CN)_6]^{3-}$ (d) $[Cu(H_2O)_6]^{2+}$ The complexes $[Co(NH_3)_6][Cr(C_2O_4)_3]$ and $[Cr(NH_3)_6][Co(C_2O_4)_3]$ [AMU 2002] (a) Linkage isomerism (b) Geometrical isomerism (c) Coordination isomerism (d) Ionisation isomerism Which of the following exhibits highest molar conductivity	40. 41.
29. 30.	paramagnetic character [AIIMS 1998] (a) $[Cr(H_2O)_6]^{3+}$ (b) $[Fe(CN)_6]^{4-}$ (c) $[Fe(CN)_6]^{3-}$ (d) $[Cu(H_2O)_6]^{2+}$ The complexes $[Co(NH_3)_6][Cr(C_2O_4)_3]$ and $[Cr(NH_3)_6][Co(C_2O_4)_3]$ [AMU 2002] (a) Linkage isomerism (b) Geometrical isomerism (c) Coordination isomerism (d) Ionisation isomerism Which of the following exhibits highest molar conductivity [MP PET 1994]	40. 41.
29. 30.	paramagnetic character [AIIMS 1998] (a) $[Cr(H_2O)_6]^{3+}$ (b) $[Fe(CN)_6]^{4-}$ (c) $[Fe(CN)_6]^{3-}$ (d) $[Cu(H_2O)_6]^{2+}$ The complexes $[Co(NH_3)_6][Cr(C_2O_4)_3]$ and $[Cr(NH_3)_6][Co(C_2O_4)_3]$ [AMU 2002] (a) Linkage isomerism (b) Geometrical isomerism (c) Coordination isomerism (d) Ionisation isomerism Which of the following exhibits highest molar conductivity [MP PET 1994] (a) $[Co(NH_3)_6]Cl_3$ (b) $[Co(NH_3)_5Cl]Cl_2$	40. 41.
29. 30.	paramagnetic character [AIIMS 1998] (a) $[Cr(H_2O)_6]^{3+}$ (b) $[Fe(CN)_6]^{4-}$ (c) $[Fe(CN)_6]^{3-}$ (d) $[Cu(H_2O)_6]^{2+}$ The complexes $[Co(NH_3)_6][Cr(C_2O_4)_3]$ and $[Cr(NH_3)_6][Co(C_2O_4)_3]$ [AMU 2002] (a) Linkage isomerism (b) Geometrical isomerism (c) Coordination isomerism (d) Ionisation isomerism Which of the following exhibits highest molar conductivity [MP PET 1994] (a) $[Co(NH_3)_6]Cl_3$ (b) $[Co(NH_3)_5Cl]Cl_2$ (c) $[Co(NH_3)_4Cl_2]Cl$ (d) $[Co(NH_3)_3Cl_3]$	40. 41. 42.
29. 30. 31.	paramagnetic character [AIIMS 1998] (a) $[Cr(H_2O)_6]^{3+}$ (b) $[Fe(CN)_6]^{4-}$ (c) $[Fe(CN)_6]^{3-}$ (d) $[Cu(H_2O)_6]^{2+}$ The complexes $[Co(NH_3)_6][Cr(C_2O_4)_3]$ and $[Cr(NH_3)_6][Co(C_2O_4)_3]$ [AMU 2002] (a) Linkage isomerism (b) Geometrical isomerism (c) Coordination isomerism (d) Ionisation isomerism Which of the following exhibits highest molar conductivity [MP PET 1994] (a) $[Co(NH_3)_6]Cl_3$ (b) $[Co(NH_3)_5Cl]Cl_2$ (c) $[Co(NH_3)_4Cl_2]Cl$ (d) $[Co(NH_3)_3Cl_3]$ Which of the following compounds is colourless	40. 41. 42.
29. 30. 31.	paramagnetic character [AIIMS 1998] (a) $[Cr(H_2O)_6]^{3+}$ (b) $[Fe(CN)_6]^{4-}$ (c) $[Fe(CN)_6]^{3-}$ (d) $[Cu(H_2O)_6]^{2+}$ The complexes $[Co(NH_3)_6][Cr(C_2O_4)_3]$ and $[Cr(NH_3)_6][Co(C_2O_4)_3]$ [AMU 2002] (a) Linkage isomerism (b) Geometrical isomerism (c) Coordination isomerism (d) Ionisation isomerism Which of the following exhibits highest molar conductivity [MP PET 1994] (a) $[Co(NH_3)_6]Cl_3$ (b) $[Co(NH_3)_5Cl]Cl_2$ (c) $[Co(NH_3)_4Cl_2]Cl$ (d) $[Co(NH_3)_3Cl_3]$ Which of the following compounds is colourless [MP PET 1994] (a) $Cv (CH COO) 2H O$ (b) $Cv Cl$	40. 41. 42.
29. 30. 31.	paramagnetic character [AIIMS 1998] (a) $[Cr(H_2O)_6]^{3+}$ (b) $[Fe(CN)_6]^{4-}$ (c) $[Fe(CN)_6]^{3-}$ (d) $[Cu(H_2O)_6]^{2+}$ The complexes $[Co(NH_3)_6][Cr(C_2O_4)_3]$ and $[Cr(NH_3)_6][Co(C_2O_4)_3]$ [AMU 2002] (a) Linkage isomerism (b) Geometrical isomerism (c) Coordination isomerism (d) Ionisation isomerism Which of the following exhibits highest molar conductivity [MP PET 1994] (a) $[Co(NH_3)_6]Cl_3$ (b) $[Co(NH_3)_5Cl]Cl_2$ (c) $[Co(NH_3)_4Cl_2]Cl$ (d) $[Co(NH_3)_3Cl_3]$ Which of the following compounds is colourless [MP PET 1994] (a) $Cu_2(CH_3COO)_4.2H_2O$ (b) Cu_2Cl_2 (c) $CwSO_5HO_6$ (d) $[Cw(NH_3)SO_5AUCO_7]$	40. 41. 42. 43.
29. 30. 31.	paramagnetic character [AIIMS 1998] (a) $[Cr(H_2O)_6]^{3+}$ (b) $[Fe(CN)_6]^{4-}$ (c) $[Fe(CN)_6]^{3-}$ (d) $[Cu(H_2O)_6]^{2+}$ The complexes $[Co(NH_3)_6][Cr(C_2O_4)_3]$ and $[Cr(NH_3)_6][Co(C_2O_4)_3]$ [AMU 2002] (a) Linkage isomerism (b) Geometrical isomerism (c) Coordination isomerism (d) Ionisation isomerism Which of the following exhibits highest molar conductivity [MP PET 1994] (a) $[Co(NH_3)_6]Cl_3$ (b) $[Co(NH_3)_5Cl]Cl_2$ (c) $[Co(NH_3)_4Cl_2]Cl$ (d) $[Co(NH_3)_3Cl_3]$ Which of the following compounds is colourless [MP PET 1994] (a) $Cu_2(CH_3COO)_4.2H_2O$ (b) Cu_2Cl_2 (c) $CuSO_4.5H_2O$ (d) $[Cu(NH_3)_4]SO_4.4H_2O$	40. 41. 42. 43.
29. 30. 31. 32.	paramagnetic character [AIIMS 1998] (a) $[Cr(H_2O)_6]^{3+}$ (b) $[Fe(CN)_6]^{4-}$ (c) $[Fe(CN)_6]^{3-}$ (d) $[Cu(H_2O)_6]^{2+}$ The complexes $[Co(NH_3)_6][Cr(C_2O_4)_3]$ and $[Cr(NH_3)_6][Co(C_2O_4)_3]$ [AMU 2002] (a) Linkage isomerism (b) Geometrical isomerism (c) Coordination isomerism (d) Ionisation isomerism Which of the following exhibits highest molar conductivity [MP PET 1994] (a) $[Co(NH_3)_6]Cl_3$ (b) $[Co(NH_3)_5Cl]Cl_2$ (c) $[Co(NH_3)_4Cl_2]Cl$ (d) $[Co(NH_3)_3Cl_3]$ Which of the following compounds is colourless [MP PET 1994] (a) $Cu_2(CH_3COO)_4.2H_2O$ (b) Cu_2Cl_2 (c) $CuSO_4.5H_2O$ (d) $[Cu(NH_3)_4]SO_4.4H_2O$ The type of magnetism exhibited by $[Mn(H_2O)_6]^{2+}$ ion is	40. 41. 42. 43.
29. 30. 31. 32.	paramagnetic character [AIIMS 1998] (a) $[Cr(H_2O)_6]^{3+}$ (b) $[Fe(CN)_6]^{4-}$ (c) $[Fe(CN)_6]^{3-}$ (d) $[Cu(H_2O)_6]^{2+}$ The complexes $[Co(NH_3)_6][Cr(C_2O_4)_3]$ and $[Cr(NH_3)_6][Co(C_2O_4)_3]$ [AMU 2002] (a) Linkage isomerism (b) Geometrical isomerism (c) Coordination isomerism (d) Ionisation isomerism Which of the following exhibits highest molar conductivity [MP PET 1994] (a) $[Co(NH_3)_6]CI_3$ (b) $[Co(NH_3)_5CI]CI_2$ (c) $[Co(NH_3)_4CI_2]CI$ (d) $[Co(NH_3)_3CI_3]$ Which of the following compounds is colourless [MP PET 1994] (a) $Cu_2(CH_3COO)_4.2H_2O$ (b) Cu_2CI_2 (c) $CuSO_4.5H_2O$ (d) $[Cu(NH_3)_4]SO_4.4H_2O$ The type of magnetism exhibited by $[Mn(H_2O)_6]^{2+}$ ion is [IIT 1994] (a) Paramagnetism (b) Diamagnetism	40. 41. 42. 43.
29. 30. 31. 32.	paramagnetic character [AIIMS 1998] (a) $[Cr(H_2O)_6]^{3+}$ (b) $[Fe(CN)_6]^{4-}$ (c) $[Fe(CN)_6]^{3-}$ (d) $[Cu(H_2O)_6]^{2+}$ The complexes $[Co(NH_3)_6][Cr(C_2O_4)_3]$ and $[Cr(NH_3)_6][Co(C_2O_4)_3]$ [AMU 2002] (a) Linkage isomerism (b) Geometrical isomerism (c) Coordination isomerism (d) Ionisation isomerism Which of the following exhibits highest molar conductivity [MP PET 1994] (a) $[Co(NH_3)_6]Cl_3$ (b) $[Co(NH_3)_5Cl]Cl_2$ (c) $[Co(NH_3)_4Cl_2]Cl$ (d) $[Co(NH_3)_3Cl_3]$ Which of the following compounds is colourless [MP PET 1994] (a) $Cu_2(CH_3COO)_4.2H_2O$ (b) Cu_2Cl_2 (c) $CuSO_4.5H_2O$ (d) $[Cu(NH_3)_4]SO_4.4H_2O$ The type of magnetism exhibited by $[Mn(H_2O)_6]^{2+}$ ion is [IIT 1994] (a) Paramagnetism (b) Diamagnetism (c) Both (a) and (b) (d) None of these	40. 41. 42. 43. 44.
29. 30. 31. 32.	paramagnetic character [AIIMS 1998] (a) $[Cr(H_2O)_6]^{3+}$ (b) $[Fe(CN)_6]^{4-}$ (c) $[Fe(CN)_6]^{3-}$ (d) $[Cu(H_2O)_6]^{2+}$ The complexes $[Co(NH_3)_6][Cr(C_2O_4)_3]$ and $[Cr(NH_3)_6][Co(C_2O_4)_3]$ [AMU 2002] (a) Linkage isomerism (b) Geometrical isomerism (c) Coordination isomerism (d) Ionisation isomerism Which of the following exhibits highest molar conductivity [MP PET 1994] (a) $[Co(NH_3)_6]CI_3$ (b) $[Co(NH_3)_5CI]CI_2$ (c) $[Co(NH_3)_4CI_2]CI$ (d) $[Co(NH_3)_3CI_3]$ Which of the following compounds is colourless [MP PET 1994] (a) $Cu_2(CH_3COO)_4.2H_2O$ (b) Cu_2CI_2 (c) $CuSO_4.5H_2O$ (d) $[Cu(NH_3)_4]SO_4.4H_2O$ The type of magnetism exhibited by $[Mn(H_2O)_6]^{2+}$ ion is [IIT 1994] (a) Paramagnetism (b) Diamagnetism (c) Both (a) and (b) (d) None of these The number of isomers possible for square planar	40. 41. 42. 43. 44.
29. 30. 31. 32. 33.	paramagnetic character [AIIMS 1998] (a) $[Cr(H_2O)_6]^{3+}$ (b) $[Fe(CN)_6]^{4-}$ (c) $[Fe(CN)_6]^{3-}$ (d) $[Cu(H_2O)_6]^{2+}$ The complexes $[Co(NH_3)_6][Cr(C_2O_4)_3]$ and $[Cr(NH_3)_6][Co(C_2O_4)_3]$ [AMU 2002] (a) Linkage isomerism (b) Geometrical isomerism (c) Coordination isomerism (d) Ionisation isomerism Which of the following exhibits highest molar conductivity [MP PET 1994] (a) $[Co(NH_3)_6]Cl_3$ (b) $[Co(NH_3)_5Cl]Cl_2$ (c) $[Co(NH_3)_4Cl_2]Cl$ (d) $[Co(NH_3)_3Cl_3]$ Which of the following compounds is colourless [MP PET 1994] (a) $Cu_2(CH_3COO)_4.2H_2O$ (b) Cu_2Cl_2 (c) $CuSO_4.5H_2O$ (d) $[Cu(NH_3)_4]SO_4.4H_2O$ The type of magnetism exhibited by $[Mn(H_2O)_6]^{2+}$ ion is [IIT 1994] (a) Paramagnetism (b) Diamagnetism (c) Both (a) and (b) (d) None of these The number of isomers possible for square planar $complex K_2[PdClBr_2(SCN)]$ is [MP PET 1994]	40. 41. 42. 43. 44.

	(c) 4	(d) 6
4.	The number of unpaired elec	etrons in $Ni(CO)_4$ is
		[AIIMS 1997]
	(a) Zero	(b) One
	(c) Three	(d) Five
5.	If the magnetic moment of	$[Ag(CN)_2]^{-1}$ is zero, then the
	number of unpaired electron	s will be [MP PET 1995]
	(a) 1	(b) 2
	(c) 3	(d) Zero
6.	$[Pt(NH_3)_4 Cl_2]Br_2$ and $[Pt($	NH_3) ₄ Br_2 Cl_2 are related to
	each other as	EMC accor CPSE DMT accord
	(a) Ontical isomers	(b) Coordinate isomers
	(c) Ionization isomers	(d) Linkage isomers
7.	Which of the following com	plex will show geometrical as
,	well as optical isomerism (er	a = ethylene diamine)
		[KCET 1996]
	(a) $Pt(NH_3)_2 Cl_2$	(b) $\left[Pt(NH_3)Cl_4 \right]$
	(c) $[Pt(en)_3]^{4+}$	(d) $[Pt(en)_2]Cl_2$
8.	Which of the following comp	lexes is diamagnetic
	с .	[RPMT 1997]
	(a) $Ni(CO)_4$	(b) $Ni(Cl_4)^{2-}$
	(c) $Ni(Br)^{2-}$	(d) NiCl. $4H_{2}O$
0	Which one has the highest p	
9.	(a) $Ni(CO)$.	(b) $[Ni(NH_a),]Cl_a$
	(a) $[N_{i}^{*}(NH_{i})]C_{i}$	(d) $[C_{1}(NH_{1})]C_{1}$
~	(c) $[IVI(IVII_3)_6]Cl_2$ Which of the following acc	(d) $[Cu(1/1_3)_4]Cl_2$
υ.	exhibit optical isomerism	[CBSE PMT 2004]
	(a) trans-dicyanobis (ethyl	enediamine) chromium (III)
	chloride	
	(b) <i>trus</i> -(etnylenediamine) c	topalt (III) bromide
	(d) diamminedichloroplatin	um (II)
1.	Which of the following does	not have optical isomer
	U	[AIIMS 2004]
	(a) $[Co(NH_3)_3Cl_3]$	
	(b) $[Co(en)_3]Cl_3$	
	(c) $[Co(en)_2 Cl_2]Cl$	(d) $[Co(en)(NH_3)_2Cl_2]Cl$
2.	Change in composition of	co-ordination sphere yields
	(a) Optical	(b) Geometrical
	(c) Ionisation	(d) None of these
3.	Types of isomerism shown b	у
	$[Cr(NH_3)_5 NO_2]Cl_2$ is	
	(a) Optical	(b) Ionisation
4.	Which of the following will	(u) LIIIKage 1 not give a precipitate with
. .	AgNO ₃	[MP PET 2003]
	(a) $[Co(NH_3)_3 Cl_3]$	(b) $[Co(NH_3)_{4}Cl_{2}]Cl$
	(c) $[Co(NH_3), Cl]Cl_2$	(d) $[Co(NH_3)_6]Cl_3$

1			
solution		LI [I	RPET 1999]
(a) 6	(b)	4	
(c) 3	(d)	2	
The colour of $CoCl_3.5$	$NH_3.H_2O$	is [Kerala (M	[ed.) 2002]
(a) Orange yellow	(b)	Orange	
(c) Green	(d)	Violet	
(e) Pink			
Which one of the	following	is expected	to be a
paramagnetic complex	K C	[MP PMT 1	991, 2000]
	solution (a) 6 (c) 3 The colour of <i>CoCl</i> ₃ .5 (a) Orange yellow (c) Green (e) Pink Which one of the paramagnetic complex	solution(a) 6(b)(c) 3(d)The colour of $CoCl_3.5NH_3.H_2O$ (a) Orange yellow(b)(c) Green(d)(e) PinkWhich one of the following paramagnetic complex	solution $[I]$ (a) 6(b) 4(c) 3(d) 2The colour of $CoCl_3.5NH_3.H_2O$ is [Kerala (M(a) Orange yellow(b) Orange(c) Green(d) Violet(e) PinkWhich one of the following is expectedparamagnetic complex[MP PMT for the following is expected]

45.

How many ions are produced from $[Co(NH_3)_6]Cl_3$ in

(c) $[Zn(NH_3)_4]^{2+}$ (d) $[Co(NH_3)_6]^{+3}$ Which one of the following will give a white precipitate 48. with A_{gNO_3} in aqueous mediun [MP PMT 1994]

(b) $[Ni(CO)_{4}]$

- (a) $[Co(NH_3)_5 Cl](NO_2)_2$ (b) $[Pt(NH_3)_2Cl_2]$
- (c) $\left[Pt(en)Cl_2\right]$ (d) $[Pt(NH_3)_4]Cl_2$
- How many ions will be produced in solution from one 49. molecule of chloropentammine cobalt (III) chloride (a) 1 (b) 2
 - (c) 3 (d) 4

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

- 50. Which of the following complex will give white precipitate [JIPMER 1997] with $BaCl_2$ (aq.)
 - (a) $[Co(NH_3)_4 SO_4]NO_2$ (b) $[Cr(NH_3)_5 SO_4]Cl$
 - (c) $[Cr(NH_3)_5Cl]SO_4$ (d) Both (b) and (c)
- The number of precipitable halide ions in the sample 51. $[Pt(NH_3)Cl_2Br]Cl$ will be

(a)	2	(b) 3
(c)	4	(d) 1

The colour of tetrammine copper (II) sulphate is 52.

(a)	Blue	(b)	Red
(c)	Violet	(d)	Green

The number of ions per mole of a complex 53. $[CoCl_2.5 NH_3]Cl_2$ in aqueous solution will be

		[MP PMT 2001]
	(a) Nine	(b) Four
	(c) Three	(d) Two
54 .	How many unpaired ele	ctrons are present in the central
	metal ion of $[CoCl_4]^{2-}$	[Orissa JEE 2005]
	(a) 3	(b) 4
	(c) 5	(d) 2
55.	What is the magnetic mo	ment of $K_3[FeF_6]$
		[Orissa JEE 2005]
	(a) 5.91 BM	(b) 4.89 BM
	(c) 3.87 BM	(d) 6.92 BM
56.	(i) $K_4[Fe(CN)_6]$ (ii) $K_3[e^{-1}]$	$Cr(CN)_6$](iii) $K_3[Fe(CN)_6]$
	(iv) $K_2[Ni(CN)_4]$	
	Choose the complex which	ch is paramagnetic
	-	[Kerala CET 2005]
	(a) (i), (ii) and (iii)	(b) (i), (iii)and (iv)
	(c) (i), (iii) and (iv)	(d) (i), (ii) and (iv)
	(e) (ii) and (iv)	
57.	In coordination compour	nd $[Co(en), Cl_2]Cl$ which is false

In coordination compound $[Co(en)_2 Cl_2]Cl$ which is false

[Kerala CET 2005]

(a) Show geometrical Isomerism

- (b) Show optical Isomerism
- (c) Show ionic Isomerism
- (d) A octahedral complex
- (e) A cationic complex

1.

2.

3.

4.

5.

6.

7.

Hybridisation and Geometry

The correct structural formula of <i>zeise's salt</i> is
(a) $K^+ \left[PtCl_3 - \eta^2 - (C_2H_4) \right]^-$
(b) $K_2 \left[PtCl_3 - \eta^2 - C_2 H_4 \right]$
(c) $K^+ \left[PtCl_2 - \eta^2 - (C_2H_4) \right] Cl^-$
(d) $K^{+}[PtCl_{3}(C_{2}H_{4}]^{-}$
The correct order of hybridisations of central atom in
NH_3 , $[PtCl_4]^{2-}$, PCl_5 and BCl_3 is [MP PMT 2003]
(a) dsp^2, dsp^3, sp^2 and sp^3
(b) sp^3 , sp^3 , sp^3d and sp^2
(c) dsp^2, sp^2, sp^3 and dsp^3
(d) dsp^2 , sp^3 , sp^2 and dsp^3
One mole of the complex compound $Co(NH_3)_5 Cl_3$, gives
3 moles of ions on dissolution in water. One mole of the
same complex reacts with two moles of $AgNO_3$ solution
to yield two moles of $AgCl(s)$. The structure of the
complex is
[AIEEE 2003] (a) $[C_0(NH_*), C][C]_*$
(b) $[C_0(NH_1), CL_1] 2NH_1$
(b) $[Co(NH_3)_3 Cl_3] \cdot 2NH_3$ (c) $[Co(NH_3)_3 Cl_3] \cdot Cl_3 C NH_3$
(b) $[Co(NH_3)_3Cl_3].2NH_3$ (c) $[Co(NH_3)_4Cl_2]Cl.NH_3$ (d) $[Co(NH_4)_4Cl_2]Cl.NH_4$
(b) $[Co(NH_3)_3 Cl_3] \cdot 2NH_3$ (c) $[Co(NH_3)_4 Cl_2] Cl \cdot NH_3$ (d) $[Co(NH_3)_4 Cl] Cl_2 \cdot NH_3$
(b) $[Co(NH_3)_3 Cl_3] \cdot 2NH_3$ (c) $[Co(NH_3)_4 Cl_2] Cl \cdot NH_3$ (d) $[Co(NH_3)_4 Cl] Cl_2 \cdot NH_3$ Cuprammonium ion $[Cu(NH_3)_4]^{2+}$ is
(b) $[Co(NH_3)_3 Cl_3].2NH_3$ (c) $[Co(NH_3)_4 Cl_2]Cl.NH_3$ (d) $[Co(NH_3)_4 Cl]Cl_2.NH_3$ Cuprammonium ion $[Cu(NH_3)_4]^{2+}$ is [MP PMT 1997; KCET 2002] (a) Tetrahedral (b) Square planar
(b) $[Co(NH_3)_3 Cl_3].2NH_3$ (c) $[Co(NH_3)_4 Cl_2]Cl.NH_3$ (d) $[Co(NH_3)_4 Cl]Cl_2.NH_3$ Cuprammonium ion $[Cu(NH_3)_4]^{2+}$ is [MP PMT 1997; KCET 2002] (a) Tetrahedral (b) Square planar (c) Triangular bipyramid (d) Octahedral
(b) $[Co(NH_3)_3 Cl_3].2NH_3$ (c) $[Co(NH_3)_4 Cl_2]Cl.NH_3$ (d) $[Co(NH_3)_4 Cl]Cl_2.NH_3$ Cuprammonium ion $[Cu(NH_3)_4]^{2+}$ is [MP PMT 1997; KCET 2002] (a) Tetrahedral (b) Square planar (c) Triangular bipyramid (d) Octahedral In the complex $[SbF_5]^{2-}, sp^3d$ hydridisation is present.
(b) $[Co(NH_3)_3 Cl_3].2NH_3$ (c) $[Co(NH_3)_4 Cl_2]Cl.NH_3$ (d) $[Co(NH_3)_4 Cl]Cl_2.NH_3$ Cuprammonium ion $[Cu(NH_3)_4]^{2+}$ is [MP PMT 1997; KCET 2002] (a) Tetrahedral (b) Square planar (c) Triangular bipyramid (d) Octahedral In the complex $[SbF_5]^{2-}, sp^3d$ hydridisation is present. Geometry of the complex is [Pb. PMT 2000]
(b) $[Co(NH_3)_3 Cl_3].2NH_3$ (c) $[Co(NH_3)_4 Cl_2]Cl.NH_3$ (d) $[Co(NH_3)_4 Cl]Cl_2.NH_3$ Cuprammonium ion $[Cu(NH_3)_4]^{2+}$ is [MP PMT 1997; KCET 2002] (a) Tetrahedral (b) Square planar (c) Triangular bipyramid (d) Octahedral In the complex $[SbF_5]^{2-}, sp^3d$ hydridisation is present. Geometry of the complex is [Pb. PMT 2000] (a) Square pyramidal (b) Square bipyramidal
(b) $[Co(NH_3)_3 Cl_3].2NH_3$ (c) $[Co(NH_3)_4 Cl_2]Cl.NH_3$ (d) $[Co(NH_3)_4 Cl]Cl_2.NH_3$ Cuprammonium ion $[Cu(NH_3)_4]^{2+}$ is [MP PMT 1997; KCET 2002] (a) Tetrahedral (b) Square planar (c) Triangular bipyramid (d) Octahedral In the complex $[SbF_5]^{2-}, sp^3d$ hydridisation is present. Geometry of the complex is [Pb. PMT 2000] (a) Square pyramidal (b) Square bipyramidal (c) Tetrahedral (d) Square
(b) $[Co(NH_3)_3 Cl_3].2NH_3$ (c) $[Co(NH_3)_4 Cl_2]Cl.NH_3$ (d) $[Co(NH_3)_4 Cl]Cl_2.NH_3$ Cuprammonium ion $[Cu(NH_3)_4]^{2+}$ is [MP PMT 1997; KCET 2002] (a) Tetrahedral (b) Square planar (c) Triangular bipyramid (d) Octahedral In the complex $[SbF_5]^{2-}, sp^3d$ hydridisation is present. Geometry of the complex is [Pb. PMT 2000] (a) Square pyramidal (b) Square bipyramidal (c) Tetrahedral (d) Square The type of hybridization involved in the metal ion of $[Ni(H_2O)_2]^{2+}$ complex is
(b) $[Co(NH_3)_3 Cl_3].2NH_3$ (c) $[Co(NH_3)_4 Cl_2]Cl.NH_3$ (d) $[Co(NH_3)_4 Cl]Cl_2.NH_3$ Cuprammonium ion $[Cu(NH_3)_4]^{2+}$ is [MP PMT 1997; KCET 2002] (a) Tetrahedral (b) Square planar (c) Triangular bipyramid (d) Octahedral In the complex $[SbF_5]^{2-}, sp^3d$ hydridisation is present. Geometry of the complex is [Pb. PMT 2000] (a) Square pyramidal (b) Square bipyramidal (c) Tetrahedral (d) Square The type of hybridization involved in the metal ion of $[Ni(H_2O)_6]^{2+}$ complex is (a) $d^3 cn^2$ (b) $cn^3 d^2$
(b) $[Co(NH_3)_3 Cl_3].2NH_3$ (c) $[Co(NH_3)_4 Cl_2]Cl.NH_3$ (d) $[Co(NH_3)_4 Cl]Cl_2.NH_3$ Cuprammonium ion $[Cu(NH_3)_4]^{2+}$ is [MP PMT 1997; KCET 2002] (a) Tetrahedral (b) Square planar (c) Triangular bipyramid (d) Octahedral In the complex $[SbF_5]^{2-}, sp^3d$ hydridisation is present. Geometry of the complex is [Pb. PMT 2000] (a) Square pyramidal (b) Square bipyramidal (c) Tetrahedral (d) Square The type of hybridization involved in the metal ion of $[Ni(H_2O)_6]^{2+}$ complex is (a) d^3sp^2 (b) sp^3d^2 (c) ret^3
(b) $[Co(NH_3)_3 Cl_3].2NH_3$ (c) $[Co(NH_3)_4 Cl_2]Cl.NH_3$ (d) $[Co(NH_3)_4 Cl]Cl_2.NH_3$ Cuprammonium ion $[Cu(NH_3)_4]^{2+}$ is [MP PMT 1997; KCET 2002] (a) Tetrahedral (b) Square planar (c) Triangular bipyramid (d) Octahedral In the complex $[SbF_5]^{2-}, sp^3d$ hydridisation is present. Geometry of the complex is [Pb. PMT 2000] (a) Square pyramidal (b) Square bipyramidal (c) Tetrahedral (d) Square The type of hybridization involved in the metal ion of $[Ni(H_2O)_6]^{2+}$ complex is (a) d^3sp^2 (b) sp^3d^2 (c) sp^3 (d) dsp^2 In the formation of $K Ed(CN)$ the hybridization involved
(b) $[Co(NH_3)_3 Cl_3].2NH_3$ (c) $[Co(NH_3)_4 Cl_2]Cl.NH_3$ (d) $[Co(NH_3)_4 Cl]Cl_2.NH_3$ Cuprammonium ion $[Cu(NH_3)_4]^{2+}$ is [MP PMT 1997; KCET 2002] (a) Tetrahedral (b) Square planar (c) Triangular bipyramid (d) Octahedral In the complex $[SbF_5]^{2-}, sp^3d$ hydridisation is present. Geometry of the complex is [Pb. PMT 2000] (a) Square pyramidal (b) Square bipyramidal (c) Tetrahedral (d) Square The type of hybridization involved in the metal ion of $[Ni(H_2O)_6]^{2+}$ complex is (a) d^3sp^2 (b) sp^3d^2 (c) sp^3 (d) dsp^2 In the formation of $K_4Fe(CN)_6$, the hybridisation involved is
(b) $[Co(NH_3)_3 Cl_3].2NH_3$ (c) $[Co(NH_3)_4 Cl_2]Cl.NH_3$ (d) $[Co(NH_3)_4 Cl_2]Cl_2.NH_3$ Cuprammonium ion $[Cu(NH_3)_4]^{2+}$ is [MP PMT 1997; KCET 2002] (a) Tetrahedral (b) Square planar (c) Triangular bipyramid (d) Octahedral In the complex $[SbF_5]^{2-}, sp^3d$ hydridisation is present. Geometry of the complex is [Pb. PMT 2000] (a) Square pyramidal (b) Square bipyramidal (c) Tetrahedral (d) Square The type of hybridization involved in the metal ion of $[Ni(H_2O)_6]^{2+}$ complex is (a) d^3sp^2 (b) sp^3d^2 (c) sp^3 (d) dsp^2 In the formation of $K_4Fe(CN)_6$, the hybridisation involved is (a) sp^2 (b) d^2sp^3
(b) $[Co(NH_3)_3 Cl_3].2NH_3$ (c) $[Co(NH_3)_4 Cl_2]Cl.NH_3$ (d) $[Co(NH_3)_4 Cl]Cl_2.NH_3$ Cuprammonium ion $[Cu(NH_3)_4]^{2+}$ is [MP PMT 1997; KCET 2002] (a) Tetrahedral (b) Square planar (c) Triangular bipyramid (d) Octahedral In the complex $[SbF_5]^{2-}, sp^3d$ hydridisation is present. Geometry of the complex is [Pb. PMT 2000] (a) Square pyramidal (b) Square bipyramidal (c) Tetrahedral (d) Square The type of hybridization involved in the metal ion of $[Ni(H_2O)_6]^{2+}$ complex is (a) d^3sp^2 (b) sp^3d^2 (c) sp^3 (d) dsp^2 In the formation of $K_4Fe(CN)_6$, the hybridisation involved is (a) sp^2 (b) d^2sp^3 (c) d^3sn^2 (d) d^4r

- Which of the following is not true for metal carbonyls 8. [MP PET 1993]
- (a) The oxidation state of the metal in the carbonyls is zero
 - (b) The secondary carbonyls are obtained from photodecomposition

	(c) Metal carbonyls are significant (d) $d\pi = n\pi$ overlap is of	ingle bonded species	21.	A tetrahedral complex hybridization
9.	An octahedral complex is	formed, when hybrid orbitals of		(a) sp^2
).	the following type are invo	blved [DCE 2003]		(c) dsp^2
	(a) sp^{3}	(b) dsp^2	22.	Back bonding is involved
	(c) sp^3d^2	(d) sp^2d		compounds
10.	Which one is an example of	of octahedral complex		(a) $[(CH_3)_3 Al]_2$
	(a) FeF_{c}^{3-}	(b) $Zn(NH_2)^{2+}_{4+}$		(c) $R - Mg - X$
	(a) $Ni(CN)^{2-}$	(d) $C_{\mu}(NH_{3})^{2+}$	23.	d^2sp^3 hybridisation leads
11.	Which of the following α	$\operatorname{cu}(1)^{-}\operatorname{cu}(1)^{-}\operatorname{su}_{3}^{-}$		(a) Hexagonal shape (c) Octabedral shape
	geometry	compresses mus a square planar	24.	Chromium hexacarbonyl
	(a) $Ag(NH_3)_2^+$	(b) $Cu(en)_2^{2+}$		involving
	(c) $[MnCl_4]^{2-}$	(d) $Ni(CO)_4$		(a) sp^3d^2
12.	The shape of $[Fe(CN)_c]^{4-}$	ion is		(c) $d^2 s p^3$
	(a) Hexagonal	(b) Pyrimidal	25.	$[CoF_6]^{-3}$ is formed by
	(c) Octahedral	(d) Octagonal		(a) $d^2 s p^3$
13.	What is the shape of <i>Fe</i> (<i>C</i>	<i>CO</i>) ₅ [CBSE PMT 2000]		(c) $d^2 s p^3$
	(a) Linear	(b) Tetrahedral (d) Trigonal bipyramidal	26.	The species havoing tetral
14	What type of hybridization	n is involved in $[Fe(CN), 1^{3-}]$		(a) $[PdCl]^{2-}$
	what type of hybridization	[AMU 1999]		(a) $[I \ u \ c_4]$
	(a) $d^2 s p^3$	(b) dsp^2		(c) $[Pa(CN)_4]$
	(c) $sp^{3}d^{2}$	(d) dsp^3	27.	Among $[Ni(CO)_4], [Ni(CI)_4]$
15.	The example of dsp^2 hybrid	ridisation is		[CBSE PMT 2004; MP PM
0	1 1 0	[MP PET 1999; AIIMS 2001]		(a) sp^3 , sp^3 , dsp^2
	(a) $Fe(CN)_6^{3-}$	(b) $Ni(CN)_4^{2-}$		(c) sp^3, dsp^2, dsp^2
	(c) $Zn(NH_3)_4^{2+}$	(d) FeF_6^{3-}		(At. no. of $Ni = 28$)
16.	The shape of $[Cu(NH_2),]^2$	⁺ is square planar. Cu^{2+} in this	28.	The bond in $K_4[Fe(CN)_6]$
	complex is	[NCERT 1989; RPET 1999]		(a) All ionic (b) All covalent
	(a) sp^3 hybridised	(b) dsp^2 hybridised		(c) Ionic and covalent
	(c) sp^3d hybridised	(d) sp^3d^2 hybridised		(d) Ionic, covalent and co
17.	The geometry of $Ni(CO)_4$	and $Ni(PPh_3)_2 Cl_2$ are	29.	Hybridization of Fe in K_3 .
		[IIT-JEE 1999; DCE 2002]		(a) sp^3
	(a) Both square planar (b) Tetrahedral and squar	re planar respectively		(c) sp^3d^2
	(c) Both tetrahedral	r a a rrain s	30.	metal atom is
10	(d) Square planar and tet	rahedral respectively	1	(a) $[MnO_4]^-$
10.	(a) $Ni(CO)$.	(b) $[NiCL]^{2-}$	1	(c) $[Fe(CN)_6]^{3-}$
	(a) $[N_{i}(H, Q)]^{2+}$	(d) $[C_{u}(NH_{-})]^{2+}$	31.	Which of the following sta
10	$[P_{f}(NH_{2}O)_{6}]$	[DCF 2001]		(a) $[Cu(NH_3)_6]^{2+}$ is a col
19.	(a) Square planar	(b) Tetrahedral		(b) $[Z_n(H_2O)_{\epsilon}]^{2+}$ ion is b
	(c) Pyramidal	(d) Pentagonal		(c) $[N_i(CN)]^{2-}$ ion has
20.	A complex involving dsp^2	hybridization has		(d) Nickel dimethyl alvoy
	(a) A square planar geom	letry	32.	Which of the following sha
	(c) A tetranearal geometric (c) An octahedral geometric geometric de la constante de la consta	ry trv		
	(d) Trigonal planar geom	etry		(a) d^* (low spin)

ion is formed due to (h) sn^3

(a)	sp	(0)	s_P
(c)	dsp^2	(d)	$d^2 s p^3$

- in which of the organometallic
- (b) $Mg^{2+}(C_5H_5^-)_2$ (d) $[(C_5H_5)_2Fe]$ s to (b) Trigonal bipyrimidal (d) Tetrahedral shape is an octahedral compound (b) dsp^2 (d) $d^3 s p^2$ orbitals hybridization (b) $d^3 s p^2$ (d) sp^3d^2
- hedral shape is [IIT-JEE (Screening) 2004]
 - (b) $[Ni(CN)_4]^{2-1}$ (d) $[NiCl_4]^{2-1}$
- $(2N)_4]^{2-}, [NiCl_4]^{2-}$ species, the Ni atom are, respectively IT 1992; BHU 1995; AFMC 1997] (d) dsp^2, sp^3, sp^3 (d) sp^3, dsp^2, sp^3
- [MP PET 2004] are:
 - o-ordiante covalent

 $Fe(CN)_6$ is [DCE 2002]

- (b) dsp^3 (d) $d^2 s p^3$
- as no 'd' electrons in the central [IIT-JEE Screening 2001]
 - (b) $[Co(NH_3)_6]^{3+}$
 - (d) $[Cr(H_2O)_6]^{3+}$
- tement is correct
 - lourless ion
 - olue coloured
 - a tetrahedral shape
 - ides is red in colour

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all form an octahedral complex
                   [DCE 2001]
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- (b) d^8 (high spin)
- (c) d^6 (low spin) (d) None of these

(d) NH_3 (c) en

34. The strongest ligand in the following is [MP PET 1995]

- (a) CN^{-} (b) *Br*
- (c) *HO*⁻ (d) F^{-}
- The neutral ligand is 35.
 - (a) Chloro (b) Hydroxo (c) Ammine (d) Oxalato
- 36. The ligands which can get attached to the central metal ion through more than one atom are called
 - (a) Ambident ligands (b) Polydentate ligands
 - (c) Chelate ligands (d) Neutral ligands
- A strong ligand gives a complex which is generally called 37.
 - (a) High spin (b) High energy
 - (c) Low spin (d) Stable

38. CN^{-} is a strong field ligand. This is due to the fact that

[CBSE PMT 2004]

- (a) It can accept electron from metal species (b) It forms high spin complexes with metal species
- (c) It carries negative charge.
- (d) It is a pseudohalide

Considering H_2O as a weak field ligand, the number of 39. unpaired electrons in $[Mn(H_2O)_6]^{2+}$ will be (At. No. of Mn= 25) asas a ajkk [CBSE PMT 2004]

- (a) Two (b) Four
- (d) Five (c) Three
- Which of the following is a π complex 40.
 - (a) Trimethyl aluminium (b) Ferrocene
 - (c) Diethvl zinc (d) Nickel carbonyl
- Which of the following is a π acid ligand 41.

[KCET 1996; AIIMS 2003]

- (a) NH_3 (b) *CO*
- (c) F^{-} (d) Ethylene diamine
- The value of the 'spin only' magnetic moment for one of 42. the following configurations is 2.84 BM. the correct one [AIEEE 2005]
 - (a) d^4 (in strong ligand field)
 - (b) d^4 (in weak ligand field)
 - (c) d^3 (in weak as well as in strong fields)
 - (d) d^5 (in strong ligand field)
- The geometry of $Ni(CO)_4$ and $Ni(PPh_3)_2Cl_2$ are 43.

[BHU 2005]

- (a) Both square planer
- (b) Tetrahedral and square planar respectively
- (c) Both tetrahedral
- (d) Square planar and tetrahedral respectively

Complexes and complex stability

- Which of the following complexes has the highest stability 1. constant at 298 K
 - (a) $[CdCl_4]^{2-}$ (b) $[CdBr_4]^{2-}$
 - (c) $[CdI_4]^{2-}$ (d) $[Cd(CN)_{4}]^{2-}$

- The most stable ion is 2. [AIEEE 2002] (a) $[Fe(OH)_3]^{3-1}$ (b) $[Fe(Cl)_{\epsilon}]^{3-1}$ (c) $[Fe(CN)_6]^{3-}$ (d) $[Fe(H_2O)_6]^{3+}$
- The most stable complex among the following is 3.

 - [MP PMT 2002]
 - (a) $K_3[Al(C_2O_4)_3]$ (b) $[Pt(en)_2]Cl_2$ (c) $Ag(NH_3)_2Cl$ (d) $K_2(Ni(EDTA))$
- Which of the following factors tends to increase the 4. stability of metal ion complexes (a) Higher ionic radius of the metal ion

 - (b) Higher charge/size ratio of the metal ion (c) Lower ionisation potential of the metal ion

 - (d) Lower basicity of the ligand
- CuSO₄ reacts with KCN solution and forms:[DPMT 2004] 5.
 - (a) $K_3[Cu(CN)_4]$ (b) *Cu*(*CN*)
 - (c) $Cu(CN)_2$ (d) $K_4[Cu(CN)_6]$
- 6. A co-ordination complex compound of cobalt has the molecular formulae containing five ammonia molecules, one nitro group and two chlorine atoms for one cobalt atom. One mole of this compound produces three mole ions in an aqueous solution on reacting with excess of AgNO₃, AgCl precipitate. The ionic formula for this complex would be:
 - [DPMT 2004; Kerala PMT 2004] (a) $[Co(NH_3)_5(NO_2)]Cl_2$
 - (b) $[Co(NH_3)_5 Cl][Cl(NO_2)]$
 - (c) $[Co(NH_3)_4(No_2)Cl][(NH_3)Cl]$
 - (d) $[Co(NH_3)_5][(NO_2)_2Cl_2]$
- In any ferric salt, on adding potassium ferrocyanide, a 7. prussian blue colour is obtained, which is

[BIT 1992; BHU 2002]

- (b) $KFe[Fe(CN)_6]$ (a) $K_3 Fe(CN)_6$
- (d) $FeSO_4.Fe(CN)_6$ (d) $Fe_4 \left[Fe(CN)_6 \right]_3$
- Prussian blue is formed when [CBSE PMT 1990] 8 (a) Ferrous sulphate reacts with FeCl₃
 - (b) Ferric sulphate reacts with $K_4 \left[Fe(CN)_6 \right]$
 - (c) Ferrous ammonium sulphate reacts with FeCl₃
 - (d) Ammonium sulphate reacts with $FeCl_3$
- Complex salt can be made by the combination of 9. $[Co^{III}(NH_3)_5 Cl]^X$ with [RPMT 2000, AFMC 2002]
 - (a) PO_4^{3-} (b) *Cl*⁻
 - (c) $2Cl^{-}$ (d) $2K^+$
- Which reagent can be used to identify nickel ion 10.
 - (a) Resorcinol
 - (b) Dimethyl glyoxime [DMG]
 - (c) Diphenyl benzidine
 - (d) Potassium ferrocyanide
- 11. Dimethyl glyoxime forms a coloured complex with
 - (a) *Ag* (b) Ni
 - (c) *Cr* (d) Zn
- Silver chloride dissolves in excess of NH₄OH. The cation 12. present in this solution is [EAMCET 1998]

	(a) Ag^+	(b)	$\left[Ag(NH_3)_2\right]^+$
	(c) $[Ag(NH_3)_4]^+$	(d)	$\left[Ag(NH_3)_6\right]^+$
13.	Silver sulphide dissolved cynamide to form the compl	in ex	a solution of sodium [AMU 1999]
	(a) $Na[Ag(CN)_2]$	(b)	$Na_3[Ag(CN)_4]$
	(c) $Na_5[Ag(CN)_6]$	(d)	$Na_2[Ag(CN)_2]$
	Multiply and will give T_{1}^{3+} is		adution

14. Which one will give Fe^{3+} ions in solution

- (a) $[Fe(CN)_6]^{3-1}$
- (b) $Fe_2(SO_4)_3$
- (c) $[Fe(CN)_6]^{4-1}$

1.

- (d) $NH_4(SO_4)_2.FeSO_4.6H_2O$
- **15.** The cation that does not form an amine complex with excess of ammonia is
 - (a) Cd^{2+} (b) Al^{3+}
 - (c) Cu^{2+} (d) Ag^+

Application of organometallics

Ziegler-Natta catalyst is an organometallic compound of

	whi	ch metal	[J & K CET 2005]				
	(a)	Iron	(b)	Zirconium			
	(c)	Rhodium	(d)	Titanium			
2.	In t	he case of small cuts, bl	eedii	ng is stopped by applying			
	pota	ash alum. Here alum acts	s as				
				[KCET (Med.) 2001]			
	(a)	Fungicide	(b)	Disinfectant			
	(c)	Germicide	(d)	Coagulating agent			
3.	The	formula of ferrocene is					
	(a)	$\left[Fe(CN)_6\right]^{4-}$	(b)	$[Fe(CN)_6]^{3-}$			
	(c)	$\left[Fe(CO)_{5}\right]$	(d)	$\left[\left(C_5H_5\right)_2Fe\right]$			
4.	Wh	ich of the following is f	form	ed when <i>n</i> -butyl lithium			
-	read	cts with tin (II) chloride		[AFMC 2001]			
	(a)	LiBr	(b)	Et_4Pb			
	(c)	$(C_4H_9)_4Sn$	(d)	$(C_2H_5)_4Pb$			
5.	Wh hyd	ich of the following o rolysis will give a three d	orgar imei	no-silicon compound on nsional silicone			
				[Orissa JEE 2003]			
	(a)	R_3SiCl	(b)	RSiCl ₃			
	(c)	$SiCl_4$	(d)	R_2SiCl_2			

6. Which one is not an organometallic compound

[J & K CET 2005; Pb. CET 2003]

- (a) RMgX (b) C_2H_5ONa
- (c) $(CH_3)_4 Sn$ (d) $KC_4 H_9$
- 7. The complex used as an anticancer agent is [AIIMS 2003] (a) $trans -[Co(NH_3)_3Cl_3]$ (b) $cis -[PtCl_2(NH_3)_2]$

(c) $cis - K_2[PtCl_2Br_2]$ (d) Na_2CO_3

- 8. The compound that is not olefinic organometallic is (a) $K[C_2H_4PtCl_3]3H_2O$ (b) $Be(CH_2)_2$
 - (c) $(C_2H_4PtCl_3)_2$ (d) $C_4H_4Fe(CO)_3$

9.	Among the following, which isnot the π-bondedorganometallic compound[CBSE PMT 2003]									
	(a) $(CH_3)_4 Sn$ (b) $K[PtCl_3(\eta^2 - C_2H_4)]$									
	(c) $Fe(\eta^5 - C_5H_5)_2$ (d) $Cr(\eta^6 - C_6H_6)_2$									
10.	Wilkinson's catalyst is used in									
	(a) Polymerization (b) Condensation									
11	(c) Halogenation (d) Hydrogenation									
11.	(a) As a catalyst in addition reaction of alkenes									
	(b) As a catalyst in polymerization reaction of alkenes									
	(c) For reducing knocking									
19	(d) For creating knocking Which of the following is an organo-metallic compound									
12.	[MP PMT 2001]									
	(a) Lithium ethoxide (b) Ethyl lithium									
10	(c) Lithium acetate (d) Lithium carbide									
13.	[AIIMS 1997]									
	(a) $Ti(C_2H_5)_4$ (b) $Ti(OC_2H_5)_4$									
	(c) $Ti(OCOCH_3)_4$ (d) $Ti(OC_6H_5)_4$									
14.	Which of the following is not an organometallic									
	compound									
	(a) Ethyl magnesium bromide									
	(b) Tetraethyl lead									
	(c) Sodium ethoxide									
15	(d) Trimethyl aluminium									
15.	(a) Ferrocene (b) CaC_2									
	(c) Tetraethyl lead (TEL) (d) All of these									
16.	Which of the following does not have a metal carbon bond									
	[CBSE PMT 2004]									
	(a) $K[Pt(C_2H_4)Ct_3]$ (b) $Nt(CO)_4$									
	(c) $Al(OC_2H_5)_3$ (d) C_2H_5MgBr									
17.	Coordination compounds have great importance in biological systems. In this context which of the following statements is incorrect [AIEEE 2004]									
	(a) Cyanocobalamin is B_{12} and contains cobalt.									
	(b) Haemoglobin is the red pigment of blood and									
	(c) Chlorophylls are green pigments in plants and contains calcium.									
	(d) Carboxypepticase- <i>A</i> is an enzyme and contains zinc.									
18.	Ziegler-Natta catalyst is [Pb. CET 2004]									
	(a) $(Pn_3P)_3 KnCl$ (b) $K[PtCl_3(C_2H_4)]$									
	(c) $[Al_2(C_2H_6)_6] + IICl_4$ (d) $[Fe(C_2H_5)_2]$									
19.	Dimethyl glyoxime gives a red precipitate with Ni^{2+} , which is used for its detection. To get this precipitate									

- which is used for its detection. To get this precipitate readily the best pH range is [AIIMS 2004] (a) < 1 (b) 2-3 (c) 3-4 (d) 9-11
- 20. The π-bonded organo metallic compound which has ethene as one of its component is [J & K CET 2005]
 (a) Zeise's salt
 (b) Ferrocene
 - (c) Dibenzene chromium (d) Tetraethyl tin.



	10.	In the process of extraction of	of gold,								
		Roasted gold ore $+ CN^- + H$	$_2O \xrightarrow{O_2} [X] + OH^-$								
		$[X] + Zn \to [Y] + Au$									
		Identity the complexes [X] and [Y]									
-		(a) $X = [Au(CN)_2]^{-}, Y = [Zn(CN)_4]^{2^{-}}$									
n]		(b) $X = [Au(CN)_4]^{3-}, Y = [Zn(CN)_4]^{2-}$									
		(c) $X = [Au(CN)_2]^-, Y = Zn(CN)_6]^{4-}$									
		(d) $X = [Au(CN)_4]^-, Y = [Zn_4]^-$	$(CN)_4]^{2-}$								
e	11. [B	A solution of potassium ferr HU 1999] Ions	ocyanide would contains [KCET 1990]								
		(a) 2	(b) 3								
2 f	12.	(c) 4 Which one of the following complex	(d) 5 complexes is an outer orbital [AIEEE 2004]								
		(a) $[Co(NH_3)_6]^{3+}$	(b) $[Mn(CN)_6]^{4-}$								
		(c) $[Fe(CN)_6]^{4-}$	(d) $[Ni(NH_3)_6]^{2+}$								
1		Atomic nos : $Mn = 25, Fe = 2$	26, Co = 27, Ni = 28								
1	13.	Which one of the following l	nas largest number of isomers								
-		?	[AIEEE 2004]								
]		(a) $[Ir(PP_3)_2H(CO)]^{2+}$	(b) $[Co(NH_3)_5 Cl]^{2+}$								
		(c) $[Ru(NH_3)_4 Cl_2]^+$	(d) $[Co(en)_2 Cl_2]^+$								
	14.	(R = alkyl group; en = ethyle Which kind of isomerism $Co(NH_3)_4 Br_2 Cl$?	nediamine) is exhibited by octahedral [IIT-JEE Screening 2005]								
r		(a) Geometrical and Ionizat(b) Geometrical and Optical(c) Optical and Ionization	ion I								
s	15.	(d) Geometrical only Which one of the following isomerism (<i>en</i> = ethylenedia	is expected to exhibit optical mine)								
е		(a) $cis - [Pt(NH_3)_2Cl_2]$	(b) $trans - [Co(en)_2 Cl_2]$								
]		(c) $trans - [Pt(NH_3)_2Cl_2]$	(d) $cis - [Co(en)_2 Cl_2]$								
	16.	$[EDTA]^{4-}$ is a:	[UPSEAT 2004]								
]		(a) Monodentate ligand	(b) Bidentate ligand								
	17.	Which of the following state	ments is incorrect ?								
		(a) In $K[E_{1}(CM)]$ the l	[KCET 2004]								
		(a) III $K_3[Fe(CN)_6]$, the I secondary valency of fer	ric ion.								
		(b) In $K_3[Fe(CN)_6]$, the ligation of the l	and has satisfied both primary								
		and secondary valencies	of ferric ion.								
1		(c) In $K_4[Fe(CN)_6]$, the ligation of the secondary valencies	and has satisfied both primary								
		(d) In $[Cu(NH_3)_4]SO_4$, the secondary valency of cou	ligand has satisfied only the								
	18	Which of the following is	considered as an anticancer								

- Which of the following is considered as an anticance [CBSE PMT 2004] species.
- (c) $K_2[Cu(CN)_4]$ (d) $K_3[Cu(CN)_4]$



19. An aqueous solution of CoCl₂ on addition of excess of concentrated HCl turns blue due to formation of [AIIMS 2005]

(a) $[Co(H_2O)_4 Cl_2]$

- (b) $[Co(H_2O)2Cl_4]^{2-}$
- (c) $[CoCl_4]^{2-}$
- (d) $[Co(H_2O)2Cl_2]$
- 20. The correct order for the wavelength of absorption in the visible region is [AIIMS 2005]
 - (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) $[Ni(NH_3)_6]^{2+} < [Ni(H_2O)_6]^{2+} < [Ni(NO_2)_6]^{4-}$
- **21.** In which of the following pairs both the complexes show optical isomerism
 [AIIMS 2005]
 - (a) $cis [Cr(C_2O_4)_2Cl_2]^{3-}$, $cis [Co(NH_3)_4Cl_2]$
 - (b) $[Co(en)_3]Cl_3$, cis- $[Co(en)_2Cl_2]Cl$
 - (c) [PtCl(dien)]Cl, $[NiCl_2Br_2]^{2-1}$
 - (d) $[Co(NO_3)_3(NH_3)_3]$, cis- $[Pt(en)_2Cl_2]$
- 22. Which of the following compounds shows optical isomerism[AIEEE 2005; CBSE PMT 2005]
 - (a) $[Cu(NH_3)_4]^{2+}$ (b) $[ZnCl_4]^{2-}$

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

(c) $[Cr(C_2O_4)_3]^{3-}$

Assertion & Reason

Read the assertion and reason carefully to mark the correct option out of the options given below :

- (a) If both assertion and reason are true and the reason is the correct explanation of the assertion.
- (b) If both assertion and reason are true but reason is not the correct explanation of the assertion.
- (c) If assertion is true but reason is false.
- (d) If the assertion and reason both are false.
- (e) If assertion is false but reason is true.

1.	Assertion	:	Potassium	ferrocyanide	and	potassium				
			ferricyanite	both are diama	agneti	2.				
	Reason	:	Both have unpaired electrons.							
2.	Assertion	:	NF_3 is a we	eaker ligand tha	an N($(H_3)_3$				

Reason: NF_3 ionizes to give F^- ions
ionsiionsionsioiiioioioioioioioioioioi

ions in aqueous solution.

5.

3. Assertion : The $[Ni(en)_3]Cl_2$ (*en* = ethylene diamine) has lower stability than $[Ni(NH_3)_6]Cl_2$

- Reason : In $[Ni(en)_3]Cl_2$ the geometry of Ni is trigonal bipyramidal
- **4.** Assertion : The ligands nitro and nitrito are called ambidentate ligands.

Reason : These ligands give linkage isomers.

- Assertion : Geometrical isomerism is also called *cistrans* isomerism.
 - Reason : Tetrahedral complexes show geometrical isomerism.

6. Assertion :
$$(en)_2 Co \bigvee_{OH}^{NH} Co(en)_2$$
 is named as

tetrakis (ethylene diamine) μ -hydroxoimido dicobalt (III) ion.

- Reason : In naming polynuclear complexes *i.e.*, containing two or more metal atoms joined by bridging ligands, the word μ is added with hyphen before the name of such ligands.
- 7. Assertion : $[Fe(CN)_6]^{3^-}$ is weakly paramagnetic while $[Fe(CN)_6]^{4^-}$ is diamagnetic.
 - Reason : $[Fe(CN)_6]^{3-}$ has +3 oxidation state while $[Fe(CN)_6]^{4-}$ has +2 oxidation state.
- **8.** Assertion : $H_2N NH_{2}$ is a chelating ligand.

Reason : A chelating ligand must possess two or more lone pairs at such a distance that it may form suitable strain free rings at the metal ion.

- **9.** Assertion : $[Ti(H_2O)_6]^{3+}$ is coloured while $[Sc(H_2O)_6]^{3+}$ is colourless.
 - Reason : d-d transition is not possible in $[Sc(H_2O)_6]^{3+}$.
- **10.** Assertion : All the octahedral complexes of Ni^{2+} must be outer orbital complexes.
 - Reason : Outer orbital octahedral complexes are given by weak ligands.
- **11.** Assertion : Potassium ferrocyanide is diamagnetic whereas potassium fericyanide is paramagnetic.
 - Reason : Crystal field splitting in ferrocyanide ion is greater than that of ferricyanide ion.

[AIIMS 2005]



1	b	2	c	3	b	4	b	5	d
6	а	7	b	8	с	9	b	10	с
11	d	12	C	13	d	14	b	15	b
16	b	17	a	18	c	19	C	20	b
21	b	22	C	23	b	24	d	25	a
26	d	27	a	28	b	29	b	30	C
31	b	32	C	33	b	34	b	35	d
36	d	37	b	38	b	39	d	40	b
41	d	42	b	43	d	44	b	45	а
46	а	47	d	48	C	49	b	50	d
51	а	52	b	53	d	54	a	55	d
56	d	57	a	58	d	59	a	60	d
61	C	62	d						

Nomenclature, oxidation State and EAN number

1	b	2	С	3	С	4	b	5	d
6	С	7	b	8	а	9	а	10	а
11	C	12	а	13	b	14	а	15	b
16	С	17	d	18	b	19	d	20	а
21	b	22	b	23	а	24	b	25	а
26	d	27	С	28	b	29	а	30	а
31	а	32	b	33	а	34	b	35	C
36	b	37	а	38	а	39	b	40	C
41	а	42	b	43	С	44	b	45	b
46	d	47	а	48	b	49	С	50	C
51	b	52	b	53	С	54	d	55	b
56	а	57	b	58	C				

Isomerism and Magnetic properties

1	а	2	d	3	a	4	с	5	С
6	d	7	b	8	а	9	а	10	C
11	d	12	d	13	b	14	С	15	а
16	b	17	а	18	d	19	а	20	b
21	C	22	b	23	b	24	а	25	а
26	d	27	d	28	а	29	С	30	а
31	b	32	а	33	C	34	а	35	d
36	C	37	d	38	а	39	d	40	b
41	а	42	C	43	d	44	а	45	b
46	е	47	а	48	d	49	С	50	С
51	d	52	a	53	C	54	а	55	a
56	C	57	C						

Hybridisation and Geometry

1	a	2	b	3	a	4	b	5	а
6	b	7	b	8	d	9	C	10	а
11	b	12	C	13	d	14	а	15	b
16	b	17	d	18	d	19	а	20	а

21	b	22	d	23	С	24	с	25	с
26	d	27	d	28	d	29	d	30	а
31	d	32	C	33	а	34	а	35	С
36	a	37	C	38	d	39	d	40	b
41	b	42	а	43	C				

Complexes and complex stability

1	d	2	d	3	d	4	b	5	а
6	а	7	d	8	b	9	С	10	b
11	b	12	b	13	а	14	b	15	b

Application of organometallics

1	d	2	d	3	d	4	c	5	b
6	b	7	b	8	а	9	а	10	d
11	c	12	b	13	а	14	С	15	d
16	C	17	С	18	C	19	d	20	а

Critical Thinking Questions

1	b	2	b	3	а	4	b	5	b
6	b	7	С	8	C	9	d	10	а
11	d	12	d	13	d	14	а	15	d
16	d	17	ad	18	а	19	c	20	a
21	b	22	С						

Assertion & Reason

1	d	2	C	3	d	4	а	5	C
6	е	7	b	8	е	9	а	10	b
11	C								



26. (d) The number of atom of the ligand that are directly bound to the central metal atom or ion by coordinate bonds is known as the coordinate number of the metal or ion. It is actually the number of chemical bonds which the ligand form with the central metal atom or ion.



- **27.** (a) CN^{-} ion \mathscr{G} acts both as reducing agent as well as good complexing agent.
- **29.** (b) ZnS structure shows the coordination number of Zn is 4.
- **30.** (c) Wilkinson's catalyst is $Rh(P, Ph_3)_3Cl$].

31.

5

Hence, number of primary valencies are 3, 2 and 1 respectively.

- 32. (c) Ligand must have capacity to donate lone pair of electrons to form co-ordinate bond.
- **33.** (b) $K_3[Fe(CN)_6]$ because in it CN^- donats a lone pair of electron.
- **34.** (b) Al has 6 co-ordination number.
- **35.** (d) $K_4[Fe(CN)_6] \rightarrow 4K^+ + [Fe(CN)_6]^{4-1}$

Complex has negative charge so it is anionic complex.

- **36.** (d) Co-ordination number is equal to total number of ligands in a complex.
- **37.** (b) Lithium tetrahydroaluminate is $Li[Al(H)_4]$.
- **40.** (b) Negative ligands end in -O eg. SO_4^{2-} (sulphato).
- 44. (b) Turnbull's blue is $K{Fe^{II}[Fe^{III}(CN)_6]}$.

46. (a)
$$Fe + 5CO \xrightarrow{\text{Heat}} [Fe(CO)_5]$$

Pressure Iron pentacarbonyl.

48. (c) When a ligand attaches to the central metal atom through two or more atoms to form a ring like structure is known as chelats and the ligand is called chelating ligand.

3. (b) eg.
$$n CH_3 - CH = CH_2 \xrightarrow[(C_2H_5)_3Al]{hCl_4+} (-CH - CH_2)_n$$

 CH_2

- 55. (d) CH_3Li is the organometallic compound in which lithium bonded with carbon and organometallic are those in which metal-carbon bond found.
- 56. (d) Potash alum is a mixed salt of K_2SO_4 and $Al_2(SO_4)_3$ and on dissolving, it gives all three ion Al^{3+}, K^+ and SO_4^{2-} of which it is made.
- **57.** (a) Carnallite is a double salt with molecular formula $KCl \cdot MgCl_2 \cdot 6H_2O$. It gives K^+, Mg^{2+} and Cl^- ions in solution.
- **59.** (a) General formula for alum is

 $M_2SO_4.R_2(SO_4)_3.24H_2O$

M = mono valent cation $(K^+, Na^+...)$

 $R = \text{Trivalent cation } (Al^{+3}, Fe^{+3})$

Hence, $K_2 SO_4 Al_2 (SO_4)_2.24 H_2 O$ represent an alum.

- 60. (d) $K_4[Fe(CN)_6]$ is a complex salt. On ionisation it will dissociate in $4K^+$ and $[Fe(CN)_6]^{4-}$ ion. Hence, in $K_4[Fe(CN)_6]$ five ions are present.
- (c) Due to C Mg bond. 61.
- (d) EAN = (At. number $-0.S + 2 \times C.N.$) 62. Hence, EAN of Ni in $Ni(CO)_4$ is $= 28 - 0 + 2 \times 4 = 36$

Nomenclature, Oxidation State & EAN number

- (b) $[Co(H_2O)_6]Cl_2 \Rightarrow [Co(H_2O)_6]^+ + 2Cl^-.$ 1.
- 5. (d) Follow IUPAC rule.
- (b) Follow IUPAC rule. 7.
- Follow IUPAC rule. (a) 9.
- Follow IUPAC rule. 10. (a)
- EAN =Atomic number Oxidation state + 2 × number of 11. (c) Ligands = 26 - 2 + 2(6) = 36.
- (a) EAN of *Pt* in $[PtCl_6]^{2-} = 80$ 12.
- (b) $Na_2[Cr F_4 O]$ 13.

x + 4(-1) + (-2) = -2

 $x-6 = -2 \Longrightarrow x = +4$.

- (a) Follow IUPAC rule. 14.
- 16. (c) Follow IUPAC rule.
- (d) Follow IUPAC rule. 17.
- The oxidation state of metal in metal carbonyl is zero. 18. (b)
- $x + 6 \times (0) + 3 \times (-1) = 0$ (d) 19.

$$x-3=0$$
, $x=+3$, Oxidation number of Cr is $=+3$.

- 20. EAN = (atomic no)- (oxidation state) + (2 × number of Ligands) (a) $= 28 - 2 + 2 \times 4 = 34$
- 21. (b) Follow IUPAC rule.

22. (b)
$$[Pt(C_2 H_4)Cl_3]^-$$

 $x + 0 + 3x(-1) = -1$, $x - 3 = -1$, $x = +2$.

- (a) $[Co(NH_3)_6]Cl_3 \rightarrow [Co(NH_3)_6]^{3+} + 3Cl^{-}$ 23. $x+6(0)=+3 \Longrightarrow x=+3$.
- (b) Follow IUPAC rule. 24.
- (a) EAN = at. no. of central atom oxidation state $+ 2 \times (no. of$ 25. ligands) = $27 - 3 + 2 \times 6 = 36$.
- (d) Follow IUPAC rules for nomenclature. 26.
- EAN of a central metal ion=(atomic no. of central atom) -27. (c) 2 oxidation state + no. of ligands × $= 26 - 3 + (6 \times 2) = 23 + 12 = 35$

28. (b)
$$+1 \times 4 + x - 1 \times 4 = 0$$

 $4 + x - 4 = 0 \Longrightarrow x = 0$ for *Ni*.

- (a) Follow IUPAC rule. 29.
- (a) In complex $K_4[Fe(CN)_6]$ the Fe obey EAN rule strictly. 30.

- $Ni(CO)_4$ has O.N. zero for Ni. 31. (a)
- $3 \times (+1) + x + 6 \times (-1) = 0$ or x = 6 3 = +3 Oxidation 32. (b) state of Fe = +3.
- 33. (a) Complexes containing carbonyl ligand (CO) have zero oxidation state.
- 34. (b) Follow IUPAC rule.
- Follow IUPAC rule. 35. (c)
- 36. (b) Follow IUPAC rule.
- Follow IUPAC rule. 38. (a)
- 39. (b) Follow IUPAC rule.
- Follow IUPAC rule. 41. (a)
- $[Ni(CN)_{4}]^{x}$, (Ni = +2) (CN = -1)42. (b)

$$x = 2 + 4(-1) \Rightarrow x = -2$$

- $[Cu(NH_3)_4]^{2+}$ so, copper has + 2 valency. (b) 44.
- (a) Follow IUPAC rule. 47.
- Follow IUPAC rule. 50. (c)
- $[Co(H_2O)_5 Cl]^{+2}$ 51. (b)

$$x-1=2 \Longrightarrow x=+3$$
.

52. (b) It is clear from the chemical formulae that Ag is central metal atom and ligands are 2 ammonia molecule. Hence, compound is $[Ag(NH_3)_2]Cl$.

(a) In the compounds $[Co(NH_3)_5 NO_2]Cl_2$, the oxidation state 53. of cobalt is +3 and here 5 NH_3 ligand, a NO_2 ligand are attached to the central atom. therefore its name is pentaamminecobalt (111) chloride.

54. (b)
$$CrO_2 Cl_2, MnO_4$$
.

1.

4.

- (b) In the given ion $[Cr(NH_3)_6]^{3+}$, the oxidation state of 55. chromium is +3 and here $6NH_3$ ligand are attached to the central metal atom. Therefore its IUPAC name is hexamminechromium (111) ion.
- (a) It is potassium ammine dicyano dioxo peroxo-chromate (VI) 56.
- (b) Potassium hexa cyanoferrate (111). 57.

Isomerism and Magnetic Properties

- (a) Octahedral complexes of the type $[MA_4B_2], [MA_2B_4], [MA_3B_3]$ exhibit geometrical isomerism.
- (d) The number of unpaired electrons in the Complex ion 2. $[CoF_6]^{3-}$ is 4.

(c)
$$\begin{bmatrix} NH_{3} \\ H_{3}N \\ H_{3}N \\ NH_{3} \end{bmatrix}^{2+} \begin{bmatrix} NH_{3} \\ H_{3}N \\ H_{3}N \\ NH_{3} \end{bmatrix}^{2+} \begin{bmatrix} NH_{3} \\ H_{3}N \\ H_{3}N \\ NH_{3} \end{bmatrix}$$

Here more than one atom function as donor, as oxygen in first one and nitrogen in second, so they show linkage isomerism

- 5. (c) The two given compounds have same composition but in solution both will give different ions. The isomerism is known as ionisation isomerism.
- 6. (d) Both produce different ions in solution state-

$$[Co(NH_3)_4 Cl_2]NO_2 \rightleftharpoons [Co(NH_3)_4 Cl_2]^+ NO_2^-$$

$$[Co(NH_3)_4 Cl. NO_2]Cl \rightleftharpoons [Co(NH_3)_4 Cl. NO_2]^+ + Cl^-$$

7. (b) The compound which has same composition but give different ions in solution, show ionization. So $[Co(NH_3)_5Br] SO_4$ is ionization isomer.

 $[Co(NH_3)_5Br]SO_4 \rightleftharpoons [Co(NH_3)_5Br]^{2+} + SO_4^{2-}$

 $[Co(NH_3)_5 SO_4]Br \rightleftharpoons [Co(NH_3)SO_4]^+ + Br^-.$

- **9.** (a) Co-ordination isomerism is caused by the interchange of ligands between cis and trans structure.
- 10. (c) $[Co(NH_3)_5NO_2]Cl_2$ will not show geometrical isomerism because this complex showed 4 and 6 co-ordination number.
- 13. (b) $[Fe(H_2O)_6]^{2^+}$ has four unpaired electrons, $[Cr(H_2O)_6]^{3^+}$, $[Cu(H_2O)_6]^{2^+}$ and $[Zn(H_2O)_6]^{2^+}$ have 3, 1,

 $[Cr(H_2O)_6]$, $[Cu(H_2O)_6]$ and $[Zn(H_2O)_6]$ have 3, 1, 0 unpaired electrons respectively.

14. (c) The electronic configuration of Ni in $[Ni(CN)_4]^{2^-}, [Ni(Cl_4)]^{2^-}$ and $Ni(CO)_4$ are as following $Ni^+ in [Ni(CN)_4]^{2^-} -$



CO and CN^- are strong ligands so they induces pairing of electrons so their complexes are diamagnetic while Cl^- is a weak ligand so it does not induce the pairing of electrons so its complex is paramagnetic.

15. (a) $[Co (NH_3)_4 Cl_2]^+$ is the Ma_4b_2 and Ma_2b_3 type complex.



16. (b) $\ln [Ag(NH_3)_2]Cl, Ag^+$ contains d^{10} configuration. All others contain unpaired electrons.





(c) $[Co(en)_2 NO_2 Cl]Br$; $[Co(en)_2 ONOCl]Br$

22. (b) Because it will not give any ions in solution.

19.

21.

31.

23. (b) $[Co(en)_2 Cl_2]^+$ have three optical isomers which are.



- **24.** (a) Magnetic moment of $[Cu(NH_3)_4]^{2+}$ ion is 1.414 due to the presence of one unpaired electron.
- 25. (a) Due to the presence of one unpaired electron, both are slightly paramagnetic.
- **27.** (d) 1. $[Cu(NH_3)_4].[PtCl_4]$
 - 2. $[Cu(NH_3)_3Cl].[PtCl_3(NH_3)]$
 - 3. $[Cu(NH_3)_2Cl_2].[PtCl_2(NH_3)_2]$ cis
 - 4. $[Cu(NH_3)_2Cl_2].[PtCl_2(NH_3)_2]$ Trans
 - 5. $[Cu(NH_3)Cl_3].[Pt(Cl)(NH_3)_3]$

6. $[Pt(NH_3)_4 Cl].[Cu Cl_4]$

- 29. (c) Co-ordination isomerism is possible when both +*ve* and -*ve* ions of a salt are complex ions and the two isomers differ in the distribution of ligands in the cation and the anion.
- **30.** (a) On ionisation it gives maximum number of (four) ions.
 - (b) The anhydrous complex of Cu^+ do not involve d-d transition and are thus colourless.

32. (a)
$$Mn^{2+}$$
 11 11 1 1 1
 $3d^7$ $4s^0$

In presence of H_2O which is a weak ligand no pairing occurs which results in unpaired electrons left in the compound, due to which it shows paramagnetism.

- **33.** (c) Geometrical isomers (cis and trans) and linkage isomers (–SCN and –NCS).
- **34.** (a) Due to presence of strong ligand all the e^- get paired. So no. of unpaired electrons are 0.
- **36.** (c) Both have same composition but give different ions in the solution.

37. (d)
$$[Pt(en)_2]Cl_2$$



et

38. (a) CO is a strong ligand so induce pairing of electrons and hence $Ni(CO)_4$ is diamagnetic.

40. (b)
$$[Co(en)_3]^{3+}$$



of formula MA_3B_3 which does not show optical isomerism.

42. (c) Change in composition of co-ordination sphere yield ionization isomers.

 $[Cr(H_2O)_6]Cl_3$ and $[CrCl_3(H_2O)_3].3H_2O$

- **43.** (d) NO_2 is ambident and can be linked either to N -side as $(-NO_2)$ or to O -side as (-ONO).
- **44.** (a) As $[Co(NH_3)_3Cl_3]$ does not losses any Cl^- ions in the solution so it will not give ppt. with $AgNO_3$.

45. (b)
$$[Co(NH_3)_6]Cl_3 \rightleftharpoons [Co(NH_3)_6]^{3+} + 3Cl^-.$$

- **46.** (e) $CoCl_3.5NH_3.H_2O$ is pink in colour.
- **47.** (a) The configuration of Ni^{2+} has two unpaired electron so it is paramagnetic.
- **48.** (d) $[Pt(NH_3)_4]Cl_2 \rightarrow [Pt(NH_3)_4]^{+2} + 2Cl^{-1}$

As it gives $\ensuremath{\mathit{Cl}^-}$ ions in solution so it will give white ppt. of AgCl with $AgNO_3$.

- **49.** (c) $[Co(NH_3)_5 Cl]Cl_2 \Rightarrow [Co(NH_2)_5 Cl]^{2+} + 2Cl^{-1}$
- 50. (c) $[Cr(NH_3)_5 Cl]SO_4 \rightarrow [Cr(NH_3)_5 Cl]^{2+} + SO_4^{2-}$ (Cr(NH₃)₅ Cl]²⁺ + SO₄²⁻ + BaCl₂ → [Cr(NH₃)₅ Cl]Cl₂ + BaSO₄ + HCl.
- **51.** (d) $[Pt(NH_3)Cl_2Br]Cl \Rightarrow [Pt(NH_3)Cl_2Br]^+ + Cl^-$

 Cl^- ion is precipitable.

- **52.** (a) Cu(II) complexes are blue.
- 53. (c) It will ionize in the following manner. $[Co(NH_3)_5]Cl_2 \rightleftharpoons [Co(NH_3)_5]^{2+} + 2Cl^- (3 \text{ ions}).$
- 54. (a) ${}_{27}Co \rightarrow [Ar]3d^7 4s^2$ $Co^{2+} \rightarrow 3d^7 4s^0$ Number of unpaired electrons = 3. 55. (a) $K_3[FeF_6]$

$$Fe^{3+} = [Ar]3d^{5}4s^{0}$$

$$3d \qquad 4s \qquad 4p$$

$$1 \qquad 1 \qquad 1 \qquad 1$$
Number of unpaired electrons = 5
Magnetic moment = $\sqrt{n(n+2)} = \sqrt{5(5+2)}$

$$= \sqrt{35} = 5.91$$
 BM.

56. (c)
$$[Fe(CN)_6]^{4-} 3d$$

 $11 11 11 x x xx$
 $dsp, Paramagnetism$
 $[CO(CN)_6]^{3-} 3d$
 $4s$
 $4s$
 $4p$
 $11 11 11 x x xx$
 xx
 xx

dsp, Paramagnetism

57. (c) When coordinate compounds gives different ions in solution then it produces ionic isomerism while this situation is not present in $[Co(en)_2 Cl_2]Cl$.

Hybridisation and Geometry

(a) $2Cl^{-}$ ions are ionizable $\cdot [C_{0}(NH), Cl]Cl \rightarrow [C_{0}(NH), Cl]^{2+}$

3.

$$\therefore [Co(NH_3)_5 Cl]Cl_2 \neq [Co(NH_3)_5 Cl]^{2^*} + 2Cl_3$$

 $2Cl^- + 2AgNO_3 \rightarrow 2AgCl + 2NO_3^-.$

- (b) Copper complexes usually involve with four co-ordination number and have square planar in shape.
- **5.** (a) Complex with sp^3d hybridisation show square pyramidal geometry.



- 8. (d) Metal carbonyls does not show overlapping.
- **9.** (c) sp^3d^2 hybridisation gives octahedral complex.



(b) Copper complexes usually involve co-ordination number of four

and are thus square planar in shape.



- **32.** (c) The compounds which show d^6 configuration are octahedral complexes.
- **33.** (a) CN^- ligand has strong field ligand because of higher value of Δ .
- **35.** (c) Ammine (NH_2) is neutral ligand.
- 37. (c) A strong field ligand produces low spin complexes.
- **38.** (d) Cyanide ion is strong field ligand because it is a pseudohalide ion pseudohalide ions are stronger coordinating ligand & they have the ability to form σ bond (from the pseudohalide to the metal) and π bond (from the metal to pseudohalide).

39. (d)
$$Mn^{25} \longrightarrow 3d^5 + 4s^2$$

40.

6.

 $Mn^{2+} \longrightarrow 3d^5 \boxed{1 \quad 1 \quad 1 \quad 1 \quad 1}$

In presence of weak ligand field, there will be no pairing of electrons. So it will form a high spin complex. i.e. the number of unpaired electrons = 5.

(b) The complexes, in which, the metal and ligand form a bond that involves the π – electrons of the ligand are know as π – complexes *e.g.* Ferrocene

Fe $(\eta^5 - C_5 H_5)_2$, zeise's salt $K[PtCl_3(\eta^2 - C_2 H_4)]$.

- **41.** (b) *CO* has strong $M \rightarrow L \quad \pi$ bonding ability so it can accept electron pairs from metal ion so it is a π -acid ligand.
- **42.** (a) d^4 (in strong ligand field).
- **43.** (c) Both $Ni(CO)_4$ and $Ni(PPh_3)_2Cl_2$ are tetrahedral.

Complexes and complex stability

- (d) The cyano and ammine complexes are far more stable than those formed by halide ions. This is due to the fact that NH₃ and CN⁻ are strong lewis bases.
 (b) Greater the charge on central metal ion greater is the stability
- (b) Greater the charge on central metal for greater is the stability of complex.
 (a) CuSO₄ on reaction with KCN gives K₂[Cu(CN)₄]
 - (a) $CuSO_4$ on reaction with KCN gives $K_3[Cu(CN)_4]$ $2CuSO_4 + 10KCN \rightarrow 2K_3[Cu(CN)_4] + 2K_2SO_4 + (CN)_2$
 - (a) The most probable complex which gives three moles ions in aqueous solution may be $[Co(NH_3)_5 NO_2]Cl_2$ because it

 $[Co(NH_3)_5NO_2]Cl_2 \rightarrow [Co(NH_3)_5NO_2]^{2+} + 2Cl^{-1}$

7. (d) $3K_4[Fe(CN)_6] + 4FeCl_3 \rightarrow Fe_4[Fe(CN)_6]_3 + 12KCl$ pot. ferrocyanide (Ferri ferrocynide) (Prusion blue)

gives two chlorine atoms on ionisation.

8. (b) $Fe_2(SO_4)_3 \rightarrow 2Fe^{3+} + 3SO_4^{2-}$

$$K_4[Fe(CN)_6] + 2Fe^{3+} \rightarrow Fe_4[Fe(CN)_6]_3$$

Prussion blue

9. (c) $[Co(NH_3)_5Cl]^x + 2Cl^- \rightarrow [Co(NH_3)_5Cl]Cl_2$.

 (b) Ni reacts with dimethylglyoxime to give red ppt. of nickeldimethyl glyoxime complex.

$$CH_{3} - C = N \xrightarrow{I} Ni \xrightarrow{N} Ni = C - CH_{3}$$
$$CH_{3} - C = N \xrightarrow{I} Ni \xrightarrow{N} Ni \xrightarrow{N} CH_{3} - C = N \xrightarrow{I} Ni \xrightarrow{N} Ni \xrightarrow{N}$$

11.

12. (b)
$$AgCl + 2NH_4OH \rightarrow [Ag(NH_3)_2]Cl + 2H_2O$$

 $[Ag(NH_3)_2]+Cl^-$

 $Ag_2S + NaCN \rightleftharpoons Na [Ag(CN)_2] + Na_2S$. 13. (a)

14. (b)
$$Fe_2(SO_4)_3 \rightarrow 2Fe^{3+} + 3SO_4^{-2}$$
.

15. (b) Aluminum is a *p*-block element and does not form complex compounds.

Application of Organometallics

- $(CH_3CH_2)_3Al + TiCl_4$ is the Ziegler-Natta catalyst. (d) 1.
- Alum acts as coagulating agent. 2. (d)
- $4CH_3CH_2CH_2CH_2 Li + SnCl_2 \rightarrow (C_4H_9)_4Sn.$ (c) 4
- 6. (b) As there is no direct bonding between the metal atom and the carbon atom.

9. $(CH_3)_4$ Sn is a σ – bonded organometallic compound. (a)

Wilkinson's catalyst is used as homogeneous catalyst in the 10. (d) hydrogenation of alkenes as -

$$H - H + C = C - C - H$$

- (b) C_2H_5 Li is an organo-metallic compound. 12.
- Because there is direct bonding of metal ion with carbon. 13. (a)
- Organometallic compounds are those compounds in which (c) 14. carbon atom is directly linked to metal. But in sodium ethoxide as oxygen is attached to sodium metal so it is not a organometallic compound.
- 16. (c) $Al(OC_2H_5)_3$ contains bonding through O and thus it does not have metal-carbon bond.
- Chlorophyll are green pigment in plant & contain magnesium 17. (c) instead of calcium.
- 19. (d) This reaction carried out in alkaline pH i.e., 9-11
- 20. (a)



dibenzene chromium Critical Thinking Questions

Its coordination number will be 6 because it is bonded with (b) three bidentale ligands.

Oxi. No. of
$$Cr$$
 in $K_3[Cr(C_2O_4)_3]$ is
 $x + 3(-2) + 3(+1) = 0 \implies x = +3$

2. (b) e.g. $Fe(CO)_5$, $Ni(CO)_4$ etc.

3. (a)
$$[Co(NH_3)_5SO_4]Br + AgNO_3 \rightarrow 0.02 \text{ mole}$$

 $[Co(NH_3)_5.SO_4]NO_3 + AgBr$ $0.02 \operatorname{mole}(y)$

$$[Co (NH_3)_5 Br_2]SO_4 + BaCl_2 \rightarrow 0.02 \text{ mole}$$

 $[Co(NH_3)_5Br]Cl_2 + BaSO_4$ $0.02 \operatorname{mole}(z)$

On using one *lit*. solution, we will get 0.01 mole y and 0.01 mole

(b) $[Fe(\eta^5 - C_5H_5)_2]$ is the organometallic compound which has 4. σ and π bonds present.

5. (b)
$$[Ni (NH_3)_4]SO_4$$

 $x + 0 + (-2) = 0 \Longrightarrow x = +2$ is valency and 4 is *C.N.* of *Ni*.

(b) Co-ordination number is equal to total number of ligands in a 6. complex.

(c)
$$n\begin{bmatrix} Cl & Cl \\ Si & \\ CH_3 & CH_3 \end{bmatrix} + 2nH_2O \rightarrow \begin{bmatrix} CH_3 \\ -O-Si-O \\ - \\ CH_3 \end{bmatrix}_n$$

(c) Because it is a polydentate ligand which binds the central atom nickel forming a ring like structure.

(d)
$$4KCN + CuSO_4 \rightarrow K_3[Cu(CN)_4]$$

Potassium tetracynocuprate

10. (a) Roasted +
$$CN^-$$
 + $H_2O \xrightarrow{O_2} [Au(CN)_2]^- + OH$
gold ore

$$\left[Au(CN)_{2}\right]^{-} + Zn \rightarrow \left[Zn(CN)_{4}\right]^{2-}.$$

(d) Potassium ferrocynide $K_{A}[Fe(CN)_{6}]$ will 11. ionize as $K_4[Fe(CN)_6] \rightleftharpoons 4K^+ + [Fe(CN)_6]^4$

So, it will give five ions in solution.

(d) Complex ion Hybridization of central atom

$$[Fe(CN)_6]^{4-}$$
 $d^2 s p^3$ (inner)

 $[Mn(CN)_6]^{4-}$
 $d^2 s p^3$ (inner)

 $[Co(NH_3)_6]^{3+}$
 $d^2 s p^3$ (inner)

 $[Ni(NH_3)_6]^{2+}$
 $s p^3 d^2$ (outer)

well 13. geomerical as as optical ows

14.





со

CI

 H_3N

 H_3N NH

(d)
$$[Co(en)_2 Cl_2]^+$$
 sh isomerism.
(a)

7.

8.

9.

12.



Ethylenediamine tetraacetate ion (EDTA)

They have six donor atoms. poly dentate ligands have flexidentate character. It is not necessary that all the donor atoms present in the polydentate ligands should form coordinate bonds with central metal atom or ion.

- 17. (a,d) In $K_3[Fe(CN)_6]$ the ligand are negative which is present in coordination spheres shows a dual behaviour. It may satisfied both primary & secondary valencies while neutral ligand satisfied only secondary valencies.
- Cis Isomer of $[Pt(NH_3)_2 Cl_2]$ is used as an anticancer drugs 18. (a) for treating several type of malignant tumours. When it is injected into the blood stream the more reactive Cl groups are lost so the Pt atom bonds to a N atom in guanosine (a part of DNA) This molecule can bond to two different guanosine units & by bridging between them it upsets the normal reproduction of DNA.
- CoCl is a weak Lewis acid, reacting with chloride ion to 19. (c) produce salt containing the tetrahedral [CoCl] ion. CoCl is blue when anhydrous, and a deep magneta colour when hydrated, for this reason it is widely used as an indicator for water.
- 20. (a) The absorption of energy or the observation of colour in a complex transition compound depends on the charge of the metal ion and the nature of the ligands attached. The same metal ion with different ligands shows different absorption depending upon the type of ligand. The presence of weak field ligands make the central metal ion to absorb low energies *i.e.*, of higher wavelength. The field strength of ligands can be obtained from spectrochemical series. i.e.

(weak field) I < Br < S < CI < NO < F < OH < HO < NH < NO< CN < CO (strong field)

mirror

l-form

(b)
$$[Co(en)_3]Cl_3$$

 $en Co Co en Co en$

21



Assertion and Reason

- Potassium ferrocyanide and potassium ferricyanide both are 1. (d) not diamagnetic because both do not have paired electrons. Assertion and reason both are false.
- 2. (c) It is correct statement that NF_3 is a weaker ligand than $N(CH_3)_3$, the reason is that fluorine is highly electronegative therefore, it with draw electrons from nitrogen atom. Hence, the lone pair of nitrogen atom cannot be ligated. While $N(CH_3)_3$ is a strong ligand because CH_3 has electron releasing group.
- (d) Both assertion and reason are false. $[Ni(en)_3]Cl_2$ is a 3. chelating compound and chelated complexes are more stable than similar complexes involves breaking of two bonds rather than one. In $[Ni(en)_3]Cl_2$, Ni with d^8 configuration shows octahedral geometry. Six electrons will occupy the t_{2g} orbitals and two electrons will occupy the e_g orbitals.

Both assertion and reason are true and reason is the correct (a) 4. explanation of assertion . When a monodentate ligand has two possible donor atoms and attached in two ways to the central metal atom are called ambidentate ligands.

- (c) Assertion is true but reason is false. Tetrahedral complexes do 5. not show geometrical isomerism because the relative position of the atoms with respect to each other will be the same.
- Assertion is false but reason is frue. 6. (e)

$$\left[(en)_2 Co \begin{pmatrix} NH \\ OH \end{pmatrix} Co(en)_2\right]^{3+}$$
 is named as tetrakis

(ethylene diamine)- μ -hydroxo- μ -imido dicobalt (III) ion. For

more than one bridging group the word μ is repeated before each bridging group.

- 7. (b) Both assertion and reason are true but reason is not the correct explanation of assertion. $[Fe(CN)_6]^{3-}$ has EAN equal to 35 and thus possesses unpaired electron to show paramagnetic nature while $[Fe(CN)_6]^{4-}$ possesses no unpaired electron and thus shows diamagnetic nature.
- 8. (e) Assertion is false but reason is true. $H_2N NH_2$ does not act as chelating ligand. The coordination by hydrazine leads to a three member highly unstable strained ring and thus it does not act as chelating agent.
- **9.** (a) Both assertion and reason are true and reason is the correct explanation of assertion. $[Sc(H_2O)_6]^{3+}$ has no unpaired electron in its d subshell and thus d-d transition is not possible whereas $[Ti(H_2O)_6]^{3+}$ has one unpaired electron in its d subshell which gives rise to d-d transition to impart colour.

(b) Both assertion and reason are true but reason is not the correct explanation of assertion.

 Ni^{2+} configuration

10.

11.



(c) $K_4[Fe(CN)_6]$ and $K_3[Fe(CN)_6]$ both are low spin complex due to strong ligand field. That is why it is false that crystal field splitting in ferrocyanide ion is greater than ferricyanide ion.

Co-odination Chemistry

ET Self Evaluation Test - 20

b .		13		40041					
	(a) Potassium ferricyanide		L	···-,	(a)	$[A \circ (NH_{\perp})_{2}]OH$			
	(b) Cobalt hexamine chlorid	e			(u)	[118(11114)2]011			
	(c) Cuprous sulphate				(b)	$[Ag(NH_4)_2]Cl$			
	(d) Mohr's salt				(c)	$[Ag(NH_3)_2]OH$			
2.	The complex $[Pt(NH_3)_6]Cl_2$	furnish	es [MP PI	ET 1995]	(d)	$[Ag(NH_2)_2]Cl$			
	(a) 5 ions	(b)	4 ions		(=)		1 1 . 777	a (ao) 1 i	
	(c) 3 ions	(d)	2 ions	12.	The	oxidation number of c	obalt in K	$Co(CO)_4$] is	5
3.	How many isomers are possil	ole in [Co	$p(en)_2 Cl_2$]					[MP PMT 200	DI; J & K CET 2005]
			[Orissa JE	E 2004]	(a)	+1	(b)	-1	
	(a) 2	(b)	4		(c)	+3	(d)	-3	
	(c) 6	(d)	1	13.	The	complex salt can	be made	e by the	combination of
4.	π -bonding is not present in		[MP PE	T 2003]	[Ca	$p^{III}(NH_3)_5 Cl]^x$ with:			[Pb. CET 2001]
	(a) Grignard reagent				(a)	PO_{1}^{3-}	(b)	Cl^{-}	
	(b) Dibenzene chromium				(a)	104	(0)	Ci	
	(c) Zeise's salt				(c)	$2Cl^{-}$	(d)	$2K^+$	
_	(d) Ferrocene			14.	Wh	ich one of the followin	ng is an inn	er orbital co	mplex as well as
5.	Grignard reagent is a				diar	nagnetic in behaviour	(Atomic nun	1 ber : Zn = 3	0), $Cr = 24$, $Co =$
	(a) Coordinate compound (b) Double calt				27,	NI = 20		CBSE PMT 2	
	(c) Organometallic compour	nd			(a)	$[Zn(NH_3)_6]^{2+}$	(b)	$[Cr(NH_3)_6]$] ³⁺
	(d) None of these				(c)	$[Co(NH_3)_6]^{3+}$	(d)	$[Ni(NH_3)_{e}]$] ²⁺
6.	Which one of the following co	omplexes	is paramagnetic	15	The	avidation state of Fair		N) 1 :a	
			[RPA	15. 17 1997]	The	oxidation state of Fe in	$\mathbf{K}_{4}[\mathbf{F}\mathbf{e}(\mathbf{C})]$	(v) ₆] is	
	(a) $[Co(F)_6]^{3+}$	(b)	$[Co(H_2O)_6]^{3+}$				(1)	[Pb. CET 2	003; MP PET 2002]
	(c) $[C_0 F_2(H_2 O)_2]$	(d)	All of these		(a)	+2	(b)	-2	
_		(-)			(c)	+3	(d)	+4	
7.	The oxidation state of Fe in the	ne comple	$ex [Fe(CO)_5] $ is	16.	The	number of moles	of AgCl	precipitate	when excess of
	(a) _1	(b)	[MP PN ⊥2	1 2003]	Ag	NO_3 is added to one	mole of [Cr	$(NH_3)_4 Cl_2$	Cl is
	(a) $+4$	(d)	Zero						[EAMCET 1998]
8.	Which of the following is non	-ionizable	2		(a)	Zero	(b)	1.0	
	(a) $[Co(NH_3)_3Cl_3]$	(b)	$[Co(NH_3)_4 Cl_2]Cl$		(c)	2.0	(d)	3.0	
	(c) $[Co(NH_3)_5Cl]Cl_2$	(d)	$[Co(NH_3)_6]Cl_2$	17.	An	anion solution gives a	white ppt.	With AgNo	O_3 solution. The
9.	The coordination and oxida	tion nun	ther of X in the cor	npound	ppt	anssolves in all. ammo	ma due to ti	ne formation	
	$[X(SO_4)(NH_3)_5]Cl$ will be	2				4 10	(1)		[//// /////////////////////////////////
			[JIPMER 1997; DC	E 2004]	(a)	$AgNO_3$	(b)	$NH_4 NO_3$	_
	(a) 6 and 4	(b)	10 and 3		(c)	$\left[Ag(NH_3)_2\right]Cl$	(d)	$Ag(NH_3)$	$_{2}$ Br
	(c) 2 and 6	(d)	6 and 3	18.	The	diamagnetic specie is			[AIIMS 2005]
10.	In $[NiCl_4]^{2-}$, the number o	f unpaire	d electron is		(a)	$[Ni(CN)]^{2-}$	(b)	$[NiCl]^{2-}$	
			[BH	U 2003]	(a)		(0)		
	(a) 4.5	(b)	2	-	(c)	$[CoCl_4]^{2-}$	(d)	$[CoF_{6}]^{2-}$	
	(c) 3	(d)	4						

11. AgCl precipitate dissolves in ammonia due to the formation of



- 1. (d) Mohr's salt ($FeSO_4.(NH_4)_2SO_4.6H_2O$) is a double salt.
- **2.** (a) $[Pt.(NH_3)_6]Cl_4 \Rightarrow [Pt.(NH_3)_6]^{4+} + 4Cl^{-}(5 \text{ ions}).$
- **3.** (b) $[Co(en)_2 Cl_2]$ has 2 geometrical isomers & 2 optical isomers.



- **5.** (c) The organometallic compound of Mg is known as Grignard reagent (R Mg X).
- (d) As all the ligands are weak so they do to induce pairing of electrons so they show paramagnetism.
- 7. (d) $\ln [Fe(CO)_5]$, x + 5(0) = 0, so oxidation number of Fe is zero.
- 8. (a) Atoms present with in co-ordination sphere do not ionise.
- 9. (d) Co-ordination no. is 6

oxidation state in $[X(SO_4)(NH_3)_5]Cl_{-1}$ is

$$x - 2 + 0 - 1 = 0, \quad x = +3.$$

10. (b) $[NiCl_4]^{2-}$

4.



sp Which has two unpaired electrons that is why it is paramagnetic.

n. (d) $AgCl + NH_3 \rightarrow [Ag(NH_3)_2]Cl$ Diammine silver(I)chloride

12. (b)
$$1 \times (+1) + x + 4 \times (0) = 0$$

 $1 + x = 0 \Longrightarrow x = -1$ Oxidation number of Co = -1.

13. (c) In the complex ion $[Co^{(III)}(NH_3)_5 Cl]^x$, charge on the complex ion $x = 3 + (0 \times 5) + (-1)$

$$x = 3 - 1 = 2$$

Hence, it will combine with that species which have -2 charge to produce a neutral complex salt. So it will combine with $2Cl^{-}$ to produce $[Co(NH_3)_5Cl]Cl_2$ complex.

14. (c)
$$[Co(NH_3)_6]^{3+}$$

15.



*d*²*sp*³ (Inner)

Due to paired e^- it is diamagnetic.

(a) $4 \times (+1) + x + 6 \times -1 = 0$

or x = +6 - 4 = +2

Oxidation state of Fe = +2

16. (b) In this complex chloride ion in the form of ionic isomerism and show primary valency.

 $AgNO_3$ is added in excess then result precipitation will occur.

17. (c)
$$AgNO_3 + Cl^- \rightarrow AgCl + NO_3^-$$

$$AgCl + 2NH_3 \rightarrow [Ag(NH_3)_2]Cl.$$

diammine silver (I)chloride.





Badecker reaction : This reaction involves the following chemical change.

 $Na_{2}[Fe(CN)_{5}NO] + Na_{2}SO_{3} \rightarrow Na_{4}[Fe(CN)_{5}(NO.SO_{3})]$

 \mathcal{K} Everitt's salt : It is $K_2[Fe(CN)_6]$ obtained by reduction of prussian blue.

S Masking : Masking is the process in which a substance without physical separation of it is so transformed that is does not enter into a particular reaction e.g., masking of Cu^{2+} by CN^{-} ion.

& Macrocyclic effect : This term refers to the greater thermodynamic stability of a complex with a cyclic polydentate ligand when compared to the complex formed with a non-cyclic ligand. e.g., Zn(II) complex with ligand;



X Prussian blue and Turnbull's blue is pot. ferric ferrocyanide. However colour of Turnbull's blue is less intense than prussian blue. Decrease in colour is due to the presence in it of a white compound of the formula $K_2\{Fe[Fe(CN)_6]\}$ named as potassium ferrous ferrocyanide.

🛋 Crystal field theory explains why certain geometries are more favoured than other by certain metals in terms of crystal field stablization energies.

E The colour of complexes are explained in terms of electronic transitions between the various d orbitals of different energies.

E In octahedral complexes, the energy of the d_{r^2} and $d_{r^2-r^2}$

orbitals increases much more than the energy of the d_{xy}, d_{yz}, d_{xz} orbitals. The potential energy increases as a result of repulsive interactions. The greater the repulsion, greater is the increases in energy.

Z Ligands with larger groups from unstable rings than the ligands with smaller groups. This is ascribable to steric hinderance produced by a larger group.

E When Ca or Mg forms complexes with EDTA, the pH of the solution decreases.

Z The copper sulphate solution e.g., turns deep blue when excess of ammonia is added. This is also due to the formation of [Cu(NH)]SO

🙇 Co-ordination compound with a general formula MA, MAB or MABCD do not show any geometric isomerism.

🛋 Flexidentate character : polydentate ligand are said to have flexidentate character if they do not use all its donar atoms to get coordinated to the metal ion e.g., EDTA generally act as a hexadentate ligand but it can also act as a pentadentate and tetradentate ligand.

X Octahedral complex of the type [M(ABCDEF)] have 15 different geometrical isomers with a pair of enantiomers. Although a few geometrical isomer have been prepared but none has been resolved e.g., [Pt (Py)(NH)(NO)(Cl)(Br)l].

Ordinary Thinking

Objective Questions

Basic Terms

1.	ln	K_4	Fe	CN)6
----	----	-------	----	----	----

- (a) (CN) are linked with primary valency
- (CN) are linked with secondary valency (b)
- *K* are linked with secondary valency (c)
- (d) *K* are linked with non-ionic valency
- The co-ordination number of copper in cuprammonium sulphate is 2.
 - (a) 2 (b) 6 (c) 4 (d) - 4
- Which of the following acts as a bidentate ligand in complex з. formation
 - (b) Oxalate (a) Acetate (c) Thiocyanate (d) EDTA The co-ordination number cobalt of in the
- 4. complex $[Co(en)_2 Br_2]Cl_2$ is (a) 2 (b) 6
 - (d) 4 (c) 5

Which of the following ligands forms a chelate 5.

[MP PET/PMT 1998]

[MP PMT 2000, 02]

(a) Acetate (b) Oxalate (d) Ammonia

(c) Cyanide According to Werner's theory

6.

9.

11.

- (a) Primary valency can be ionized
- (b) Secondary valency can be ionized
- (c) Primary and secondary valencies both cannot be ionized
- (d) Only primary valency cannot be ionized
- Which of the following is not true for ligand-metal complex 7.
 - [MP PET 1993]
 - (a) Larger the ligand, the more stable is the metal-ligand bond
 - (b) Highly charged ligand forms strong bond
 - (c) Larger the permanent dipole moment of ligand, the more stable is the bond
 - Greater the ionization potential of central metal, the stronger is (d) the bond

8. What is the co-ordination number of the metal in $|Co(en)_2 Cl_2|^+$

(a)	4	(b)	5
(c)	6	(d)	3

Bidentate ligand is

(a) CN^{-} (b) Ethylene diammine (en)

(c) SCN^{-} (d) EDTA

The coordination number of Pt in $\left[Pt(NH_3)_4 Cl_2\right]^{++}$ ion is 10.

[MP PET 1995]

(b) 4 (a) 2 (d) 8 (c) 6

- Which is the example of hexadentate ligand
 - (a) 2, 2—dipyridyl
 - (b) Dimethyl glyoxime
 - (c) Aminodiacetate ion
 - (d) Ethylene diammine tetra acetate ion [EDTA]

(a) Same as primary valency

^{12.} The coordination number of a metal in coordination compounds is[MP PET 199

 (c) Same as secondary valency (d) None of these 13. Ligand in a complex salt are (a) Anions linked by coordinate bonds to a central metal atom or ion (b) Cations linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion 	[AFMC 2004]
 (a) None of these (b) Ligand in a complex salt are [KCET 1992] (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion 	[AFMC 2004]
 13. Ligand in a complex salt are [KCET 1992] (a) Anions linked by coordinate bonds to a central metal atom or ion (b) Cations linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion 	[AFMC 2004]
 (a) Anions linked by coordinate bonds to a central metal atom or ion (b) Cations linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Any number of co-ordinate sites (d) No capacity to co-ordinate sites (d) No capacity to co-ordinate sites (e) Any number of co-ordinate sites (f) No capacity to co-ordinate sites (g) Solution (h) Cations linked by coordinate bonds to a central metal atom or ion 	[AFMC 2004]
 (b) Cations linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion 	[AFMC 2004]
 (b) Cattors linked by coordinate bonds to a central metal atom of a second linked by coordinate bonds to a central metal atom or ion (c) Molecules linked by coordinate bonds to a central metal atom or ion (c) 5 (d) 	[AFMC 2004]
(a) 3 (b) (c) Molecules linked by coordinate bonds to a central metal atom (c) 5 (d) or ion (c) 5 (d)	
or ion (c) 5 (d)	4
(d) Ions or molecules linked by coordinate bonds to a central metal	oxidising (c) complexing, the
atom or ion set of properties shown by CN^- ion t	owards metal species is
14. A group of atoms can function as a ligand only when (a) c, a (b)	b, c
[KCET 1989; DCE 1999; MP PMT 2000] (c) a, b (d)	a, b, c
(a) It is a small molecule 28. That ion or molecule which forms	a complex compound with
(b) It has an unshared electron pair transitional metal ion is called	
(c) It is a negatively charged ion (a) Recipient (b)	Ligand
(d) It is a positively charged ion (c) Coordinate ion (d)	No special name
15. Which of the following complexes show six coordination number [RPET 2000]. Coordination number of <i>Zn</i> in <i>ZnS</i> (zir	1c blende) is
(a) $[Zn(CN)_4]^{2-}$ (b) $[Cr(H_2O)_4]^{3+}$	[Orissa JEE 2004]
(a) 6 (b)	4
(c) $[Cu(CN)_4]^{2-}$ (d) $[Ni(NH_3)_4]^{2+}$ (c) 8 (d)	12
16. The number of ions formed when cuprammonium sulphate is 30. Wilkinson's catalyst used as a ho	mogeneous catalyst in the
dissolved in water is [KCET 1993] hydrogenation of alkenes contains	
(a) 1 (b) 2 (a) Iron (b)	Aluminium
(c) 4 (d) Zero (c) Rhodium (d)	Cobalt
31. Given the molecular formula of the he	xa coordinated complexes (A)
17. The coordination number of Cu in complex $[Cu(H_2O)_4]$ is $[MP CoCl_3.5NH_3]$ (B) $CoCl_3.5NH_3$	(C) $CoCl_3.4NH_3$. If the
(a) 4 (b) 3 number of co-ordinated <i>NH</i> ₃ molecu	les in <i>A</i> , <i>B</i> and <i>C</i> respectively
(c) 2 (d) 1 are 6.5 and 4. the primary valency in (d)	(A). (B) and (C) are:[DCE 2003]
18. The primary valence of the metal ion in the co-ordination compound (a) 6.5.4 (b)	3.2.1
$K_2[Ni(CN)_4]$ is (c) 0.1.2 (d)	3, 2, 1
(a) Four (b) Zero 32 Generally a group of atoms can function	on as a ligand if
(c) Two (d) Six	[MP PET 1996]
19. The metal which does not form a polynuclear carbonyl is (a) They are positively charged ions	[
(b) They are free radicals $(b) = C_0$	
(a) With (b) CO (c) They are either neutral molecules	or negatively charged ions
(c) Cr (d) Fe (d) None of these	
20. Which one of the following forms with an excess of CN^- (Cyanide) 33. The ligand in potassium ferricyanide is	
a complex having coordination number two (a) K^+ (b)	CN^{-}
[AIIMS 2004]	
(a) Cu^+ (b) Ag^+ (c) Fe^{3+} (d)	$(CN)_6$
34. Co-ordination number of aluminum is	[MHCET 2004]
(c) Ni^{2+} (d) Fe^{2+} (a) 8 (b)	6
21. According to Lewis the ligands are [MP PMT 2002] (c) 12 (d)	4
(a) Acidic in nature 35. In $K_A Fe(CN)_c$, Fe is in the form of	of
(b) Basic in nature (a) An atom (b)	An ion
(c) Neither acidic nor basic	Anionia complex
(d) Some are acidic and others are basic	Anonic complex
22. The coordination number of a central metal atom in a complex is	
determined by [AIEEE 2004]	
(a) The number of ligands around a metal ion bonded by sigma (a) Br (b)	$C_2 O_4^{2^-}$
and pi-bonds both. (c) CH_2NH_2 (d)	$CH_2C \equiv N$
(b) The number around a metal ion bonded by pi-bonds	uningto the ligand is
\sim	
(c) The number of ligands around a metal ion bonded by sigma	[Allwo 1997]
 (c) The number of ligands around a metal ion bonded by sigma (b) the the composite number of ligands (b) the the composite number of ligands 	
 (c) The number of ligands around a metal ion bonded by sigma bonds (d) The number of only anionic ligands bonded to the metal ion (a) H⁺ (b) 	H
 (c) The number of ligands around a metal ion bonded by sigma bonds (d) The number of only anionic ligands bonded to the metal ion (a) H⁺ (b) (b) (c) H[MP PET 1989] (d) 	H None of these
 (c) The number of ligands around a metal ion bonded by sigma bonds (d) The number of only anionic ligands bonded to the metal ion (a) <i>Cu</i> (b) <i>Ag</i> (c) <i>H</i>[MP PET 1989] (d) Which of the following is the odd one of the following is the following is the odd one of the following is the odd one of the following is the odd one of the following is the fo	H None of these out [MP PET 1996]
(c) The number of ligands around a metal ion bonded by sigma bonds 371 In the ecomposite number of anionic ligands bonded to the metal ion (a) The number of only anionic ligands bonded to the metal ion (a) In the extraction of which of the following, complex ion forms (a) Cu (b) Ag (a) H^+ (b) (c) $H[MP PET 1989]$ (d)(d) (d) 38. (c) Fe (d) Na Which of the following is the odd one of (a) Potassium ferrocyanide	H None of these out [MP PET 1996]
 (c) The number of ligands around a metal ion bonded by sigma bonds (d) The number of only anionic ligands bonded to the metal ion (a) Cu (b) Ag (c) Fe (d) Na (a) Cu (b) Ag (c) Fe (c) Fe (d) Na (b) Ag (c) Fe (d) Na (c) Fe (d) Na (c) Fe (d) Na (b) Ag (c) Fe (d) Na (c) Fe (d) Na (c) Fe (d) Na (b) Ferrous ammonium sulphate (c) Ferrous ammonium sulphate 	H None of these out [MP PET 1996]
 (c) The number of ligands around a metal ion bonded by sigma bonds (d) The number of only anionic ligands bonded to the metal ion (a) Cu (b) Ag (c) Fe (c) Fe (d) Na (a) Normal salt (b) Mixed salt (c) The number of only anionic ligands bonded to the metal ion (a) Cu (b) Ag (c) Fe (c) Fe (c) Mixed salt (c) Potassium ferrocyanide is a (c) Potassium ferrocyanide (c) Potassium ferrocyanide (c) Potassium ferrocyanide (c) Potassium ferrocyanide (c) Potassium ferricyanide 	H None of these out [MP PET 1996]

39.	The basic ligand is		
	(a) NH_3	(b)	CN^{-}
	(c) F^-	(d)	All
40.	The negative ligand is	()	
	(a) Aqua	(b)	Sulphato
	(c) Carboxyl	(d)	Nitro sodium
41.	Which has yellow colour		
	(a) Potassium cobaltinitrite	(
	(b) Potassium hexanitro cobalta	te (ll	I)
	(c) Fischer's salt		
42	(d) All the above		[MP PMT 2003]
	(a) Accept e^- -pair		[//// 1/// 2003]
	(b) Donate e^- -pair		
	(c) Neither accept e^- -pair nor	· dona	ate
	(d) All of these happen		
43.	Which of the following is a comm	non d	lonor atom in ligands [BHU 2001]
	(a) Arsenic	(b)	Nitrogen
	(c) Oxygen	(d)	Both (b) and (c)
44.	Trunbull's blue is a compound	()	
			[KCET 1993]
	(a) Ferricyanide	(b)	Ferrous ferricyanide
	(c) Ferrous cyanide	(d)	Ferriferrocyanide
45.	Tollen's reagent is		[KCET 1990]
	(a) $\left[Ag(NH_3)_2\right]^+$	(b)	Ag_2O
	(c) $\left[Cu(OH)_4\right]^{2-}$	(d)	Cu_2O
46.	Finely divided iron combines with	n CO	to give
			[UPSEAT 2002]
	(a) $Fe(CO)_5$	(b)	$Fe_2(CO)_9$
	(c) $Fe_2(CO)_{12}$	(d)	$Fe(CO)_6$
47.	In a complex, the highest possible	e coo	rdination number is
	(a) 6	(b)	12
-	(c) 4	(d)	8
48.	The number of neutral molecules central metal atom in a complex	s or r ion is	negative groups attached to the scalled
	(a) Atomic number	(b)	Effective atomic number
	(c) Coordination number	(d)	Primary valency
49.	EDTA combines with cations to f	form	
	(a) lon-exchange resins	(b)	Chelates
	(c) Clathrates	(d)	Polymers
50.	An example of a double salt is	(1)	[MP PET 2001]
	(a) Bleaching powder	(b)	Нуро
	(c) $K_4[Fe(CN)_6]$	(d)	Potash alum
51.	In complex compounds, metal lig	and t	bond is
	(a) Coordinate bond	(b)	Hydrogen bond
	(c) lonic bond	(d)	Covalent bond
52.	Ammonia forms the complex ior	n [<i>Cı</i>	$(NH_3)_4]^{2+}$ with copper ions
	in alkaline solutions but not in for it[AIEEE 2003]	acidio	c solution. What is the reason
	(a) In acidic solutions hydration	ı prot	ects copper ions
	(b) In acidic solutions protons	coord	inate with ammonia molecules
	forming NH_4^+ ions and N	H_3	molecules are not available
		1 0	

(c) In alkaline solutions insoluble $Cu(OH)_2$ is precipitated which is soluble in excess of any alkali

	(d) Copper hydroxide is an ampho	teric	substance
53.	Zeigler—Natta catalyst is used fo	r wh	ich type of reaction
	(a) Hydrogenation	(b)	Polymerization
	(c) Oxidation	(d)	Reduction
54.	Which of the following is not compound.	con	sidered as an organometallic [AIIMS 2004]
	(a) Cis-platia	(b)	Ferrocene
	(c) Zeise's salt	(d)	Gringard reagent
55.	Which one is organometallic com	poun	d[MP PMT 2004]
	(a) Lithium methoxide	(b)	Lithium dimethyl amide
_	(c) Lithium acetate	(d)	Methyl lithium
56.	An aqueous solution of potash alu	ım g	ives [UPSEAT 2004]
	(a) Two types of ions	(b)	Only one type of ion
	(c) Four types of ions	(d)	Three types of ions
57.	Carnallite in solution in H_2O , s	hows	the properties of
			[DCE 2003]
	(a) K^+, Mg^{2+}, Cl^-	(b)	$K^+, Cl^-, SO_4^{2-}, Br^-$
	(c) K^+, Mg^{2+}, CO_3^{2-}	(d)	K^+, Mg^{2+}, Cl^-, Br^-
58.	What is the co-ordination numbe	r of d	cobalt in $Co(NH_3)_3Cl_3$
	(a) 3	(b)	4
	(c) 5	(d)	6
59.	The formula of alum is		[Pb. CET 2002]
	(a) $K_2 SO_4 . Al_2 (SO_4)_3 . 24H_2$	0	
	(b) $K_4[Fe(CN)_6]$		
	(c) $K_2 SO_4 . Al_2 (SO_4)_3 . 6H_2 O_4$)	
	(d) $Na_2CO_3.10H_2O$		
60.	Number of ions present in $K_4[F$	e(Cl	(Pb. CET 2000) [Pb. CET 2000]
	(a) 2	(b)	10
	(c) 3	(d)	5
61.	CH_3MgI is an organometallic c	omp	ound due to
			[DCE 2002]
	(a) $Mg-I$ bond	(b)	C-I bond
	(c) $C - Mg$ bond	(d)	C-H bond
62.	What is the EAN of nickel in <i>Ni</i> (CO)	4 [BVP 2003]
	(a) 34	(b)	35
	(c) 32	(d)	36

Nomenclature, Oxidation state and EAN number

1.	How many ions are $[Co(H_2O)_6]Cl_2$	produced	in	aqueous	solution of [RPMT 2002]
	(a) 2	(b)	3		
	(c) 4	(d)	6		
2.	IUPAC name of $[Pt(NH_3)_3]$	(Br)(NO	$_2)Cl$	Cl is	
				[0	BSE PMT 1998]
	(a) Triamminechlorobromo	nitroplatii	num	(IV) chlorid	e
	(b) Triamminebromonitrocl	nloroplati	num	(IV) chlorid	e
	(c) Triamminebromochloro	nitroplatii	num	(IV) chlorid	e

(d) Triamminenitrochlorobromoplatinum (IV) chloride

Oxidation state of nitrogen is incorrectly given for

3.

[UPSEAT 2000, 01]

	Cor	mpound	Oxidation state
	(a)	$[Co(NH_3)_5 Cl]Cl_2$	0
	(b)	NH ₂ OH	-1
	(c)	$(N_2H_5)_2SO_4$	+2
	(d)	Mg_3N_2	-3
4.	The	e formula of dichloro <i>bis</i> (urea	a) copper (11) is
			[CBSE PMT 1997]
	(a)	$[Cu\{O = C(NH_2)_2\}Cl_2]$]
	(b)	$[CuCl_2 \{ O = C(NH_2)_2 \}]$	2
	(c)	$[Cu\{O = C(NH_2)_2\}Cl]C$	21
	(d)	$\left[CuCl_{2}\right]\left\{O=C(NH_{2})_{2}H\right\}$	H ₂ }
5.	The	IUPAC name of the complex	$\left[Pt(NH_3)_2Cl_2\right]$ is
	(a)	Platinum (11) diammino dich	hloride
	(D) (c)	Bis (ammino) dichloro platinati	e (IV) num (IV)
	(d)	Dichloro diammine platinun	n (ll)
6.	Cor	rect formula of diammine silv	ver (1) chloride is
	(a)	$Ag(NH_3)Cl$	(b) $Ag(NH_2)Cl$
	(c)	$Ag(NH_3)_2$ Cl	(d) $\left[Ag(NH_2)_2\right]Cl$
7.	The	formula of sodium nitroprus	sside is [AIIMS 1992
	(a)	$Na_4[Fe(CN)_5 NOS]$	(b) $Na_2[Fe(CN)_5 NO]$
	(c)	$NaFe[Fe(CN)_6]$	(d) $Na_2[Fe(CN)_6 NO_2]$
8.	The	e correct name of $[Pt(NH_3)_4]$	$_4Cl_2][PtCl_4]$ is
	()	TT - 111 1.1	[MP PET 2003
	(a) (b)	Dichloro tetra ammine dichloro plati	num (iv) tetrachloro platinate (ii)
	(c)	Tetrachloro platinum (ii) tet	traammine platinate (iv)
	(d)	Tetrachloro platinum (ii) di	chloro tetraammine platinate (iv)
9.	Cor	rect formula of potassium fer	rrocyanide is
		$K \left[\Gamma \left(C N \right) \right]$	[CBSE PMT 1988]
	(a)	$\mathbf{K}_{4}[Fe(CN)_{6}]$	(b) $K_2[Fe(CN)_6]H_2O$
	(c)	$K_3[Fe(CN)_6]$	(d) None of these
10.	The	E IUPAC name of $[Co(NH_3)]$	$(NO_2)_3$ is
	(a)	Trinitrotriammine cobalt (II	II)
	(b)	Trinitrotriammine cobalt (II	l) II) ion
	(d)	Trinitritriammine cobaltate	(111)
11.	ln .	$K_{4}[Fe(CN)_{c}]$ the E.A.N. of	f <i>Fe</i> is [DCE 2000]
	(a)	33	(b) 35
	(c)	36	(d) 26
12.	Wh	ich of the following pairs is n	ot correctly matched
			[MP PET 1993]
	(a)	Effective atomic number of	$Pt \text{ in } \left[PtCl_6 \right]^{2-} = 84$
	(b)	Absorption peak for $\left[Cr^{III}\right]$	$(NH_3)_6^{+3} = 21680 cm^{-1}$
	(c)	Crystal field stabilization e = (-) $0.8\Delta_0$	energy of d^2 in weak ligand field

	(d) Example of weak ligand field for d^5 configuration $= \left[Mn^{II}F_6\right]^{-4}$
13.	The oxidation number of chromium in sodium tetrafluoro oxochromate complex is
	(a) II (b) IV
	(c) VI (d) III
14.	The IUPAC name of $K_{4}[Fe(CN)_{6}]$ is
•	[CRSE PMT 1000+ MP PET 1002+
	[2002 1111 1990, 111 1992, MP PMT 1995, 97; Kurukshetra CET 2002]
	(a) Potassium hexacyanoferrate (II)
	(b) Potassium ferrocyanide
	(c) Tetrapotassium hexacyanoferrate (II)
	(d) Tetrapotassium ferroushexacyanide (11)
15.	The IUPAC name of $[Ni(CO)_4]$ is [RPET 1999]
	(a) Tetra carbonyl nickel (11)
	(b) Tetra carbonyl nickel (0)
	(c) Tetra carbonyl nickelate (11)
	(d) Tetra carbonyl nickelate (0)
16.	The correct nomenclature for $Fe_4[Fe(CN)_6]_3$ is
	[MP PMT 1994]
	(a) Ferroso-ferric cyanide
	(b) Ferric-ferrous hexacyanate
	(c) Iron (III) hexacyanoterrate (II)
	(d) Hexacynoferrate (III-II)
17.	The IUPAC name of compound $Na_3[Co(ONO)_6]$ will be
	[MP PMT 2000]
	(a) Hexanitritocobalt (III) sodium
	(c) Sodium bezanitrocobaltate (111)
	(d) Sodium hexanitritocobaltate (III)
18.	In which of the following complexes oxidation state of metal is zero
	(a) $\left[Pt(NH_3)_2 Cl_2\right]$ (b) $\left[Cr(CO)_6\right]$
	(c) $\begin{bmatrix} Cr(NH_{\star}) & Cl_{\star} \end{bmatrix}$ (d) $\begin{bmatrix} Cr(en) & Cl_{\star} \end{bmatrix}$
19.	The oxidation number of Cr in $[Cr(NH_3)_6]Cl_3$ is
	[CBSE PMT 2001]
	$ \begin{array}{c} (a) & \delta \\ (b) & 0 \\ (c) & 4 \\ (c) & (d) & 2 \\ (c) & (c) & (c) \\ (c) & $
20	$\left(U \right) = \left[\frac{N}{4} \right] = \left[$
20.	$\frac{1}{10} \frac{1}{10} \frac{1}{10} \frac{1}{3} \frac{1}{4} \frac{1}{10} \frac{1}{4} \frac{1}{10} \frac{1}{4} \frac{1}{10} \frac{1}{$
	(a) 34 (b) 35 (d) 27
~	$(U) SV \qquad (U) S'$
21.	TUPAC name of $[CO(OVO)(VH_3)_5 CI_2]$ is
	(a) Pantaammina nitro aabalt (111) ablarida
	(h) Pentaammine nitrito cobalt (111) chloride
	(c) Pentaammine nitroso cobalt (111) chloride
	(d) Pentaammine oxo-nitro cobalt (111) chloride
22.	The oxidation number of Pt in $[Pt(C_2H_2)CL_2]$ is
	(a) +1 (b) +2
	(c) + 3 $(d) + 4$
23.	The oxidation state of cobalt in the complex compound
	$[Co(NH_3)_6]Cl_3$ is

- - (a) +3 (b) +6

	(c) $+ 5$ (d) $+ 2$	
24.	The correct IUPAC name of potassium cuprochloride is	
	(a) Potassium copper (1) tetrachloride	
	(b) Potassium tetrachlorocuprate (1)	
	(c) Tetrachloropotassium cuprate (1)	07
	(d) Tetrachlorocopper (1) potassiate	37.
25.	The effective atomic number of cobalt in the complex	
	$[Co(NH_2)_{\epsilon}]^{3+}$ is [MP PET 2003]	
		28
	(a) 30 (b) 33	30.
	$ \begin{array}{c} (c) & 24 \\ (d) & 50 \end{array} $	
26.	IUPAC name of $K_3 Fe(CN)_6$ is	
	[MP PMT 1993; MP PET 1997]	
	(a) Potassium ferrocyanide (11)	
	(b) Potassium hexaferrocyanate (III)	39.
	(c) Potassium ferrohexacyanate (II)	
	(d) Potassium hexacyanoferrate (III)	
27.	The EAN of iron in potassium ferricyanide is	
	[Pb. CET 2000]	
	(a) 18 (b) 54	
	(c) 35 (d) 23	
28.	In the coordination compound, $K_4[Ni(CN)_4]$ oxidation state of	40.
	nickel is [AIEEE 2003]	
	(a) -1 (b) 0	
	(c) $+1$ (d) $+2$	
29.	According to IUPAC nomenclature sodium nitroprussied is named is	
- 51	[CBSE PMT 2003]	41.
	(a) Sodium pentacyanonitrosyl ferrate (111)	
	(b) Sodium nitroferricyanide	
	(c) Sodium nitroferrocyanide	
	(d) Sodium pentacyanonitrosyl ferrate (11)	47
30.	Pick out the complex compound in which the central metal atom	-7-2-
	obeys EAN rule strictly [KCET 2003]	
	(a) $K_4[Fe(CN)_6]$ (b) $K_3[Fe(CN)_6]$	
	(c) $[Cr(H, O)]Cl$ (d) $[Cu(NH)]SO$	43.
	$(1) [0] (11_20)_6 [0]_3 (1) [0] (1) [0]_4 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_1 [0]_$	
31.	Which of the following is wrong statement [BHU 2003]	
	(a) $Nl(CO)_4$ has oxidation number + 4 for Nl	
	(b) $Ni(CO)_4$ has zero oxidation number for Ni	
	(c) <i>Ni</i> is metal	
	(d) CO is gas	44.
32.	Oxidation state of <i>Fe</i> in $K_2[Fe(CN)_c]$ [RPMT 2002]	
0	(a) 2 (b) 2 (b) 2	
		45.
22	(c) 0 (d) Note of these	
33.	(a) Carbonyl (b) Farrograpida	
	(a) Amine (d) Cremide	
	(c) Annue (u) Cyande	-
34.	The proper name for $K_2[PtCl]_6$ is [MH CET 2002]	46.
	(a) Potassium platinum hexachloride	
	(b) Potassium hexachloro platinum IV	
	(c) Potassium hexachloro platinate IV	
	(d) Potassium hexachloro platinum	
35.	IUPAC name of $K_3[Al(C_2O_4)_3]$ is called	
	[MP PMT 1993, 02, 03]	
	(a) Potassium alumino oxalato	47
	(b) Potassium aluminium (III) triovalate	7/•
	(c) Potassium trioxalato aluminate (111)	
	(d) Potassium triovalato aluminate (11/)	
36.	The I.U.P.A.C. name of $K_3[I(C_2O_4)_3]$ is	
	[MP PMT 2001]	48.

	(a) (b) (c) (d)	Potassium tri oxalato iridium Potassium tri oxalato iridate Potassium tris (oxalato) irid Potassium tris (oxalato) irid	n (111) (111) ium (1 ate (11	11) 1)	
37.	The	charge on $[Ag(CN)_2]^-$ cor	nplex	is	[A11MS 2001]
	(a)	-1	(b)	+1	
	(c)	+2	(d)	+3	
38.	The	IUPAC name of $[Co(NH_3)]$	$_{6}$]Cl ₃	is	[IIT-JEE 1994]
	(a)	Hexammine cobalt (III) chlo	ride		
	(b)	Hexammine cobalt (11) chlor	ide Iorida		
	(c) (d)	None of these	onue		
39.	IUP	AC name of $\left[Co(NH_3)_3(H)\right]$	$_{2}O)_{2}$	Cl Cl_2 is	
			_	-	[MP PET 1994]
	(a)	Diaquachlorodiammine coba	lt (111)) chloride	
	(b)	Triamminediaquachloro cob	alt (III J+ (III)) chloride	
	(c) (d)	Diamminediaquachloro coba	lt (11)	chloride	
40.	Dich	loro diammine platinum (11)	comp	lex has the for	mula
					[MP PMT 1997]
	(a)	$Pt[Cl_2(NH_3)_2]$	(b)	$Pt[R.(NH_2)]$	$[2]Cl_2$
	(c)	$[PtCl_2(NH_3)_2]$	(d)	$[Pt.R.(NH_2$	$_{2}]Cl_{2}$
41.	The	formula of potassiumdicyano	bis (oxalato) nickel	ate (11) is
	(a)	$K_4[Ni(CN)_2(Ox)_2]$	(b)	$K_3[Ni_2[Ni_2]$	$(CN)_2(Ox)_2$
	(c)	$K[Ni(CN)(Ox)_2]$	(d)	$K_2[Ni(CN)]$	$\left[Ox \right]_{2} $
42.	The	value of <i>x</i> which appears in t	the co	mplex [Ni(CN	$\left(\right)_{4}^{x}$ is
	(a)	+ 2	(b)	- 2	
	(c)	0	(d)	4	
43.	Pick	the correct name of $[Co(N_{i})]$	$(H_3)_5$	$Cl]Cl_2$	[AMU 2001]
	(a)	Chloropentammine cobalt (I	11) • 1		
	(b) (c)	Chloropentammine cobalt (III) chlo	oride	loride	
	(d)	Chloropentammine cobalt (I	1) chlo	oride	
44.	The	valency of cuprammonium ic	on is		
	(a)	+ 4	(b)	+ 2	
45	(c) In v	- 2 which of the following com	(d)	– 4 ds. transition	metal has zero
40.	oxid	ation state	ipoun		[CBSE PMT 1999]
	(a)	CrO ₅	(b)	$NH_2.NH_2$	
	(c)	NOClO ₄	(d)	$[Fe(CO)_5]$	
46.	The	complex chlorocompound dia	quatria	ammine cobalt	(III) chloride is
	(a)	$[Co(NH_2)_2(H_2O)_2]Cl_2$			[CBSE PM1 2002]
	(b)	$[Co(NH_2)_2 (H_2O)_2]Cl_2$			
	(c)	$[C_0C_1(NH_a)_a, (H_aO)_a]C_1$	1.		
	(d)	$[C_0 C_1(NH_3)_3 (H_2 O_2)_2]C_1$	^v 3 1		
477	(u) The	$[Co(M_3)_3 (H_2O)_2] = C_2(M_2O)_2$	(2)		a named as
4/.	(a)	Chlorocyanonitrotriammine	* 3 /3 · cohali	110 ₂ 01010]1	5 Hallieu dS
	(b)	Nitrochlorocyanotriammine	cobalt	t (111)	
	(c)	Cyanonitrochlorotriammine	cobali	t (111)	
	(d)	Triamminenitrochlorocyano	cobal	t (III)	

48. The oxidation number of *Pt* in $[Pt(C_2H_4)Cl_3]^-$ is

[UPSEAT 1999, 01] (a) +1 (b) +2 (c) +3 (d) +4 What is the structural formula of lithium tetrahydridoaluminate 40 $Al[LiH_{4}]$ (b) $Al_2[LiH_4]_3$ (a) 2. (c) $Li[AlH_4]$ (d) $Li[AlH_4]_2$ IUPAC name for $K[Ag(CN)_2]$ is 50. Potassium argentocyanide (a) Potassium silver cyanide (b) з. (c) Potassium dicyanoargentate (1) Potassium dicyanosilver (11) (d) The oxidation state of *Co* in $[Co(H_2O)_5 Cl]^{2+}$ is 51. 4 (a) + 2 (b) + 3 (c) + 1 (d) + 4 The chemical formula of diammine silver (1) chloride is 52. [BHU 2004] $[Ag(NH_3)]Cl$ (b) $[Ag(NH_3)_2]Cl$ 5. (a) (c) $[Ag(NH_3)_2]Cl$ (d) $[Ag(NH_4)_2]Cl$ IUPAC name of $[Co(NH_3)_5 NO_2]Cl_2$ [Pb. CET 2000] 53. Pentamminenitrocobalt (111) chloride (a) 6. Pentamminenitrosocobalt (III) chloride (b) Pentamminenitrocobalt (11) chloride (c) None of these (d) The pair of the compounds in which both the metals are in the 54. highest possible oxidation state is 7. [IIT-JEE (Screening) 2004] (a) $[Fe(CN)_{\epsilon}]^{3-}, [Co(CN)_{\epsilon}]^{3-}$ (b) CrO_2Cl_2, MnO_4^- 8 (c) TiO_3, MnO_2 (d) $[Co(CN)_6]^{3-}, MnO_3$ 9. The IUPAC name of $[Cr(NH_3)_6]^{3+}$ is [Pb. CET 2001] 55. Hexamminechromium (VI) ion (a) (b) Hexamminechromium (III) ion Hexamminechromium (11) ion (c)Hexamminechloride (d) The IUPAC name of $K_2[Cr(CN)_2O_2(O)_2(NH_3)]$ is 56. 10. [DCE 2003] (a) Potassium ammine dicyano dioxoperoxochromate (VI) Potassium ammine cyano peroxo dioxo chromium (VI) (b) 11. Potassium ammine cyano peroxo dioxo chromiun (VI) (c) Potassium ammine cyano peroxo dioxo chromatic (IV) (d) The IUPAC name of the coordination compound $K_3[Fe(CN)_6]$ is [AIEEE 2005] 57. (a) Potassium hexacyanoferrate (11) (b) Potassium hexacyanoferrate (111) 12. (c) Potassium hexacyanoiron (11) (d) Tripotassium hexacyanoiron (11) 58. Which compound is zero valent metal complex [KCET 2005] (a) $[Cu(NH_3)_4]SO_4$ (b) $[Pt(NH_3), Cl_2]$ (c) $[Ni(CO)_4]$ (d) $K_3[Fe(CN)_6]$ 13. Isomerism and magnetic properties

Which one of the following octahedral complexes will not show 1. geometric isomerism (A and B are monodentate ligands) $[MA_5B]$ (b) $[MA_2B_4]$ (a) [MA [MP PMT 2003] (d) $[MA_4B_2]$ (c) The number of unpaired electrons in the complex ion $[CoF_6]^{3-}$ is (Atomic no. of Co = 27) [CBSE PMT 2003] (a) Zero (b) 2 (c) 3 (d) 4 Which would exhibit co-ordination isomerism (a) $\left[Cr(NH_3)_6\right]\left[Co(CN)_6\right]$ (b) $\left[Co(en)_2 Cl_2\right]$ (d) $\left[Cr(en)_2 Cl_2\right]^+$ (c) $\left[Cr(NH_3)_6\right]Cl_3$ $[Co(NH_3)_{\epsilon} NO_2]Cl_2$ and $[Co(NH_3)_{\epsilon} (ONO)]Cl_2$ are related to each other as (a) Geometrical isomers (b) Optical isomers (c) Linkage isomers (d) Coordination isomers $[Co(NH_3)_5 Br] SO_4$ and $[Co(NH_3)_5 SO_4] Br$ are examples of which type of isomerism [MP PMT 1993, 94, 95; MP PET 1997; MP PET/PMT 1998] (a) Linkage (b) Geometrical (c) lonization (d) Optical $[Co(NH_3)_A Cl_2]NO_2$ and $[Co(NH_3)_A Cl_NO_2]Cl$ are [MP PMT 1993; MP PET 1995, 2001] isomers (a) Geometrical (b) Optical (c) Linkage (d) lonization Which would exhibit ionisation isomerism [MP PET 1997] (b) $\left[Co(NH_3)_5 Br\right]SO_4$ (a) $Cr(NH_3)_6 Cl_3$ (c) $\left[Cr(en)_2 Cl_2\right]$ (d) $\left[Cr(en)_3 Cl_3\right]$ $[Ti(H_2O)_6]^{+3}$ is paramagnetic in nature due to [RPMT 2002] (a) One unpaired e^- (b) Two unpaired *e* (c) Three unpaired e^{-} (d) No unpaired e^{-1} Coordination isomerism is caused by the interchange of ligands UPSEAT 2002 hetween the Cis and Trans structure (a) Complex cation and complex anion (b) (c) Inner sphere and outer sphere (d) Low oxidation and higher oxidation states Which one of the following will not show geometrical isomerism (a) $[Cr(NH_3)_4 Cl_2]Cl$ (b) $[Co(en)_2 Cl_2]Cl$ (c) $[Co(NH_3)_5 NO_2]Cl_2$ (d) $[Pt(NH_3), Cl_2]$ Paramagnetic co-ordination compounds contain electrons (a) No (b) Both paired and unpaired Paired (c) (d) Unpaired Which of the following isomeric pairs shows ionization isomerism (a) $\left[Co(NH_3)_6\right]\left[Cr(CN)_6\right]$ and $\left[Cr(NH_3)_6\right]\left[Co(CN)_6\right]$ (b) $[Cr(H_2O)_6]Cl_3$ and $[Cr(H_2O)_5Cl]Cl_2.H_2O$ (c) $\left[Pt(NH_3)_2 Cl_2\right]$ and $\left[Pt(NH_3)_4\right]\left[PtCl_4\right]$ (d) $\left[Co(NH_3)_5 Br\right] SO_4$ and $\left[Co(NH_3)_5 SO_4\right] Br$ Among the following ions which one has the highest paramagnetism[11T 1993; L (a) $[Cr(H_2O)_6]^{3+}$ (b) $[Fe(H_2O)_6]^{2+}$

	(c) $[Cu(H_2O)_6]^{2+}$ (d) $[Zn(H_2O)_6]^{2+}$		(b) Only $[Fe(CN)_6]^{3-}$ is paramagnetic
14.	Amongst $Ni(CO)_{4}$, $[Ni(CN)_{4}]^{2-}$ and $[NiCl_{4}]^{2-}$ [11T 1991]		(c) Only $[FeF_6]^{3-}$ is paramagnetic
	(a) $Ni(CO)$ and $[NiCl]^{2-}$ are diamographic and		(d) Both are diamagnetic
	(a) $N(CO)_4$ and $[N(CO)_4]$ are diamagnetic and $[N(CO)_4]^{2-1}$	26.	Which of the following is paramagnetic [AFMC 1997]
	$[Ni(CN)_4]$ is paramagnetic		(a) $[Ni(CO)_4]$ (b) $[Co(NH_3)_6]^{3+}$
	(b) $[NiCl_4]^{2-}$ and $[Ni(CN)_4]^{2-}$ are diamagnetic and		(c) $[Ni(CN)_4]^{2-}$ (d) $[NiCl_4]^{2-}$
	$Ni(CO)_4$ is paramagnetic	27.	The total number of possible isomers for the complex compound
	(c) $Ni(CO)_4$ and $[Ni(CN)_4]^{2-}$ are diamagnetic and		$\begin{bmatrix} Cu^{II}(NH_3)_4 \end{bmatrix} \begin{bmatrix} Pt^{II}Cl_4 \end{bmatrix}$ are
	$[NiCl_{4}]^{2-}$ is paramagnetic		[CBSE PMT 1998; DPMT 2004; J & K CET 2005]
	(1) $y'(\alpha x) = 1$ (1) $y'(\alpha x) = 1$ (1) $y'(\alpha x) = 1$		(a) 3 (b) 4 (c) 5 (d) 6
	(d) $Ni(CO)_4$ is diamagnetic and $[NiCl_4]$ and $[Ni(CN)_4]$ are paramagnetic	28.	Which one of the following shows maximum paramagnetic character
15	$\left[C_{\alpha}(NH_{\alpha}), CL_{\alpha}\right]^{+}$ which		(a) $\left[Cr(H_2 O)_6 \right]^{3+}$ (b) $\left[Fe(CN)_6 \right]^{4-}$
12.	$ \begin{array}{c} (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) $		(c) $[F \not\in (CN)]^{3-}$ (d) $[C \mu(H, Q)]^{2+}$
	(c) Bonding isomerism (d) Ionisation isomerism	20	$\begin{bmatrix} c \\ c $
16.	The compound which does not show paramagnetism is	29.	$[Cr(NH_{*}),][Co(C_{*}O_{*}),]$
	[IIT 1992]		(a) Linkage isomerism (b) Geometrical isomerism
	(a) $[Cu(NH_3)_4]Cl_2$ (b) $[Ag(NH_3)_2]Cl$		(c) Coordination isomerism (d) Ionisation isomerism
	(c) NO (d) NO_2	30.	Which of the following exhibits highest molar conductivity
17.	The number of geometrical isomers for $\left[\textit{Pt}(\textit{NH}_3)_2 \textit{Cl}_2 \right]$ is		$[MP \text{ PET 1994}]$ (c) $[C_{0}(NH)] CI$ (c) $[C_{0}(NH)] CI]CI$
	[CBSE PMT 1995]		(a) $[CO(NH_3)_6]CI_3$ (b) $[CO(NH_3)_5CI_5]CI_2$
	(a) Two (b) One		(c) $\begin{bmatrix} Co(NH_3)_4 Cl_2 \end{bmatrix} Cl$ (d) $\begin{bmatrix} Co(NH_3)_3 Cl_3 \end{bmatrix}$
19	(c) Inree (d) Four The pair of complex compounds $\begin{bmatrix} Cr(H, O) & CL \end{bmatrix}$ and	31.	Which of the following compounds is colourless [MP PET 1994]
10.	The pair of complex compounds $[Cr(H_2O)_6Cr_3]$ and $[Cr(H_2O)_6Cr_3]$ and $[Cr(H_2O)_6Cr_3]$ (MP PMT 1007)		(a) $Cu_2(CH_2COO)_4.2H_2O$ (b) Cu_2Cl_2
	(a) Linkage isometrism (b) Ionisation isometrism		(c) $CuSO_{1} 5H_{2}O_{2}$ (d) $[Cu(NH_{2}),]SO_{2} 4H_{2}O_{2}$
	(c) Coordination isomerism (d) Hydrate isomerism		$(c) = c_{10} c$
19.	The number of geometrical isomers of the complex	32.	The type of magnetism exhibited by $[Mn(H_2O)_6]^{-1}$ ion is
	$[CO(NO_2)_2(NH_3)_2]$ is [CBSE PMT 1997]		(a) Paramagnetism (b) Diamagnetism
	(a) 2 (b) 3 (c) 4 (d) 0		(c) Both (a) and (b) (d) None of these
20.	The type of isomerism present in nitropentamine chromium (III)	33.	The number of isomers possible for square planar complex
	chloride is [AIEEE 2002]		$K_2[PdClBr_2(SCN)]$ is [MP PET 1994]
	(c) Ionization (d) Polymerisation		(a) 2 (b) 3 (d) 6
21.	Which of the following compounds exhibits linkage isomerism	24	[MP PMT 2001] The number of unpaired electrons in $Ni(CO)$, is
	(a) $[Co(en)_3]Cl_3$ (b) $[Co(NH_3)_6[Cr(CN)_6]$	34.	
	(c) $[Co(en)_2 NO_2 Cl]Br$ (d) $[Co(NH_3)_5 Cl]Br_2$		(a) Zero (b) One
22.	Pick out from the following complex compounds, a poor electrolytic		(c) Three (d) Five
	conductor in solution [MP PM 1994] (a) $K_{1}[PtCl_{1}]$ (b) $[Co(NH_{1})(NO_{1})_{1}]$	35.	If the magnetic moment of $\left[Ag(CN)_2 ight]^{-1}$ is zero, then the number
	(a) $K_2[IICI_6]$ (b) $[CU(NH_3)_3(IVO_2)_3]$		of unpaired electrons will be [MP PET 1995]
	(c) $\mathbf{K}_4 [\mathbf{r}e(\mathbf{c}\mathbf{r}')_6]$ (d) $[\mathbf{c}u(\mathbf{r}\mathbf{r}\mathbf{r}_3)_4]\mathbf{p}\mathbf{O}_4$		$ \begin{array}{cccc} (a) & 1 \\ (b) & 2 \\ (c) & 3 \\ (d) & Zero \\ \end{array} $
23.	The possible number of optical isomers in $[Co(en)_2 Cl_2]^{\dagger}$ are	[/ 36.	$MP(PET 2003)$ (0) Zero $Pf(NH_2)$, $Cl_2 Br_2$ and $Pf(NH_2)$, $Br_2 Cl_2$ are related to each
	(a) 2 (b) 3 (c) 4 (d) 6	301	other as
24	Magnetic moment of $[C\mu(NH_{-}), 1^{2+}]$ ion is [DDET 2003]		[MP PET 1996; AFMC 2000; CBSE PMT 2001]
4 4 .	(a) 1.414 (b) 1.73		(a) Optical isomers (b) Coordinate isomers
	(c) 2.23 (d) 2.38	37.	Which of the following complex will show geometrical as well as
25.	What is true for $[Fe(CN)_6]^{3-}$ and $[FeF_6]^{3-}$ [RPET 1999]		optical isomerism (<i>en</i> = ethylene diamine)
	(a) Both are paramagnetic		[KCET 1996]

	(a) $Pt(NH_3)_2 Cl_2$	(b) $\left[Pt(NH_3)Cl_4\right]$
	(c) $[Pt(en)_3]^{4+}$	(d) $\left[Pt(en)_{2}\right]Cl_{2}$
38.	Which of the following complexes	s is diamagnetic
-		[RPMT 1997]
	(a) $Ni(CO)_4$	(b) $Ni(Cl_4)^{2-}$
	(c) $Ni(Br)_4^{2-}$	(d) $NiCl_2.4H_2O$
39.	Which one has the highest param	agnetism [AMU 2001]
	(a) $Ni(CO)_4$	(b) $[Ni(NH_3)_4]Cl_2$
	(c) $[Ni(NH_3)_6]Cl_2$	(d) $[Cu(NH_3)_4]Cl_2$
40.	Which of the following coordia optical isomerism	antion compounds would exhibit [CBSE PMT 2004]
	(a) <i>trans-</i> dicyanobis (ethylenedia	amine) chromium (111) chloride
	(b) <i>tris</i> -(ethylenediamine) cobalt	(III) bromide
	(c) pentaamminenitrocobalt (III) (d) diamminedichloroplatinum ()) iodide 11)
41.	Which of the following does not h	nave optical isomer
	() [C ()] [U]	[A11MS 2004]
	(a) $[Co(NH_3)_3Cl_3]$	
	(b) $[Co(en)_3]Cl_3$	
40	(c) $[Co(en)_2 Cl_2]Cl$	(d) $[Co(en)(NH_3)_2Cl_2]Cl$
42.	isomers	[DCE 2002]
	(a) Optical	(b) Geometrical
43.	(c) Ionisation Types of isomerism shown by	(d) None of these [DCE 2002]
	$[Cr(NH_3)_5 NO_2]Cl_2$ is	
	(a) Optical	(b) Ionisation
	(c) Geometrical	(d) Linkage
44.	Which of the following will not give $\left[C_{1} \right] = \left[C_{2} \right]$	(1) $\begin{bmatrix} c \\ c \end{bmatrix} \begin{bmatrix} c \\ c \end{bmatrix}$
	(a) $\begin{bmatrix} CO(NH_3)_3 CI_3 \end{bmatrix}$	(b) $[CO(NH_3)_4 Cl_2]Cl$
	(c) $[Co(NH_3)_5 CI]CI_2$	(d) $[Co(NH_3)_6]Cl_3$
45.	How many ions are produced from	m $[Co(NH_3)_6]Cl_3$ in solution
	(a) 0 (c) 3	(d) 2
46.	The colour of $CoCl_3.5NH_3.H_2$	$_2O$ is [Kerala (Med.) 2002] 1
	(a) Orange yellow	(b) Orange
	(c) Green (e) Pink	(d) Violet
47.	Which one of the following is complex	expected to be a paramagnetic [MP PMT 1991, 2000]
	(a) $\left[Ni(H_2O)_6\right]^{2+}$	(b) $\left[Ni(CO)_4\right]$
	(c) $[Zn(NH_3)_4]^{2+}$	(d) $\left[Co(NH_3)_{\epsilon} \right]^{+3}$
48.	Which one of the following w $AgNO_2$ in aqueous mediun	vill give a white precipitate with [MP PMT 1994]
	(a) $[C_0(NH_2), Cl](NO_2)$.	(b) $[Pt(NH_2), Cl_2]$
	(c) $[Pt(en)Cl_{-}]$	(d) $[Pt(NH_2),]Cl_2$
49.	How many ions will be produced	d in solution from one molecule of
	chloropentammine cobalt (111) chl	oride
	(a) 1 (c) 3	$\begin{array}{c} (b) & 2 \\ (d) & 4 \end{array}$
50.	Which of the following complex	x will give white precipitate with
	$BaCl_2$ (aq.)	[JIPMER 1997]
	() (O, U, U, V) (O, U, U, V)	(1) $\left[\alpha \left(\lambda \mu \right) \right] = \left[\alpha \left(\lambda \mu \right) \right]$

(a)
$$[Co(NH_3)_4 SO_4]NO_2$$
 (b) $[Cr(NH_3)_5 SO_4]Cl$

	(a) $[Cr(NH), CIISO (d), Both (h), and (c)]$
	(c) $[Cr(iNH_3)_5Cr_1SO_4$ (d) Both (b) and (c)
51.	The number of precipitable halide ions in the sample $[Pt(NH_3)Cl_2Br]Cl$ will be
	(a) 2 (b) 3
	(c) 4 (d) 1
52.	The colour of tetrammine copper (11) sulphate is
	(a) Blue (b) Red
	(c) Violet (d) Green
53.	The number of ions per mole of a complex $[CoCl_2.5 NH_3]Cl_2$ in
	aqueous solution will be
	[MP PMT 2001]
	(a) Nine (b) Four
	(c) Three (d) Two
54.	How many unpaired electrons are present in the central metal ion of
	$[CoCl_4]^{2^-}$ [Orissa JEE 2005]
	(a) 3 (b) 4
	(c) 5 (d) 2
55.	What is the magnetic moment of $K_3[FeF_6]$
	[Orissa JEE 2005]
	(a) 5.91 BM (b) 4.89 BM
	(c) 3.87 BM (d) 6.92 BM
56.	(i) $K_4[Fe(CN)_6]$ (ii) $K_3[Cr(CN)_6]$ (iii) $K_3[Fe(CN)_6]$
	(iv) $K_2[Ni(CN)_4]$
	Choose the complex which is paramagnetic
	[Kerala CET 2005]
	(a) (i), (ii) and (iii) (b) (i), (iii) and (iv) (c) (ii) $(iii) = 1$ (iv) (ii) $(iii) = 1$ (iv)
	(c) (1), (11) and (1V) (d) (1), (1) and (1V) (e) (ii) and (iv)
	(e) (ii) and (iv) In coordination compound $[Co(an), Cl_{-}]Cl_{-}$ which is follow
57.	In coordination compound $[CO(en)_2 Cl_2]Cl$ which is false
	(a) Show geometrical isomerism
	(b) Shawp operical data merism
	(c) Show ionic Isomerism
	(d) A octahedral complex
	(e) A cationic complex
	[RPET 1999]
	Hybridisation and Geometry
	· ·
1.	The correct structural formula of <i>zeise's salt</i> is
	(a) $K^+ \left[PtCl_3 - \eta^2 - (C_2H_4) \right]^-$
	(b) $K_2 \left[PtCl_3 - \eta^2 - C_2 H_4 \right]$
	(c) $K^+ \left[PtCl_2 - \eta^2 - (C_2H_4) \right] Cl^-$

(d) $K^{+}[PtCl_{3}(C_{2}H_{4}]^{-}$

The correct order of hybridisations of central atom in NH_3 , $[PtCl_4]^{2-}$, PCl_5 and BCl_3 is

- [MP PMT 2003]
- (a) dsp^2, dsp^3, sp^2 and sp^3 (b) sp^3, sp^3, sp^3d and sp^2
- (c) dsp^2 , sp^2 , sp^3 and dsp^3

(d)
$$dsp^2$$
, sp^3 , sp^2 and dsp^3

One mole of the complex compound $Co(NH_3)_5 Cl_3$, gives 3 moles of ions on dissolution in water. One mole of the same complex reacts with two moles of $AgNO_3$ solution to yield two moles of AgCl(s). The structure of the complex is

[AIEEE 2003]

	(a) $[Co(NH_3)_5 Cl]Cl_2$	
	(b) $[Co(NH_3)_3Cl_3].2NH_3$	
	(c) $[Co(NH_3)_4 Cl_2]Cl.NH_3$	
	(d) $[Co(NH_3)_4 Cl]Cl_2.NH_3$	
4.	Cuprammonium ion $\left[Cu(NH_3)\right]$	${}_{4}]^{2+}$ is
	() T . 1 1 1	[MP PMT 1997; KCET 2002]
	(a) Triangular bipyramid	(d) Octahedral
5	In the complex $[ShF_{-}]^{2-}$ $sn^{3}d$	hydridisation is present Geometry
J .	of the complex is	[Pb. PMT 2000]
	(a) Square pyramidal	(b) Square bipyramidal
6	(c) Tetrahedral The two of hybridization	(d) Square involved in the motal ion of
0.	$[Ni(H, O), 1^{2+}]$ complex is	involved in the metal lon of
	$[101120]_6$ complex is	(1) 3.12
	(a) $d^{-}sp^{-}$	(b) $sp^{+}a^{-}$
	(c) sp^3	(d) dsp^2
7.	In the formation of $K_4 Fe(CN)_6$, the hybridisation involved is
	(a) sp^2	(b) d^2sp^3
	(c) $d^3 sp^2$	(d) d^4p
8.	Which of the following is not tru	e for metal carbonyls
	(a) The oxidation state of the m	[MP PET 1993] netal in the carbonyls is zero
	(b) The secondary carbony	ls are obtained from photo-
	decomposition	anded maries
	(c) Metal carbonyis are single to (d) $d\pi - n\pi$ overlap is observed.	ved in metal carbonyls
9.	An octahedral complex is form	ned, when hybrid orbitals of the
-	following type are involved	[DCE 2003]
	(a) sp^3	(b) dsp^2
	(c) sp^3d^2	(d) sp^2d
10.	Which one is an example of octain	hedral complex
	$()$ $E E^{3-}$	[MP PET 2000]
	(a) FeF_6	(b) $Zn(NH_3)_4^2$
	(c) $Ni(CN)_4^{2-}$	(d) $Cu(NH_3)_4^{2+}$
11.	Which of the following complexe	s has a square planar geometry
	(a) $Ag(NH_3)_2^+$	(b) $Cu(en)_2^{2+}$
	(c) $[MnCl_4]^{2-}$	(d) $Ni(CO)_4$
12.	The shape of $[Fe(CN)_c]^{4-}$ ion	is
	(a) Hexagonal	(b) Pyrimidal
	(c) Octahedral	(d) Octagonal
13.	What is the shape of $Fe(CO)_5$	[CBSE PMT 2000]
	(a) Linear	(b) Tetrahedral
	(c) Square planar	(d) Frigonal Dipyramidal $1 + \frac{1}{2} = \frac{1}{2} E_{\alpha}(CM) + \frac{1}{2}$
14.	What type of hybridization is inv	olved in $[Fe(CN)_6]^{\circ}$
	(a) $d^2 s n^3$	(b) dsn^2
	(a) $a^3 d^2$	$(1) dap^3$
	(c) $sp a$	(a) asp
15.	The example of dsp^2 hybridisat	ion is
	() $E_{\alpha}(CM)^{3-}$	[MP PEI 1999; AIIMS 2001]
	(a) $Fe(CN)_6^2$	(b) $Ni(CN)_4$
	()2.	2

	16.	The shape of $[Cu(NH_3)_4]^{2+}$ complex is	is s	quare planar, <i>Cu</i> ²⁺ in this [NCERT 1989; RPET 1999]
		(a) sp^3 hybridised	(b)	dsp^2 hybridised
		(c) sp^3d hybridised	(d)	sp^3d^2 hybridised
	17.	The geometry of $Ni(CO)_4$ and	Ni(I	$PPh_3)_2 Cl_2$ are
ET 2002]		(a) Path aguara planar		[IIT-JEE 1999; DCE 2002]
		(b) Tetrahedral and square plan	ar re	spectively
'a a matmi		(c) Both tetrahedral	1	21 I
MT 2000]	18.	(d) Square planar and tetrahedr Which complex has square planar	r stru	cture [JIPMER 2002]
		(a) $Ni(CO)_4$	(b)	$[NiCl_4)^{2^-}$
ion of		(c) $[Ni(H_2O)_6]^{2+}$	(d)	$[Cu(NH_3)_4]^{2+}$
	19.	$[Pt(NH_3)_4]Cl_2$ is		[DCE 2001]
		(a) Square planar (c) Pyramidal	(b) (d)	Tetrahedral Pentagonal
	20.	A complex involving dsp^2 hybrid	dizati	on has
5		(a) A square planar geometry (b) A tetrahedral geometry		
		(c) An octahedral geometry		
		(d) Trigonal planar geometry		1 1 . 1
PET 1993]	21.	A tetrahedral complex ion is form	ned d	ue to hybridization
)		(a) sp	(D)	sp
photo-	77	(c) dsp^2 Back bonding is involved in which	(d) boft	<i>d</i> ² sp ³ he organometallic compounds
	44.	(a) $[(CH_{-}), A]$	(b)	$Mg^{2+}(C_{-}H_{-}^{-})$
C .1		(a) $\left[\left(CH_{3}\right)_{3}HI_{12}\right]$ (c) $R - Ma - X$	(d)	$\begin{bmatrix} (C \ H \) \ E_{\theta} \end{bmatrix}$
OF the CE 2003]		$\frac{1^2}{3} \frac{3}{1} \frac{1}{1} $	(u)	
-	23.	<i>a sp</i> hybridisation leads to (a) Hexagonal shape	(b)	Trigonal binyrimidal
		(c) Octahedral shape	(d)	Tetrahedral shape
	24.	Chromium hexacarbonyl is an oct	tahed	ral compound involving
ET 2000]		(a) sp^3d^2	(b)	dsp ²
		(c) $d^2 s p^3$	(d)	$d^3 sp^2$ orbitals
	25.	$[CoF_6]^{-3}$ is formed by hybri	idizat	ion
etry		(a) $d^2 s p^3$	(b)	$d^3 sp^2$
		(c) $d^2 s p^3$	(d)	sp^3d^2
	26.	The species havoing tetrahedral s	hape	is
		(-) $[\mathbf{P}_{d}\mathbf{C}_{l}]^{2-}$	(L)	[IIT-JEE (Screening) 2004] $[Ni(CN)]^{2-}$
		(a) $[PaCl_4]$	(D)	$[N(CN)_4]$
		(c) $[Pd(CN)_4]^2$	(d)	$[NiCl_4]^2$
	27.	Among $[Ni(CO)_4], [Ni(CN)]$	₄] ²⁻ ,	$[NiCl_4]^{2^-}$ species, the
		[CBSE PMT 2004	m are ; MP 1	PMT 1992; BHU 1995; AFMC 1997]
		(a) sp^3 , sp^3 , dsp^2	(d)	dsp^2, sp^3, sp^3
MU 1999]		(c) sp^3, dsp^2, dsp^2	(d)	sp^3, dsp^2, sp^3
		(At. no. of $Ni = 28$)	. ,	-
	28.	The bond in $K_4[Fe(CN)_6]$ are:	:	[MP PET 2004]
		(a) All ionic (b) All covalent		
MS 2001]		(c) Ionic and covalent		
		(d) lonic, covalent and co-ordiar	nte co	walent

29. Hybridization of *Fe* in $K_3Fe(CN)_6$ is [DCE 2002]

(c) $Zn(NH_3)_4^{2+}$ (d) FeF_6^{3-}

	(a) sp^3	(b)	dsp^3
	(c) sp^3d^2	(d)	d^2sp^3
30.	The complex ion which has no	• ' <i>d</i> '	electrons in the central metal
	atom is		[IIT-JEE Screening 2001]
	(a) $[MnO_4]^-$	(b)	$\left[Co(NH_3)_6\right]^{3+}$
	(c) $[Fe(CN)_{6}]^{3-}$	(d)	$[Cr(H_2O)_6]^{3+}$
31.	Which of the following statemen	it is co	prrect
	(a) $\left[C_{\mu}(NH_{\star})\right]^{2+}$ is a colour	rless i	on
	(d) $[2(113)_6]^{2+}$ is a conce		1
	(b) $[2n(H_2O)_6]^{-1}$ ion is blu	e coloi	ured
	(c) $[Ni(CN)_4]^{-1}$ ion has a te	trahec	Iral shape
32	(d) Nickel dimethyl glyoxides is Which of the following shall for	s red ii n an c	n colour octabedral complex
	Which of the following shall for	in un c	[DCE 2001]
	(a) d^4 (low spin)	(b)	d^8 (high spin)
	(c) d^6 (low spin)	(d)	None of these
33.	Which one of the following is a	strong	field ligand
	(a) <i>CN</i> ⁻	(b)	NO_2^-
	(c) en	(d)	NH 2
34.	The strongest ligand in the follo	wing i	s [MP PET 1995]
•••	(a) CN^{-}	(b)	Rr^{-}
	(a) HO^-	(d)	F ⁻
35.	The neutral ligand is	(u)	1
	(a) Chloro	(b)	Hydroxo
	(c) Ammine	(d)	Oxalato
36.	The ligands which can get attac	hed to	the central metal ion through
	(a) Ambident ligands	(b)	Polydentate ligands
	(c) Chelate ligands	(d)	Neutral ligands
37.	A strong ligand gives a complex	which	is generally called
	(a) High spin	(b)	High energy Stable
-0	(c) Low spin CM^{-1} :	(a)	
38.	C/V is a strong field ligand. T	his is (due to the fact that [CBSE PMT 2004]
	(a) It can accept electron from	metal	species
	(b) It forms high spin complex	es wit	h metal species
	(c) It carries negative charge.		
20	(a) It is a pseudonalide Considering $H(O)$ as a weak f	ald li	and the number of unnaired
39.	$I_{2} = I_{2} = I_{2} = I_{2} = I_{2}$		
	electrons in $[M(\Pi_2 O)_6]$ w	viii be	(At. No. of $Mn = 25$) asas a [CRSE DMT 2004]
	(a) Two	(b)	Four
	(c) Three	(d)	Five
40.	Which of the following is a π -	compl	ex
	(a) Trimethyl aluminium	(b)	Ferrocene
4 1	(c) Dietnyi zinc Which of the following is a π –	(a) acid l	igand
-	which of the following is a <i>m</i>	ucia i	[KCET 1996; AllMS 2003]
	(a) NH_3	(b)	CO
	(c) F^-	(d)	Ethylene diamine
42.	The value of the 'spin only'	magn	etic moment for one of the
	following configurations is 2.84	BM. tł	e correct one
	() 1 ⁴ (· · · · · · · · · · · · · · · · · · ·		[AIEEE 2005]
	(a) a (in strong ligand field)		
	(b) d^{-} (in weak ligand field)		

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

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

- **43.** The geometry of *Ni*(*CO*) and *Ni*(*PPh*), *Cl* are
 - (a) Both square planer
 - (b) Tetrahedral and square planar respectively
 - (c) Both tetrahedral
 - $(d) \quad \mbox{Square planar and tetrahedral respectively} \\$

Complexes and complex stability

[BHU 2005]

	1.	Which of the following complexes has the highest stability constant at 298 ${\rm K}$
		(a) $[CdCl_4]^{2-}$ (b) $[CdBr_4]^{2-}$
]		(c) $[CdI_4]^{2-}$ (d) $[Cd(CN)_4]^{2-}$
	2.	The most stable ion is [AIEEE 2002]
		(a) $[Fe(OH)_3]^{3-}$ (b) $[Fe(Cl)_6]^{3-}$
		(c) $[Fe(CN)_6]^{3-}$ (d) $[Fe(H_2O)_6]^{3+}$
	3.	The most stable complex among the following is
		$[MP PMT 2002]$ (a) $K_{*}[A](C, O,)_{*}]$ (b) $[P_{t}(en)_{*}]CL$
		(c) $A_0(NH) C$ (d) $K_1(Ni(EDTA))$
	4.	Which of the following factors tends to increase the stability of metal ion complexes
		(a) Higher ionic radius of the metal ion
		(c) Lower ionisation potential of the metal ion
h		(d) Lower basicity of the ligand
	5.	$CuSO_4$ reacts with KCN solution and forms: [DPMT 2004]
		(a) $K_3[Cu(CN)_4]$ (b) $Cu(CN)$
		(c) $Cu(CN)_2$ (d) $K_4[Cu(CN)_6]$
.]	6.	A co-ordination complex compound of cobalt has the molecular formulae containing five ammonia molecules, one nitro group and two chlorine atoms for one cobalt atom. One mole of this compound produces three mole ions in an aqueous solution on reacting with excess of $AgNO_3$, $AgCl$ precipitate. The ionic formula for this
		complex would be:
		[DPMT 2004; Kerala PMT 2004]
4		(a) $[Co(NH_3)_5(NO_2)]Cl_2$
J		(b) $[Co(NH_3)_5Cl][Cl(NO_2)]$
а		(c) $[Co(NH_3)_4(No_2)Cl][(NH_3)Cl]$
		(d) $[Co(NH_3)_5][(NO_2)_2Cl_2]$
	7.	In any ferric salt, on adding potassium ferrocyanide, a prussian blue colour is obtained, which is
		[BIT 1992; BHU 2002] (a) $K E_{\ell}(CN)$ (b) $K E_{\ell}[E_{\ell}(CN)]$
		$ \begin{array}{c} (a) K_3 T e(CN)_6 \end{array} \\ (b) KT e[T e(CN)_6] \end{array} \\ (c) KT e[T e(CN)_6] \end{array} $
,1	8	(d) $Fe_{3}O_{4}$, $Fe(CN)_{6}$ (d) $Fe_{4}[Fe(CN)_{6}]_{3}$ Prussian blue is formed when [CBSE PMT 1000]
ני	0.	(a) Ferrous subhate reacts with $FeCl_{2}$
		(b) Ferric subhate reacts with $K_{\rm e}[Fe(CN)_{\rm e}]$
e		(c) Formous approximation subhata reserve with F_2C_1
		(1) A matrix 1 1 matrix $reacts$ with $FeCl_3$
5]		(d) Ammonium sulphate reacts with $FeCl_3$

Complex salt can be made by the combination of $[Co^{III}(NH_3)_5 Cl]^X$ with[RPMT 2000, AFMC 2002]

9.

	(a) PO_4^{3-}	(b)	Cl^-
	(c) $2Cl^{-}$	(d)	$2K^{+}$
10.	Which reagent can be used to id	entify	nickel ion
	(a) Resorcinol		
	(b) Dimethyl glyoxime [DMG]		
	(c) Diphenyl benzidine		
11	(d) Potassium ferrocyanide	mad a	amalay with
11.	(a) = A a	(b)	Ni
	(d) Ag	(0)	7.
10	(c) Cr	(a)	Zn NUL OLL TI
12.	Silver chloride dissolves in exces	SOL	[FAMCET 1008]
	(a) Ag	(b)	$[Ag(NH_3)_2]$
	(c) $\left[Ag\left(NH_3\right)_4\right]^+$	(d)	$\left[Ag(NH_3)_6\right]^+$
13.	Silver sulphide dissolved in a so the complex	olution	of sodium cynamide to form [AMU 1999]
	(a) $Na[Ag(CN)_2]$	(b)	$Na_3[Ag(CN)_4]$
	(c) $Na_5[Ag(CN)_6]$	(d)	$Na_2[Ag(CN)_2]$
14.	Which one will give Fe^{3+} ions	in solı	ution
••••	(a) $[E_{a}(CN)]^{3-}$		
	(a) $[Pe(CN)_6]$		
	(b) $Fe_2(SO_4)_3$		
	(c) $\left[Fe(CN)_6\right]^{4-}$		
	(d) $NH_4(SO_4)_2$.FeSO ₄ .6H	I_2O	
15.	The cation that does not form	an a	mine complex with excess of
	ammonia is		2
	(a) Cd^{2+}	(b)	Al^{3+}
	(c) Cu^{2+}	(d)	Ag^+
	Application of or	aan	omotallics
_		yan	
1.	Ziegler-Natta catalyst is an organ	nometa	allic compound of which metal
	(a) Iron	(b)	Zirconium
2	(c) Khodium In the case of small cuts bleed	(d) Jing j	Titanium s stopped by applying potash
	alum. Here alum acts as		s stopped by applying potasi
	(-) <u>Francisia</u>	(L)	[KCET (Med.) 2001]
	(a) Fungicide (c) Germicide	(d)	Coagulating agent
3.	The formula of ferrocene is	(-)	
	(a) $[Fe(CN)_6]^{4-}$	(b)	$[Fe(CN)_{6}]^{3-}$
	(c) $[Fe(CO)_5]$	(d)	$[(C_5H_5), Fe]$
4.	Which of the following is forme	ed wh	en <i>n</i> -butyl lithium reacts with
	tin (11) chloride		[AFMC 2001]
	(a) LiBr	(b)	Et_4Pb
	(c) $(C_4H_9)_4Sn$	(d)	$(C_2H_5)_4Pb$
5.	Which of the following organo-	silicon	compound on hydrolysis will
	give a three dimensional silicone		[Orissa IEE 2003]
	(a) $R_3 SiCl$	(b)	RSiCl ₃
	(c) $SiCl_{4}$	(d)	R_2SiCl_2
6.	Which one is not an organometa	llic co	mpound
			[] & K CET 2005; Pb. CET 2003]

(a)
$$RMgX$$
 (b) C_2H_5ONa

	(c) $(CH_3)_4 Sn$ (d) KC_4H_9
7.	The complex used as an anticancer agent is [AIIMS 2003]
	(a) trans $-[Co(NH_3)_3Cl_3]$ (b) cis $-[PtCl_2(NH_3)_2]$
	(c) $cis - K_2[PtCl_2Br_2]$ (d) Na_2CO_3
8.	The compound that is not olefinic organometallic is
	(a) $K[C_2H_4PtCl_3]3H_2O$ (b) $Be(CH_2)_2$
	(c) $(C_2H_4PtCl_3)_2$ (d) $C_4H_4Fe(CO)_3$
9.	Among the following, which is not the π -bonded organometallic compound [CBSE PMT 2003]
	(a) $(CH_3)_4 Sn$ (b) $K[PtCl_3(\eta^2 - C_2H_4)]$
	(c) $Fe(\eta^5 - C_5H_5)_2$ (d) $Cr(\eta^6 - C_6H_6)_2$
10.	Wilkinson's catalyst is used in
	(a) Polymerization (b) Condensation
11	(c) Halogenation (d) Hydrogenation What is the use of tetraethyl lead
	(a) As a catalyst in addition reaction of alkenes
	(b) As a catalyst in polymerization reaction of alkenes
	(c) For reducing knocking (d) For creating knocking
12.	Which of the following is an organo-metallic compound
	[MP PMT 2001]
	(a) Lithium ethoxide (b) Ethyl lithium (c) Lithium acetate (d) Lithium carbide
13.	Which of the following is an organometallic compound
	[A11MS 1997]
	(a) $Ii(C_2H_5)_4$ (b) $Ii(OC_2H_5)_4$
	(c) $Ii(OCOCH_3)_4$ (d) $Ii(OC_6H_5)_4$
14.	[MP PET 1996; BHU 2002]
	(a) Ethyl magnesium bromide
	(b) Tetraethyl lead
	(d) Trimethyl aluminium
15.	An organometallic compound amongst the following is
	(a) Ferrocene (b) CaC_2 [] & K CET 2005]
16	(c) Tetraethyl lead (TEL) (d) All of these Which of the following does not have a metal carbon bond
10.	[CBSE PMT 2004]
	(a) $K[Pt(C_2H_4)Cl_3]$ (b) $Ni(CO)_4$
	(c) $Al(OC_2H_5)_3$ (d) C_2H_5MgBr
17.	Coordination compounds have great importance in biological
	incorrect [AIEEE 2004]
	(a) Cyanocobalamin is B_{12} and contains cobalt.
	(b) Haemoglobin is the red pigment of blood and contains iron.(c) Chlorophylls are green pigments in plants and contains
	calcium. (d) Carboxypepticase-A is an enzyme and contains zinc
18.	Ziegler-Natta catalyst is [Pb. CET 2004]
	(a) $(Ph_3P)_3RhCl$ (b) $K[PtCl_3(C_2H_4)]$
	(c) $[Al_2(C_2H_6)_6] + TiCl_4$ (d) $[Fe(C_2H_5)_2]$
19.	Dimethyl glyoxime gives a red precipitate with Ni^{2+} , which is used
	for its detection. To get this precipitate readily the best <i>pH</i> range is[AIIMS 2004
	(a) < 1 (b) 2-3 (c) 3-4 (d) 9-11
20.	The π – bonded organo metallic compound which has ethene as
	one of its component is [] & K CET 2005]
	(a) Leise's salt (b) Ferrocene

 $[X] + Zn \rightarrow [Y] + Au$ Identify the complexes [X] and [Y](a) $X = [Au(CN)_2]^-, Y = [Zn(CN)_4]^{2-1}$ Critical Thinking (b) $X = [Au(CN)_{4}]^{3-}, Y = [Zn(CN)_{4}]^{2-}$ **Objective Questions** (c) $X = [Au(CN)_2]^-, Y = Zn(CN)_6]^{4-1}$ The coordination number and oxidation state of Cr in 1. (d) $X = [Au(CN)_4]^-, Y = [Zn(CN)_4]^{2-1}$ $K_3[Cr(C_2O_4)_3]$ are, respectively [CBSE PMT 1995] A solution of potassium ferrocyanide would contains ions 11. (a) 4 and +2 (b) 6 and +3 (a) 2 (b) 3 (c) 3 and +3 (d) 3 and 0 (d) 5 (c) 4 2. The complex compounds which result from the coordination of Which one of the following complexes is an outer orbital complex 12 carbon monoxide are known as [BHU 1999] (a) $[Co(NH_3)_6]^{3+}$ (b) $[Mn(CN)_6]^{4-}$ (a) Electronic (b) Carbonvls (c) Carbonates (d) Carbon permono (c) $[Fe(CN)_6]^{4-}$ (d) $[Ni(NH_3)_6]^{2+}$ Mixture X = 0.02 mol of $[Co(NH_3)_5 SO_4]Br$ and 0.02 mol of з. Atomic nos : Mn = 25, Fe = 26, Co = 27, Ni = 28 $[Co(NH_3)_5 Br]SO_4$ was prepared in 2 *litre* of solution Which one of the following has largest number of isomers ? 13. 1 *litre* of mixture X + excess $AgNO_3 \rightarrow Y$. 1 *litre* of mixture X + excess $BaCl_2 \rightarrow Z$ (a) $[Ir(PP_3)_2H(CO)]^{2+}$ (b) $[Co(NH_3)_5 Cl]^{2+}$ Number of moles of Y and Z are [IIT JEE 2003] (c) $[Ru(NH_3)_4 Cl_2]^+$ (d) (a) 0.01.0.01 (b) 0.02, 0.01 (c) 0.01, 0.02 (d) 0.02, 0.02 (R = alkyl group; en = ethylenediamine)Which of the following organometallic compound is σ and π 4 Which kind of isomerism is 14. bonded [MH CET 2001; PCET 2002] $Co(NH_3)_4 Br_2 Cl$? (a) $Fe(CH_3)_3$ (a) Geometrical and Ionization (b) $[Fe(\eta^5 - C_5H_5)_2]$ Geometrical and Optical (b) (c) Optical and Ionization (c) $[Co(CO)_5 NH_2]^{2+}$ (d) Geometrical only (d) $K[PtCl_3(n^2 - C_2H_4)]$ 15. Which one of the following is expected to exhibit optical isomerism (en = ethylenediamine) In $[Ni(NH_3)_4]SO_4$, the valency and coordination number of Ni 5. (a) $cis - [Pt(NH_3)_2Cl_2]$ (b) $trans - [Co(en)_2 Cl_2]$ will be respectively (c) $trans - [Pt(NH_3)_2Cl_2]$ (d) $cis - [Co(en)_2 Cl_2]$ (a) 3 and 6 (b) 2 and 4 (c) 4 and 2 (d) 4 and 4 $[EDTA]^{4-}$ is a: 16. Co-ordination number of *Fe* in the complexes $[Fe(CN)_6]^{4-}$, (a) Monodentate ligand (b) Bidentate ligand 6. (c) Quadridentate ligand (d) Hexadentate ligand $[Fe(CN)_6]^{3-}$ and $[FeCl_4]^-$ would be respectively Which When the to have a statements is incorrect ? 17. (a) 2, 3, 3 (b) 6, 6, 4 (a) In $K_3[Fe(CN)_6]$, the ligand has satisfied only the secondary (c) 6, 3,3 (d) 6, 4, 6 valency of ferric ion. On hydrolysis $(Me)_2 SiCl_2$ will produce 7. [IIT-JEE 2003] (b) In $K_3[Fe(CN)_6]$, the ligand has satisfied both primary and (a) $(Me)_2 Si(OH)_2$ secondary valencies of ferric ion. (b) $(Me)_2 Si = O$ (c) In $K_4[Fe(CN)_6]$, the ligand has satisfied both primary and secondary valencies of ferrous ion. (c) $-[-O - (Me)_2 Si - O -]_n -$ (d) In $[Cu(NH_3)_4]SO_4$, the ligand has satisfied only the (d) $Me_2SiCl(OH)$ secondary valency of copper. Which of the following represents a chelating ligand 8. Which of the following is considered as an anticancer species. 18. [IIPMER 2002] (b) *OH*⁻ (a) H_2O (a) (c) DMG (d) Cl^{-} H_2N Cl $CuSO_4$ reacts with KCN solution and forms 9. Cl_{1} CH_2 [MP PMT 1992; IIT 1996; UPSEAT 2001, 02] || CH_2 (d) (a) $Cu(CN)_2$ (b) *Cu*(*CN*) (c) Cl(c) $K_2[Cu(CN)_4]$ (d) $K_3[Cu(CN)_4]$ In the process of extraction of gold, 10. 19.

Roasted gold ore $+ CN^{-} + H_2O \xrightarrow{O_2} [X] + OH^{-}$

An aqueous solution of $CoCl_2$ on addition of excess of concentrated HCl turns blue due to formation of

[IIT-IEE 2003]

 $[Co(en), Cl_2]^+$

exhibited by octahedral

[IIT-JEE Screening 2005]

[UPSEAT 2004]

[KCET 2004]

[AIEEE 2004]

[AIIMS 2005]

 $(\mathsf{a}) \quad [Co(H_2O)_4\,Cl_2]$

- (b) $[Co(H_2O)2Cl_4]^{2-}$
- (c) $[CoCl_4]^{2-}$
- (d) $[Co(H_2O)2Cl_2]$
- 20. The correct order for the wavelength of absorption in the visible region is [AllMS 2005]
 - (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) $[Ni(NH_3)_6]^{2+} < [Ni(H_2O)_6]^{2+} < [Ni(NO_2)_6]^{4-}$
- 21. In which of the following pairs both the complexes show optical isomerism [AIIMS 2005]
 - (a) $cis-[Cr(C_2O_4)_2Cl_2]^{3-}$, $cis-[Co(NH_3)_4Cl_2]$
 - (b) $[Co(en)_3]Cl_3$, cis- $[Co(en)_2Cl_2]Cl$
 - (c) [PtCl(dien)]Cl, $[NiCl_2Br_2]^{2-}$
 - (d) $[Co(NO_3)_3(NH_3)_3]$, cis- $[Pt(en)_2Cl_2]$
- 22. Which of the following compounds shows optical isomerism [AIEEE 2005; CBSE PMT 2005]
 - (a) $[Cu(NH_3)_4]^{2+}$ (b) $[ZnCl_4]^{2-}$
 - (c) $[Cr(C_2O_4)_3]^{3-}$ (d) $[Co(CN)_6]^{3-}$
- Assertion & Reason
- Read the assertion and reason carefully to mark the correct option out of the options given below :
- (a) If both assertion and reason are true and the reason is the correct explanation of the assertion.
 (b) If both assertion and reason are true but reason is not the correct
- (c) If assertion is true but reason is false,
 (c) If assertion is true but reason is false,
- (d) If the assertion and reason both are false.
- (e) If assertion is false but reason is true.

1.	Assertion	:	Potassium ferrocyanide and potassium ferricyanite both are diamagnetic.
	Reason	:	Both have unpaired electrons.
2.	Assertion	:	NF_3 is a weaker ligand than $N(CH_3)_3$
	Reason	:	NF_3 ionizes to give F^- ions
			ionsiionsionsioiiioioioioioioioioion
ions i	n aqueous solu	ıtic	on.
3.	Assertion	:	The $[Ni(en)_3]Cl_2$ (<i>en</i> = ethylene diamine) has
			lower stability than $[Ni(NH_3)_6]Cl_2$
	D		In $[Ni(an), 1Cl]$ the geometry of Ni is trigonal

	Reason	: In $[M(en)_3]Cl_2$ the geometry of M is trigonal bipyramidal
4.	Assertion	 The ligands nitro and nitrito are called ambidentate ligands.
	Reason	: These ligands give linkage isomers.
5.	Assertion	: Geometrical isomerism is also called <i>cis-trans</i> isomerism.

Reason : Tetrahedral complexes show geometrical isomerism.

		$[NH]^{3+}$
6.	Assertion	$: \left[(en)_2 Co \left(\begin{array}{c} O \\ O \\ O \end{array} \right)_2 \right] \text{is named as tetrakis}$
		(ethylene diamine) μ -hydroxo-imido dicobalt (111)
		ion.
	Keason	: In naming polynuclear complexes <i>i.e.</i> , containing two or more metal atoms joined by bridging ligands, the word μ is added with hyphen before the name of such ligands.
7.	Assertion	: $[Fe(CN)_6]^{3-}$ is weakly paramagnetic while
		$[Fe(CN)_6]^{4-}$ is diamagnetic.
	Reason	: $[Fe(CN)_6]^{3-}$ has +3 oxidation state while
		$[Fe(CN)_6]^{4-}$ has +2 oxidation state.
8.	Assertion	: $H_2N - NH_{2}$ is a chelating ligand.
	Reason	: A chelating ligand must possess two or more lone pairs at such a distance that it may form suitable strain free rings at the metal ion.
9.	Assertion	: $[Ti(H_2O)_6]^{3+}$ is coloured while $[Sc(H_2O)_6]^{3+}$ is colourless.
	Reason	: d - d transition is not possible in $\left[Sc(H_2O)_6\right]^{3+}$.
10.	Assertion	: All the octahedral complexes of Ni^{2+} must be outer orbital complexes.
	Reason	: Outer orbital octahedral complexes are given by weak ligands
11.	Assertion	: Potassium ferrocyanide is diamagnetic whereas potassium fericyanide is paramagnetic.
	Reason	: Crystal field splitting in ferrocyanide ion is greater

: Crystal field splitting in ferrocyanide ion is greater than that of ferricyanide ion.

[AIIMS 2005]



Basic Terms

1	b	2	С	3	b	4	b	5	d			
6	а	7	b	8	C	9	b	10	c			
11	d	12	c	13	d	14	b	15	b			
16	b	17	а	18	C	19	c	20	b			
21	b	22	C	23	b	24	d	25	a			
26	d	27	а	28	b	29	b	30	c			
31	b	32	c	33	b	34	b	35	d			
36	d	37	b	38	b	39	d	40	b			
41	d	42	b	43	d	44	b	45	a			
46	а	47	d	48	C	49	b	50	d			
51	а	52	b	53	d	54	а	55	d			
56	d	57	а	58	d	59	а	60	d			
61	C	62	d									
Nom	Nomenclature, oxidation State and EAN number											
1	b	2	C	3	C	4	b	5	d			

6	C	7	b	8	а	9	а	10	а
11	c	12	а	13	b	14	а	15	b
16	c	17	d	18	b	19	d	20	а
21	b	22	b	23	а	24	b	25	а
26	d	27	С	28	b	29	а	30	а
31	a	32	b	33	a	34	b	35	С
36	b	37	а	38	а	39	b	40	С
41	a	42	b	43	c	44	b	45	b
46	d	47	а	48	b	49	С	50	С
51	b	52	b	53	С	54	d	55	b
56	а	57	b	58	C				

Isomerism and Magnetic properties

1	а	2	d	3	а	4	С	5	С
6	d	7	b	8	а	9	а	10	C
11	d	12	d	13	b	14	C	15	а
16	b	17	а	18	d	19	а	20	b
21	C	22	b	23	b	24	а	25	а
26	d	27	d	28	а	29	С	30	а
31	b	32	а	33	C	34	а	35	d
36	C	37	d	38	а	39	d	40	b
41	а	42	C	43	d	44	а	45	b
46	е	47	а	48	d	49	С	50	C
51	d	52	а	53	C	54	а	55	а
56	С	57	С						

Hybridisation and Geometry

1	a	2	b	3	a	4	b	5	a
6	b	7	b	8	d	9	С	10	a
11	b	12	C	13	d	14	а	15	b
16	b	17	d	18	d	19	а	20	a
21	b	22	d	23	с	24	c	25	C
26	d	27	d	28	d	29	d	30	a
31	d	32	C	33	a	34	а	35	C
36	а	37	C	38	d	39	d	40	b
41	b	42	a	43	C				

Complexes and complex stability

1	d	2	d	3	d	4	b	5	а
6	а	7	d	8	b	9	С	10	b
11	b	12	b	13	a	14	b	15	b

Application of organometallics

1	d	2	d	3	d	4	C	5	b
6	b	7	b	8	а	9	а	10	d
11	C	12	b	13	а	14	C	15	d
16	C	17	C	18	С	19	d	20	а

Critical Thinking Questions

1	b	2	b	3	а	4	b	5	b
6	b	7	c	8	c	9	d	10	a
11	d	12	d	13	d	14	а	15	d
16	d	17	ad	18	а	19	c	20	a
21	b	22	C						

Assertion & Reason

1	d	2	с	3	d	4	a	5	c
6	е	7	b	8	е	9	а	10	b
11	C								