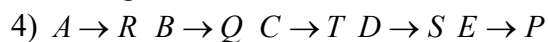
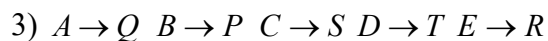
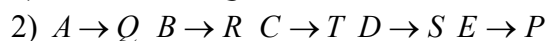
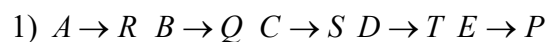
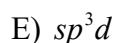
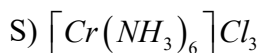
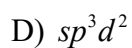




- Which of the following octahedral complexes the magnitude of Δ_0 will be maximum?
 1) $[Co(NH_3)_6]^{+3}$ 2) $[Co(C_2O_4)_3]^{-3}$ 3) $[CoCl_6]^{-3}$ 4) $[Co(CN)_6]^{-3}$
- The primary and secondary valencies of cobalt in $CoCl_3.3NH_3$ is
 1) 6, 3 2) 3, 6 3) 2, 6 4) 2, 4
- The IUPAC name of $[Fe(C_5H_5)_2]$ is
 1) Ferrocene 2) Bis (μ^5 - cyclopentadienyl) Iron (0)
 3) Bis (η^5 - cyclopentadienyl) Iron (II) 4) Bis (η^{10} - cyclopentadienyl) Iron (0)
- The number of bridged carbonyls in $[Mn_2(CO)_{10}]$, $[Co_2(CO)_8]$ are respectively
 1) 2, 2 2) 0, 2 3) 2, 0 4) 0, 3
- The cationic complex which has two isomers is
 1) $[Co(NH_3)_5NO_2]^{+2}$ 2) $[Co(NH_3)_4Cl_2]^{+2}$ 3) Both 1 & 2 4) $[Co(NH_3)_5Cl]^{+2}$
- The d-electronic configuration of $[CoF_6]^{-3}$ octahedral crystal field is $t_2g^x e_g^y$. The value of x and number of unpaired electrons respectively are
 1) 4, 2 2) 4, 4 3) 2, 4 4) 6, 0
- The increasing order of intensity of colours of the compound is
 1) $[NiCl_4]^{-2} < [Ni(H_2O)_6]^{+2} < [Ni(CN)_4]^{-2}$
 2) $[Ni(CN)_4]^{-2} < [Ni(H_2O)_6]^{+2} < [NiCl_4]^{-2}$
 3) $[Ni(H_2O)_6]^{+2} < [NiCl_4]^{+2} < [Ni(CN)_4]^{-2}$
 4) $[Ni(CN)_4]^{-2} < [NiCl_4]^{+2} < [Ni(H_2O)_6]^{-2}$
- Among the following metal carbonyls, the C – O bond order is highest in
 1) $[Mn(CO)_5]^{-}$ 2) $[Cr(CO)_5]^{-2}$ 3) $[V(CO)_5]^{-2}$ 4) $[V(CO)_5]^{-3}$
- Among the following diamagnetic complexes are
 i) $K_4[Fe(CN)_6]$ ii) $Na_2[Zn(OH)_4]$ iii) $K_2[Pt(CN)_4]$
 iv) $Na_3[Co(C_2O_4)_3]$ v) $[Ni(H_2O)_6]Cl_2$ vi) $[Co(H_2O)_6]Cl_3$
 1) i, ii, iii, iv 2) ii, iii, iv, v 3) i, ii, iv, vi 4) i, ii, v, vi
- On treatment of 100ml of 1M solution of $CoCl_3.6H_2O$ with excess of $AgNO_3$ 1.2×10^{23} ions are precipitated. The complex is
 1) $[Co(H_2O)_4Cl_2]Cl.2H_2O$ 2) $[Co(H_2O)_5Cl]Cl_2.H_2O$
 3) $[Co(H_2O)_3Cl_3]3H_2O$ 4) $[Co(H_2O)_6]Cl_3$
- Match the following set of hybrid orbitals from List-I with complexes given in List-II

<u>List – I</u>	<u>List – II</u>
A) sp^3	P) $Fe(CO)_5$
B) dsp^2	Q) $[Cu(NH_3)_4]^{+2}$
C) d^2sp^3	R) $[Ni(CO)_4]$



12. The IUPAC name of Wilkinson catalyst is

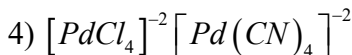
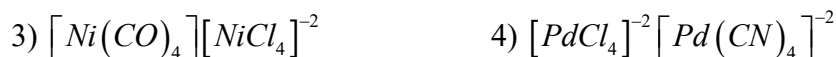
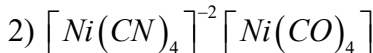
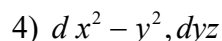
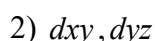
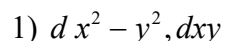
1) Chlorotri (triphenyl phosphene) Rhodium (II)

2) Chlorotris (tri phosphene) Rhodium (0)

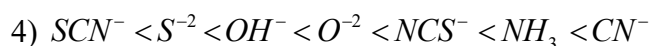
3) Chloridotris (triphenyl phosphene) Rhodium (I)

4) Rhodium (I) tris (phenyl phosphine) chorine

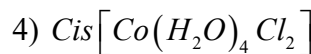
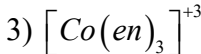
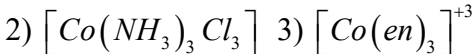
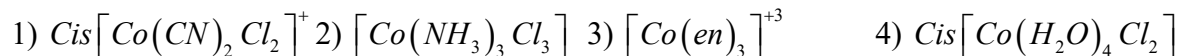
13. The pair of complexes where in both exhibit tetrahedral geometry.

14. The degenerate orbital of $[CoCl_6]^{-3}$ are

15. Which of the following is increasing order of ligand field strength



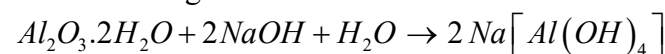
16. Which of the following complex does not exhibit optical isomerism?

17. $4Ag + 8NaCN + 2H_2O \rightarrow 4X + 4NaOH$. The coordination numbers of the Ag, Zn in
 $2X + Zn \rightarrow Y + 2Ag$

complexes X and Y respectively



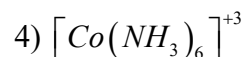
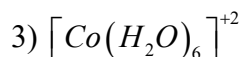
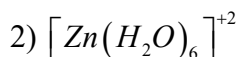
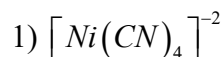
18. In the leaching of alumina from bauxite the reaction involved is



the primary and secondary

sodium aluminate (soluble)

valencies of Al metal are respectively

19. In Mond's process $Ni + 4CO \xrightarrow{330-350K} A \xrightarrow{450-470K} Ni + 4CO$ number of Ni
impure *complex* *pure*
in volatile 'A' is20. The effective atomic number of iron in Sodium Nitro Prusside $Na_2[Fe(CN)_5NO]$ is21. Which of the following complex shows similar magnetic behavior with $[Cr(NH_3)_6]^{+3}$ 22. How many ions are produced from the complex $CoCl_3 \cdot 6NH_3$ in solution?

23. Which of the following complexes are homoleptic?
 1) $[Co(NH_3)_3Cl_3]$ 2) $[Ni(NH_3)_4Cl_2]$ 3) $[Co(en)_3]^{+3}$ 4) $[Co(NH_3)_4(NO_2)_2]Cl$
24. Assertion: $[Fe(H_2O)_5NO]SO_4$ is paramagnetic
Reason: The Fe in $[Fe(H_2O)_5NO]SO_4$ has three unpaired electrons
 1) Assertion and Reason both are true, Reason is correct explanation of Assertion
 2) Assertion and Reason both are true but Reason is not correct explanation of Assertion
 3) Assertion is true, Reason is false
 4) Assertion is false, Reason is true
25. Assertion: Toxic metal ions are removed by the chelating ligands
Reason: Chelate complexes tend to be more stable
 1) Assertion and Reason both are true, Reason is correct explanation of Assertion
 2) Assertion and Reason both are true but Reason is not correct explanation of Assertion
 3) Assertion is true, Reason is false
 4) Assertion is false, Reason is true
26. Assertion: $[Ti(H_2O)_6]^{+3}$ is coloured while $[Sc(H_2O)_6]^{+3}$ is colourless
Reason: d – d transition is not possible in $[Sc(H_2O)_6]^{+3}$
 1) Assertion and Reason both are true, Reason is correct explanation of Assertion
 2) Assertion and Reason both are true but Reason is not correct explanation of Assertion
 3) Assertion is true, Reason is false
 4) Assertion is false, Reason is true
27. The colour of $K_2Cr_2O_7$ and $KMnO_4$ is due to
 1) $M \rightarrow L$ charge transfer 2) d – d transition
 3) $L \rightarrow M$ charge transfer 4) $\sigma \rightarrow \sigma^*$ transition
28. The maximum possible denticity of $EDTA^{4-}$ ligand given below towards a transition metal ion is
 1) 4 2) 6 3) 8 4) 5
29. The colour and shape of tetrammine copper(II) sulphate is
 1) Blue, Tetrahedral 2) Blue, Squareplanar 3) Violet, Octahedral 4) Green, Tetrahedral
30. Match the metals List-I with the coordination compounds List-II
- | <u>List – I</u> | | <u>List - II</u> | |
|-----------------|---|-------------------------|---|
| A) Mg | | P) Vitamin B_{12} | |
| B) Fe | | Q) Haemoglobin | |
| C) Rh | | R) Chlorophyll | |
| D) Co | | S) Wilkinson's catalyst | |
| A | B | C | D |
| 1) R | Q | S | P |
| 2) P | S | Q | R |
| 3) R | P | S | Q |
| 4) P | Q | R | S |

KEY

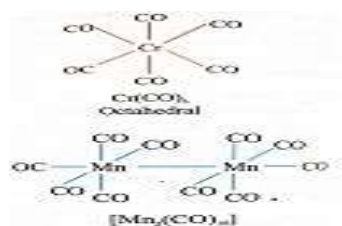
1	2	3	4	5	6	7	8	9	10
4	2	2	2	3	2	2	1	1	2
11	12	13	14	15	16	17	18	19	20
1	3	3	2	4	2	4	1	4	3
21	22	23	24	25	26	27	28	29	30
3	2	3	1	1	1	3	6	2	1

HINTS

- CF SE depends upon the field strength of ligand. The field strength of ligand decreases as shown

below $Cl^- < C_2O_4^{2-} < NH_3 < CN^-$

- Oxidation number of Co is +3. So primary valency is 3. It is an octahedral complex so secondary valency is 6 (coordination number) $3+6=9$
-
-
-



No of bridged Co are 0 No of bridged Co are 2

- $[Co(NH_3)_5NO_2]^{+2}$ has two linkage isomers
 $[Co(NH_3)_4Cl_2]^+$ has two Geometrical isomers
- $CO^{+3} - 3d^6 4s^0 : F^- : WFL$
 $x=4 \ y=2$ No of unpaired $e^-s = 4$
 $4+4=8$
- The intensity of colour depends on the strength of the ligand attached with the central metal atom because more strong field ligand more is splitting energy, less is intensity of colour. Strength of ligand is in the order $Cl^- < H_2O < CN^-$. Splitting Energy order is
 $[Ni(CN)_4]^{-2} < [Ni(C_2O)_6]^{+2} < NiCl_4^{-2}$
- Greater the extent of $d\pi - p\pi$ back bonding smaller will be the bond order of Co bond in metal carbonyls. As the negative charge on the coordination sphere of carbonyl complexes increases, the extent of back bonding also increases and bond order decreases
- For diamagnetic complex, no unpaired electrons in the valence shell of central metal
 $K_4[Fe(CN)_6]Fe^{+2} - d^6$ Configuration - Strong field ligand diamagnetic
 $Na_2[Zn(OH)_4]Zn^{+2} - d^{10}$ Weak field ligand - Strong field ligand diamagnetic
 $K_2[Pt(CN)_4]Pt^{+2} - d^8$ Strong field ligand - Strong field ligand diamagnetic

$Na_3[Co(C_2O_4)_3]Co^{+3} - d^6$ Strong chelating ligand – diamagnetic

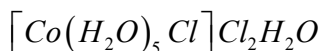
$[Ni(H_2O)_6]Cl_2Ni^{+2} - d^8$ Weak field ligand – paramagnetic

$[Co(H_2O)_6]Cl_3 Co^{3+} - d^6$ Weak field ligand – paramagnetic

10. Numbers of moles of complex = $\frac{M \times V(nl)}{1000} = \frac{1 \times 100}{1000}$

Number of Cl^- ions present in complex are = $\frac{\text{No of moles of ions precipitated}}{\text{No of moles of complex}} = \frac{0.2}{0.1} = 2$

$\therefore 2Cl^-$ are present outside the coordination sphere. Thus the complex is



11. $Fe(CO)_5$ - C.NO – 5 - sp^3 Hybridization

$[Cu(NH_3)_4]^{+2}$ - C.NO – 4 - dsp^2 Hybridization

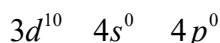
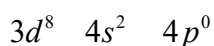
$[Ni(CO)_4]$ - C.NO – 4 - d^2sp^3 Hybridization

$[Cr(NH_3)_6]Cl_3$ - C.NO – 6 - sp^3d^2 Hybridization

$[CoF_6]^{-3}$ - C.NO – 6 - sp^3d Hybridization

12. $[(Ph_3P)_3RhCl]$ - Chloridotris (triphenyl phosphine) Rhodium-I

13. $[Ni(CO)_4] - sp^3$ - Tetrahedral $Ni - 0.NO - 'O'$

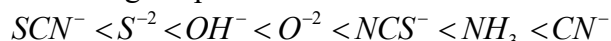


$[NiCl_4]^{-2} - sp^3$ - Tetrahedral

14. The degenerate complex five degenerate orbitals splits into $t_2\theta(dxy, dyz, dzx)$

$eg(x^2 - y^2, dz^2)$

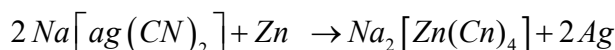
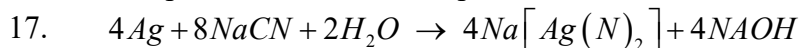
15. According to spectrochemical series increasing order of field strength of ligands is



16. Optical isomerism is exhibited only by those complexes which lack elements of symmetry

$[Co(NH_3)_3Cl_3]$ shows facial as well as isomerism and contains plane of symmetry. Thus this

Complex does not exhibit optical isomerism



18. Primary valency is oxidation number +3

Secondary valency is coordination number + 4

19. Volatile complex is $-[Ni(CO)_4]$

Coordination number of Nickel is 4

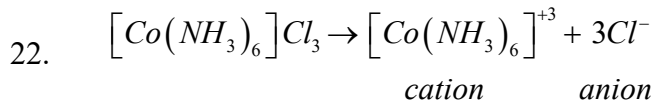
20. In $Na_2[Fe(CN)_5NO]$ $2(+1) + x + 5(-1) + 1 = 0 \quad x = +2$

$EAN = (26 - 2) + (6 \times 2) = 24 + 12 = 36$

21. $[Cr(NH_3)_6]^{+3} \quad 3d^3 \quad 4s^0 \quad 4p^0$

$[Co(H_2O)_6]^{+2} \quad 3d^7 \quad 4s^0 \quad 4p^0 \quad 4d^0$

Both have same number of inpaired e^-s . and its magnetic is $\mu = 3.87 B.M$



23. The complex in which metal is attached to same type of ligands is called homeotic complex

24.

25.

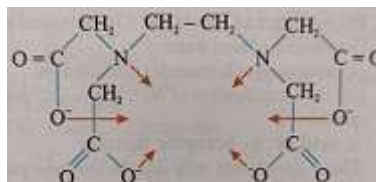
26.

27. In MnO_4^- , Mn has + 7 0.5 no electron in d – orbital

In CrO_7^{2-} , Cr has +6 oxidation state. It has no electron in d-orbital. So ligand is able to donate the electron into

recant d – orbital of metal ($L \rightarrow M$ charge transfer)

28. EDTA – Ethylenedimaine + tetra acetate ion



4 0^- ; \ddot{N} total 6 donor atoms

29.

30. Mg is present in chlorophyll having molecular formula $C_{55}H_{70}O_6N_4Mg$. Rh is present in Wilkinson catalyst having M.F $[(Ph_3P)_3RhCl]$. Fe is present in hemoglobin

Co is present in cyanocobalamin in vitamin B_{12} . Having formula $C_{63}H_{58}\overset{II}{CO}N_{14}O_{14}P$