

COORDINATION COMPOUNDS

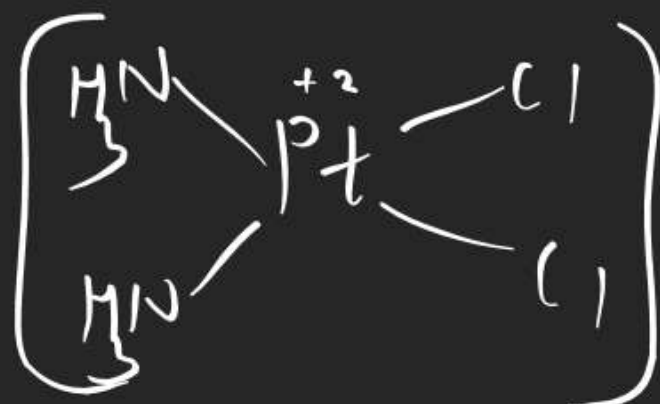
2. The compound that inhibits the growth of tumors is :

(A) trans- $[\text{Pt}(\text{Cl})_2(\text{NH}_3)_2]$

(B) cis- $[\text{Pd}(\text{Cl})_2(\text{NH}_3)_2]$

✓ (C) cis - $[\text{Pt}(\text{Cl})_2(\text{NH}_3)_2]$

(D) trans - $[\text{Pd}(\text{Cl})_2(\text{NH}_3)_2]$



NOT
= organometallic compound.

cis platin — Cancer
the

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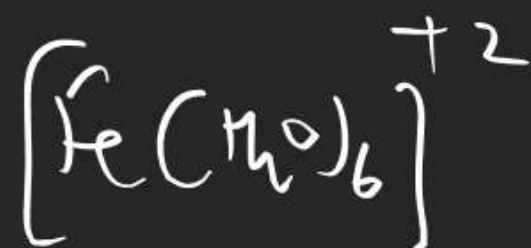
3. The calculated spin-only magnetic moments (BM) of the anionic and cationic species of $[\text{Fe}(\text{H}_2\text{O})_6]^{+2}$ and $[\text{Fe}(\text{CN})_6]^{-4}$, respectively, are:

(A) 0 and 4.9

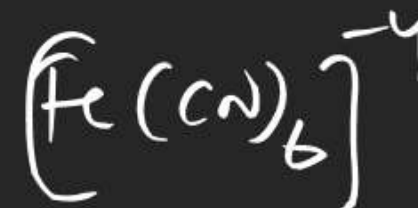
(B) 2.84 and 5.92

(C) 4.9 and 0

(D) 0 and 5.92

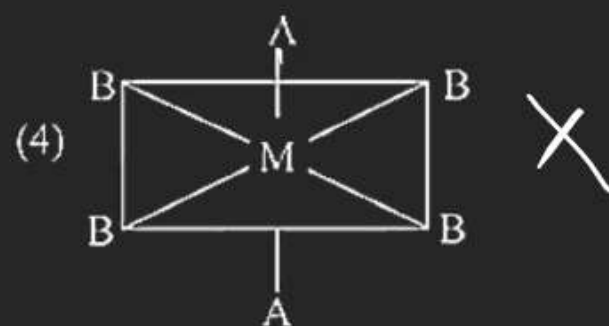
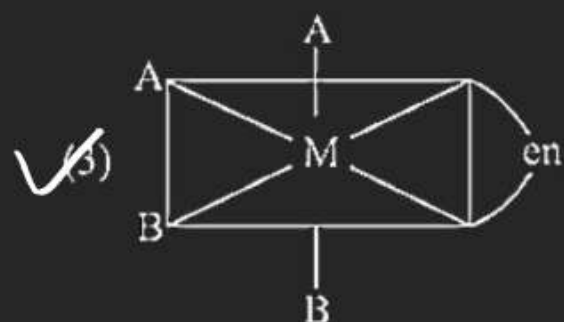
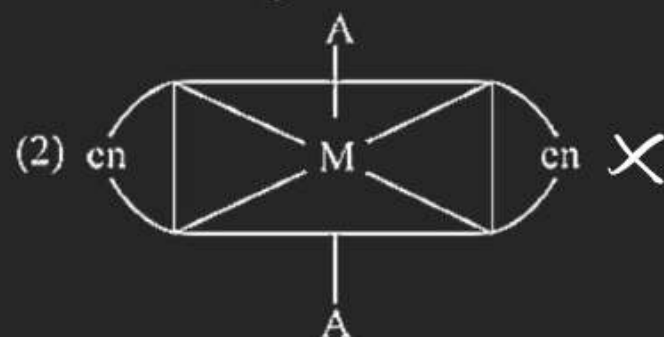
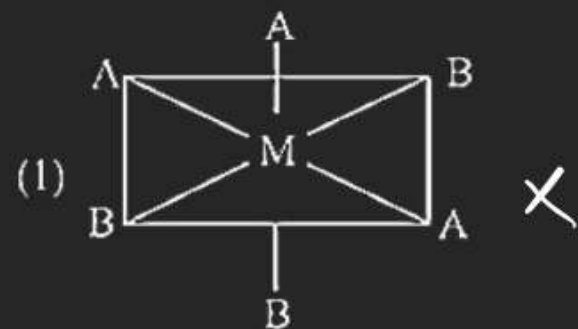


4.90



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4. The one that will show optical activity is: (en = ethane 1, 2-diamine)



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5. The degenerate orbitals of $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$ are:

(A) d_{xz} and d_{yz}

(B) d_{yz} and d_{z^2}

(C) d_{z^2} and d_{xz}

(D) $d_{x^2-y^2}$ and d_{xy}

$$Cr = 3d^3$$



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6. The correct statements among I to III are:

(I) Valence bond theory cannot explain the color exhibited by transition metal complexes.

(II) Valence bond theory can predict quantitatively the magnetic properties of transition metal complexes.

(III) Valence bond theory cannot distinguish ligands as weak and strong field ones.

(A) (II) and (III) only

(B) (I), (II) and (III)

(C) (I) and (III) only

(D) (I) and (II) only

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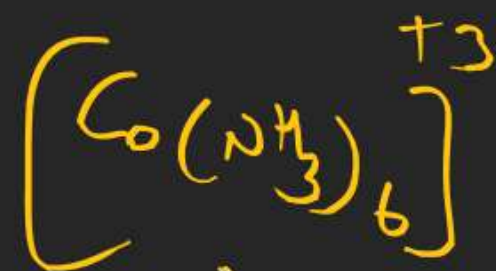
8. Three complexes, $[\text{CoCl}(\text{NH}_3)_5]^{2+}$ (I), $[\text{Co}(\text{NH}_3)_5\text{H}_2\text{O}]^{3+}$ (II) and $[\text{Co}(\text{NH}_3)_6]^{3+}$ (III) absorb light in the visible region. The correct order of the wavelength of light absorbed by them is :

(A) (III) > (I) > (II)

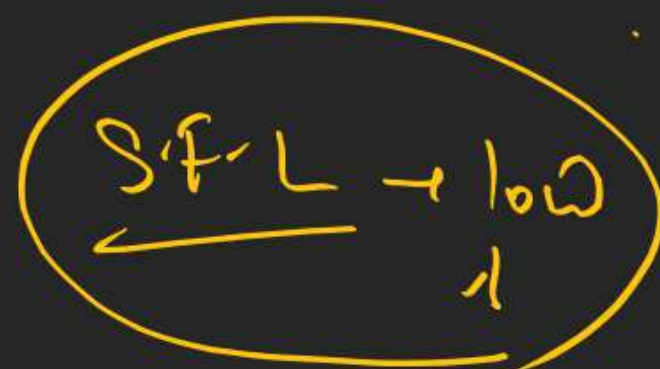
(B) (III) > (II) > (I)

(C) (II) > (I) > (III)

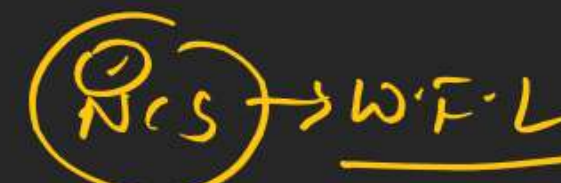
(D) (I) > (II) > (III)



$$E = \frac{hc}{\lambda}$$



donor atom



halide donor atom

oxygen donor atom

Nitrogen donor atom

Carbon donor atom

W.F.L

S.F.L

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9. The crystal field stabilization energy (CFSE) of $[\text{Fe}(\text{H}_2\text{O})_6] \text{Cl}_2$ and $\text{K}_2[\text{NiCl}_4]$, respectively are :

(A) $-0.6\Delta_o$ and $-0.8\Delta_t$

(C) $-2.4\Delta_o$ and $-1.2\Delta_t$

(B) $-0.4\Delta_o$ and $-0.8\Delta_t$

(D) $-0.4\Delta_o$ and $-1.2\Delta_t$

$$= -0.4 \times 4\Delta_o + 0.6 \times 2\Delta_o$$

$$= -1.6\Delta_o + 1.2\Delta_o$$

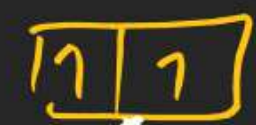
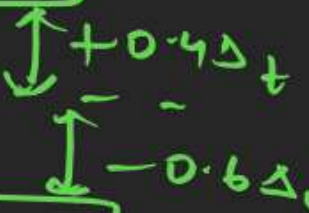
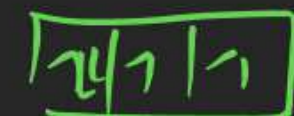
$$= \underline{-0.4\Delta_o}$$

$$\text{C.F.S.E} = -0.4\Delta_o x + 0.6\Delta_o y + mp$$

x - no of e^- in t_{2g}

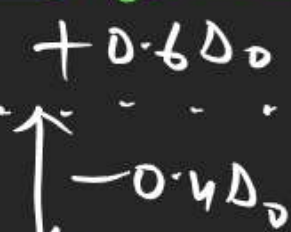
y - no of e^- in e_g

m - no of e^- pairs



$$+0.4 \times 4 - 0.6 \times 4$$

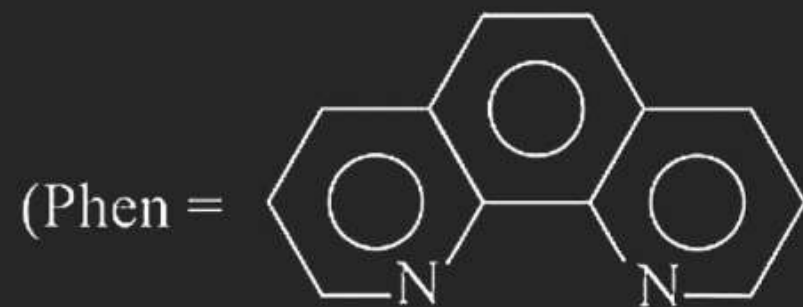
$$+1.6 - 2.4$$



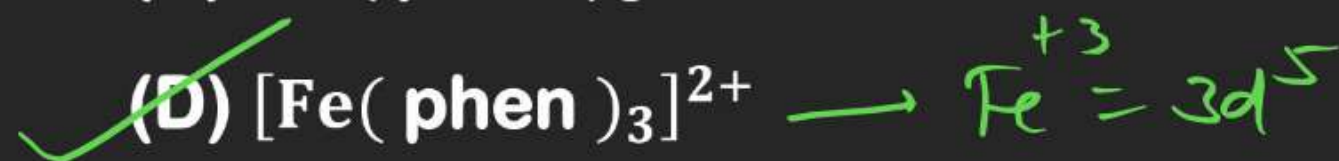
$$\begin{array}{r} 2.4 \\ 1.6 \\ \hline 0.8 \end{array}$$

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10. The complex ion that will lose its crystal field stabilization energy upon oxidation of its metal to +3 state is :

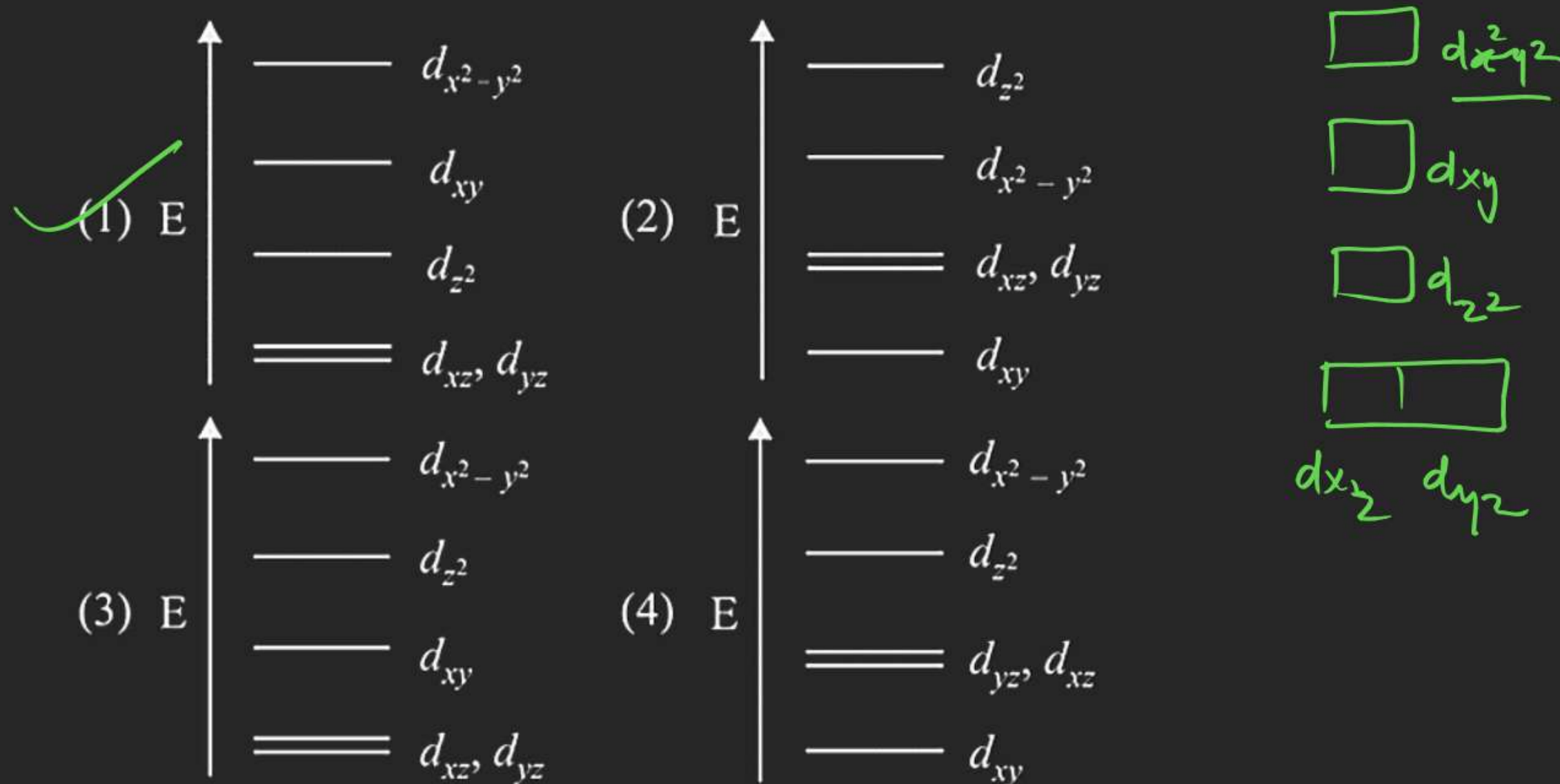


and
ignore pairing energy)



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11. Complete removal of both the axial ligands (along the z-axis) from an octahedral complex leads to which of the following splitting patterns? (relative orbital energies not on scale)



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12. The compound used in the treatment of lead poisoning is :

(A) D-penicillamine

(B) desferrioxime B

(C) Cis-platin

✓ (D) EDTA]

COORDINATION COMPOUNDS

13. The coordination numbers of Co and Al in $[\text{Co}(\text{Cl})(\text{en})_2]\text{Cl}$ and $\text{K}_3[\text{Al}(\text{C}_2\text{O}_4)_3]$, respectively, are : (en = ethane-1, 2-diamine)

(A) 5 and 3

(B) 3 and 3

☒ (C) 6 and 6

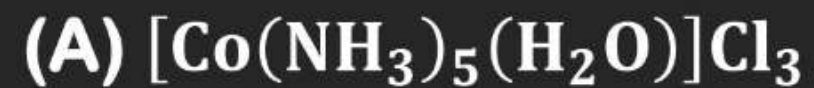
(D) 5 and 6

COORDINATION COMPOUNDS

14. Two complexes $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$ (A) and $[\text{Cr}(\text{NH}_3)_6]\text{Cl}_3$ (B) are violet and yellow coloured, respectively. The incorrect statement regarding them is:
- (A) Δ_0 values of (A) and (B) are calculated from the energies of violet and yellow light, respectively.
 - (B) both are paramagnetic with three unpaired electrons.
 - (C) both absorb energies corresponding to their complementary colors.
 - (D) Δ_0 value for (A) is less than that of (B).

COORDINATION COMPOUNDS

16. The complex that has highest crystal field splitting energy (Δ) is:



COORDINATION COMPOUNDS

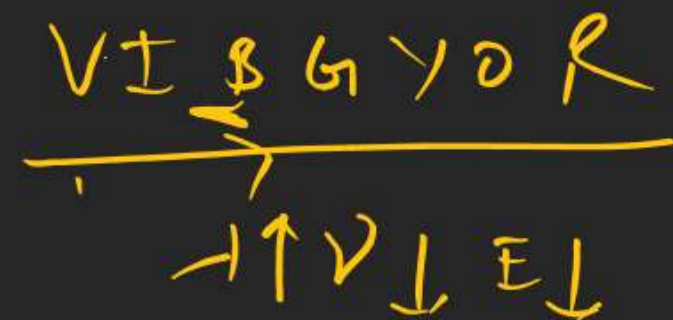
17. Homoleptic octahedral complexes of a metal ion M^{3+} with three monodentate ligands L_1 , L_2 and L_3 absorb wavelengths in the region of green, blue and red respectively. The increasing order of the ligand strength is:

(A) $L_3 < L_1 < L_2$ ✓

(C) $L_1 < L_2 < L_3$

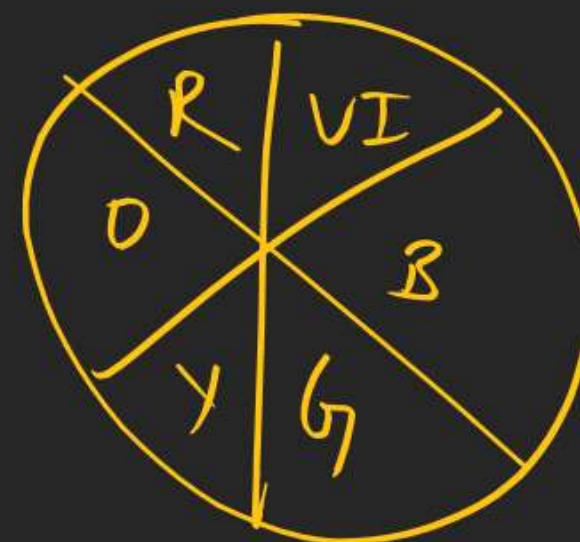
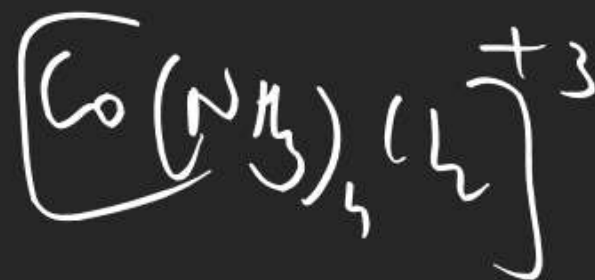
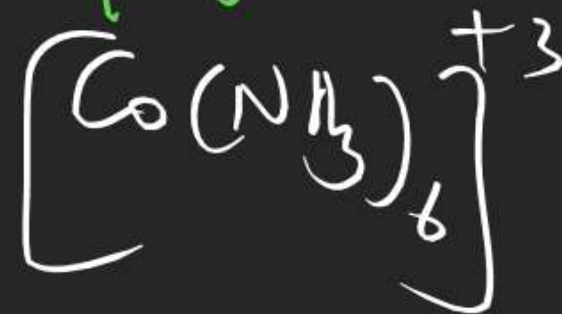
(B) $L_3 < L_2 < L_1$

(D) $L_2 < L_1 < L_3$



Homoleptic \Rightarrow Same type of ligand

Heteroleptic



COORDINATION COMPOUNDS

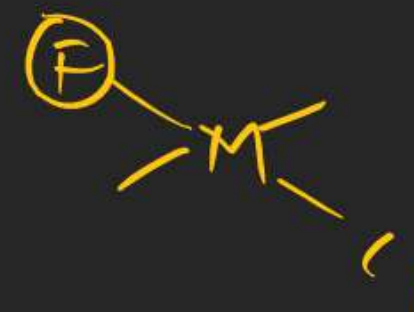
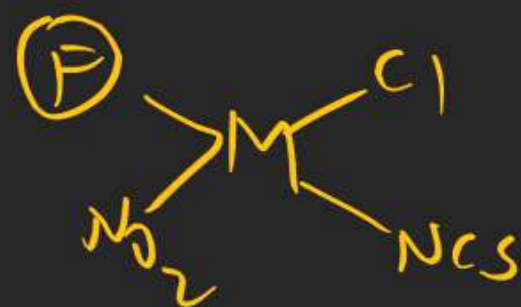
18. The total number of isomers for a square planar complex $[M(F)(Cl)(SCN)(NO_2)]$ is:

(A) 16

(B) 8

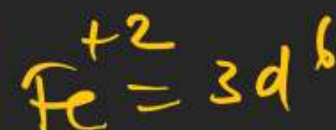
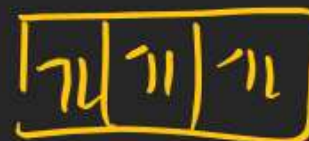
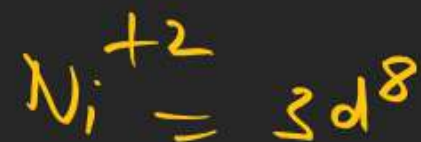
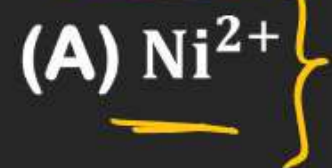
(C) 4

~~(D) 12~~



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19. The difference in the number of unpaired electrons of a metal ion in its high spin and low-spin octahedral complexes is two. The metal ion is:



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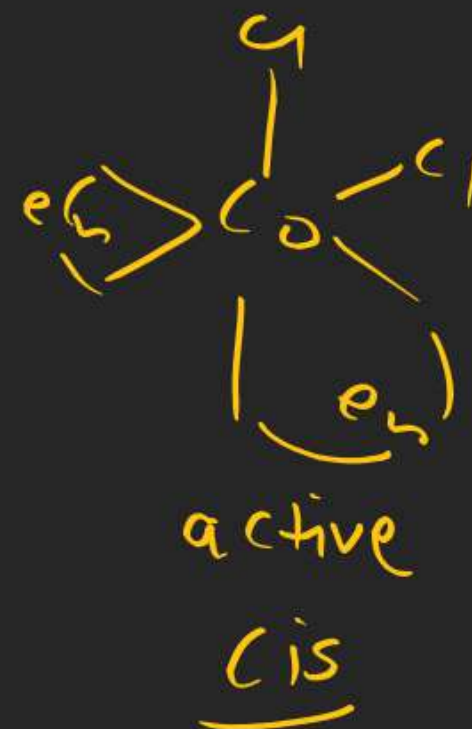
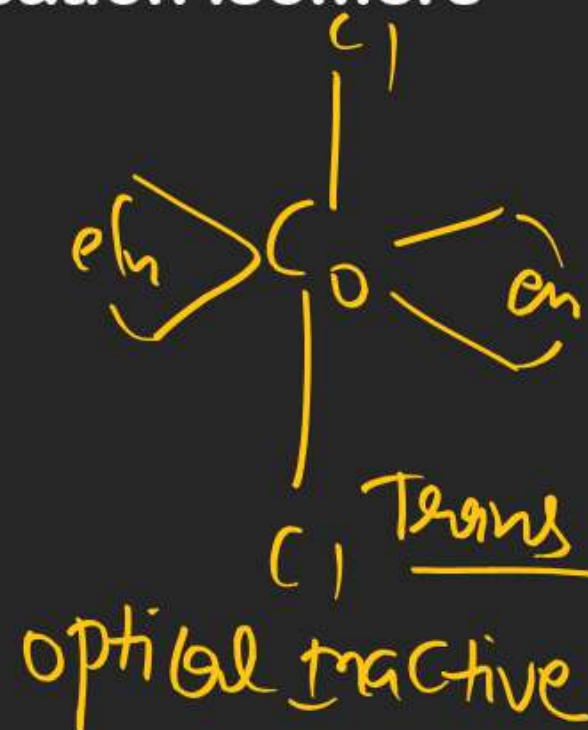
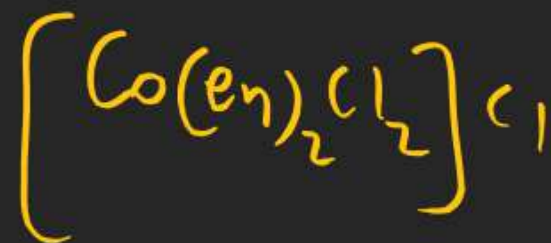
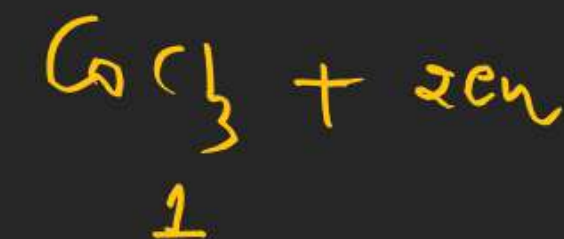
20. A reaction of cobalt(III) chloride and ethylenediamine in a 1:2 mole ratio generates two isomeric products A (violet coloured) and B (green coloured). A can show optical activity, but, B is optically inactive. What type of isomers does A and B represent?

(A) Geometrical isomers

(B) Coordination isomers

(C) Linkage isomers

(D) Ionisation isomers



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21. Match the metals (column I) with the coordination compound(s)/enzyme(s) (column II) :

(column I)

(column II)

Metals

Coordination

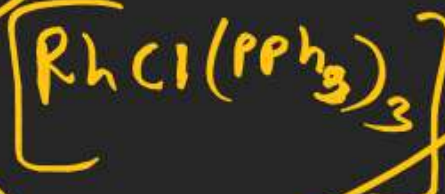
compound(s)/enzyme(s)

(A) Co

(B) Zn

(C) Rh

(D) Mg



(i) Wilkinson catalyst

(ii) Chlorophyll

(iii) Vitamin B₁₂

(iv) Carbonic anhydrase

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

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

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

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

COORDINATION COMPOUNDS

22. The coordination number of Th in $K_4[Th(C_2O_4)_4(H_2O)_2]$ is:

($C_2O_4^{2-}$ = oxalato)

(A) 14

(B) 6

(C) 8

~~(D) 10~~

COORDINATION COMPOUNDS

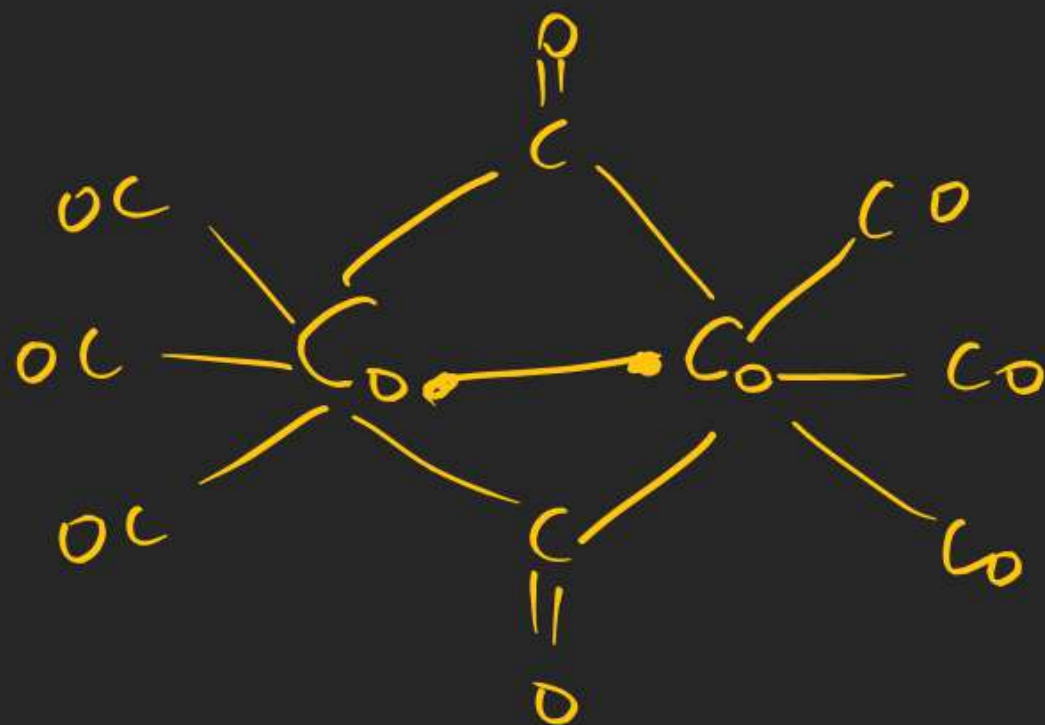
23. The number of bridging CO ligand(s) and Co – Co bond(s) in $\text{Co}_2(\text{CO})_8$, respectively are:

☒ (A) 2 and 1

(B) 2 and 0

(C) 0 and 2

(D) 4 and 0



COORDINATION COMPOUNDS

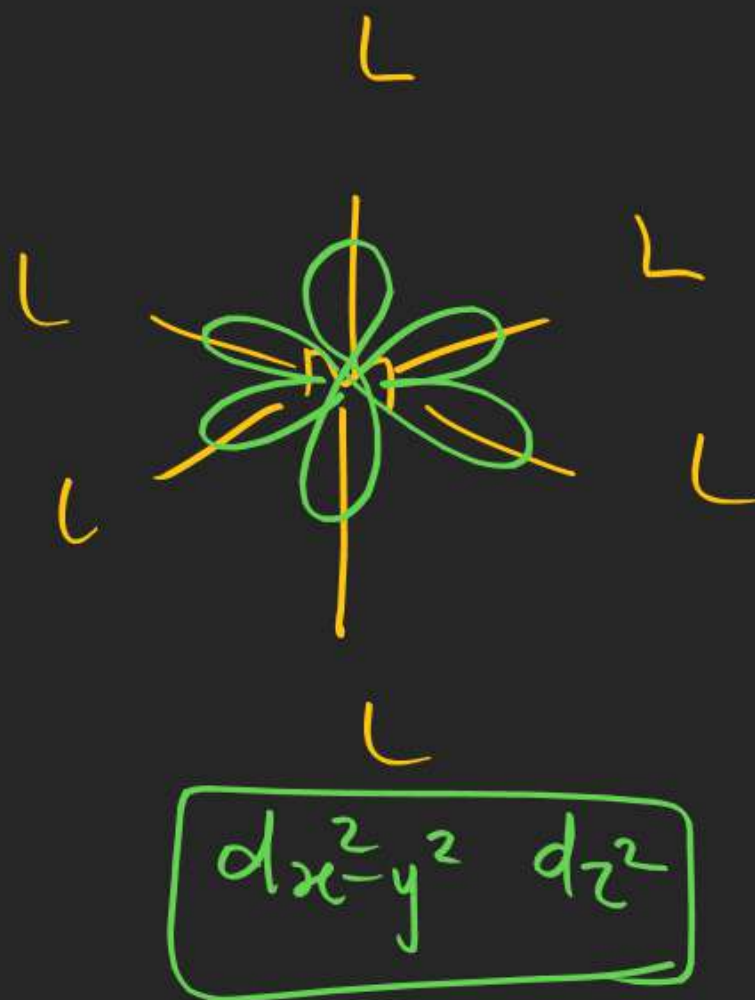
24. The metal d-orbitals that are directly facing the ligands in $K_3[Co(CN)_6]$ are :

(A) d_{xy} and $d^2 - y^2$

☒ (B) $d_{x^2-y^2}$ and d_{z^2}

☒ (C) d_{xz} , d_{yz} and d_{z^2}

(D) d_{xy} , d_{xz} and d_{yz}



COORDINATION COMPOUNDS

25. The magnetic moment of an octahedral homoleptic Mn(II) complex is 5.9 BM.

The suitable ligand for this complex is :

(A) Ethylenediamine

(B) CN^-

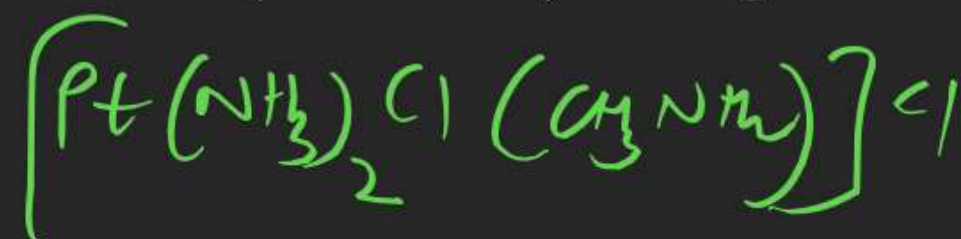
(C) NCS^-

(D) CO

COORDINATION COMPOUNDS

(2020)

1. Correct IUPAC name of $[\text{Pt}(\text{NH}_3)_2\text{Cl}(\text{CH}_3\text{NH}_2)]\text{Cl}$ is:
- (A) Bis(ammine)chlorido(methylamine)platinum(II) chloride
 - ✓ (B) Diamminechlorido(methylamine)platinum(II) chloride
 - (C) Diamminechlorido(aminomethyl)platinum(II) chloride
 - (D) Chloridobis(ammine)methylamineplatinum(II) chloride



Diammine chlorido methylamine platinum (II) chloride

COORDINATION COMPOUNDS

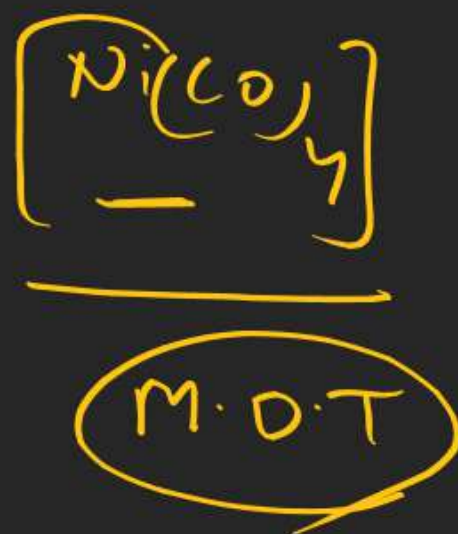
2. Which theory can explain bonding of $\text{Ni}(\text{CO})_4$:

(A) MOT

(B) CFT

(C) VBT

(D) wernner's theory



COORDINATION COMPOUNDS

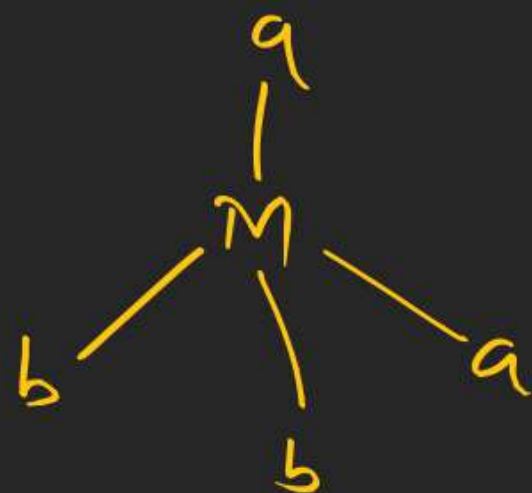
3. For the complex $[Ma_2 b_2]$ if M is sp^3 or dsp^2 hybridised respectively then total number of optical isomers are respectively :

(A) 1,1

(B) 2,1

☒ (C) 0,0

(D) 1,2



COORDINATION COMPOUNDS

4. Which of the following statements are incorrect?

(a) Co^{+3} with strong field ligand forms high magnetic moment complex.

(b) For Co^{+3} if pairing energy (P) $>$ Δ_0 then the complex formed will have $t_{2g}^4 e_g^2$ configuration

(c) For $[\text{Co}(\text{en})_3]^{3+}$ $\lambda_{\text{absorbed}}$ is less than $\lambda_{\text{absorbed}}$ for $[\text{CoF}_6]^{3-}$

(d) If $\Delta_0 = 18000 \text{ cm}^{-1}$ for Co^{+3} then with same ligands for it $\Delta_t = 16000 \text{ cm}^{-1}$

(A) A, D

(B) B, C

(C) A, B

(D) A, B, C, D

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

$$= \frac{4}{9} \times 18000$$

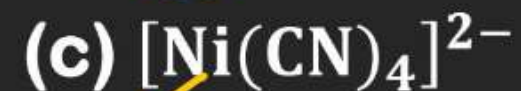
COORDINATION COMPOUNDS

5. Which of the following complex exhibit facial meridional geometrical isomerism.



COORDINATION COMPOUNDS

6. Correct order of magnetic moment (spin only) for the following complexes



(A) $a = b = c < d$

(B) $a < b < c < d$

(C) $a > b > c > d$

(D) $a = b > c > d$

$a = b = c < d$



$T-S$ always
large
splitting

