

Q1 JEE Main 2020 - 2 September (Morning)

For octahedral Mn(II) and tetrahedral Ni(II) complexes, consider the following statements:

- (I) both the complexes can be high spin.
- (II) Ni(II) complex can very rarely be low spin.
- (III) with strong field ligands, Mn(II) complexes can be low spin.
- (IV) aqueous solution of Mn(II) ions is yellow in colour.

The correct statements are :

- (A) (I), (III) and (IV) only
- (B) (I) and (II) only
- (C) (II), (III) and (IV) only
- (D) (I), (II) and (III) only

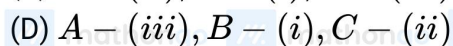
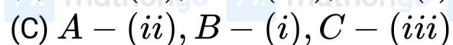
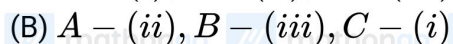
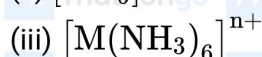
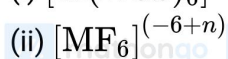
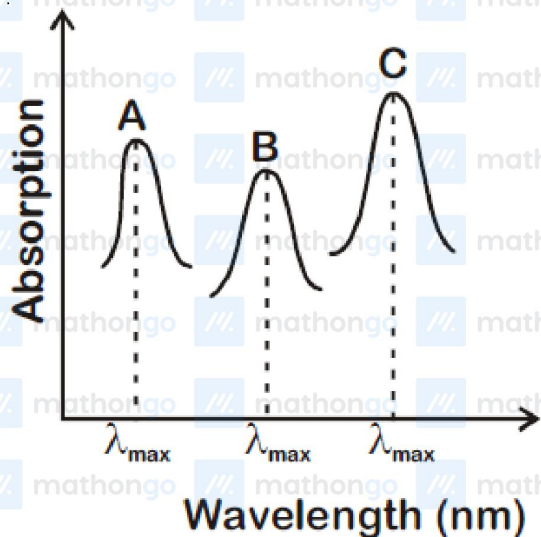
Q2 JEE Main 2020 - 2 September (Morning)

Consider that a d^6 metal ion (M^{2+}) forms a complex with aqua ligands, and the spin only magnetic moment of the complex is 4.90 BM. The geometry and the crystal field stabilization energy of the complex is

- (A) tetrahedral and $-1.6\Delta_t + 1P$
- (B) octahedral and $-2.4\Delta_0 + 2P$
- (C) tetrahedral and $-0.6\Delta_t$
- (D) octahedral and $-1.6\Delta_0$

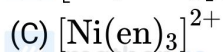
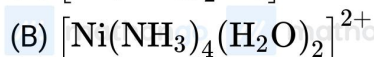
Q3 JEE Main 2020 - 2 September (Evening)

Simplified absorption spectra of three complexes ((i), (ii) and (iii)) of Mn^{n+} ion are provided below; their λ_{max} values are marked as A, B and C respectively. The correct match between the complexes and their λ_{max} values is



Q4 JEE Main 2020 - 2 September (Evening)

The one that is not expected to show isomerism is



Q5 JEE Main 2020 - 3 September (Morning)

The electronic spectrum of $[Ti(H_2O)_6]^{3+}$ shows a single broad peak with a maximum at $20,300\text{cm}^{-1}$. The crystal field stabilization energy (CFSE) of the complex ion, in kJ mol^{-1} , is

$$\left(1 \text{kJmol}^{-1} = 83.7 \text{cm}^{-1}\right)$$

- (A) 145.5
 (B) 97
 (C) 242.5
 (D) 83.7

Q6 JEE Main 2020 - 3 September (Morning)

The complex that can show optical activity

- (A) $\text{cis} [\text{Fe}(\text{NH}_3)_2(\text{CN})_4]^-$
 (B) $\text{trans} - [\text{Cr}(\text{Cl}_2)(\text{ox})_2]^{3-}$
 (C) $\text{trans} - [\text{Fe}(\text{NH}_3)_2(\text{CN})_4]$
 (D) $\text{cis} - [\text{CrCl}_2(\text{ox})_2]^{3-}$ (ox = oxalate)

Q7 JEE Main 2020 - 3 September (Evening)

The d-electron configuration of $[\text{Ru}(\text{en})_3] \text{Cl}_2$ and $[\text{Fe}(\text{H}_2\text{O})_6] \text{Cl}_2$, respectively are

- (A) $t_{2g}^6 e_g^0$ and $t_{2g}^6 e_g^0$
 (B) $t_{2g}^6 e_g^0$ and $t_{2g}^4 e_g^2$
 (C) $t_{2g}^4 e_g^2$ and $t_{2g}^4 e_g^2$
 (D) $t_{2g}^4 e_g^2$ and $t_{2g}^6 e_g^0$

Q8 JEE Main 2020 - 3 September (Evening)

Complex A has a composition of $\text{H}_{12}\text{O}_6\text{Cl}_3\text{Cr}$. If the complex on treatment with conc. H_2SO_4 loses

13.5% of its original mass, the correct molecular formula of A is

[Given : atomic mass of Cr = 52 amu and Cl = 35amu]

- (A) $[\text{Cr}(\text{H}_2\text{O})_6] \text{Cl}_3$
 (B) $[\text{Cr}(\text{H}_2\text{O})_4 \text{Cl}_2] \text{Cl} \cdot 2\text{H}_2\text{O}$
 (C) $[\text{Cr}(\text{H}_2\text{O})_3 \text{Cl}_3] \cdot 3\text{H}_2\text{O}$
 (D) $[\text{Cr}(\text{H}_2\text{O})_5 \text{Cl}] \text{Cl}_2 \cdot \text{H}_2\text{O}$

Q9 JEE Main 2020 - 4 September (Morning)

The number of isomers possible for $[\text{Pt}(\text{en})(\text{NO}_2)_2]$ is

- (A) 3
- (B) 1
- (C) 4
- (D) 2

Q10 JEE Main 2020 - 4 September (Morning)

The pair in which both the species have the same magnetic moment (spin only) is

- (A) $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$ and $[\text{CoCl}_4]^{2-}$
- (B) $[\text{Co}(\text{OH})_4]^{2-}$ and $[\text{Fe}(\text{NH}_3)_6]^{2+}$
- (C) $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$ and $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$
- (D) $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$ and $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$

Q11 JEE Main 2020 - 4 September (Evening)

The one that can exhibit highest paramagnetic behaviour among the following is
gly = glycinate; bpy = 2, 2'-bipyridine

- (A) $[\text{Fe}(\text{en})(\text{bpy})(\text{NH}_3)_2]^{2+}$
- (B) $[\text{Pd}(\text{gly})_2]$
- (C) $[\text{Co}(\text{OX})_2(\text{OH})_2]^-$ ($\Delta_0 > P$)
- (D) $[\text{Ti}(\text{NH}_3)_6]^{3+}$

Q12 JEE Main 2020 - 4 September (Evening)

The Crystal Field Stabilization Energy (CFSE) of $[\text{CoF}_3(\text{H}_2\text{O})_3]$ ($\Delta_0 < P$) is

- (A) $-0.8 \Delta_0$
- (B) $-0.8 \Delta_0 + 2P$
- (C) $-0.4 \Delta_0$
- (D) $-0.4 \Delta_0 + P$

Coordination Compounds

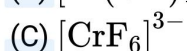
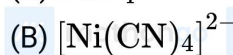
JEE Main 2020 Chapterwise

Questions with Answer Keys

Chemistry

Q13 JEE Main 2020 - 4 September (Evening)

The molecule in which hybrid MOs involve only one d-orbital of the central atom is



Q14 JEE Main 2020 - 5 September (Morning)

The values of the crystal field stabilization energies for a high spin d^6 metal ion in octahedral and tetrahedral fields, respectively,

(A) $-1.6\Delta_0$ and $-0.4\Delta_t$

(B) $-2.4\Delta_0$ and $-0.6\Delta_t$

(C) $-0.4\Delta_0$ and $-0.27\Delta_t$

(D) $-0.4\Delta_0$ and $-0.6\Delta_t$

Q15 JEE Main 2020 - 5 September (Morning)

The total number of coordination sites in ethylenediaminetetraacetate (EDTA^{4-}) is

Q16 JEE Main 2020 - 5 September (Evening)

Consider the complex ions,



The correct statement regarding them is

(A) both (A) and (B) can be optically active.

(B) both (A) and (B) can not be optically active.

(C) (A) can not be optically active, but (B) can be optically active.

(D) (A) can be optically active, but (B) can not be optically active.

Q17 JEE Main 2020 - 5 September (Evening)

Considering that $\Delta_0 > P$, the magnetic moment (in BM) of $[\text{Ru}(\text{H}_2\text{O})_6]^{2+}$ would be

Q18 JEE Main 2020 - 6 September (Morning)

The species that has a spin-only magnetic moment of 5.9 BM, is (T_d = tetrahedral)

- (A) $[\text{MnBr}_4]^{2-}$ (T_d)
 (B) $[\text{NiCl}_4]^{2-}$ (T_d)
 (C) $\text{Ni}(\text{CO})_4$ (T_d)
 (D) $[\text{Ni}(\text{CN})_4]^{2-}$ (square planar)

Q19 JEE Main 2020 - 6 September (Evening)

For a d metal ion in an octahedral field, the correct electronic configuration is

- (A) $t_{2g}^4 e_g^0$ when $\Delta_0 < P$
 (B) $t_{2g}^3 e_g^1$ when $\Delta_0 > P$
 (C) $e_g^2 t_{2g}^2$ when $\Delta_0 < P$
 (D) $t_{2g}^3 e_g^1$ when $\Delta_0 < P$

Q20 JEE Main 2020 - 7 January (Morning)

Correct IUPAC name of $[\text{Pt}(\text{NH}_3)_2\text{Cl}(\text{NH}_2\text{CH}_3)]\text{Cl}$ is:

- (A) Bis(amine)chlorido(methylamine)platinum(II) chloride
 (B) Diamminechlorido(methanamine)platinum(II)chloride
 (C) Diamminechlorido(aminomethyl)platinum(II) chloride
 (D) Chloridobis(amine)methylamineplatinum(II) chloride

Q21 JEE Main 2020 - 7 January (Evening)

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

Coordination Compounds

JEE Main 2020 Chapterwise

Questions with Answer Keys

Chemistry

(B) B, C

(C) A, B

(D) A

Q22 JEE Main 2020 - 7 January (Evening)

For the complex $[Ma_2b_2]$ 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

Q23 JEE Main 2020 - 8 January (Morning)

Which of the following complex exhibit facial meridional geometrical isomerism.

(A) $[Pt(NH_3)Cl_3]^-$

(B) $[PtCl_2(NH_3)_2]$

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

(D) $[Co(NO_2)_3(NH_3)_3]$

Q24 JEE Main 2020 - 8 January (Morning)

The volume (in mL) of 0.125 M $AgNO_3$ required to quantitatively precipitate chloride ions in 0.3 g of $[Co(NH_3)_6]Cl_3$ is

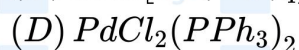
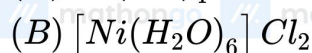
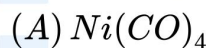
$$^M[Co(NH_3)_6]Cl_3 = 267.46g/mol$$

$$^M[AgNO_3] = 169.87g/mol$$

Multiply your answer with 100

Q25 JEE Main 2020 - 8 January (Evening)

The correct order of the calculated spin-only magnetic moments of complexes (A) to (D) is



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

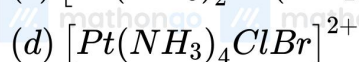
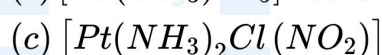
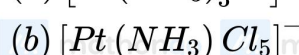
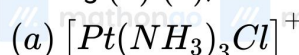
(B) $a < b < c < d$

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

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

Q26 JEE Main 2020 - 8 January (Evening)

Among (a)-(d), the complexes that can display geometrical isomerism are :



(A) c, d

(B) a, b

(C) a, b & c

(D) a, b, c & d

Q27 JEE Main 2020 - 8 January (Evening)

Complexes (ML_5) of metal Ni and Fe have ideal square pyramidal and trigonal bipyramidal geometries, respectively. The sum of the 90° , 120° and 180° $L-M$ angles in the two complexes is . . .

Q28 JEE Main 2020 - 9 January (Morning)

Complex X of composition of $Cr(H_2O)_6Cl_n$ has a spin only magnetic moment of $3.83 BM$. It reacts with $AgNO_3$ and shows geometrical isomerism. The IUPAC nomenclature of X is :

(A) Hexaaquachromium (III) chloride

Coordination Compounds

JEE Main 2020 Chapterwise

Questions with Answer Keys

Chemistry

- (B) Tetraaquadichloridochromium (III) chloride dihydrate
(C) Dichloridotetraaqua chromium(IV) chloride dehydrate
(D) Tetraaquadichloridochromium (IV) chloride dehydrate

Q29 JEE Main 2020 - 9 January (Morning)

$[Pd(F)(Cl)(Br)(I)]^{2-}$ has n number of geometrical isomers. Then, the spin-only magnetic moment and crystal field stabilisation energy $[CFSE]$ of $[Fe(CN)_6]^{n-6}$, respectively, are :
[Note : Ignore the pairing energy]

- (A) 1.73 B. M. and $-2\Delta_0$
(B) 2.84 B. M. and $-1.6\Delta_0$
(C) 0 and $-1.6\Delta_0$
(D) 5.92 B. M. and $-2.4\Delta_0$

Q30 JEE Main 2020 - 2 September (Morning)

The oxidation states of iron atoms in compounds (A), (B) and (C), respectively, are x , y and z . The sum of x , y and z is



Answer Key

Q1 (D)

Q2 (C)

Q3 (A)

Q4 (B)

Q5 (B)

Q6 (D)

Q7 (B)

Q8 (B)

Q9 (A)

Q10 (D)

Q11 (C)

Q12 (C)

Q13 (B)

Q14 (D)

Q15 (6)

Q16 (C)

Q17 (0)

Q18 (A)

Q19 (D)

Q20 (B)

Q21 (A)

Q22 (C)

Q23 (D)

Q24 (2692)

Q25 (A)

Q26 (A)

Q27 (20)

Q28 (B)

Q29 (A)

Q30 (6)