JEE–MAIN EXAMINATION – APRIL 2025

(HELD ON MONDAY 07th APRIL 2025) **TIME : 9:00 AM TO 12:00 NOON**

CHEMISTRY — TEST PAPER WITH SOLUTION

SECTION-A

51. Given below are two statements :

Statement I : Ozonolysis followed by treatment with Zn, H_2O of cis-2-butene gives ethanal.

Statement II : The production obtained by ozonolysis followed by treatment with Zn, H_2O of 3, 6-dimethyloct-4-ene has no chiral carbon atom.

In the light of the above statements, choose the ***correct*** answer from the options given below

(1) Both Statement I and Statement II are true

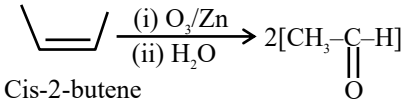
(2) Statement I is false but Statement II are true

(3) Statement I is true but Statement II is false

(4) Both Statement I and Statement II are false

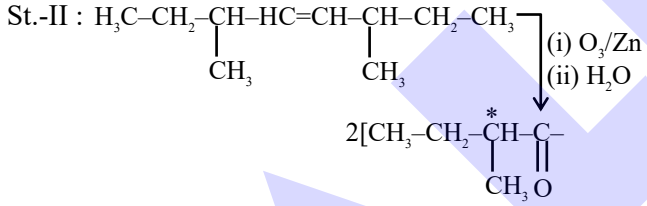
Ans. (3)

Sol. St.-I :



Cis-2-butene Ethanol

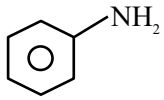
St.-II :



St-I : Correct statement

St-II : In correct statement because product has chiral centre.

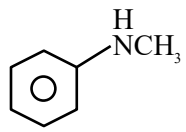
52. Which of the following amine (s) show (s) positive carbylamines test ?

A. 

B. $(CH_3)_2NH$

C. CH_3NH_2

D. $(CH_3)_3N$

E. 

Choose the **correct** answer from the options given below :

(1) A and E Only

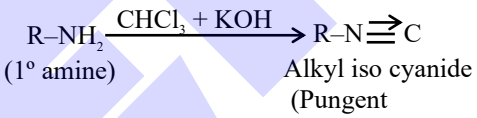
(2) C Only

(3) A and C Only

(4) B, C and D Only

Ans. (3)

Sol. Only 1° or primary amines gives positive carbylamines test.



(1° amine) Alkyl iso cyanide (Pungent

Option (A) and (C) are primary amine and given ⊕ve carbyl amine test

53. Reaction A(g) → 2B(g) + C(g) is a first order reaction. It was started with pure A

t/min	Pressure of system at time t/mm Hg
10	160
∞	240

Which of the following option is <u>incorrect</u> ?

(1) Initial pressure of A is 80 mm Hg

(2) The reaction never goes to completion

(3) Rate constant of the reaction is 1.693 min^{-1}

(4) Partial pressure of A after 10 minute is 40 mm Hg

Ans. (3)

Sol. $A(g) \longrightarrow 2B(g) + C(g)$

$t = 0 \quad P_0$

$t \to \infty \quad 0 \quad 2P_0 \quad P_0$

$P_\infty = 3P_0 = 240$

$P_0 = 80$ mm of Hg

$$Kt = \ell n\left(\frac{P_\infty - P_0}{P_\infty - Pt}\right)$$

$$K \times 10 = \ell n\left(\frac{240-80}{240-160}\right)$$

$$K = \frac{\ell n 2}{10} = 0.0693 \text{ min}^{-1}$$

Option (3) is incorrect

54. Total enthalpy change for freezing of 1 mol of water at 10°C to ice at –10°C is _____

(Given : $\Delta_{fus}H = x$ kJ/mol

$C_p[H_2O(l)] = y$ J mol^{-1} K^{-1}

$C_p[H_2O(s)] = z$ J mol^{-1} K^{-1}

(1) $-x - 10y - 10z$

(2) $-10(100x + y + z)$

(3) $10(100x + y + z)$

(4) $x - 10y - 10z$

Ans. (2)

Sol.

$$\begin{array}{ccc} H_2O_{(\ell)} & \longrightarrow & H_2O_{(s)} \\ 10°C & & 10°C \\ \downarrow nC_{P(\ell)}\Delta T & & \uparrow nC_{P(s)}\Delta T \\ H_2O_{(\ell)} & \xrightarrow{-\Delta H_{fusion}} & H_2O_{(s)} \\ 0°C & & 0°C \end{array}$$

$\Delta H = 1 \times y(0 - 10) - x \times 1000 + 1 \times z(-10° - 0°)$

$\Delta H = -10(100x + y + z)$ Joule.

55. An aqueous solution of HCl with pH 1.0 is diluted by adding equal volume of water (ignoring dissociation of water). The pH of HCl solution would

(Given log 2 = 0.30)

(1) reduce to 0.5

(2) increase to 1.3

(3) remain same

(4) increase to 2

Ans. (2)

Sol. $HCl_{(aq)}$ pH = 1; $[H^+] = 10^{-1}$

If equal volume of water is added concentration will become half

$$[H^+]_{sol} = \frac{10^{-1}}{2}$$

pH = 1.3

56. Given below are two statements :

Statement I : Dimethyl ether is completely soluble in water. However, diethyl ether is soluble in water to a very small extent.

Statement II : Sodium metal can be used to dry diethyl ether and not ethyl alcohol.

In the light of given statements, choose the ***correct*** answer from the options given below

(1) Statement I is false but Statement II are true

(2) Both Statement I and Statement II are false

(3) Statement I is true but Statement II is false

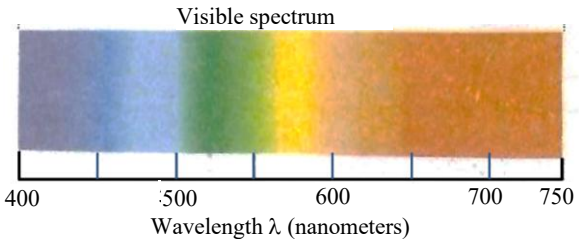
(4) Both Statement I and Statement II are true

Ans. (4)

Sol. **St-I** – St-I is correct because both given ether are soluble in water → Di ethyl ether and butan-1-ol are miscible to almost same extent i.e., 7.5 and 9 gm per 100 ml water due to H-bonding

St-II : - St. II is also correct because sodium metal is not used with ethyl alcohol as H_2 gas release with ethyl a below

57.



Which of the following statements are correct, if the threshold frequency of caesium is 5.16×10^{14} Hz ?

A. When Cs is placed inside a vacuum chamber with an ammeter connected to it and yellow light is focused on Cs the ammeter shows the presence of current.

B. When the brightness of the yellow light is dimmed, the value of the current in the ammeter is reduced.

C. When a red light is used instead to the yellow light, the current produced is higher with respect to the yellow light.

D. When a blue light is used, the ammeter shows the formation of current.

E. When a white light is used, the ammeter shows formation of current.

Choose the correct answer from the options given below :

(1) A, D and E Only

(2) B, C and D Only

(3) A, C, D and E Only

(4) A, B, D and E Only

Ans. (4)

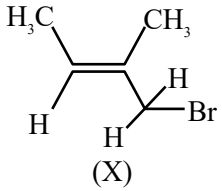
Sol. $\lambda = \frac{C}{\nu} = \frac{3\times10}{5.16\times10^{14}}$

$\lambda = 581.39$ nm

* λ_{Photon} is near & below yellow light it can show photoelectric effect.
* If intensity of light decreases photocurrent decreases.
* Red light will not produce photoelectric effect.
* $\nu_{Blue} > \nu_{yellow}$ so photoelectric current will be produced.
* White light contain all frequencies so it will show photo electric current.

Correct statements are ABD & E.

58. Which of the following is the correct IUPAC name of given organic compound (X) ?



(X)

(1) 2-Bromo-2-methylbut-2-ene

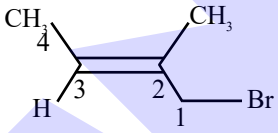
(2) 3-Bromo-3-methylprop-2-ene

(3) 1-Bromo-2-methylbut-2-ene

(4) 4-Bromo-3-methylbut-2-ene

Ans. (3)

Sol.



1-Bromo-2-methyl but-2-ene

59. At the sea level, the dry air mass percentage composition is given as nitrogen gas : 70.0, oxygen gas : 27.0 and argon gas : 3.0. If total pressure is 1.15 atm, then calculate the ratio of followings respectively :

(i) partial pressure of nitrogen gas to partial pressure of oxygen gas

(ii) partial pressure of oxygen gas to partial pressure of argon gas

(Given : Molar mass of N, O and Ar are 14, 16, and 40 g mol^{-1} respectively)

(1) 4.26, 19.3 (2) 2.59, 11.85

(3) 5.46, 17.8 (4) 2.96, 11.2

Ans. (4)

Sol. $\frac{P_{N_2}}{Po_2} = \frac{x_{N_2}.P_T}{x_{O_2}.P_T} = \frac{n_{N_2}}{n_{O_2}}$ {using Dalton's law of partial pressure}

$= \frac{70/28}{27/32} = 2.96$

$\frac{P_{O_2}}{P_{Ar}} = \frac{n_{O_2}}{n_{Ar}} = \frac{27/32}{3/40} = 11.25$

60. Given below are two statements :

Statement I : Mohr's salt is composed of only three types of ions-ferrous, ammonium and sulphate.

Statement II : If the molar conductance at infinite dilution of ferrous, ammonium and sulphate ions are x_1, x_2 and x_3 S cm^2 mol^{-1}, respectively then the molar conductance for Mohr's salt solution at infinite dilution would be given by $x_1 + x_2 + 2x_3$

In the light of the given statements, choose the **correct** answer from the options given below :

(1) Both statements I and Statement II are false

(2) Statement I is false but Statement II is true

(3) Statement I is true but Statement II are false

(4) Both statements I and Statement II are true

Ans. (3)

Sol. Mohr's salt : $FeSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O$

Using Kohlrousch law

λ_m^∞ (Mohr's salt) = $x_1 + 2x_2 + 2x_3$

61. The number of valence electrons present in the metal among Cr, Co, Fe and Ni which has the lowest enthalpy of atomisation is

(1) 8

(2) 9

(3) 6

(4) 10

Ans. (3)

Sol. Out of Cr, Co, Fe and Ni

Chromium has lowest heat of atomisation.

Cr = $[Ar]3d^5 4s^1$

$\because$ Total six valence e^- in Cr.

62. When a salt is treated with sodium hydroxide solution it gives gas X. On passing gas X through reagent Y a brown coloured precipitate is formed. X and Y respectively, are

(1) X = NH_3 and Y = HgO

(2) X = NH_3 and Y = K_2HgI_4 + KOH

(3) X = NH_4Cl and Y = KOH

(4) X = HCl and Y = NH_4Cl

Ans. (2)

Sol. $NH_4^+ + NaOH \longrightarrow H_2O + NH_3\uparrow$

$$2[HgI_4]^{2-} + NH_3 + 3OH^- \longrightarrow \underbrace{HgO.Hg\begin{matrix}NH_2\\ I\end{matrix}}_{\text{Brown ppt}} + 7I^- + 2H_2O$$

NH_3 is identify by $K_2[HgI_4]$ + KOH

63. The group 14 elements A and B have the first ionisation enthalpy values of 708 and 715 kJ mol^{-1} respectively. The above values are lowest among their group members. The nature of their ions A^{2+} B^{4+} respectively is

(1) both reducing (2) both oxidising

(3) reducing and oxidising (4) oxidising and reducing

Ans. (3)

Sol. As per given information of ionisation energy

A = Sn & B = Pb

$A^{+2} = Sn^{2+}$ = Reducing agent

$B^{+4} = Pb^{+4}$ = Oxidising agent

64. The first transition series metal 'M' has the highest enthalpy of atomisation in its series. One of its aquated ion (M^{n+}) exists in green colour. The nature of the oxide formed by the above M^{n-} ion is :

(1) neutral

(2) acidic

(3) basic

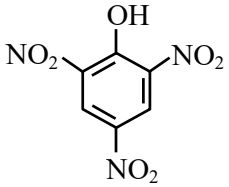
(4) amphoteric

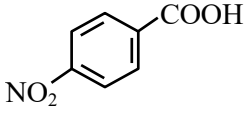
Ans. (3)

Sol. * In 3d series Vanadium has highest enthalpy of atomization and colour of V^{+3} is green.

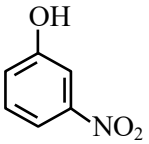
* Oxide form by V^{+3} is V_2O_3 (Basic oxide)

65. Which of the following compounds is least likely to give effervescence of CO_2 in presence of aq. $NaHCO_3$?

(1) 

(2) 

(3) $Ph - \overset{(+)}{N}H_3\ \overset{(-)}{Cl}$

(4) 

Ans. (4)

Sol. Concept – Those compounds which are more acidic than H_2CO_3 can gives effervescence of CO_2 with aq. $NaHCO_3$.

Release $CO_2\uparrow$gas with aq. NaHCO3

$\Rightarrow [A.S.]_{Comp.} > [A.S.]_{H_2CO_3}$

$\rightarrow$ Option 1, 2 and 3 gives effervescence of CO_2 gas with $NaHCO_3$

$\rightarrow$ Option (4) Not gives CO_2 gas with $NaHCO_3$.

66. Match the **LIST-I** with **LIST-II**.

LIST-I Molecule/ion		**LIST-II Bond pair : lone pair (on the central atom)**	
A.	ICl_2^-	I.	4 : 2
B.	H_2O	II.	4 : 1
C.	SO_2	III.	2 : 3
D.	XeF_4	IV.	2 : 2

Choose the ***correct*** answer from the options given below :

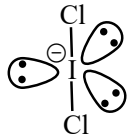
(1) A-IV, B-III, C-II, D-I

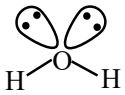
(2) A-III, B-IV, C-II, D-I

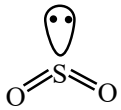
(3) A-III, B-IV, C-I, D-II

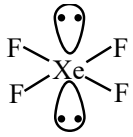
(4) A-II, B-I, C-IV, D-III

Ans. (2)

Sol. (A)  B.P : L.P = 2 : 3

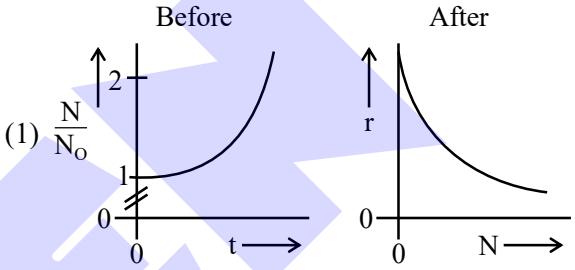
(B)  B.P : L.P = 2 : 2

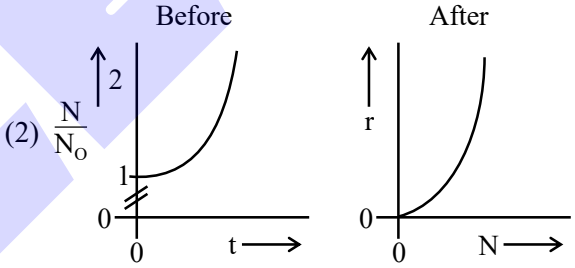
(C)  B.P : L.P = 4 : 1

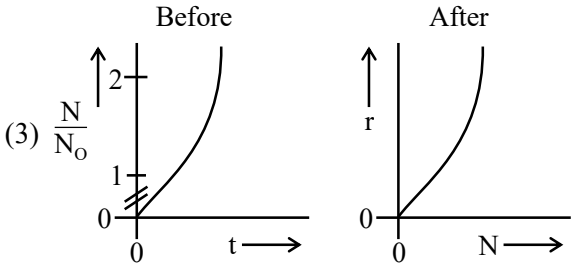
(D)  B.P : L.P = 4 : 2

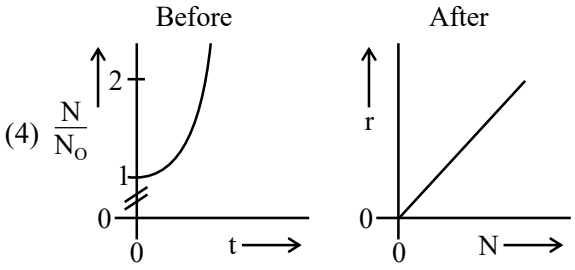
67. A person's wound was exposed to some bacteria and then bacteria growth started to happen at the same place. The wound was later treated with some antibacterial medicine and the rate of bacterial decay (r) was found to be proportional with the square of the existing number of bacteria at any instance. Which of the following set of graphs correctly represents the 'before' and 'after' situation of the application of the medicine?

[Given : N = No. of bacteria, t = time, bacterial growth follows Ist order kinetics.]

(1) 

(2) 

(3) 

(4) 

Ans. (2)

Sol. *Before applying medicine

$\frac{dA}{dt} = K[A]$ (First order growth) (Rate law)

$\frac{A}{A_0} = \frac{N}{N_0} = e^{Kt}$

*After applying medicine

Active Bacteria $\rightarrow$ Inactive Bacteria

(A) (I)

$r = -\frac{dA}{dt} = K[A]^2$ (Rate law)

$\boxed{y = Kx^2}$ Parabola

68. Given below are two statements :

Statement I: D-(+)-glucose + D-(+) fructose $\xrightarrow{-H_2O}$ sucrose

sucrose $\xrightarrow{\text{Hydrolysis}}$ D-(+)-glucose + D-(+) fructose

Statement II : Invert sugar is formed during sucrose hydrolysis.

In the light of the above statements, choose the ***correct*** answer from the options given below -

(1) Both Statement I and Statement II are true.

(2) Statement I is false but Statement II are true.

(3) Statement I is true but Statement II is false.

(4) Both Statement I and Statement II are false.

Ans. (2)

Sol. On hydrolysis of sucrose gives D-(+)-glucose and D-(–)-fructose while in St. (1) D-(+)-fructose is given evince St-(1) is incorrect.

St. II – It is correct because sucrose on hydrolysis gives invert sugar

69. An octahedral complex having molecular composition $Co.5NH_3.Cl.SO_4$ has two isomers A and B. The solution of A gives a white precipitate with $AgNO_3$ solution and the solution of B gives white precipitate with $BaCl_2$ solution. The type of isomerism exhibited by the complex is,

(1) Co-ordinate isomerism

(2) Linkage isomerism

(3) Ionisation isomerism

(4) Geometrical isomerism

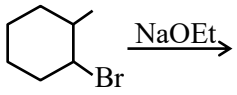
Ans. (3)

Sol. (A) complex is $[Co(NH_3)_5(SO_4)]Cl$

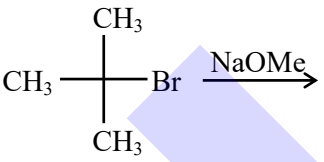
(B) complex is $[Co(NH_3)_5Cl]SO_4$

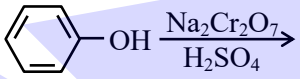
Both (A) and (B) are Ionisation isomers.

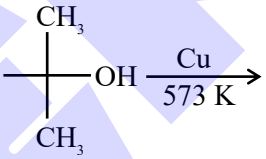
70. The reactions which cannot be applied to prepare an alkene by elimination, are

A. 

B. $CH_3 - CH_2 - \underset{\underset{Br}{|}}{CH} - CH_3 \xrightarrow{KOH\ (aq.)}$

C. 

D. 

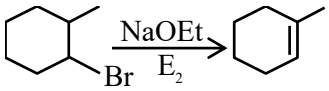
E. 

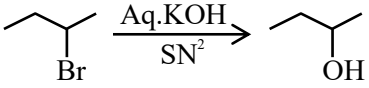
Choose the ***correct*** answer from the option given below :

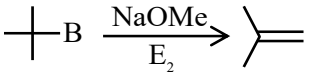
(1) B & E Only (2) B, C & D Only

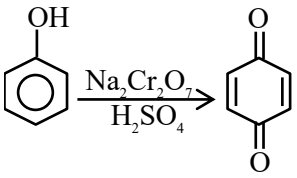
(3) A, C & D Only (4) B & D Only

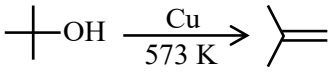
Ans. (4)

Sol. (A) 

(B) 

(C) 

(D) 

(E) 

(3° Alcohol)

Option (B) and (D) reaction are not able to form alkene as a product.

SECTION-B

71. An organic compound weighing 500 mg, produced 220 mg of CO_2. on complete combustion. The percentage composition of carbon in the compound is ..... %. (nearest integer)
(Given molar mass in g mol^{-1} of C : 12, O : 16)

Ans. **(12)**

Sol. Organic compound $\xrightarrow[\Delta]{CuO} CO_2 + H_2O$

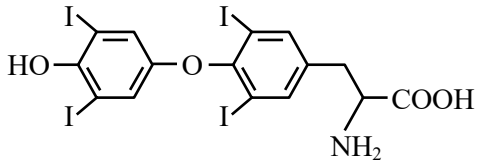
$$n_{CO_2} = \frac{220\times10^{-3}}{44} = 5\times10^{-3} \text{ moles}$$

$m_C = 5 \times 10^{-3} \times 12$

$$\%m \text{ carbon} = \frac{5\times10^{-3}\times12}{500\times10^{-3}}\times100 = 12\%$$

Correct answer is 12

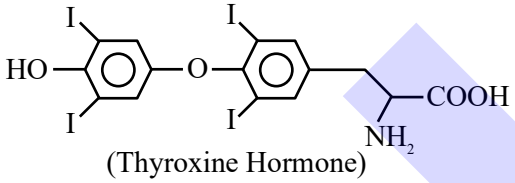
72. Thyroxine, the hormone has given below structure



The percentage of iodine in thyroxine is ..... %. (nearest integer)
(Given molar mass in g mol^{-1} C:12. H:1, O:16, N:14, I:127)

Ans. **(65)**

Sol.



(Thyroxine Hormone)

→ Molecular formula of Thyroxine ⇒ $C_{15}H_{11}O_4NI_4$

→ Molecular mass of Thyroxine –

C → 15 × 12 = 180

H → 11 × 1 = 11

O → 16 × 4 = 64

N → 14 × 1 = 14

I → 127 × 4 = 508

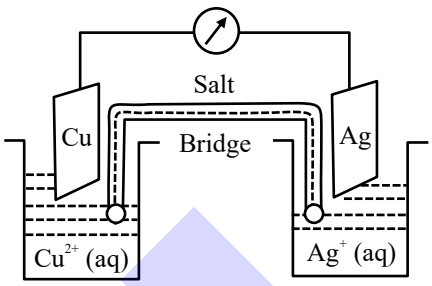
→ Molecular mass of Thyroxine ⇒ 777

$$\rightarrow \%\text{ of Iodine} = \frac{508}{777}\times100$$

= 65.38 %

Nearest integer = 65

73. 1 Faraday electricity was passed through Cu^{2+} (1.5 M, 1 L)/Cu and 0.1 Faraday was passed through Ag^+ (0.2 M, 1 L)/Ag electrolytic cells. After this the two cells were connected as shown below to make an electrochemical cell. The emf of the cell thus formed at 298 K is-



Given : $E^\circ_{Cu^{2+}/Cu} = 0.34$ V

$E^\circ_{Ag^+/Ag} = 0.8$ V

$$\frac{2.303RT}{F} = 0.06 \text{ V}$$

Ans. **(400)**

Sol. * $Cu^{+2} + 2e^- \longrightarrow Cu$

(1 faraday = charge on 1 mole electron)

t = 0 1.5 1 mole

t = t 1 – 0.5 mole

$[Cu^{+2}] = 1$ M after electrolysis

* $Ag\oplus + e^- \longrightarrow Ag$

t = 0 0.2 0.1 mole

t = t 0.1 – –

$[Ag^+] = 0.1$ M after electrolysis

Cell reaction $Cu_{(s)} + 2Ag^+_{(aq)} \rightarrow Cu^{+2}_{(aq)} + 2Ag_{(s)}$

$$E = E^\circ - \frac{0.06}{n}\log\frac{[Cu^{+2}]}{[Ag^+]^2}$$

$$E = (0.8 - 0.34) - \frac{0.06}{2}\log\frac{1}{(0.1)^2} = 0.4\text{V}$$

Correct answer = 400 mV

74. The percentage dissociation of a salt (MX_3) solution at given temperature (van't Hoff factor i = 2) is..... % (Nearest integer)

Ans. **(33)**

Sol. $MX_3 \rightarrow M^{+3} + 3X^{\ominus}$

$i = 1 + (n - 1)\alpha$

$i = 1 + (4 - 1)\alpha = 2$

$\alpha = \frac{1}{3} = 33.33\% \approx 33\%$

75. The number of paramagnetic complex among $[FeF_6]^{3-}$, $[Fe(CN)_6]^{3-}$, $[Mn(CN)_6]^{3-}$, $[Co(C_2O_4)_3]^{3-}$, $[MnCl_6]^{3-}$ and $[CoF_6]^{3-}$, which involved d^2sp^3 hybridization is .....

Ans. **(2)**

Sol.

$[FeF_6]^{3-}$	Paramagnetic	sp^3d^2
$[Fe(CN)_6]^{3-}$	Paramagnetic	d^2sp^3
$[Mn(CN)_6]^{3-}$	Paramagnetic	d^2sp^3
$[Co(C_2O_4)_3]^{3-}$	Diamagnetic	d^2sp^3
$[MnCl_6]^{3-}$	Paramagnetic	sp^3d^2
$[CoF_6]^{3-}$	Paramagnetic	sp^3d^2

Only $[Fe(CN)_6]^{3-}$ and $[Mn(CN)_6]^{3-}$ are paramagnetic and d^2sp^3 hybridisation of metal.

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