# JEE (MAIN)-2025 (Online)

## Chemistry Memory Based
## Answer & Solutions

**MORNING SHIFT**

**DATE : 04-04-2025**

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| CHEMISTRY | TEST PAPER WITH SOLUTION |
| --- | --- |

**SECTION-A**

**1.** Which of the following is the ratio of 5th Bohr orbit ($r_5$) of $He^+$ & $Li^{2+}$ ?

(1) $\frac{2}{3}$          (2) $\frac{3}{2}$

(3) $\frac{9}{4}$          (4) $\frac{4}{9}$

**Ans.** **(2)**

**Sol.** $r = 0.529 \times \dfrac{n^2}{z}$

$$\dfrac{(r_5)_{He^+}}{(r_5)_{Li^{+2}}} = \dfrac{0.529 \times \dfrac{25}{2}}{0.529 \times \dfrac{25}{3}} = \dfrac{3}{2}$$

**2.** Which of the following pair of ions have equal number of unpaired electrons

(1) $V^{2+}$ and $Ni^{2+}$          (2) $Cr^{2+}$ and $Mn^{2+}$

(3) $Fe^{2+}$ and $Sc^{2+}$          (4) $Mn^{3+}$ and $Fe^{2+}$

**Ans.** **(4)**

**Sol.** $V^{2+}$     = [Ar] $3d^3\ 4s^0$

3d

| 1 | 1 | 1 | | |
| --- | --- | --- | --- | --- |

No. of unpaired electrons = 3

$Ni^{2+}$     = [Ar] $3d^8\ 4s^0$

| 1↓ | 1↓ | 1↓ | 1 | 1 |
| --- | --- | --- | --- | --- |

No. of unpaired electrons = 2

$Cr^{2+}$     = [Ar] $3d^4\ 4s^0$

| 1 | 1 | 1 | 1 | |
| --- | --- | --- | --- | --- |

No. of unpaired electrons = 4

$Mn^{2+}$ = [Ar] $3d^5\ 4s^0$

| 1 | 1 | 1 | 1 | 1 |
| --- | --- | --- | --- | --- |

No. of unpaired electrons = 5

$Fe^{2+}$ = [Ar] $3d^6\ 4s^0$

| 1↓ | 1 | 1 | 1 | 1 |
| --- | --- | --- | --- | --- |

No. of unpaired electrons = 4

$Mn^{3+}$ = [Ar] $3d^4\ 4s^0$

| 1 | 1 | 1 | 1 | |
| --- | --- | --- | --- | --- |

No. of unpaired electrons = 4

$Sc^{2+}$ = [Ar] $3d^1\ 4s^0$

| 1 | | | | |
| --- | --- | --- | --- | --- |

No. of unpaired electrons = 1

**3.** Incorrect order of atomic radius is

(1) B < Al          (2) In < Tl

(3) Al < Ga          (4) Ga < In

**Ans.** **(3)**

**Sol.** Size order  $\Rightarrow$ B < Al > Ga < In < Tl

The radius of Ga is smaller than Al. Due to poor shielding effect of d-electrons in Ga

**4.** One mole of an ideal gas expands from 10 $dm^3$ to 20 $dm^3$ through isothermal reversible process. Find ΔU, q & w

(1) ΔU = 0, q = 0, w = 0

(2) ΔU = 0, q ≠ 0, w ≠ 0

(3) ΔU ≠ 0, q = 0, w ≠ 0

(4) ΔU ≠ 0, q ≠ 0, w = 0

**Ans.** **(2)**

**Sol.** Isothermal reversible expansion of an ideal gas

$\therefore$   ΔU = 0

q = – w

$w = -nRT \ln \dfrac{V_2}{V_1}$

$\therefore$  w ≠ 0 ,     q ≠ 0

**5.** The rate of a chemical reaction is $K[A]^n\ [B]^m$. If concentration of A is doubled and concentration of B is halved, then change of rate will be:

(1) $2^{n-m}$          (2) $2^{m-n}$

(3) $2^{2n-2m}$          (4) $2^{2m-n}$

**Ans.** **(1)**

**Sol.** $r_1 = k[A]^n[B]^m$          ...(1)

$r_2 = k[2A]^n\left[\dfrac{B}{2}\right]^m$          …(2)

(1) Divided by (2)

$$\dfrac{r_2}{r_1} = \dfrac{k[2A]^n\left[\dfrac{B}{2}\right]^m}{k[A]^n[B]^m}$$

$\dfrac{r_2}{r_1} = [2]^n\left[\dfrac{1}{2}\right]^m$

$r_2 = r_1(2)^{(n-m)}$

**6.** Observe the following diagram.
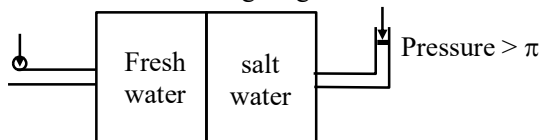


For reverse osmosis, which of the following can be used for porous membrane?

(1) Cellulose acetate

(2) Porous silicate

(3) Silicone

(4) Glass memebrane

**Ans.** **(1)**

**Sol.** Cellulose acetate is used as porous membrane for reverse osmosis.

[NCERT Based]

**7.** Which of the following is correct option regarding 1s orbital

(1) It is symmetrical

(2) It is non-symmetrical
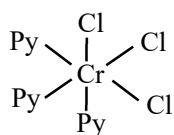
(3) It is directional

(4) It has two radial nodes

**Ans.** **(1)**

**Sol.** 1s orbital $\Rightarrow$ Symmetrical

Non-directional

No radial node

**8.** Total number of stereoisomers possible for complexes $[Cr(Cl)_3(Py)_3]$ and $[CrCl_2(C_2O_4)_2]$ respectively are

(1) 2,3          (2) 3,2

(3) 3,3          (4) 2,2

**Ans.** **(1)**

**Sol.** $[Cr(Cl)_3(Py)_3]$
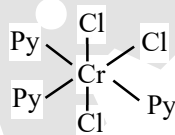


$[CrCl_2(C_2O_4)_2]$
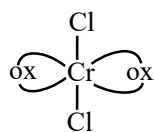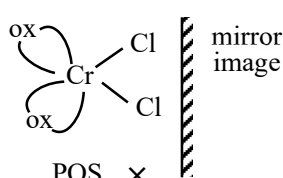


**9.** Among the following complexes

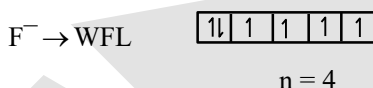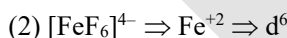$[Fe(CN)_6]^{4-}$, $[FeF_6]^{4-}$,
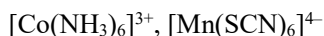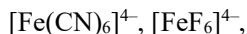
$[Co(NH_3)_6]^{3+}$, $[Mn(SCN)_6]^{4-}$

The complexes having CFSE equals to 0 and having magnetic moment of 5.92 BM.

(1) $[Fe(CN)_6]^{4-}$          (2) $[FeF_6]^{4-}$

(3) $[Co(NH_3)_6]^{3+}$          (4) $[Mn(SCN)_6]^{4-}$

**Ans.** **(4)**

(1) $[Fe(CN)_6]^{4-} \Rightarrow Fe^{+2} \Rightarrow d^6$

$CN^- \to$ SFL          $d^6 \Rightarrow$



n = 0

(2) $[FeF_6]^{4-} \Rightarrow Fe^{+2} \Rightarrow d^6$

$F^- \to$ WFL



n = 4

(3) $[Co(NH_3)_6]^{3+} \Rightarrow Co^{+3} \Rightarrow d^6$

$NH_3 \to$ SFL



n = 0

(4) $[Mn(SCN)_6]^{4-} \Rightarrow Mn^{+2} \Rightarrow d^5$

$SCN^{\ominus} \to$ WFL
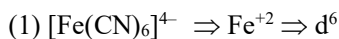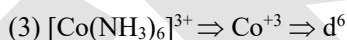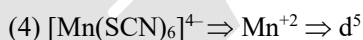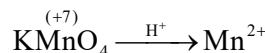


n = 5

$\mu = \sqrt{35} = 5.92$

**10.** $KMnO_4$ oxidises others in acidic medium, difference between two oxidation states of Mn is x. Neutral $FeCl_3$ reacts with oxalate to form a complex compound having y-d-electrons. Find x + y.
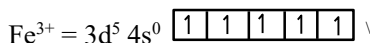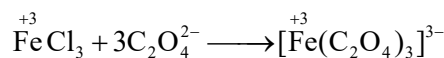
(1) 5          (2) 10

(3) 6          (4) 8

**Ans.** **(2)**

**Sol.** In acidic medium –

$$\underset{(+7)}{KMnO_4} \xrightarrow{H^+} Mn^{2+}$$

Change in oxidation state of Mn = 5

x = 5

$$\underset{+3}{Fe}Cl_3 + 3C_2O_4^{2-} \longrightarrow [\underset{+3}{Fe}(C_2O_4)_3]^{3-}$$

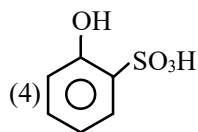$Fe^{3+} = 3d^5 \, 4s^0$



No. of d-electons = 5

y = 5

$\Rightarrow$ x + y = 10

**11.** In the reaction sequence

 + oleum $\longrightarrow$ (X)

(X) $\xrightarrow{\text{(I) NaOH, (II) H}^+,\Delta}$ (Y)

(Y) $\xrightarrow{\text{Zn,dust}}$ (Z)

The compound (Z) is

(1)  (OH)

(2)  (SO₃H)

(3) 

(4)  (OH, SO₃H)
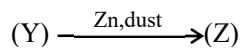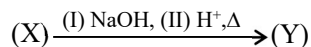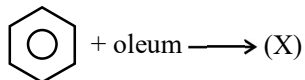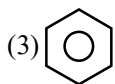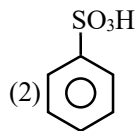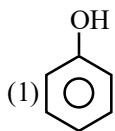
**Ans.** **(3)**

**Sol.**



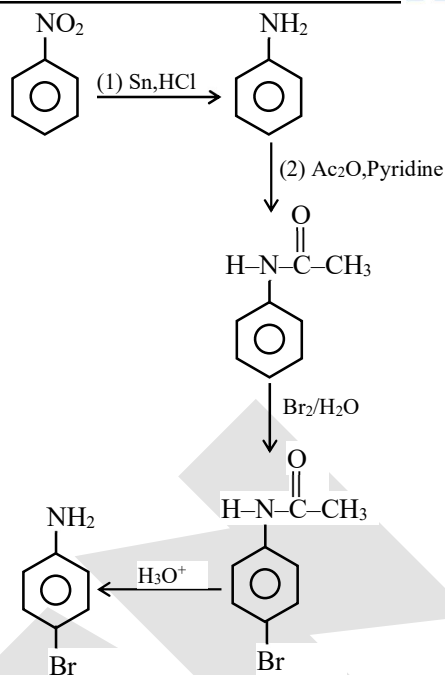**12.** In the reaction sequence



$\xrightarrow[\substack{(1)\ Sn,\ HCl \\ (2)\ Ac_2O,\ pyridine \\ (3)\ Br_2/H_2O \\ (4)\ H_3O}]{}$ P (major product)

(1) 

(2) 

(3) 

(4) 

**Ans.** **(4)**

**Sol.**



**13.**

 $\xrightarrow{Br_2 + h\nu}$ (A) $\xrightarrow{\text{Alc. KOH}}$ (B) $\xrightarrow[H_2O_2]{HBr}$ (C)

Identify (A), (B) and (C).

(1) 

(2) 

(3) 

(4) 

**Ans.** **(3)**

**Sol.**
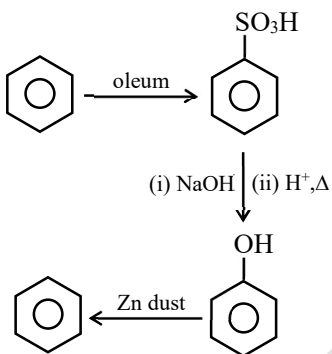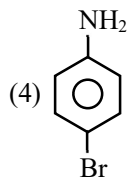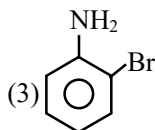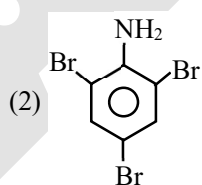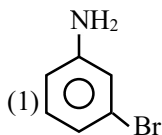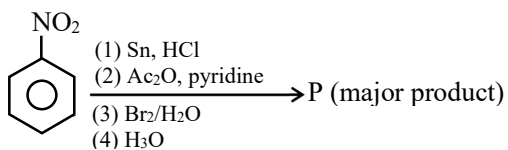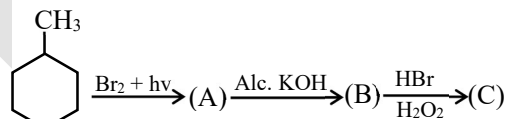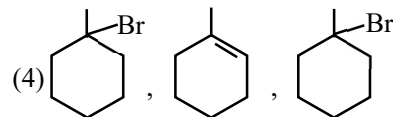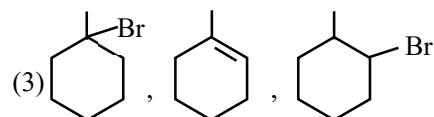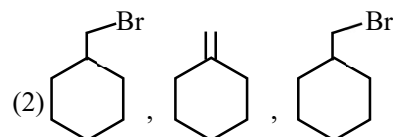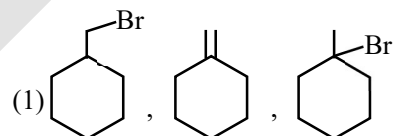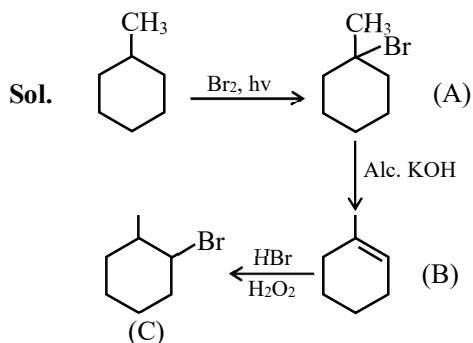


**14.** Consider the two products

$$CH_3-CH_2-CH_2-\overset{\overset{\displaystyle O}{\|}}{\underset{a}{C}}-H \text{ and } CH_3-CH=CH-\overset{\overset{\displaystyle O}{\|}}{\underset{b}{C}}-H$$

(A)                          (B)
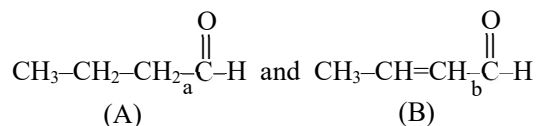
The correct order of dipole moment and bond length order will be :

(1) A > B ; a > b      (2) A < B ; a < b

(3) A < B ; a > b      (4) A > B ; a < b

**Ans.** **(3)**

**Sol.**

$$CH_3-CH_2-CH_2-\overset{\overset{\displaystyle O}{\|}}{\underset{a}{C}}-H \quad CH_3-CH=CH-\overset{\overset{\displaystyle O}{\|}}{\underset{b}{C}}-H$$

(A)                  (B)

$$CH_3-CH_2-CH_2-\overset{\overset{\displaystyle O^\ominus}{|}}{\underset{a\ \oplus}{C}}-H \quad CH_3-\overset{\oplus}{CH}-CH=\overset{\overset{\displaystyle O^\ominus}{|}}{\underset{b}{C}}-H$$
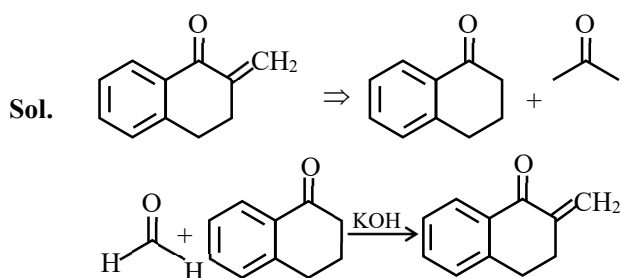
(A)       <       (B)
                    (more polar)
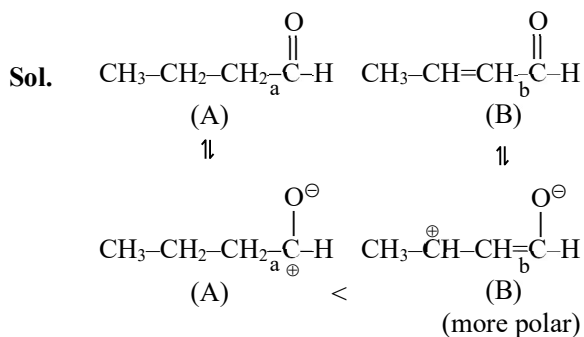
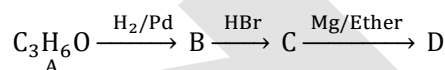Bond length (b) < (a)

**15.** Which of the following compound is not a product of intramolecular aldol condensation reaction?



**Ans.** **(2)**

**Sol.**
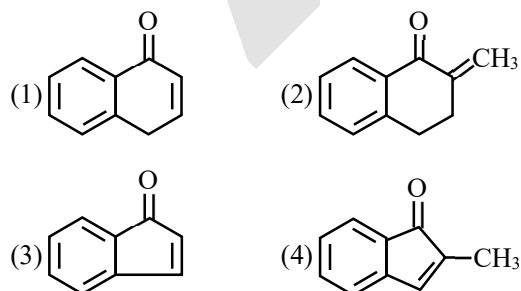


**16.** In following sequence of reaction. A is converted to D

$$\underset{A}{C_3H_6O} \xrightarrow{H_2/Pd} B \xrightarrow{HBr} C \xrightarrow{Mg/Ether} D$$

D is treated with A followed by hydrolysis to give 2, 3-dimethyl-butan-2-ol. Then identify A, B, C.

(1) A = CH₃COCH₃, B = CH₃–CH(OH)CH₃, C = CH₃–CH(Br)CH₃

(2) A = CH₃CH₂CHO, B = CH₃CH₂CH₂OH, C = CH₃CH₂CH₂Br

(3) A = CH₂=CH–CH₂OH, B = CH₃CH₂CH₂OH, C = CH₃CH₂CH₂Br

(4) A = Cyclopropanol, B = Cyclopropenone, C = Bromo propane

**Ans.** **(1)**

**Sol.**
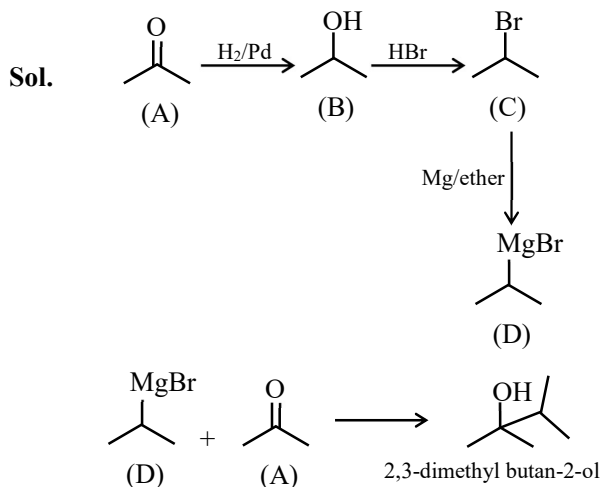
**17.** The activation energy of forward reaction and backward reaction is 100 kJ/mole and 180 kJ/mole respectively. Find the correct statement if catalyst is added under same condition of temperature.

(1) Catalyst does not change ΔG of reaction

(2) Catalyst can make non-spontaneous reaction spontaneous

(3) Catalyst changes ΔH of reaction

(4) Enthalpy of reaction (ΔH) is 280 kJ/mole

**Ans.** **(1)**

**Sol.** $\Delta H = E_{af} - E_{ab}$

$= 100 - 180 = -80$ kJ/mol

## SECTION-B

**18.** Among the following, the number of paramagnetic molecules are :

$O_2, N_2, F_2, B_2, Cl_2$

**Ans.** **(2)**

**Sol.** $O_2 : \sigma_{1s}^2 \sigma*_{1s}^2 \sigma_{2s}^2 \sigma*_{2s}^2 \sigma_{2p}^2$

$(\pi_{2p}^2 = \pi_{2p}^2)(\pi*_{2p}^1 = \pi*_{2p}^1)$ ; Paramagnetic

$N_2 : \sigma_{1s}^2 \sigma*_{1s}^2 \sigma_{2s}^2 \sigma*_{2s}^2 (\pi_{2p}^2 = \pi_{2p}^2)(\sigma_{2p}^2)$ :

Diamagnetic

$F_2 : \sigma_{1s}^2 \sigma*_{1s}^2 \sigma_{2s}^2 \sigma*_{2s}^2 \sigma_{2p}^2 (\pi_{2p}^2 = \pi_{2p}^2)$

$(\sigma*_{2p}^2 = \sigma*_{2p}^2)$ Diamagnetic

$B_2 : \sigma_{1s}^2 \sigma*_{1s}^2 \sigma_{2s}^2 \sigma*_{2s}^2 (\pi_{2p}^1 = \pi_{2p}^1)$

Paramagnetic

$Cl_2 :$ Diamagnetic

**19.** 0.01 M HX ($K_a = 4 \times 10^{-10}$) is diluted till the solution has pH = 6. If the new concentration is $x \times 10^{-4}$ M then find x.

**Ans.** **(25)**

**Sol.** pH = 6

$[H^+] = 10^{-6}$

$[H^+] = \sqrt{k_a c}$

$10^{-6} = \sqrt{4 \times 10^{-10} \times c}$

$4 \times 10^{-10} \times c = (10^{-6})^2$

$c = \dfrac{10^{-12}}{4 \times 10^{-10}}$

$c = 25 \times 10^{-4}$