

JEE-MAIN EXAMINATION – JANUARY 2026
(HELD ON FRIDAY 23rd JANUARY 2026)
TIME : 9:00 AM TO 12:00 NOON
CHEMISTRY
TEST PAPER WITH SOLUTION
SECTION-A

51. Which of the following statements regarding the energy of the stationary state is **true** in the following one-electron system?

- (1) -1.09×10^{-18} J for second orbit of H atom.
- (2) $+2.18 \times 10^{-18}$ J for second orbit of He^+ ion
- (3) $+8.72 \times 10^{-18}$ J for first orbit of He^+ ion
- (4) -2.18×10^{-18} J for third orbit of Li^{2+} ion

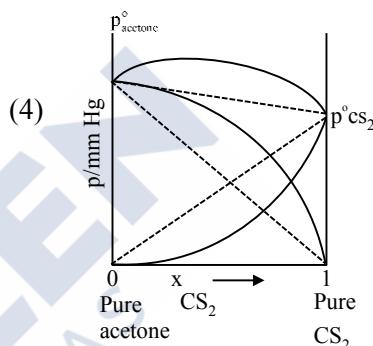
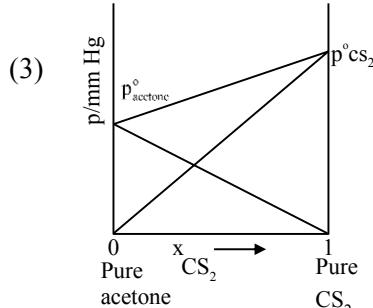
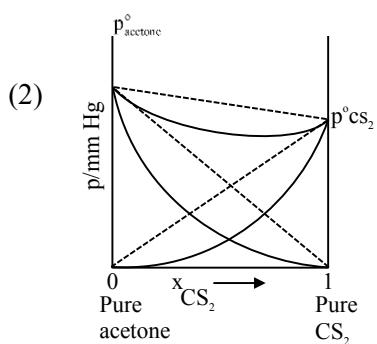
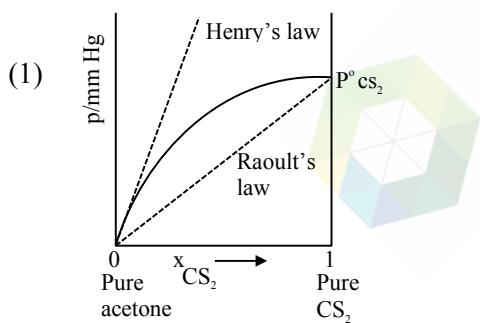
Ans. (4)

Sol. $E_n = -2.18 \times 10^{-18} \frac{Z^2}{n^2}$ J/atom.

For 3rd orbit of Li^{2+} ion

$$= -2.18 \times 10^{-18} \times \frac{3^2}{3^2} = -2.18 \times 10^{-18} \text{ J.}$$

52. Which one of the following graphs accurately represents the plot of partial pressure of CS_2 vs its mole fraction in a mixture of acetone and CS_2 at constant temperature?


Ans. (1)

Sol. Mixture of CS_2 and $\text{CH}_3-\overset{\text{O}}{\underset{\text{||}}{\text{C}}}-\text{CH}_3$ show positive deviation

$$P_{\text{CS}_2} > P_{\text{CS}_2}^0 \cdot X_{\text{CS}_2}$$

53. The correct trend in the first ionization enthalpies of the elements in the 3rd period of periodic table is:

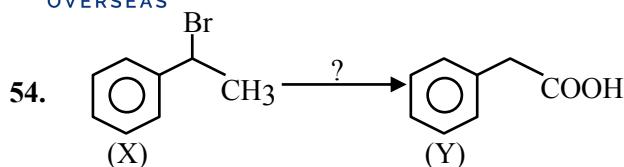
- (1) $\text{Al} < \text{Si} < \text{S} < \text{P} < \text{Cl}$
- (2) $\text{Al} < \text{S} < \text{P} < \text{Si} < \text{Cl}$
- (3) $\text{Si} < \text{S} < \text{Al} < \text{P} < \text{Cl}$
- (4) $\text{S} < \text{Si} < \text{Al} < \text{P} < \text{Cl}$

Ans. (1)

Sol. In general on moving from left to right in a period ionization energy increases as Z_{eff} increases.

$$\text{Al} < \text{Si} < \text{S} < \text{P} < \text{Cl}$$

(Ionisation energy of phosphorus is more because of half filled stable configuration)

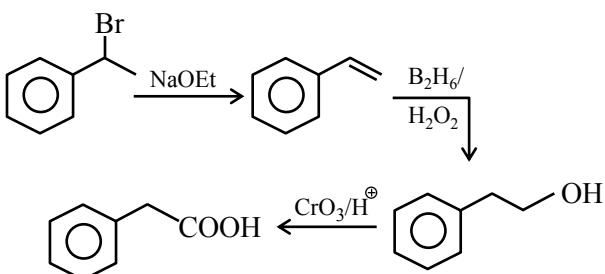


The correct sequence of reagents for the above conversion of X to Y is :

- (1) (i) NaOH (aq) (ii) Jones reagent (iii) H_3O^+
- (2) $\text{B}_2\text{H}_6/\text{H}_2\text{O}_2$ (ii) NaOEt (iii) Jones reagent
- (3) (i) Jones reagent (ii) NaOEt (iii) Hot KMnO_4/KOH
- (4) (i) NaOEt (ii) $\text{B}_2\text{H}_6/\text{H}_2\text{O}_2$ (iii) Jones reagent

Ans. (4)

Sol.



55. In the given electrochemical cell, $\text{Ag}(\text{s})|\text{AgCl}(\text{s})|\text{FeCl}_2(\text{aq}), \text{FeCl}_3(\text{aq})|\text{Pt}(\text{s})$ at 298 K, the cell potential (E_{cell}) will increase when :

- (A) Concentration of Fe^{2+} is increased.
- (B) Concentration of Fe^{3+} is decreased
- (C) Concentration of Fe^{2+} is decreased
- (D) Concentration of Fe^{3+} is increased
- (D) Concentration of Cl^- is increased

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

(1) A and B only	(2) A and E only
(3) B only	(4) C, D and E only

Ans. (4)

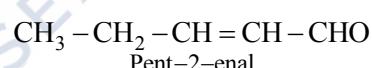
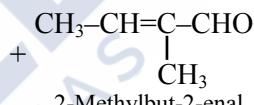
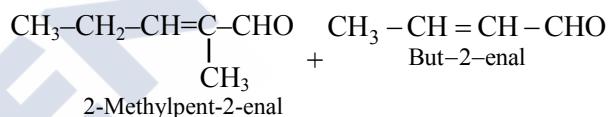
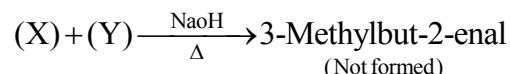
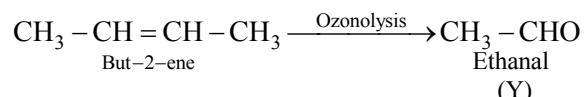
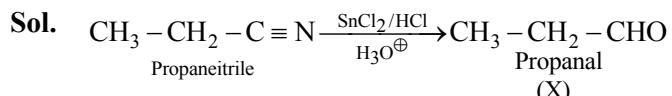
Sol. $\text{Cl}_{\text{aq}}^- + \text{Ag}_{(\text{s})} + \text{Fe}_{\text{aq}}^{+3} \rightarrow \text{Fe}_{\text{aq}}^{+2} + \text{AgCl}_{(\text{s})}$

$$E_{\text{cell}} = E_{\text{cell}}^\circ - \frac{0.059}{1} \log \frac{[\text{Fe}^{2+}]}{[\text{Cl}^-][\text{Fe}^{3+}]}$$

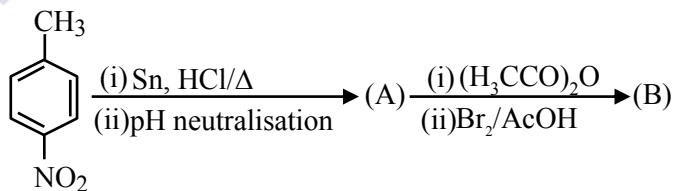
56. 'x' is the product which is obtained from propanenitrile and stannous chloride in the presence of hydrochloric acid followed by hydrolysis. 'y' is the product which is obtained from the but-2-ene by the ozonolysis followed by hydrolysis. From the following, which product is not obtained when one mole of 'x' and one mole of 'y' react with each other in the presence of alkali followed by heating ?

- (1) 2-Methylbut-2-enal
- (2) Pent-2-enal
- (3) 2-Methylpent-2-enal
- (4) 3-Methylbut-2-enal

Ans. (4)



57. Consider the following sequence of reactions.



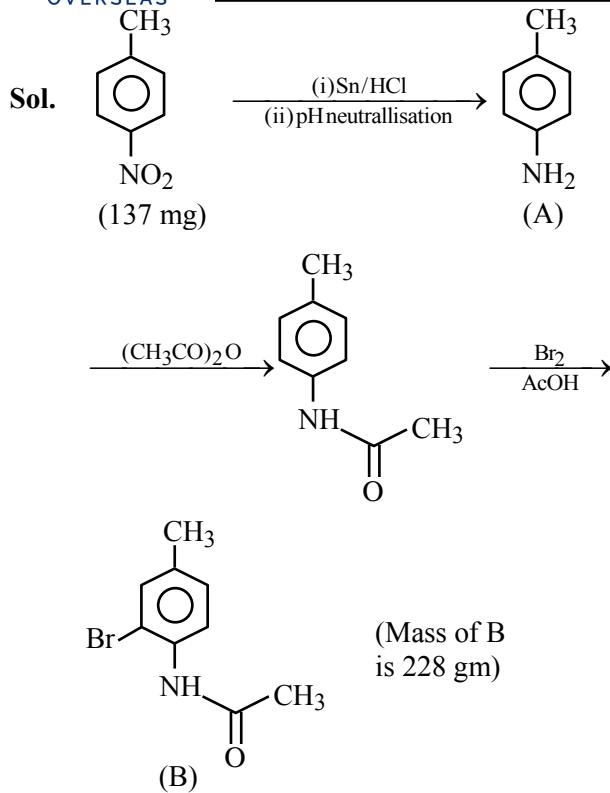
4-Nitrotoluene

Assuming that the reaction proceeds to completion, then 137 mg of 4-nitrotoluene will produce _____ mg of B.

(Given molar mass in g mol⁻¹ H : 1, C : 12, N : 14, O : 16, Br : 80)

(1) 301	(2) 146
(3) 228	(4) 208

Ans. (3)



$$\text{Mole} = \frac{137 \times 10^{-3}}{137} = 0.001 \text{ mole}$$

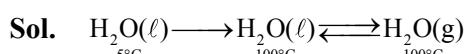
Mole of product = 0.001 mole

$$\text{Mass of product} = 0.001 \times 228 \text{ gm} = 0.228 \text{ gm} = 228 \text{ mg}$$

58. A cup of water at 5°C (system) is placed in a microwave oven and the oven is turned on for one minute during which, the water begins to boil. Which of the following option is **true** ?

- $q = +\text{ve}$, $w = 0$, $\Delta U = -\text{ve}$
- $q = +\text{ve}$, $w = -\text{ve}$, $\Delta U = +\text{ve}$
- $q = -\text{ve}$, $w = -\text{ve}$, $\Delta U = -\text{ve}$
- $q = +\text{ve}$, $w = -\text{ve}$, $\Delta U = -\text{ve}$

Ans. (2)



due to expansion

$$w = -\text{ve}$$

as heat is given to system so $q = +\text{ve}$ and internal energy of gas will be more than internal energy of liquid so $\Delta U = +\text{ve}$

59. Given below are two statements :

Statement I : $[\text{CoBr}_4]^{2-}$ ion will absorb light of lower energy than $[\text{CoCl}_4]^{2-}$ ion.

Statement II : In $[\text{CoI}_4]^{2-}$ ion, the energy separation between the two set of d-orbitals is more than $[\text{CoCl}_4]^{2-}$ ion.

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

- Both **Statement I** and **Statement II** are false
- Statement I** is true but **Statement II** is false
- Statement I** is false but **Statement II** is true
- Both **Statement I** and **Statement II** are true

Ans. (2)

Sol. Statement 1 (True)

Strength of ligand : $\text{Cl}^- > \text{Br}^-$

$\Delta_t : [\text{CoCl}_4]^{2-} > [\text{CoBr}_4]^{2-}$

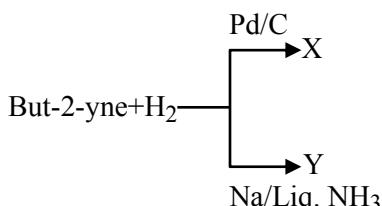
$E_{\text{absorbed}} : [\text{CoCl}_4]^{2-} > [\text{CoBr}_4]^{2-}$

Statement 2 (False)

Strength of ligand : $\text{I}^- < \text{Cl}^-$

$\Delta_t : [\text{CoI}_4]^{2-} < [\text{CoCl}_4]^{2-}$

60. But-2-yne and hydrogen (one mole each) are separately treated with (i) Pd/C and (ii) Na/liq. NH_3 , to give the products X and Y respectively.



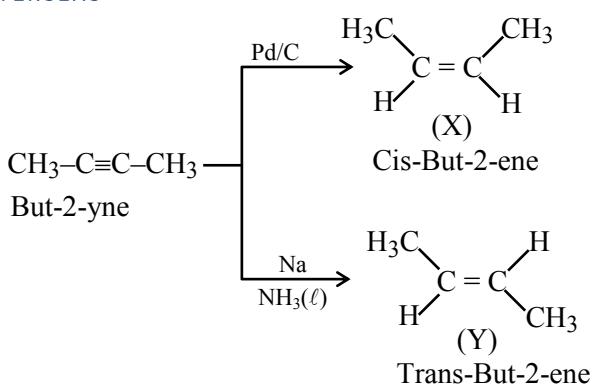
Identify the **incorrect** statements.

- X and Y are stereoisomers.
- Dipole moment of X is zero
- Boiling point of X is higher than Y.
- X and Y react with $\text{O}_3/\text{Zn} + \text{H}_2\text{O}$ to give different products.

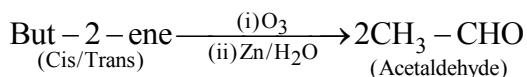
Choose the **correct** answer from the options given below :

- B and C only
- B and D only
- A and B only
- A and C only

Ans. (2)

Sol.


Dipole moment x \neq 0



61. Given,

(A) n = 5, m_l = -1

(B) n = 3, l = 2, m_l = -1, m_s = + $\frac{1}{2}$

The maximum number of electron(s) in an atom that can have the quantum numbers as given in (A) and (B) respectively are :

(1) 26 and 1

(2) 4 and 1

(3) 2 and 4

(4) 8 and 1

Ans. (4)

Sol. (A) n = 5

l = 0 m_l = 0

l = 1 m_l = -1, 0, 1 \Rightarrow 2 electrons

l = 2 m_l = -2, -1, 0, 1, 2, 3 \Rightarrow 2 electrons

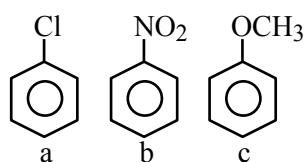
l = 3 m_l = -3, -2, -1, 0, 1, 2, 3, 4 \Rightarrow 2 electrons

l = 4 m_l = -4, -3, -2, -1, 0, 1, 2, 3, 4 \Rightarrow 2 electrons

Total number of electrons = 8

(B) n = 3, l = 2, m_l = -1, m_s = + $\frac{1}{2}$ \Rightarrow only 1 electron is possible

62. Consider the following compounds



Arrange these compounds in the increasing order of reactivity with nitrating mixture.

(1) c < a < b (2) b < c < a
(3) c < b < a (4) b < a < c

Ans. (4)

Sol. In Ph—OMe, —OMe is a electron donor group (+M).

Ph—NO₂, —NO₂ is a strong withdrawing group (—M).

Ph—Cl, —Cl is a electron withdrawing group.

63. The statements that are **incorrect** about the nickel (II) complex of dimethylglyoxime are :

A. It is red in colour

B. It has a high solubility in water at pH = 9

C. The Ni ion has two unpaired d-electrons

D. The N—Ni—N bond angle is almost close to 90°

E. The complex contains four five-membered metallacycles (metal containing rings)

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

(1) C and E only

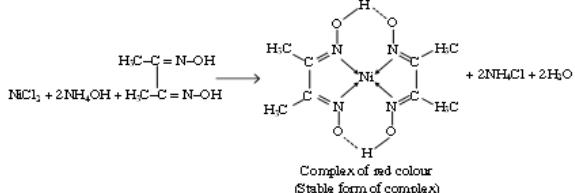
(2) A, D and B only

(3) B, C and E only

(4) C and D only

Ans. (3)

Sol.



In the above complex, Ni is present in +2 oxidation number.

A) It is rosy red ppt

B) It is precipitated in basic medium

C) Ni⁺² : 3d⁸

Hybridisation : dsp²

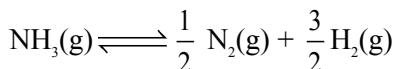
Unpaired e⁻ = 0

Geometry : Square planar

D) N—Ni—N Bond angle is close to 90°

E) 2 five membered metal containing rings are formed.

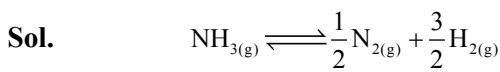
72. For the following gas phase equilibrium reaction at constant temperature,



If the total pressure is $\sqrt{3}$ atm and the pressure equilibrium constant (K_p) is 9 atm, then the degree of dissociation is given as $(x \times 10^{-2})^{-1/2}$.

The value of x is _____ (Nearest integer)

Ans. (125)



$t = 0$	1 mole	—	—
$t = t_{\text{eq}}$	$1 - \alpha$	$\alpha/2$	$3\alpha/2$

$$k_p = \frac{\left(\frac{\alpha}{2}\right)^{1/2} \left(\frac{3\alpha}{2}\right)^{3/2}}{(1 - \alpha)} \left[\frac{P_T}{1 + \alpha} \right]^1 \quad \left[\because P_T = \sqrt{3} \text{ atm} \right]$$

$$9 = \frac{\left(\frac{\alpha}{2}\right)^{1/2} \left(\frac{3\alpha}{2}\right)^{3/2}}{(1 - \alpha)} \times \frac{(3)^{1/2}}{1 + \alpha}$$

$$9 = \frac{9 \left(\frac{\alpha}{2}\right)^2}{1 - \alpha^2}$$

$$1 - \alpha^2 = \frac{\alpha^2}{4}$$

$$\frac{5\alpha^2}{4} = 1$$

$$\alpha^2 = 0.8$$

$$\alpha = (0.8)^{1/2}$$

$$\alpha = \left[\frac{1}{0.8} \right]^{-1/2}$$

$$\alpha = [125 \times 10^{-2}]^{-1/2}$$

$$x = 125.$$

73. x mg of pure HCl was used to make an aqueous solution. 25.0 mL of 0.1M $\text{Ba}(\text{OH})_2$ solution is used when the HCl solution was titrated against it. The numerical value of x is _____ $\times 10^{-1}$. (Nearest integer)

Given : Molar mass of HCl and $\text{Ba}(\text{OH})_2$ are 36.5 and 171.0 g mol^{-1} respectively.

Ans. (1825)



2.5 mmole 5mmole

wt of HCl = 5×36.5 (milligram)

= 182.5 (milligram)

Hence x = 1825.

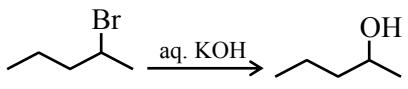


74. Consider all the structural isomers with molecular formula $\text{C}_5\text{H}_{11}\text{Br}$ are separately treated with KOH (aq) to give respective substitution products, without any rearrangement. The number of products which can exhibit optical isomerism from these is _____.

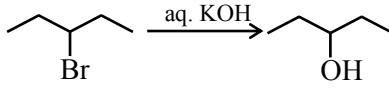
Ans. Allen Ans. (3 or 6)

NTA Ans. (3)

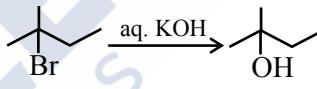
Sol. $\text{C}_5\text{H}_{11}\text{Br}$



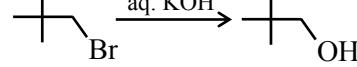
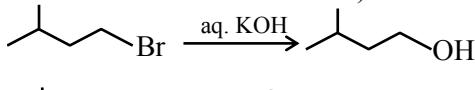
Show optical isomer



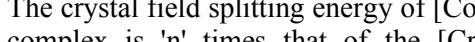
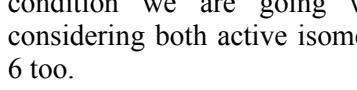
(Show optical isomer)



(Show optical isomer)



(Show optical isomer)



(Show optical isomer)

As per the language given and considering the condition we are going with answer 3 and considering both active isomers we will be giving 6 too.

75. The crystal field splitting energy of $[\text{Co}(\text{oxalate})_3]^{3-}$ complex is 'n' times that of the $[\text{Cr}(\text{oxalate})_3]^{3-}$ complex. Here 'n' is _____. [Assume $\Delta_0 \gg P$]

Ans. (2)

Sol. Pairing energy neglected w.r.t. Δ_0
 $[\text{Co}(\text{ox})_3]^{3-} : \text{Co}^{+3} : \text{d}^6 ; \text{t}_2\text{g}^{2,2,2} \text{eg}^{0,0}$

$$\text{CFSE} = 6 \times (-0.4\Delta_0) = -2.4\Delta_0$$

$[\text{Cr}(\text{ox})_3]^{3-} : \text{Cr}^{+3} : \text{d}^3 ; \text{t}_2\text{g}^{1,1,1} \text{eg}^{0,0}$

$$\text{CFSE} = 3 \times (-0.4\Delta_0) = -1.2\Delta_0$$

$$\frac{(\text{CFSE})_{\text{Co}^{+3}}}{(\text{CFSE})_{\text{Cr}^{+3}}} = 2$$