

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

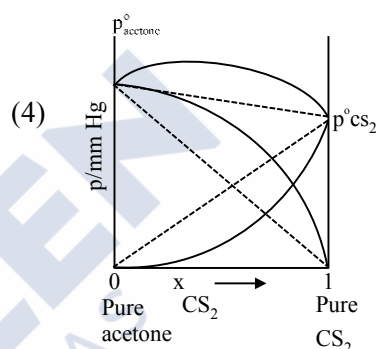
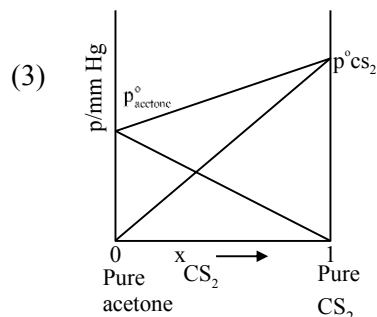
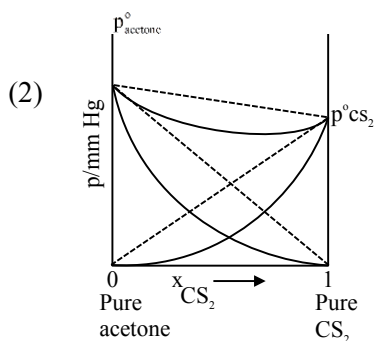
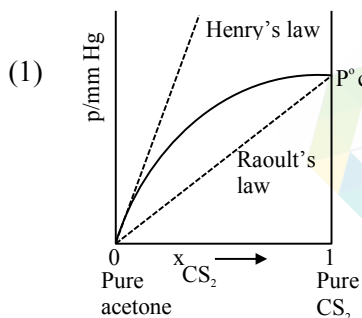
Ans. (4)

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 $\text{CH}_3\text{C}(=\text{O})\text{CH}_3$ show positive

deviation

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

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

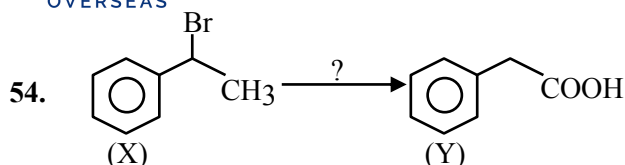
Ans. (1)

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)

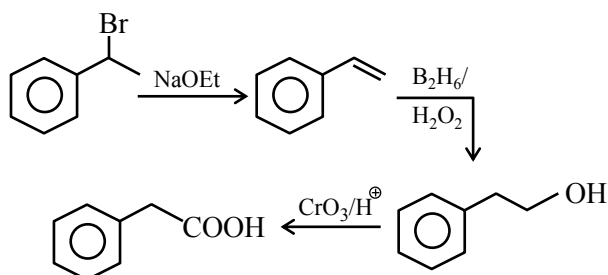


The correct sequence of reagents for the above conversion of X to Y is :

- (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.



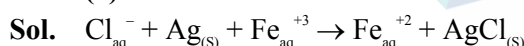
55. In the given electrochemical cell, $\text{Ag(s)}|\text{AgCl(s)}|\text{FeCl}_2(\text{aq}), \text{FeCl}_3(\text{aq})|\text{Pt(s)}$ at 298 K, the cell potential (E_{cell}) will increase when :

- (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
- (E) 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)

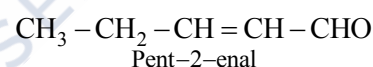
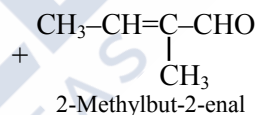
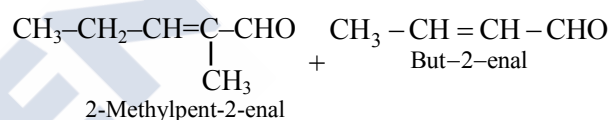
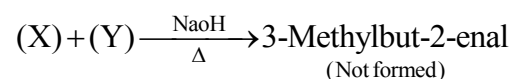
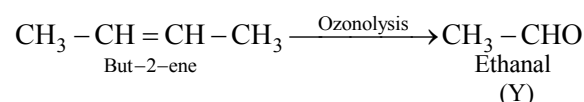
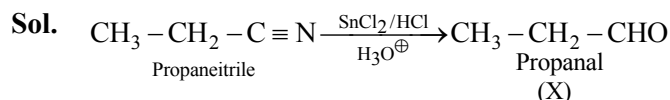


$$E_{\text{cell}} = E^\circ_{\text{cell}} - \frac{0.059}{1} \log \frac{[\text{Fe}^{2+}]}{[\text{Cl}^-][\text{Fe}^{3+}]}$$

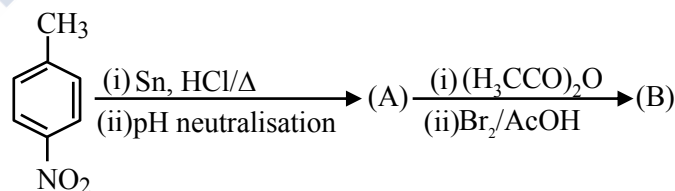
56. 'x' is the product which is obtained from propanenitrile and stannous chloride in the presence of hydrochloric acid followed by hydrolysis. 'y' is the product which is obtained from the but-2-ene by the ozonolysis followed by hydrolysis. From the following, which product is not obtained when one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



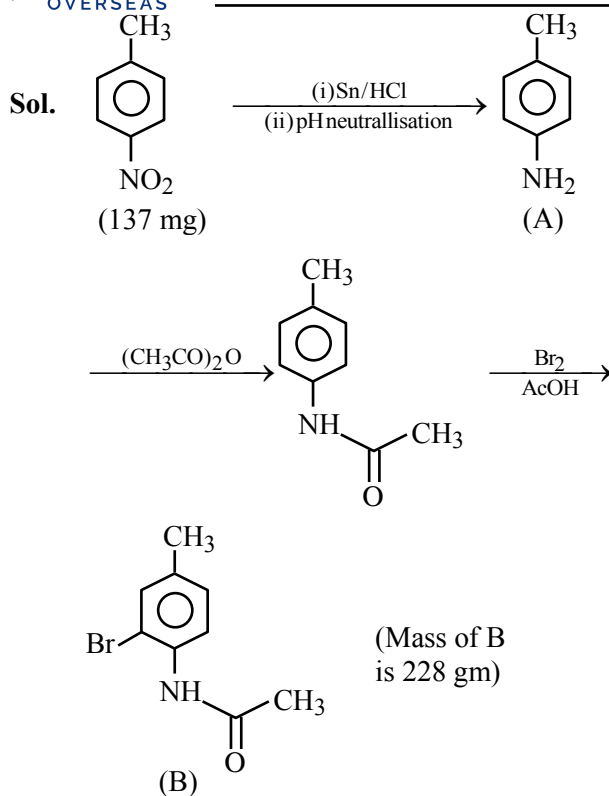
4-Nitrotoluene

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)



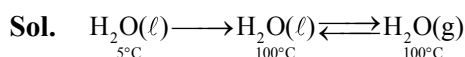
$$\text{Mole} = \frac{137 \times 10^{-3}}{137} = 0.001 \text{ mole}$$

$$\text{Mole of product} = 0.001 \text{ mole}$$

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

- 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** ?
- (1) $q = +ve$, $w = 0$, $\Delta U = -ve$
 - (2) $q = +ve$, $w = -ve$, $\Delta U = +ve$
 - (3) $q = -ve$, $w = -ve$, $\Delta U = -ve$
 - (4) $q = +ve$, $w = -ve$, $\Delta U = -ve$

Ans. (2)



due to expansion

$w = -ve$

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

- 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 :

- (1) Both **Statement I** and **Statement II** are false
- (2) **Statement I** is true but **Statement II** is false
- (3) **Statement I** is false but **Statement II** is true
- (4) Both **Statement I** and **Statement II** are true

Ans. (2)

Sol. Statement 1 (True)

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

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

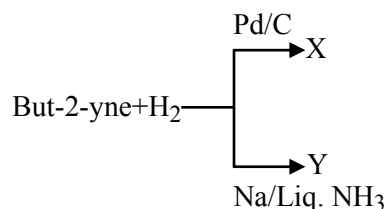
$$E_{\text{absorbed}} : [\text{CoCl}_4]^{2-} > [\text{CoBr}_4]^{2-}$$

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.

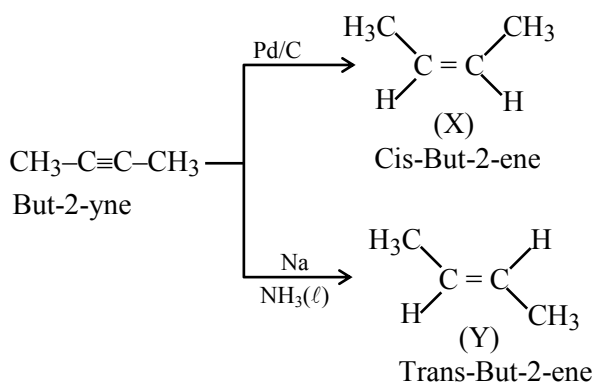
- A. X and Y are stereoisomers.
- B. Dipole moment of X is zero
- C. Boiling point of X is higher than Y.
- D. X and Y react with $\text{O}_3/\text{Zn} + \text{H}_2\text{O}$ to give different products.

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

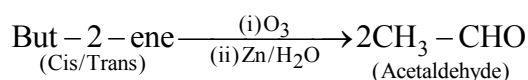
- (1) B and C only
- (2) B and D only
- (3) A and B only
- (4) A and C only

Ans. (2)

Sol.



Dipole moment $\times \neq 0$



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) $n = 5$

$l = 0 \quad m_l = 0$

$l = 1 \quad m_l = -1, 0, 1 \Rightarrow 2 \text{ electrons}$

$l = 2 \quad m_l = -2, -1, 0, 1, 2 \Rightarrow 2 \text{ electrons}$

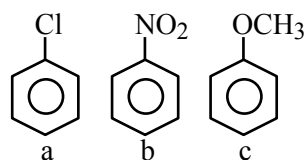
$l = 3 \quad m_l = -3, -2, -1, 0, 1, 2, 3 \Rightarrow 2 \text{ electrons}$

$l = 4 \quad m_l = -4, -3, -2, -1, 0, 1, 2, 3, 4 \Rightarrow 2 \text{ electrons}$

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 an electron donor group (+M).

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

Ph-Cl, -Cl is an electron withdrawing group.

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

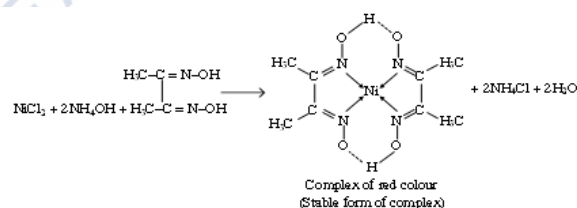
- A. It is red in colour
 B. It has a high solubility in water at pH = 9
 C. The Ni ion has two unpaired d-electrons
 D. The N-Ni-N bond angle is almost close to 90°
 E. The complex contains four five-membered metallacycles (metal containing rings)

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)

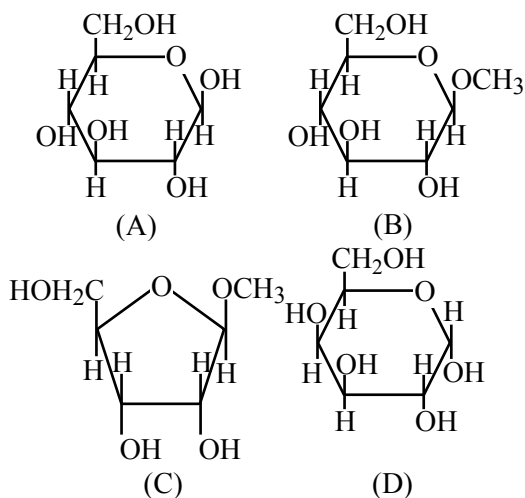
Sol.



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) $\text{Ni}^{+2} : 3d^8$
 Hybridisation : dsp^2
 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.

64. From the given following (A to D) cyclic structures, those which will not react with Tollen's reagent are :



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

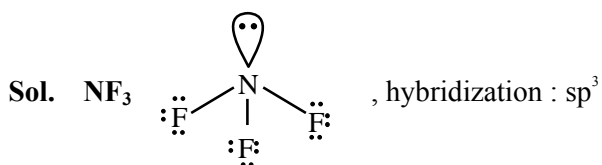
Ans. (4)

Sol. Compound in option (B) and (C) are acetals (i.e. not having anomeric -OH). Hence they do not give Tollen's test.

65. Identify the molecule(X) with maximum number of lone pairs of electrons (obtained using Lewis dot structure) among HNO_3 , H_2SO_4 , NF_3 and O_3 . Choose the **correct** bond angle made by the central atom of the molecule (X).

- (1) 120° (2) 107°
(3) 102° (4) 116°

Ans. (3)



Number of lone pair in $\text{NF}_3 = 10$

Bond angle in $\text{NF}_3 \approx 102^\circ$

66. Match List-I with List-II.

List-I	List-II
Functional group (detection)	Change observed during detection
(A) Unsaturation (Baeyer's test)	(I) Red colour Appears
(B) Alcoholic group (Ceric ammonium nitrate test)	(II) Silver mirror appears
(C) Aldehyde group (Tollen's reagent)	(III) Violet colour appears
(D) Phenolic group (FeCl_3 test)	(IV) Discharge of pink colour

Choose the correct answer from the options given below :

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

Ans. (3)

Sol. (A) – IV, (B)-I, (C)-II, (D)-III

67. Given below are two statements :

Statement-I : Sublimation is used for the separation and purification of compounds with low melting point.

Statement-II : The boiling point of a liquid increases as the external pressure is reduced.

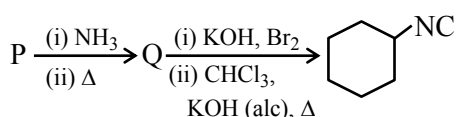
In the light of the above statements, choose the **correct** answer from the options given below :

- (1) Statement-I is false but Statement-II is true.
(2) Statement-I is true but Statement-II is false.
(3) Both Statement-I and Statement-II are true.
(4) Both Statement-I and Statement-II are false.

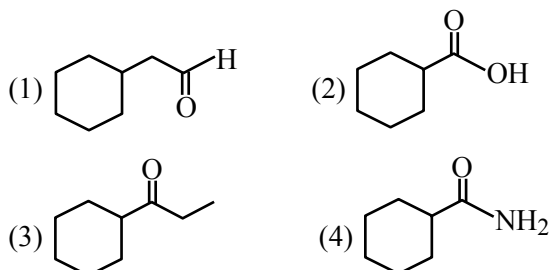
Ans. (4)

Sol. Theory based

68. Compound 'P' undergoes the following sequence of reactions :

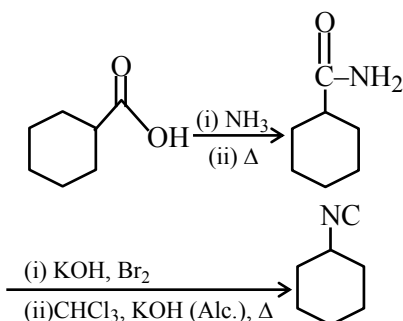


'P' is :



Ans. (2)

Sol.



69. The correct statements from the following are :

- (A) Ionic radii of trivalent cations of group 13 elements decreases down the group.
(B) Electronegativity of group 13 elements decreases down the group.
(C) Among the group 13 elements, Boron has highest first ionisation enthalpy.
(D) The trichloride and triiodide of group 13 elements are covalent in nature.

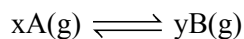
Choose the **correct** answer from the options given below :

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

Ans. (3)

- Sol. (A) $B^{+3} < Al^{+3} < Ga^{+3} < In^{+3} < Tl^{+3}$: ionic size
(B) $B > Tl > In > Ga > Al$: EN
(C) $B > Tl > Ga > Al > In$: IE
(D) Trichlorides and triiodides of group 13th elements are covalent in nature

70. Consider the general reaction given below at 400 K



The values of K_p and K_c are studied under the same condition of temperature but variation in x and y.

(i) $K_p = 85.87$ and $K_c = 2.586$ appropriate units

(ii) $K_p = 0.862$ and $K_c = 28.62$ appropriate units

The value of x and y in (i) and (ii) respectively are:

(1) (i) 3, 1 ; (ii) 3, 1

(2) (i) 4, 1 ; (ii) 4, 1

(3) (i) 1, 3 ; (ii) 2, 1

(4) (i) 1, 2 ; (ii) 2, 1

Ans. (4)

Sol. For reaction (i) : $K_p > K_c$

$$\Delta n_g > 0$$

$$y - x > 0.$$

$$85.87 = 2.586 (0.0821 \times 400)^{y-x}$$

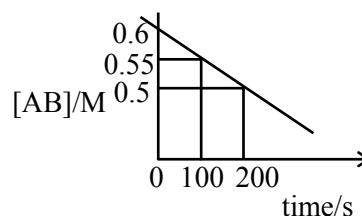
$$\text{Solving } y - x \approx 1$$

For reaction (ii) : $K_p < K_c$

$$y - x < 0.$$

SECTION-B

71. For the thermal decomposition of reaction AB(g) , the following is constructed.



The half life of the reaction is 'x' min.

x = _____ min. (Nearest integer)

Ans. (10)

Sol. $[\text{AB}]_0 - [\text{AB}]_t = kt$

$$0.60 - 0.55 = k(100)$$

$$k = 5 \times 10^{-4}$$

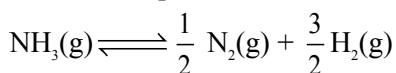
$$\text{Half life } (t_{1/2}) = \frac{[\text{AB}]_0}{2k}$$

$$= \frac{0.60}{2 \times 5 \times 10^{-4}}$$

$$= 600 \text{ sec}$$

$$= 10 \text{ min}$$

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

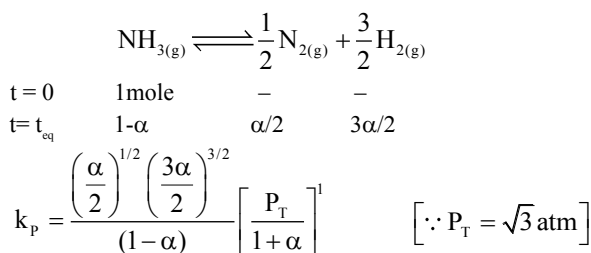


If the total pressure is $\sqrt{3}$ atm and the pressure equilibrium constant (K_p) is 9 atm, then the degree of dissociation is given as $(x \times 10^{-2})^{-1/2}$.

The value of x is _____ (Nearest integer)

Ans. (125)

Sol.



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

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

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

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

$$\alpha^2 = 0.8$$

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

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

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

$$x = 125.$$

73. x mg of pure HCl was used to make an aqueous solution. 25.0 mL of 0.1M Ba(OH)₂ solution is used when the HCl solution was titrated against it. The numerical value of x is _____ × 10⁻¹. (Nearest integer)

Given : Molar mass of HCl and Ba(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)

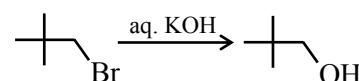
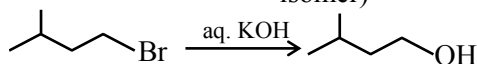
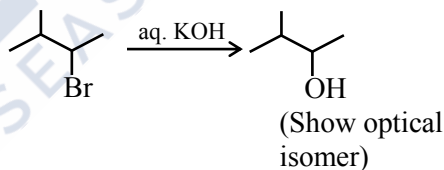
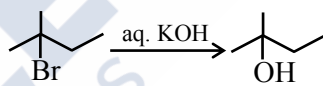
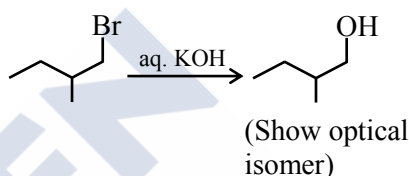
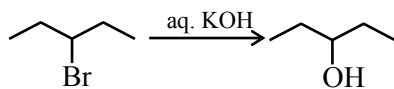
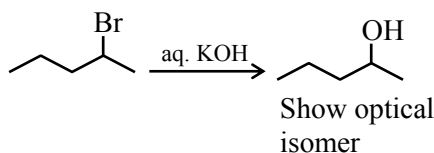
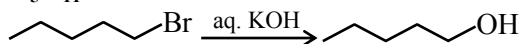
Hence x = 1825.

74. Consider all the structural isomers with molecular formula C₅H₁₁Br 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. C₅H₁₁Br



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 [Co(oxalate)₃]³⁻ complex is 'n' times that of the [Cr(oxalate)₃]³⁻ complex. Here 'n' is _____. [Assume Δ₀ >> P]

Ans. (2)

Sol. Pairing energy neglected w.r.t. Δ₀
[Co(ox)₃]³⁻ : Co⁺³ : d⁶ ; t_{2g}^{2,2,2} e_g^{0,0}

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

[Cr(ox)₃]³⁻ : Cr⁺³ : d³ ; t_{2g}^{1,1,1} e_g^{0,0}

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

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