JEE Main January 2025

Question Paper With Text Solution

23 January | Shift-1

CHEMISTRY

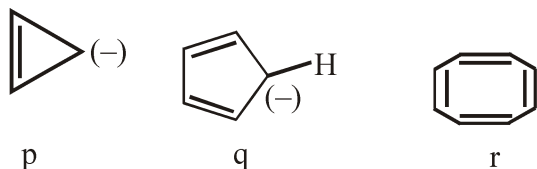# JEE MAIN JANUARY 2025 | 23TH JANUARY SHIFT-1

SECTION – A

Question ID : 7364751039

51. The correct stability order of the following species/molecules is:
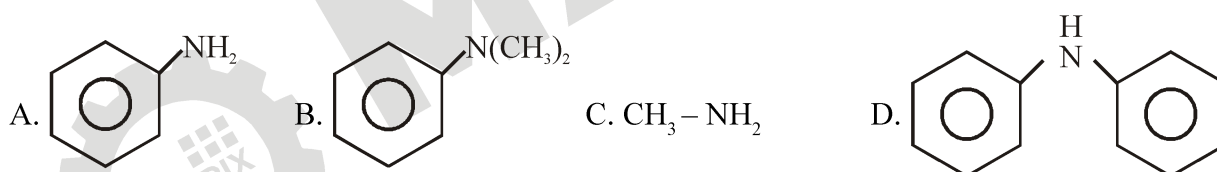

p   q   r

(1) q > p > r   (2) q > r > p   (3) r > q > p   (4) p > q > r

Ans.   Official answer NTA (2)

Sol.

Question ID : 7364751043

52. Which among the following react with Hinsberg's reagent?

Choose the correct answer from the options given below:

C. $CH_3 - NH_2$

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

Ans.   Official answer NTA (3)

Sol.

Question ID : 7364751028

53. Match the LIST-I with LIST-II

LIST-I

(Classification of molecules based on octet rule)

A. Molecules obeying octet rule

B. Molecules with incomplete octet

C. Molecules with incomplete octet with odd electron

D. Molecules with expanded octet

LIST-II

(Example)

I. NO, NO_2

II. BCl_3 $AlCl_3$

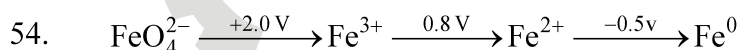III. H_2SO_4, PCl_5

IV. CCl_4, CO_2

Choose the correct answer from the options given below:

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

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

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

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

Ans. Official answer NTA (3)

Sol.

Question ID : 7364751032

54. $FeO_4^{2-} \xrightarrow{+2.0\,V} Fe^{3+} \xrightarrow{0.8\,V} Fe^{2+} \xrightarrow{-0.5v} Fe^0$

In the above diagram, the standard electrode potentials are given in volts (over the arrow).

The value of $E_{FeO_4^{2-}/Fe^{2+}}$ is

(1) 1.7 V   (2) 1.2 V   (3) 1.4 V   (4) 2.1 V

Ans. Official answer NTA (1)

Sol.

Question ID : 7364751040

55. Match the LIST-I with LIST-II

LIST-I	**LIST-II**
Name reaction	**Product obtainable**
A. Swarts reaction	I. Ethyl benzene
B. Sandmeyer's reaction	II. Ethyl iodide
C. Wurtz Fittig reaction	III. Cyanobenzene
D. Finkelstein reaction	IV. Ethyl fluoride

Choose the correct answer from the options given below:

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

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

Ans. Official answer NTA (4)

Sol.

Question ID : 7364751033

56. The element that does not belong to the same period of the remaining elements (modern periodic table) is:

(1) Iridium   (2) Osmium   (3) Platinum   (4) Palladium

Ans. Official answer NTA (4)

Sol.

Question ID : 7364751038

57. Propane molecule on chlorination under photochemical condition gives two di-chloro products, " x " and "y". Amongst "x " and "y ", " x " is an optically active molecule. How many tri-chloro products (consider only structural isomers) will be obtained from "x " when it is further treated with chlorine under the photochemical condition?

(1) 2   (2) 4   (3) 5   (4) 3

Ans. Official answer NTA (4)

Sol.

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Question ID : 7364751044

58. Given below are two statements

Statement I: Fructose does not contain an aldehydic group but still reduces Tollen's reagent

Statement II: In the presence of base, fructose undergoes rearrangement to give glucose.

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 is true

(3) Both Statement I and Statement II are false

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

Ans. Official answer NTA (1)

Sol.

Question ID : 7364751030

59. $CrCl_3 \cdot xNH_3$ can exist as a complex. 0.1 molal aqueous solution of this complex shows a depression in freezing point of 0.558 °C. Assuming 100 % ionisation of this complex and coordination number of Cr is 6 , the complex will be (Given $K_f = 1.86$ K kg mol^{-1})

(1) $\left[Cr(NH_3)_6 \right] Cl_3$

(2) $\left[Cr(NH_3)_4 Cl_2 \right] Cl$

(3) $\left[Cr(NH_3)_3 Cl_3 \right]$

(4) $\left[Cr(NH_3)_5 Cl \right] Cl_2$

Ans. Official answer NTA (4)

Sol.

Question ID : 7364751026

60. 2.8×10^{-3} mol of CO_2 is left after removing 10^{21} molecules from its 'x' mg sample. The mass of CO_2 taken initially is

Given: $N_A = 6.02 \times 10^{23} \, mol^{-1}$

(1) 98.3 mg   (2) 48.2 mg   (3) 196.2 mg   (4) 150.4 mg

Ans. Official answer NTA (3)

Question ID : 7364751027

61. Heat treatment of muscular pain involves radiation of wavelength of about 900 nm. Which spectral line of H atom is suitable for this?

Given : Rydberg constant $R_H = 10^5 \, cm^{-1}, h = 6.6 \times 10^{-34} \, Js, c = 3 \times 10^8 \, m/s$)

(1) Lyman series, $\infty \rightarrow 1$

(2) Paschen series, $5 \rightarrow 3$

(3) Balmer series, $\infty \rightarrow 2$

(4) Paschen series, $\infty \rightarrow 3$

Ans. Official answer NTA (4)

Sol.

Question ID : 7364751041

62. What amount of bromine will be required to convert 2 g of phenol into 2,4,6-tribromophenol? (Given molar mass in $g \, mol^{-1}$ of C, H, O, Br are 12,1,16,80 respectively)

(1) 20.44 g

(2) 6.0 g

(3) 10.22 g

(4) 4.0 g

Ans. Official answer NTA (3)

Sol.

Question ID : 7364751031

63. Which of the following happens when NH_4OH is added gradually to the solution containing 1 M A^{2+} and 1 M B^{3+} ions? Given : $K_{sp}\left[A(OH)_2\right] = 9 \times 10^{-10}$ and $K_{sp}\left[B(OH)_3\right] = 27 \times 10^{-18}$ at 298 K.

   (1) $B(OH)_3$ will precipitate before $A(OH)_2$

   (2) $A(OH)_2$ and $B(OH)_3$ will precipitate together

   (3) $A(OH)_2$ will precipitate before $B(OH)_3$

   (4) Both $A(OH)_2$ and $B(OH)_3$ do not show precipitation with NH_4OH

Ans. Official answer NTA (1)

Sol.

Question ID : 7364751034

64. The incorrect statement among the following is

   (1) SO_2 can act as an oxidizing agent, but not as a reducing agent.

   (2) PF_3 exists but NF_5 does not.

   (3) NO_2 can dimerise easily.

   (4) PH_3 shows lower proton affinity than NH_3.

Ans. Official answer NTA (1)

Sol.

Question ID : 7364751035

65. The correct set of ions (aqueous solution) with same colour from the following is:

   (1) Zn^{2+}, V^{3+}, Fe^{3+} (2) Ti^{4+}, V^{4+}, Mn^{2+}

   (3) $Sc^{3+}, Ti^{3+}, Cr^{2+}$ (4) V^{2+}, Cr^{3+}, Mn^{3+}

Ans. Official answer NTA (4)

Sol.

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66. The complex that shows Facial - Meridional isomerism is:

(1) $\left[Co\left(NH_3\right)_4 Cl_2 \right]^+$ (2) $\left[Co\left(NH_3\right)_3 Cl_3 \right]$

(3) $\left[Co(en)_3 \right]^{3+}$ (4) $\left[Co(en)_2 Cl_2 \right]^+$

Ans. Official answer NTA (2)

Sol.

Question ID : 7364751029

67. Ice at –5 °C is heated to become vapor with temperature of 110 °C at atmospheric pressure. The entropy change associated with this process can be obtained from

(1) $\int_{268\,K}^{383\,K} C_p dT + \dfrac{\Delta H_{melting}}{273} + \dfrac{\Delta H_{boiling}}{373}$

(2) $\int_{268\,K}^{383\,K} C_p dT + \dfrac{qrev}{T}$

(3) $\int_{268\,K}^{273\,K} \dfrac{C_{p,m}}{T} dT + \dfrac{\Delta H_m,\ fusion}{T_f} + \dfrac{\Delta H_{m,\ vaporisation}}{T_b} + \int_{273\,K}^{373\,K} \dfrac{C_{p,m} dT}{T} + \int_{373\,K}^{383\,K} \dfrac{C_{p,m} dT}{T}$

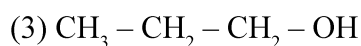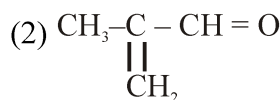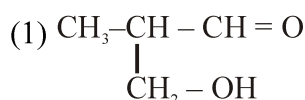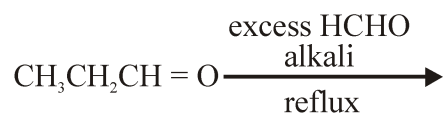(4) $\int_{268\,K}^{273\,K} C_{p,m} dT + \dfrac{\Delta H_m,\ fusion}{T_f} + \dfrac{\Delta H_{m,\ vaporisation}^{T_b}}{T_b} + \int_{273\,K}^{373\,K} C_{p,m} dT + \int_{373\,K}^{383\,K} C_{p,m} dT$

Ans. Official answer NTA (3)

Sol.

Question ID : 7364751042

68. The major product of the following reaction is:

$$CH_3CH_2CH = O \xrightarrow[\text{reflux}]{\substack{\text{excess HCHO} \\ \text{alkali}}}$$

(1) $CH_3 – \underset{\underset{CH_2 - OH}{|}}{CH} – CH = O$ (2) $CH_3 – \underset{\underset{CH_2}{||}}{C} – CH = O$

(3) $CH_3 – CH_2 – CH_2 – OH$ (4) $CH_3 – \underset{\underset{CH_2 - OH}{\diagdown}}{\overset{\overset{CH_2 - OH}{\diagup}}{C}} – CH_2 – OH$

Ans. Official answer NTA (4)

Sol.
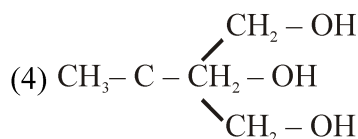
Question ID : 7364751045

69.   Given below are two statements:

Statement I: In Lassaigne's test, the covalent organic molecules are transformed into ionic compounds.

Statement II: The sodium fusion extract of an organic compound having N and S gives prussian blue colour with $FeSO_4$ and $Na_4\left[Fe(CN)_6\right]$.

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.   Official answer NTA (2)

Sol.

Question ID : 7364751036

70.   The d-electronic configuration of an octahedral Co (II) complex having magnetic moment of 3.95 BM is:
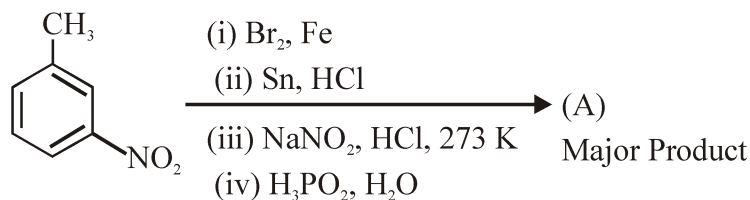
(1) $t_{2g}{}^5 e_g^2$ (2) $t_{2g}{}^6 e_g{}^1$ (3) $e^4 t_2^3$ (4) $t_{2g}{}^3 e_g^0$

Ans.   Official answer NTA (1)

Sol.

SECTION – B

Question ID : 7364751049

71.   Consider the following sequence of reactions to produce major product (A)

Molar mass of product (A) is _____ g mol⁻¹.

(Given molar mass in g mol⁻¹ of C: 12, H: 1, O: 16, Br: 80, N: 14, P: 31)

Ans.   Official answer NTA (171)

Sol.

Question ID : 7364751048

72.   For the thermal decomposition of N_2O_5 (g) at constant volume, the following table can be formed, for the reaction mentioned below.

$$2\,N_2O_5(g) \rightarrow 2\,N_2O_4(g) + O_2(g)$$

Sr. No.	Time/s	Total pressure/(atm)
1	0	0.6
2	100	'x

x = _____ × 10⁻³ atm [nearest integer]

Given : Rate constant for the reaction is $4.606 \times 10^{-2}\,s^{-1}$.

Ans.   Official answer NTA (897)

Answer by Matrix is (900)

Sol.

Question ID : 7364751047

73. If 1 mM solution of ethylamine produces pH = 9, then the ionization constant (K_b) of ethylamine is 10^{-x}. The value of x is _____ (nearest integer).

[The degree of ionization of ethylamine can be neglected with respect to unity.]

Ans. Official answer NTA (7)

Sol.

Question ID : 7364751046

74. The standard enthalpy and standard entropy of decomposition of N_2O_4 to NO_2 are $55.0 \, kJ \, mol^{-1}$ and $175.0 \, J / K / mol$ respectively. The standard free energy change for this reaction at 25 °C in J mol⁻¹ is _____ (Nearest integer)

Ans. Official answer NTA (2850)

Sol.

Question ID : 7364751050

75. During " S " estimation, 160 mg of an organic compound gives 466 mg of barium sulphate. The percentage of Sulphur in the given compound is _____ %.

(Given molar mass in g mol⁻¹ of $Ba : 137, S : 32, O : 16$)

Ans. Official answer NTA (40)

Sol.