JEE Main January 2025

Question Paper With Text Solution

28 January | Shift-1

CHEMISTRY

MATRIX

JEE Main & Advanced | XI-XII Foundation| VI-X Pre-Foundation

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JEE MAIN JANUARY 2025 | 28TH JANUARY SHIFT-1

SECTION – A

Question ID : 7364751567

51. Both acetaldehyde and acetone (individually) undergo which of the following reactions?

A. Iodoform Reaction

B. Cannizaro Reaction

C. Aldol Condensation

D. Tollen's Test

E. Clemmensen Reduction

Choose the correct answer from the options given below:

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

Ans. Official answer NTA (2)

Sol.

Question ID : 7364751553

52. What is the freezing point depression constant of a solvent, 50 g of which contain 1 g non volatile solute (molar mass $256\,g\,mol^{-1}$) and the decrease in freezing point is 0.40 K

(1) 5.12 K kg mol^{-1} (2) 4.43 K kg mol^{-1} (3) 1.86 K kg mol^{-1} (4) 3.72 K kg mol^{-1}

Ans. Official answer NTA (1)

Sol.

Question ID : 7364751556

53. Match the LIST-I with LIST-II

LIST-I (Redox Reaction)		LIST-II (Type of Redox Reaction)	
A.	$CH_{4(g)} + 2O_{2(g)} \xrightarrow{\Delta} CO_{2(g)} + 2H_2O_{(l)}$	I.	Disproportionation reaction
B.	$2NaH_{(s)} \xrightarrow{\Delta} 2Na_{(s)} + H_{2(g)}$	II.	Combination reaction
C.	$V_2O_{5(s)} + 5Ca_{(s)} \xrightarrow{\Delta} 2V_{(s)} + 5CaO_{(s)}$	III.	Decomposition reaction
D.	$2H_2O_{2(aq)} \xrightarrow{\Delta} 2H_2O_{(l)} + O_{2(g)}$	IV.	Displacement reaction

Choose the correct answer from the options given below:

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

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

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

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

Ans. Official answer NTA (4)

Sol.

Question ID : 7364751561

54. Consider 'n' is the number of lone pair of electrons present in the equatorial position of the most stable structure of ClF_3. The ions from the following with 'n' number of unpaired electrons are

A. V^{3+}

B. Ti^{3+}

C. Cu^{2+}

D. Ni^{2+}

E. Ti^{2+}

Choose the correct answer from the options given below:

(1) B and C Only

(2) A and C Only

(3) A, D and E Only

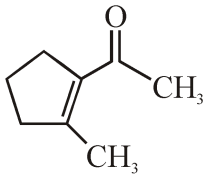
(4) B and D Only

Ans. Official answer NTA (3)

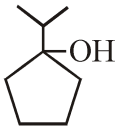
Sol.

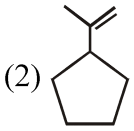
Question ID :

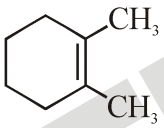
55. A molecule ("P") on treatment with acid undergoes rearrangement and gives ("Q"). ("Q") on ozonolysis followed by reflux under alkaline condition gives ("R"). The structure of ("R") is given below.

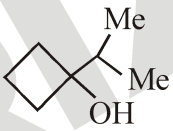


The structure of ("P") is

(1) 

(2) 

(3) 

(4) 

Ans. Official answer NTA (1)

Answer by Matrix is (1 & 2)

Sol.

Question ID :

56.

$[A]_0 / mol\,L^{-1}$	$t_{1/2}$ / min
0.100	200
0.025	100

For a given reaction $R \rightarrow P$, $t_{1/2}$ is related to $[A]_0$ as given in table.

Given: $\log 2 = 0.30$

Which of the following is true?

A. The order of the reaction is $1/2$.

B. If $[A]_0$ is 1 M, then $t_{1/2}$ is $200\sqrt{10}$ min

C. The order of the reaction changes to 1 if the concentration of reactant changes from 0.100 M to 0.500 M.

D. $t_{1/2}$ is 800 min for $[A]_0 = 1.6M$

Choose the correct answer from the options given below:

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

Ans. Official answer NTA (2)

Sol.

Question ID : 7364751554

57. Ice and water are placed in a closed container at a pressure of 1 atm and temperature 273.15 K . If pressure of the system is increased 2 times, keeping temperature constant, then identify correct observation from following

(1) The solid phase (ice) disappears completely.

(2) Volume of system increases .

(3) Liquid phase disappears completely.

(4) The amount of ice decreases.

Ans. Official answer NTA (1)

Sol.

Question ID : 7364751555

58. A weak acid HA has degree of dissociation x . Which option gives the correct expression of $(pH - pK_a)$?

(1) $\log\left(\frac{x}{1-x}\right)$ (2) $\log(1+2x)$ (3) $\log\left(\frac{1-x}{x}\right)$ (4) 0

Ans. Official answer NTA (1)

Sol.

Question ID : 7364751570

59. Given below are two statements:

Statement I: In the oxalic acid vs $KMnO_4$ (in the presence of dil H_2SO_4) titration the solution needs to be heated initially to $60^\circ C$, but no heating is required in Ferrous ammonium sulphate (FAS) vs $KMnO_4$ titration (in the presence of dil H_2SO_4)

Statement II: In oxalic acid vs $KMnO_4$ titration, the initial formation of $MnSO_4$ takes place at high temperature, which then acts as catalyst for further reaction. In the case of FAS vs $KMnO_4$, heating oxidizes Fe^{2+} into

Fe^{3+} by oxygen of air and error may be introduced in the experiment.

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 (3)

Sol.

Question ID : 7364751558

60. The incorrect decreasing order of atomic radii is

(1) Si > P > Cl > F

(2) Be > Mg > Al > Si

(3) Mg > Al > C > O

(4) Al > B > N > F

Ans.

Ans. Official answer NTA (2)

Question ID : 7364751551

61. In a multielectron atom, which of the following orbitals described by three quantum numbers will have same energy in absence of electric and magnetic fields?

A. $n = 1, l = 0, m_l = 0$

B. $n = 2, l = 0, m_l = 0$

C. $n = 2, l = 1, m_l = 1$

D. $n = 3, l = 2, m_l = 1$

E. $n = 3, l = 2, m_l = 0$

Choose the correct answer from the options given below:

(1) D and E Only

(2) A and B Only

(3) B and C Only

(4) C and D Only

Ans. Official answer NTA (1)

Sol.

Question ID : 7364751552

62. The molecules having square pyramidal geometry are

(1) SbF_5 & PCl_5 (2) BrF_5 & PCl_5 (3) BrF_5 & $XeOF_4$ (4) SbF_5 & $XeOF_4$

Ans. Official answer NTA (3)

Sol.

Question ID : 7364751559

63. Consider the following elements In, Tl, Al, Pb, Sn and Ge .

The most stable oxidation states of elements with highest and lowest first ionisation enthalpies, respectively, are

(1) +4 and +3
(2) +1 and +4
(3) +4 and +1
(4) +2 and +3

Ans. Official answer NTA (3)
Answer by Matrix is (1)

Sol.

Question ID : 7364751569

64. Given below are two statements:

Statement I : D-glucose pentaacetate reacts with 2, 4-dinitrophenylhydrazine

Statement II : Starch, on heating with concentrated sulfuric acid at $100^{\circ}C$ and 2-3 atmosphere pressure produces glucose.

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

In the light of the above statements, choose the most appropriate answer from the options given below

(1) Both Statement I and Statement II are false

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

(3) Both Statement I and Statement II are true

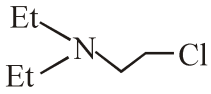
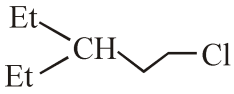
(4) Statement I is true but Statement II is false

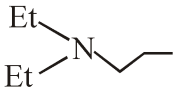
Ans. Official answer NTA (2)

Sol.

Question ID : 7364751563

65. Given below are two statements:

Statement I:  will undergo alkaline hydrolysis at a faster rate than 

Statement II:  , intramolecular substitution takes place first by involving lone pair of electrons on nitrogen.

In the light of the above statements, choose the most appropriate answer from the options given below.

(1) Statement I is correct but Statement II is incorrect
(2) Both Statement I and Statement II are correct
(3) Both Statement I and Statement II are incorrect
(4) Statement I is incorrect but Statement II is correct

Ans. Official answer NTA (2)

Sol.

Question ID : 7364751560

66. Which of the following oxidation reactions are carried out by both $K_2Cr_2O_7$ and $KMnO_4$ in acidic medium?

A. $I^- \rightarrow I_2$

B. $S^{2-} \rightarrow S$

C. $Fe^{2+} \rightarrow Fe^{3+}$

D. $I^- \rightarrow IO_3^-$

E. $S_2O_3^{2-} \rightarrow SO_4^{2-}$

Choose the correct answer from the options given below:

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

Ans. Official answer NTA (3)

Sol.

Question ID : 7364751562

67. The metal ion whose electronic configuration is not affected by the nature of the ligand and which gives a violet colour in non-luminous flame under hot condition in borax bead test is

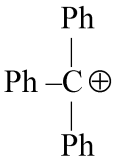
(1) Cr^{3+} (2) Ti^{3+} (3) Mn^{2+} (4) Ni^{2+}

Ans. Official answer NTA (4)

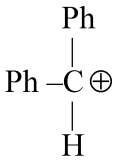
Sol.

Question ID : 7364751564

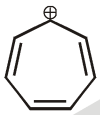
68. The correct order of stability of following carbocations is:



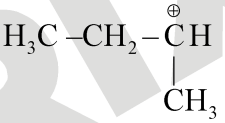
A



B



C



D

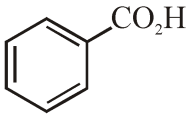
(1) B > C > A > D
(2) A > B > C > D
(3) C > B > A > D
(4) C > A > B > D

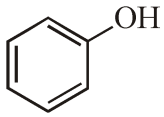
Ans. Official answer NTA (4)

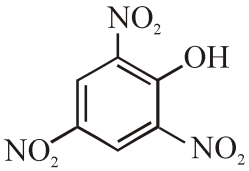
Sol.

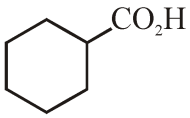
Question ID : 7364751568

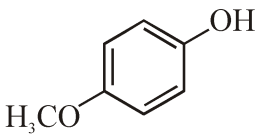
69. The compounds that produce CO_2 with aqueous $NaHCO_3$ solution are:

A. 

B. 

C. 

D. 

E. 

Choose the correct answer from the options given below:

(1) A, B and E Only
(2) A and C Only

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

Ans. Official answer NTA (3)

Sol.

Question ID : 7364751566

70. The products A and B in the following reactions, respectively are

$$A \xleftarrow{Ag-NO_2} CH_3-CH_2-CH_2-Br \xrightarrow{AgCN} B$$

(1) $CH_3-CH_2-CH_2-ONO, CH_3-CH_2-CH_2-CN$

(2) $CH_3-CH_2-CH_2-NO_2, CH_3-CH_2-CH_2-CN$

(3) $CH_3-CH_2-CH_2-NO_2, CH_3-CH_2-CH_2-NC$

(4) $CH_3-CH_2-CH_2-ONO, CH_3-CH_2-CH_2-NC$

Ans. Official answer NTA (3)

Sol.

SECTION – B

Question ID : 7364751571

71. The molarity of a 70% (mass/mass) aqueous solution of a monobasic acid (X) is ____$\times 10^{-1}$ M(Nearest integer)

[Given: Density of aqueous solution of (X) is $1.25\,g\,mL^{-1}$

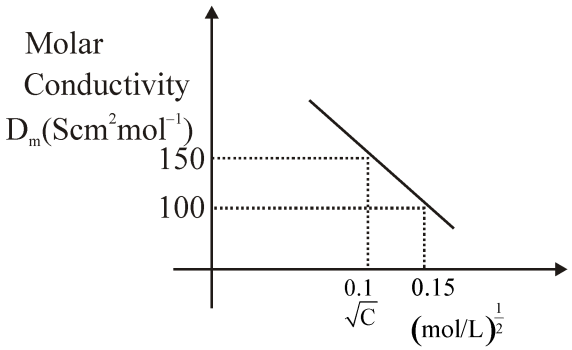
Molar mass of the acid is $70\,g\,mol^{-1}$]

Ans. Official answer NTA (125)

Sol.

Question ID : 7364751573

72. Given below is the plot of the molar conductivity vs $\sqrt{\text{concentration}}$ for KCl in aqueous solution.



If, for the higher concentration of KCl solution, the resistance of the conductivity cell is \$100 \Omega\$, then the resistance of the same cell with the dilute solution is 'x' Ω The value of x is _____ (Nearest integer)

Ans. Official answer NTA (150)

Sol.

Question ID : 7364751572

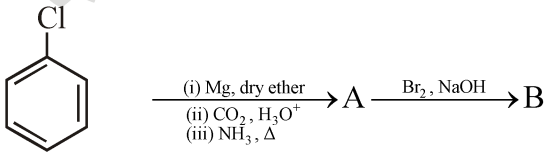
73. The formation enthalpies, $\Delta H_f^{\ominus}$ for $H_{(g)}$ and $O_{(g)}$ are 220.0 and 250.0 kJ mol^{-1}, respectively, at 298.15 K , and $\Delta H_f^{\ominus}$ for $H_2O_{(g)}$ is –242.0 kJ mol^{-1} at the same temperature. The average bond enthalpy of the O –H bond in water at 298.15 K is _____ $kJmol^{-1}$ (nearest integer).

Ans. Official answer NTA (466)

Sol.

Question ID : 7364751575

74. Consider the following sequence of reactions:



Chlorobenzene

11.25 mg of chlorobenzene will produce ---x10^{-1}mg of product B .

(Consider the reactions result in complete conversion.)

[Given molar mass of C, H, O, N and Cl as 12, 1, 16, 14 and 35.5 g mol^{-1} respectively]

Ans. Official answer NTA (93)

Sol.

Question ID : 7364751574

75. Quantitative analysis of an organic compound (X) shows following % composition.

C : 14.5 %

Cl : 64.46%

H: 1.8%

(Empirical formula mass of the compound (X) is _____ 10^{-1}

(Given molar mass in _____ mol^{-1} C : 12, H: 1, O : 16, Cl : 35.5)

Ans. Official answer NTA (1655)

Sol.