JEE Main January 2025

Question Paper With Text Solution

22 January | Shift-2

CHEMISTRY

MATRIX

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

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JEE MAIN JANUARY 2025 | 22TH JANUARY SHIFT-2

SECTION – A

Question ID : 656445283

51. Arrange the following compounds in increasing order of their dipole moment :

HBr, H_2S, NF_3 and $CHCl_3$

(1) $CHCl_3 < NF_3 < HBr < H_2S$

(2) $NF_3 < HBr < H_2S < CHCl_3$

(3) $H_2S < HBr < NF_3 < CHCl_3$

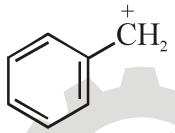
(4) $HBr < H_2S < NF_3 < CHCl_3$

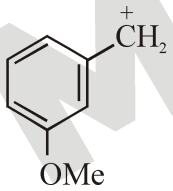
Ans. Official answer NTA (2)

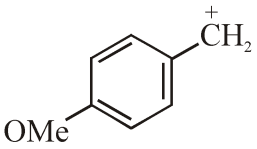
Sol.

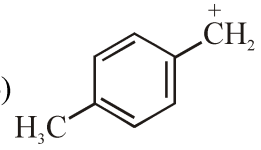
Question ID : 656445290

52. The most stable carbocation from the following is

(1) 

(2) 

(3) 

(4) 

Ans. Official answer NTA (3)

Sol.

Question ID : 656445279

53. Match List - I with List - II.

List - I

(Partial Derivatives)

(A) $\left(\frac{\partial G}{\partial T}\right)_P$ (I) Cp

(B) $\left(\frac{\partial H}{\partial T}\right)_P$ (II) –S

(C) $\left(\frac{\partial G}{\partial P}\right)_T$ (III) Cv

(D) $\left(\frac{\partial U}{\partial T}\right)_V$ (IV) V

Choose the correct answer from the options given below :

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

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

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

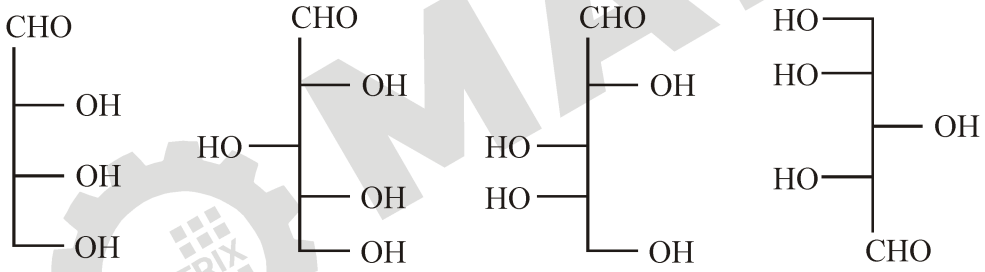
(4) (A)-(II), (B)-(I), (C)-(IV), (D)-(III)

Ans. Official answer NTA (4)

Sol.

Question ID : 656445295

54. Identify the number of structure/s from the following which can be correlated to D-glyceraldehyde.



(A) (B) (C) (D)

(1) three (2) one (3) two (4) four

Ans. Official answer NTA (1)

Sol.

Question ID : 656445288

55. Given below are two statements :

Statement (I): Nitrogen, sulphur, halogen and phosphorus present in an organic compound are detected by Lassaigne's Test.

Statement (II) : The elements present in the compound are converted from covalent form into ionic form by fusing the compound with Magnesium in Lassaigne's test.

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) Both Statement I and Statement II are true

(3) Both Statement I and Statement II are false

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

Ans. Official answer NTA (4)

Sol.

Question ID : 656445276

56. Given below are two statements :

Statement (I) : A spectral line will be observed for a $2p_x \rightarrow 2p_y$ transition.

Statement (II) : $2p_x$ and $2p_y$ are degenerate orbitals.

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 true but Statement II is false

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

(4) Both Statement I and Statement II are false

Ans. Official answer NTA (3)

Sol.

Question ID : 656445277

57. The molar solubility(s) of zirconium phosphate with molecular formula $\left(Zr^{4+}\right)_3\left(PO_4^{3-}\right)_4$ is given by relation :

(1) $\left(\frac{K_{sp}}{8435}\right)^{\frac{1}{7}}$ (2) $\left(\frac{K_{sp}}{5348}\right)^{\frac{1}{6}}$ (3) $\left(\frac{K_{sp}}{9612}\right)^{\frac{1}{3}}$ (4) $\left(\frac{K_{sp}}{6912}\right)^{\frac{1}{7}}$

Ans. Official answer NTA (4)

Sol.

Question ID : 656445281

58. The species which does not undergo disproportionation reaction is :

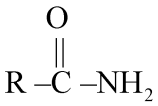
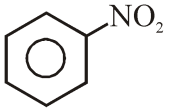
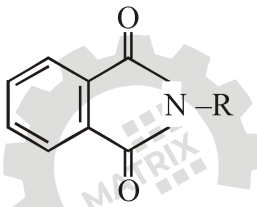
(1) ClO_2^- (2) ClO_3^- (3) ClO^- (4) ClO_4^-

Ans. Official answer NTA (4)

Sol.

Question ID : 656445294

59. Match the Compounds (List - I) with the appropriate Catalyst/Reagents (List - II) for their reduction into corresponding amines.

List-I (Compounds)	List-II (Catalyst/Reagents)
(A) 	(I) NaOH (aqueous)
(B) 	(II) H_2 / Ni
(C) $R-C\equiv N$	(III) $LiAlH_4, H_2O$
(D) 	(IV) Sn, HCl

Choose the correct answer from the options given below :

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

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

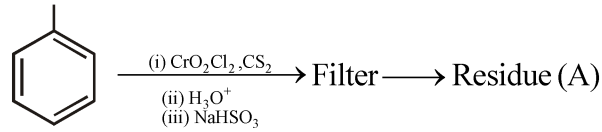
(3) (A)-(III), (B)-(II), (C)-(IV), (D)-(I)

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

Ans. Official answer NTA (4)

Sol.

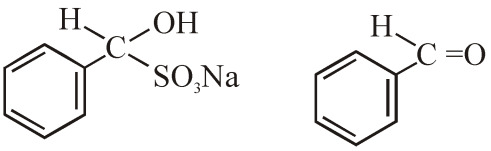
Question ID : 656445293

60. 

Residue (A) +HCl (dil) $\rightarrow$ Compound (B)

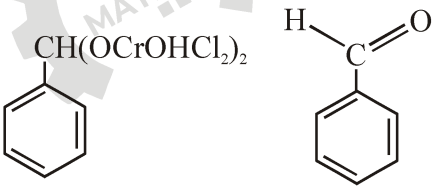
Structure of residue (A) and compound (B) formed respectively is

[A] [B]

(1) 

(2) 

(3) 

(4) 

Ans.

Ans. Official answer NTA (1)

Question ID : 656445287

61. The correct order of the following complexes in terms of their crystal field stabilization energies is

(1) $[Co(NH_3)_6]^{2+} < [Co(NH_3)_6]^{3+} < [Co(NH_3)_4]^{2+} < [Co(en)_3]^{3+}$

(2) $[Co(NH_3)_4]^{2+} < [Co(NH_3)_6]^{2+} < [Co(en)_3]^{3+} < [Co(NH_3)_6]^{3+}$

(3) $[Co(en)_3]^{3+} < [Co(NH_3)_6]^{3+} < [Co(NH_3)_6]^{2+} < [Co(NH_3)_4]^{2+}$

(4) $[Co(NH_3)_4]^{2+} < [Co(NH_3)_6]^{2+} < [Co(NH_3)_6]^{3+} < [Co(en)_3]^{3+}$

Ans. Official answer NTA (4)

Sol.

Question ID : 656445284

62. Given below are two statements :

Statement (I): An element in the extreme left of the periodic table forms acidic oxides.

Statement (II) : Acid is formed during the reaction between water and oxide of a reactive element present in the extreme right of the periodic table.

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 true but Statement II is false

(3) Both Statement I and Statement II are false

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

Ans. Official answer NTA (4)

Sol.

Question ID : 656445280

63. Density of 3 M NaCl solution is 1.25 g / mL . The molality of the solution is :

(1) 2.79 m (2) 2. 3 m (3) 1.79 m (4) 4. 2 m

Ans. Official answer NTA (1)

Sol.

Question ID : 656445278

64. Given below are two statements :

Statement (I) : Corrosion is an electrochemical phenomenon in which pure metal acts as an anode and impure metal as a cathode.

Statement (II) : The rate of corrosion is more in alkaline medium than in acidic medium.

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) Both Statement I and Statement II are true

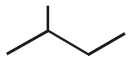
(3) Statement I is true but Statement II is false

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

Ans. Official answer NTA (3)

Sol.

Question ID : 656445292

65. $RBr \xrightarrow[(ii)\ H_2O]{(i)\ Mg,dryether}$ 

2-Methylbutane

The maximum number of RBr producing 2-methylbutane by above sequence of reactions is _____.

(Consider the structural isomers only)

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

Ans. Official answer NTA (3)

Sol.

Question ID : 656445285

66. The maximum covalency of a non-metallic group 15 elelment 'E' with weakest E –E bond is :

(1) 4 (2) 5 (3) 6 (4) 3

Ans. Official answer NTA (1)

Sol.

Question ID : 656445286

67. Identify the homoleptic complex(es) that is/are low spin.

(A) $\left[Fe(CN)_5NO\right]^{2-}$

(B) $\left[CoF_6\right]^{3-}$

(C) $\left[Fe(CN)_6\right]^{4-}$

(D) $\left[Co\left(NH_3\right)_6\right]^{3+}$

(E) $\left[Cr\left(H_2O\right)_6\right]^{2+}$

Choose the correct answer from the options given below :

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

Ans. Official answer NTA (2)

Sol.

Question ID : 656445291

68. The alkane from below having two secondary hydrogens is :

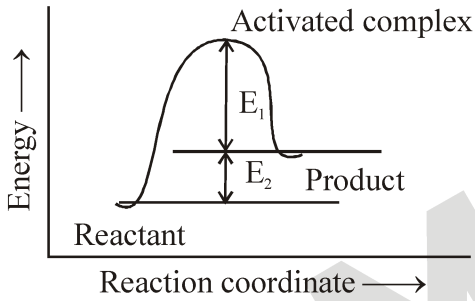
(1) 2,2,3,3-Tetramethylpentane
(2) 2,2,4,5-Tetramethylheptane
(3) 2,2,4,4-Tetramethylhexane
(4) 4-Ethyl-3,4-dimethyloctane

Ans. Official answer NTA (1)

Sol.

Question ID : 656445282

69. Consider the given figure and choose the correct option :



(1) Activation energy of forward reaction is $E_1 + E_2$ and product is less stable than reactant.

(2) Activation energy of forward reaction is $E_1 + E_2$ and product is more stable than reactant.

(3) Activation energy of both forward and backward reaction is $E_1 + E_2$ and reactant is more stable than product.

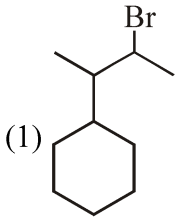
(4) Activation energy of backward reaction is E_1 and product is more stable than reactant.

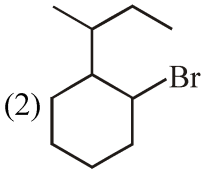
Ans. Official answer NTA (1)

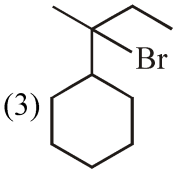
Sol.

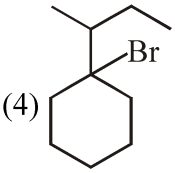
Question ID : 656445289

70. When sec-butylcyclohexane reacts with bromine in the presence of sunlight, the major product is

(1) 

(2) 

(3) 

(4) 

Ans. Official answer NTA (3)

Sol.

SECTION – B

Question ID : 656445296

71. 20 mL of 2 M NaOH solution is added to 400 mL of 0.5 M NaOH solution. The final concentration of the solution is _____ $\times 10^{-2}$ M . (Nearest integer)

Ans. Official answer NTA (57)

Sol.

Question ID : 656445300

72. The complex of Ni^{2+} ion and dimethyl glyoxime contains _____ number of Hydrogen (H) atoms.

Ans. Official answer NTA (14)

Sol.

Question ID : 656445297

73. Consider the following cases of standard enthalpy of reaction $\left(\Delta H_r^\circ \text{ in kJ mol}^{-1}\right)$

$$C_2H_6(g)+\frac{7}{2}O_2(g)\rightarrow 2CO_2(g)+3H_2O(l)\Delta H_1^\circ=-1550$$

$$C(graphite)+O_2(g)\rightarrow CO_2(g)\quad \Delta H_2^\circ=-393$$

$$H_2(g)+\frac{1}{2}O_2(g)\rightarrow H_2O(l)\quad \Delta H_3^\circ=-286$$

The magnitude of $\Delta H^\circ_{f\,C_2H_6(g)}$ is _____ kJ mol^{-1} (Nearest integer).

Ans. Official answer NTA (95)

Sol.

Question ID : 656445298

74. Niobium (Nb) and ruthenium (Ru) have "x" and "y" number of electrons in their respective 4d orbitals.

The value of x + y is:

Ans. Official answer NTA (11)

Sol.

Question ID : 656445299

75. The compound with molecular formula C_6H_6, which gives only one monobromo derivative and takes up four moles of hydrogen per mole for complete hydrogenation has _____ π electrons.

Ans. Official answer NTA (8)

Sol.