JEE Main April 2024

Question Paper With Text Solution

08 April | Shift-2

CHEMISTRY

MATRIX

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

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61. The correct sequence of acidic strength of the following aliphatic acids in their decreasing order is :

CH_3CH_2COOH, CH_3COOH, $CH_3CH_2CH_2COOH$, HCOOH

(1) $CH_3COOH > CH_3CH_2COOH > CH_3CH_2CH_2COOH > HCOOH$

(2) $HCOOH > CH_3CH_2CH_2COOH > CH_3CH_2COOH > CH_3COOH$

(3) $CH_3CH_2CH_2COOH > CH_3CH_2COOH > CH_3COOH > HCOOH$

(4) $HCOOH > CH_3COOH > CH_3CH_2COOH > CH_3CH_2CH_2COOH$

Question ID: 87827056133

Ans. Official Answer by NTA (4)

Sol. +I of alkyl groups decrease acidity of carboxylic acid.

62. In qualitative test for identification of presence of phosphorous, the compound is heated with an oxidising agent. Which is further treated with nitric acid and ammonium molybdate respectively. The yellow coloured precipitate obtained is :

(1) $(NH_4)_3PO_4.\ 12(NH_4)_2\ MoO_4$

(2) $Na_3PO_4.\ 12MoO_3$

(3) $(NH_4)_3PO_4.\ 12MoO_3$

(4) $MoPO_4.\ 21NH_4NO_3$

Question ID: 87827056128

Ans. Official Answer by NTA (3)

Sol. $H_3PO_4 + 12(NH_4)_2\ MoO_4 + 2HNO_3 \rightarrow (NH_4)_3\ PO_4\ .\ 12MoO_3 + 21(NH_4)NO_3 + 12H_2O$

63. Identify the incorrect statements about group 15 elements :

(A) Dinitrogen is a diatomic gas which acts like an inert gas at room temperature.

(B) The common oxidation states of these elements are –3, +3 and +5.

(C) Nitrogen has unique ability to form $p\pi - p\pi$ multiple bonds.

(D) The stabnility of +5 oxidation states increases down the group.

(E) Nitrogen shows a maximum covalency of 6.

Choose the correct answer from the options given below :

(1) (B), (D), (E) only

(2) (D) and (E) only

(3) (A), (C), (E) only

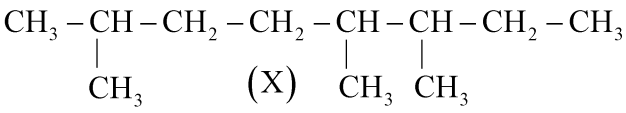
(4) (A), (B), (D) only

Question ID: 87827056124

Ans. Official Answer by NTA (2)

Sol. Stability of +5 decrease down the group. Nitrogen show + 5 with a maximum covalency of 4.

64. IUPAC name of following hydrocarbon(X) is :



(1) 2-Ethyl-2,6-diethylheptane
(2) 3,4,7-Trimethyloctane
(3) 2,5,6-Trimethyloctane
(4) 2-Ethyl-3,6-dimethylheptane

Question ID: 87827056131

Ans. Official Answer by NTA (3)

Sol. Lesser number of locants is given priority.

65. Given below are two statements :

Statement (I) : Fusion of MnO_2 with KOH and an oxidising agent gives dark green K_2MnO_4.

Statement (II) : Manganate ion on electrolytic oxidation in alkaline medium gives permanganate 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) 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

Question ID: 87827056126

Ans. Official Answer by NTA (2)

Sol. $3MnO_2 + 4\,KOH + O_2 \rightarrow 2K_2MnO_4 + 2H_2O$

$3MnO_4^{2-} + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$

66. For a reaction $A \xrightarrow{K_1} B \xrightarrow{K_2} C$

If the rate of formation of B is set to be zero then the concentration of B is given by :

(1) $K_1K_2[A]$ (2) $(K_1/K_2)[A]$ (3) $(K_1 - K_2)[A]$ (4) $(K_1 + K_2)[A]$

Question ID: 87827056122

Ans. Official Answer by NTA (2)

Sol. Rate of formation $B = k_1(A)$

Rate of concentration $B = k_2(B)$

$k_1(A) = k_2(B)$

$$(B) = \frac{k_1}{k_2}(A)$$

67. Given below are two statements :

Statements (I) : Kjeldahl method is applicable to estimate nitrogen in pyridine.

Statement (II) : The nitrogen present in pyridine can easily be converted into ammonium sulphate in Kjeldahl method.

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 false

(3) Both statement I and statement II are true

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

Question ID: 87827056129

Ans. Official Answer by NTA (2)

Sol. Kjeldahl method is not applicable to N atom in the ring. Because it cannot be easily converted into ammonium sulphate.

68. Which on the following compounds will readily react with dilute NaOH ?

(1) C_6H_5OH (2) $(CH_3)_3COH$ (3) C_2H_5OH (4) $C_6H_5CH_2OH$

Question ID: 87827056135

Ans. Official Answer by NTA (1)

Sol. Phenol are more acidic than alcohol.

69. When Ψ_A and Ψ_B are the wave functions of atomic orbitals, the σ^* is represented by :

(1) $\Psi_A + 2\Psi_B$ (2) $\Psi_A + \Psi_B$ (3) $\Psi_A - 2\Psi_B$ (4) $\Psi_A - \Psi_B$

Question ID: 87827056118

Ans. Official Answer by NTA (4)

Sol. Subtractic interference results in anti bonding MO.

$\Psi_A - \Psi_B$

70. The emf of cell $Tl\left|\begin{matrix}Tl^+\\(0.001M)\end{matrix}\right|\left|\begin{matrix}Cu^{2+}\\(0.01M)\end{matrix}\right|Cu$ is 0.83 V at 298 K. It could be increased by :

(1) decreasing concentration of both Tl^+ and Cu^{2+} ions

(2) increasing concentration of Tl^+ ions

(3) increasing concentration of Cu^{2+} ions

(4) increasing concentration of both Tl^+ and Cu^{2+} ions

Question ID: 87827056120

Ans. Official Answer by NTA (3)

Sol. Anode

$2Tl \rightarrow 2Tl^{+} + 2e^{-}$

Cathode

$Cu^{2+} + 2e^{-} \rightarrow Cu$

Nernst Equestion $E_{cell} = E^{o}_{cell} - \frac{0.059}{2}\log\frac{(Tl^{+})^2}{(Cu^{2+})}$

71. The reaction

$$\frac{1}{2}H_{2(g)} + AgCl_{(s)} \rightarrow H^{+}_{(aq)} + Cl^{-}_{(aq)} + Ag_{(s)}$$

occurs in which of the following galvanic cell :

(1) $Pt\left|H_{2(g)}\right|KCl_{(soln.)}\left|AgCl_{(s)}\right|Ag$

(2) $Ag\left|AgCl_{(s)}\right|KCl_{(soln.)}\left|AgNO_{3(aq.)}\right|Ag$

(3) $Pt\left|H_{2(g)}\right|HCl_{(soln.)}\left|AgNO_{3(aq.)}\right|Ag$

(4) $Pt\left|H_{2(g)}\right|HCl_{(soln.)}\left|AgCl_{(s)}\right|Ag$

Question ID: 87827056121

Ans. Official Answer by NTA (1)

Sol. Anode

$H_2 \rightarrow 2H^{+} + 2e^{-}$

Cathode

$2AgCl + 2e^{-} \rightarrow 2Ag + 2Cl^{-}$

72. Given below are two statements :

Statement (I) : A Buffer solution is the mixture of a salt and an acid or a base mixed in any particular quantities.

Statement (II) : Blood is naturally occurring buffer solution whose pH is maintained by $H_2CO_3/HCO_3^{\ominus}$ concentrations.

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

Question ID: 87827056119

Ans. Official Answer by NTA (4)

Sol. Buffer is prepared by weak acid / base and its salt.

73. Match List I with List II

List I (Test)	**List II (Identification)**
(A) Bayer's test	(I) Phenol
(B) Ceric ammonium nitrate test	(II) Aoldehyde
(C) Phthalein dy test	(III) Alcoholic-OH group
(D) Schiff's test	(IV) Unsaturation

Choose the correct answer from the options given below :

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

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

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

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

Question ID: 87827056137

Ans. Official Answer by NTA (4)

Sol. Fact Based

74. Match List I with List II

List I (Complex ion)	**List II (Spin only magnetic moment in B.M.)**
(A) $[Cr(NH_3)_6]^{3+}$	(I) 4.90
(B) $[NiCl_4]^{2-}$	(II) 3.87
(C) $[CoF_6]^{3-}$	(III) 0.0
(D) $[Ni(CN)_4]^{2-}$	(IV) 2.83

Choose the correct answer from the options given below :

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

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

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

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

Question ID: 87827056127

Ans. Official Answer by NTA (3)

Sol. Cr^{3+} $3d^3 4s^0$ 3 unpaired

$[Cr(NH_3)_6]^{3+}$	d^2sp^3	
Ni^{2+}	$3d^84s^0$	
$[NiCl_4]^{2-}$	Sp^3	2 unpaired
Co^{+3}	$3d^64s^0$	
$(CoF_6)^{3-}$	sp^3d^2	4 unpaired
$(Ni(CN)_4)^{2-}$	dsp^2	0 unpaired

75. Given below are two statements :

Statement (I) : S_N2 reactions are 'stereospecific', indicating that they result in the formation of only one stereo-isomer as the product.

Statement (II) : S_N1 reactions generally result in formation of product as racemic mixtures.

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

Question ID: 87827056132

Ans. Official Answer by NTA (4)

Sol. S_N2 happens only from back side attack S_N1 reaction forms carbocation so planar intermediate for nucleophile.

76. Given below are two statements :

Statement (I) : All the following compounds react with p-toluenesulfonyl chloride.

$C_6H_5NH_2$ $(C_6H_5)_2NH$ $(C_6H_5)_3N$

Statement (II) : Their products in the above reaction are soluble is aqueous NaOH.

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

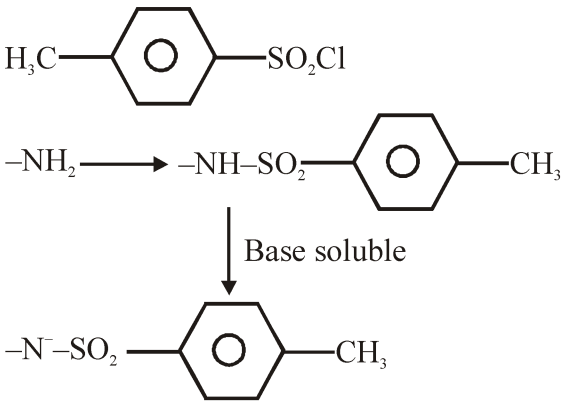
(3) Statement I is true but statement II is false

(4) Both statement I and statement II are false

Question ID: 87827056136

Ans. Official Answer by NTA (4)

Sol. 1° amine



2° amines reacts with p toluene sulfonyl chloride but not base soluble 3° amine don't ever react.

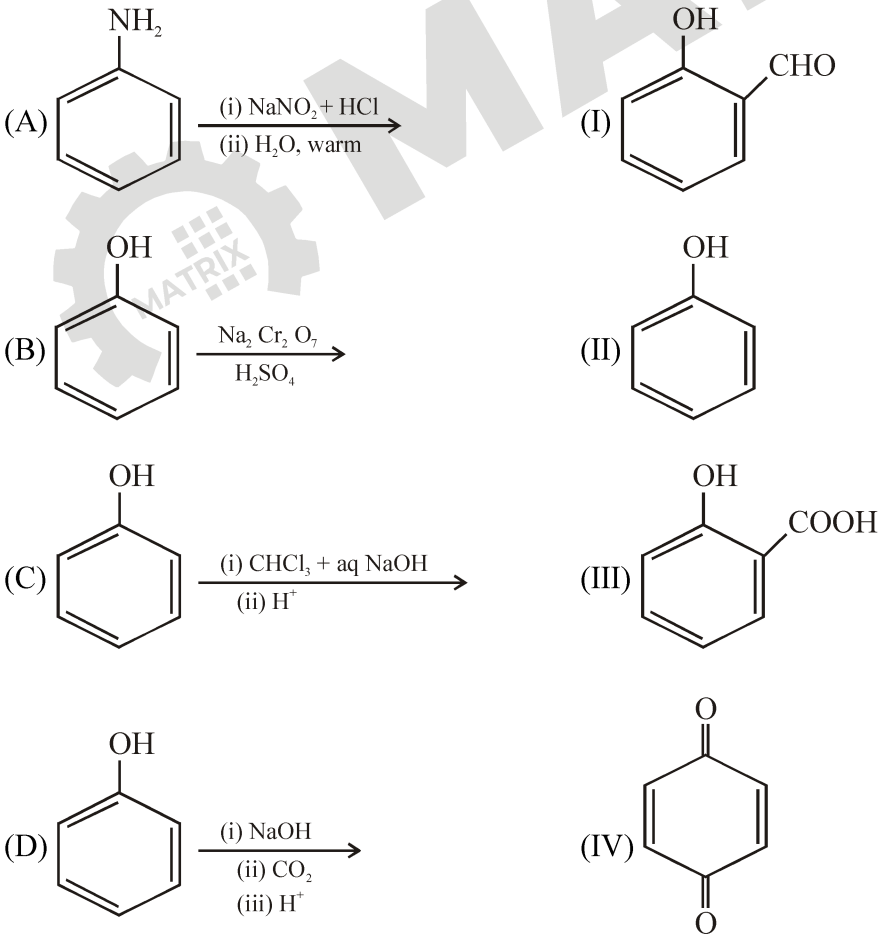
77. Match List I with List II

List I

(Reactions)

List II

(Products)



Choose the correct answer from the options given below :

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

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

Question ID: 87827056134

Ans. Official Answer by NTA (2)

Sol. (1) Diazonium followed by H_2O.
(2) Oxidation
(3) Reimer Teiman reaction
(4) Kolbe Schmidt reaction

78. The shape of carbocation is :

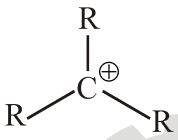
(1) diagonal pyramidal (2) trigonal planar

(3) diagonal (4) tetrahedral

Question ID: 87827056130

Ans. Official Answer by NTA (2)

Sol. Carbocation is sp^2 hybridised so trigonal planar.



79. Identify the correct statements about p-block elements and their compounds.

(A) Non metals have higher electronegativity than metals.

(B) Non metals have lower ionisation enthalpy than metals.

(C) Compounds formed between highly reactive nonmetals and highly reactive metals are generally ionic.

(D) The non-metal oxides are generally basic in nature.

(E) The metal oxides are generally acidic or neutral in nature.

Choose the correct answer from the options given below :

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

Question ID: 87827056123

Ans. Official Answer by NTA (1)

Sol. Non metals have more IE than metals
Metal oxides → Basic
Non metal oxides → acidic

80. The equilibrium $Cr_2O_7^{2-} \rightleftharpoons 2CrO_4^{2-}$ is shifted to the right in :

(1) a basic medium (2) an acidic medium

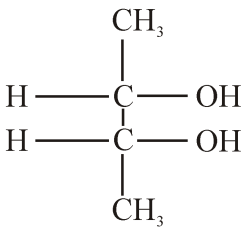
(3) a weakly acidic medium (4) a neutral medium

Question ID: 87827056125

Ans. Official Answer by NTA (1)

Sol. $Cr_2O_7^{2-} + 2OH^- \rightarrow 2CrO_4^{2-} + H_2O$

81. Total number of optically active compounds from the following is _____.



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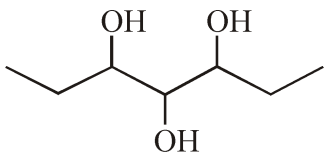

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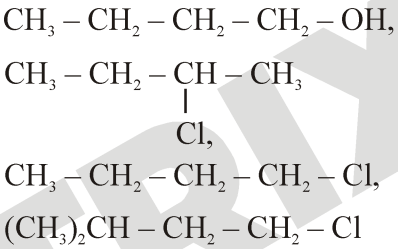


Question ID: 87827056146

Ans. Official Answer by NTA (1)

Sol. Compound 4 can be optically active.

82. Wavenumber for a radiation having 5800 Å wavelength is $x \times 10\ cm^{-1}$. The value of x is _____.

(Integer answer)

Question ID: 87827056139

Ans. Official Answer by NTA (1724)

Answer by Matrix is (– 172413)

Sol. $\frac{1}{\lambda} = \nu^- = wave\ number$

$$\frac{1}{5800} \times 10^{10} = 172413 \times 10^{-9} \times 10^{10}$$

83. Molality of an aqueous solution of urea is 4.44 m. Mole fraction of urea in solution is $x \times 10^{-3}$. Value of x is _____. (Integer answer)

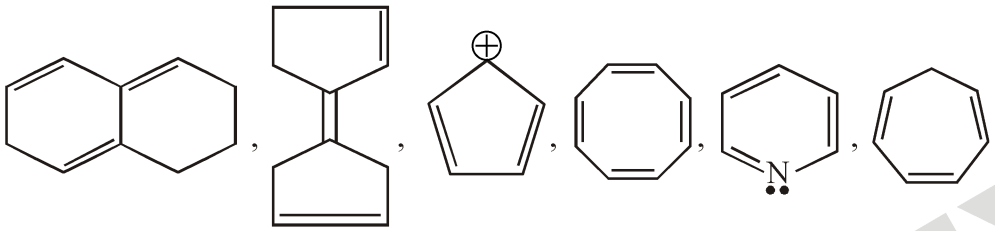
Question ID: 87827056142

Ans. Official Answer by NTA (74)

Sol. 1 Kg H_2O 4.44 moles urea

$$x_{urea} = \frac{4.44}{4.44 + 55.5} = 73 \times 10^{-3}$$

84. Total number of aromatic compounds among the following compounds is _____.



Question ID: 87827056145

Ans. Official Answer by NTA (1)

Sol. Only pyridine is aromatic.

85. A solution is prepared by adding 1 mole ethyl alcohol in 9 mole water. The mass percent of solute in the solution is _____ (Integer answer) (Given : Molar mass in g mol^{-1} Ethyl alcohol : 46 water : 18)

Question ID: 87827056138

Ans. Official Answer by NTA (22)

Sol. Mass % ethanol = $\frac{46}{46 + 9(8)} \times 100 = 22.11$

86. Two moles of benzaldehyde and one mole of acetone under alkaline condition using aqueous NaOH after heating gives x as the major product. The number of π bonds in the product x is _____.

Question ID: 87827056143

Ans. Official Answer by NTA (9)

Sol. $2Ph - CHO + CH_3 - \overset{\overset{O}{\|}}{C} - CH_3 \xrightarrow[\Delta]{OH^-} PH - CH = CH - \overset{\overset{O}{\|}}{C} - CH = CH - Ph$

Aldol condensation

87. Total number of unpaired electrons in the complex ions $[Co(NH_3)_6]^{3+}$ and $[NiCl_4]^{2-}$ is _____.

Question ID: 87827056144

Ans. Official Answer by NTA (2)

Sol. $[Co(NH_3)_6]^{3+}$ d^2sp^3 0 unpaired

$[NiCl_4]^{2-}$ sp^3 2 unpaired

88. Number of molecules having bond order 2 from the following molecules is _____.

C_2,O_2, Be_2, Li_2, Ne_2, N_2, He_2

Question ID: 87827056140

Ans. Official Answer by NTA (2)

Sol.

Molecules		B.O.
C_2	=	2
O_2	=	2
Be_2	=	0
Li_2	=	1
Ne_2	=	0
N_2	=	3
He_2	=	0

89. $\Delta_{vap}H^{\ominus}$ for water is +40.79 kJ mol^{-1} at1 bar and 100 °C. Change in internal energy for this vapourisation under same condition is _____ kJ mol^{-1}. (Integer answer)

(Given R = 8.3 JK^{-1} mol^{-1})

Question ID: 87827056141

Ans. Official Answer by NTA (38)

Sol. $H_2O_{(\ell)} \rightleftharpoons H_2O_{(v)}$

$\Delta H = \Delta U + \Delta ngRT$

$\Delta U = 40.79 - 3.0959 = 37.69$

90. The total number of carbon atoms present in tyrosine, an amino acid, is _____ .

Question ID: 87827056147

Ans. Official Answer by NTA (9)

Sol.