JEE Main January 2025

Question Paper With Text Solution

28 January | Shift-2

CHEMISTRY

MATRIX

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

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JEE MAIN JANUARY 2025 | 28TH JANUARY SHIFT-2

SECTION – A

Question ID : 656445739

51. Identify product [A],[B] and [C] in the following reaction sequence.

$$CH_3-C\equiv CH \xrightarrow[H_2]{Pd/C} [A] \xrightarrow[(ii)Zn,H_2O]{(i)O_3} [B]+[C]$$

(1) $[A]: CH_3-CH=CH_2, [B]: CH_3CHO, [C]: CH_3CH_2OH$

(2) $[A]: CH_3-CH=CH_2, [B]: CH_3CHO, [C]: HCHO$

(3) $[A]: CH_2=CH_2, [B]: H_3C-\overset{\overset{O}{||}}{C}-CH_3, [C]: HCHO$

(4) $[A]: CH_3CH_2CH_3, [B]: CH_3CHO, [C]: HCHO$

Ans. Official answer NTA (2)

Sol.

Question ID : 656445735

52. The amphoteric oxide among V_2O_3, V_2O_4 and V_2O_5, upon reaction with alkali leads to formation of an oxide anion. The oxidation state of V in the oxide anion is :

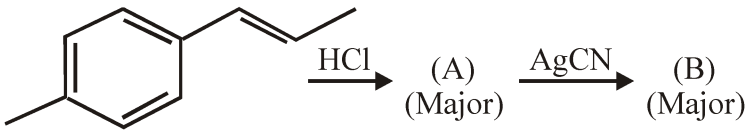
(1) +3 (2) +5 (3) +7 (4) +4

Ans. Official answer NTA (2)

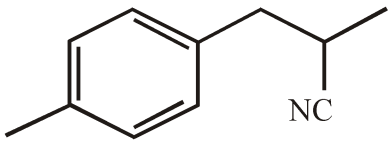
Sol.

Question ID : 656445741

53. The product B formed in the following reaction sequence is :



(1)



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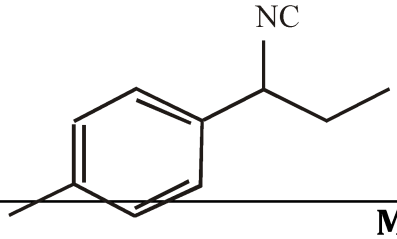
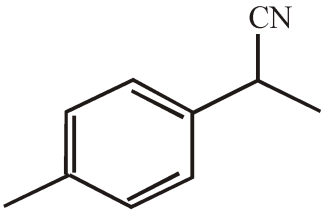
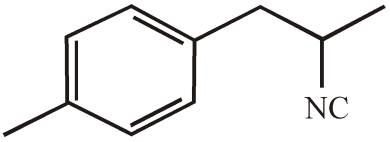


(3) 

(4) 

Ans. Official answer NTA (2)

Sol.

Question ID : 656445736

54. Match List - I with List - II.

List - I **(Complex)**	**List - II** **(Hybridisation of central metal ion)**
(A) $\left[CoF_6\right]^{3-}$	(I) d^2sp^3
(B) $\left[NiCl_4\right]^{2-}$	(II) sp^3
(C) $\left[Co\left(NH_3\right)_6\right]^{3+}$	(III) sp^3d^2
(D) $\left[Ni(CN)_4\right]^{2-}$	(IV) dsp^2

Choose the correct answer from the options given below :

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

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

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

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

Ans. Official answer NTA (2)

Sol.

Question ID : 656445728

55. Assume a living cell with $0.9\%(\omega / \omega)$ of glucose solution (aqueous). This cell is immersed in another solution having equal mole fraction of glucose and water.

(Consider the data upto first decimal place only)

The cell will :

(1) shrink since solution is $0.5\%(\omega / \omega)$

(2) shrink since solution is $0.45\%(\omega / \omega)$ as a result of association of glucose molecules (due to hydrogen bonding)

(3) show no change in volume since solution is $0.9\%(\omega / \omega)$

(4) swell up since solution is $1\%(\omega / \omega)$

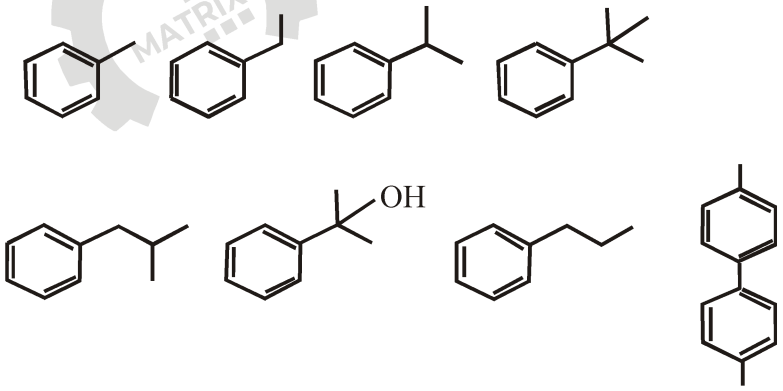
Ans. Official answer NTA (3)

Answer by Matrix is (Bonus)

Sol.

Question ID : 656445742

56. The total number of compounds from below when treated with hot $KMnO_4$ giving benzoic acid is



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

Ans. Official answer NTA (1)

Sol.

Question ID : 656445726

57. Which of the following is/are not correct with respect to energy of atomic orbitals of hydrogen atom?

(A) 1 s < 2p <3 d <4 s

(B) 1s < 2s = 2p < 3s = 3p

(C) 1 s <2 s <2 p <3 s <3 p

(D) 1 s <2 s <4 s <3 d

Choose the correct answer from the options given below :

(1) (A) and (B) only

(2) (C) and (D) only

(3) (B) and (D) only

(4) (A) and (C) only

Ans. Official answer NTA (2)

Sol.

Question ID : 656445744

58. Match List - I with List - II.

List - I	**List - II**
(Saccharides)	**(Glycosidic-linkages found)**
(A) Sucrose	(I) $\alpha 1-4$
(B) Maltose	(II) $\alpha 1-4$ and $\alpha 1-6$
(C) Lactose	(III) $\alpha 1-\beta 2$
(D) Amylopectin	(IV) $\beta 1-4$

Choose the correct answer from the options given below :

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

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

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

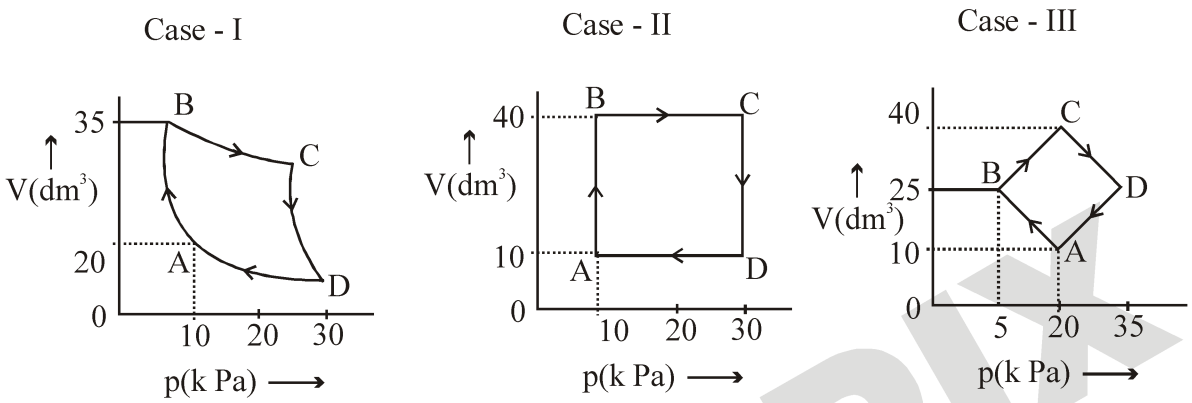
(4) (A)-(IV), (B)-(II), (C)-(I), (D)-(III)

Ans. Official answer NTA (3)

Sol.

Question ID : 656445727

59.



An ideal gas undergoes a cyclic transformation starting from the point A and coming back to the same point by tracing the path $A \rightarrow B \rightarrow C \rightarrow D \rightarrow A$ as shown in the three cases above.

Choose the correct option regarding ΔU :

(1) $\Delta U(\text{Case} - \text{I}) = \Delta U(\text{Case} - \text{II}) = \Delta U(\text{Case} - \text{III})$

(2) $\Delta U(\text{Case} - \text{I}) > \Delta U(\text{Case} - \text{III}) > \Delta U(\text{Case} - \text{II})$

(3) $\Delta U(\text{Case} - \text{III}) > \Delta U(\text{Case} - \text{II}) > \Delta U(\text{Case} - \text{I})$

(4) $\Delta U(\text{Case} - \text{I}) > \Delta U(\text{Case} - \text{II}) > \Delta U(\text{Case} - \text{III})$

Ans. Official answer NTA (1)

Sol.

Question ID : 656445745

60. Identify correct conversion during acidic hydrolysis from the following :

(A) starch gives galactose.

(B) cane sugar gives equal amount of glucose and fructose.

(C) milk sugar gives glucose and galactose.

(D) amylopectin gives glucose and fructose.

(E) amylose gives only glucose.

Choose the correct answer from the options given below :

(1) (A), (B) and (C) only

(2) (C), (D) and (E) only

(3) (B), (C) and (D) only

(4) (B), (C) and (E) only

Ans. Official answer NTA (4)

Question ID : 656445730

61. Arrange the following in increasing order of solubility product :

$Ca(OH)_2$, AgBr, PbS, HgS

(1) $PbS < HgS < Ca(OH)_2 < AgBr$

(2) $HgS < AgBr < PbS < Ca(OH)_2$

(3) $Ca(OH)_2 < AgBr < HgS < PbS$

(4) $HgS < PbS < AgBr < Ca(OH)_2$

Ans. Official answer NTA (4)

Sol.

Question ID : 656445733

62. Identify the inorganic sulphides that are yellow in colour :

(A) $(NH_4)_2 S$ (B) PbS (C) CuS (D) $As_2 S_3$

(E) (E)$As_2 S_5$

Choose the correct answer from the options given below :

(1) (D) and (E) only

(2) (A) and (B) only

(3) (A) and (C) only

(4) (A), (D) and (E) only

Ans. Official answer NTA (4)

Sol.

Question ID : 656445729

63. Concentrated nitric acid is labelled as 75 % by mass. The volume in mL of the solution which contains 30 g of nitric acid is _____.

Given : Density of nitric acid solution is 1.25 g / mL .

(1) 32 (2) 55 (3) 45 (4) 40“

Ans. Official answer NTA (1)

Sol.

Question ID : 656445734

64. Given below are two statements :

Statement (I): According to the Law of Octaves, the elements were arranged in the increasing order of their atomic number.

Statement (II) : Meyer observed a periodically repeated pattern upon plotting physical properties of certain elements against their respective atomic numbers.

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) Both Statement I and Statement II are false

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

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

Ans. Official answer NTA (2)

Sol.

Question ID : 656445737

65. The purification method based on the following physical transformation is :

$$\underset{(X)}{\text{Solid}} \xrightarrow{\text{Heat}} \underset{(X)}{\text{Vapour}} \xrightarrow{\text{Cool}} \underset{(X)}{\text{Solid}}$$

(1) Extraction (2) Crystallization (3) Distillation (4) Sublimation

Ans. Official answer NTA (4)

Sol.

Question ID : 656445732

66. Consider an elementary reaction

$$A(g) + B(g) \rightarrow C(g) + D(g)$$

If the volume of reaction mixture is suddenly reduced to $\frac{1}{3}$ of its initial volume, the reaction rate will become ' x ' times of the original reaction rate. The value of x is :

(1) 3 (2) 9 (3) $\frac{1}{3}$ (4) $\frac{1}{9}$

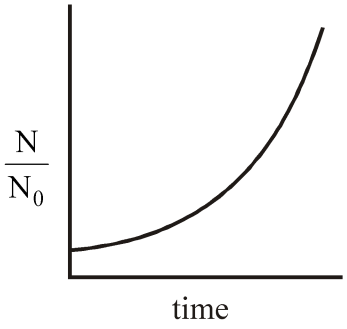
Ans. Official answer NTA (2)

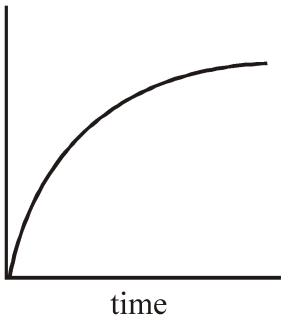
Sol.

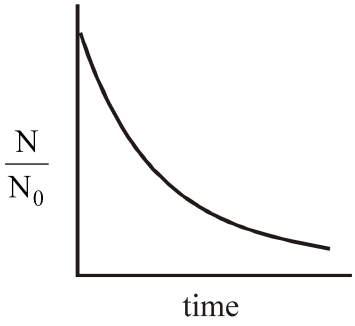
Question ID : 656445731

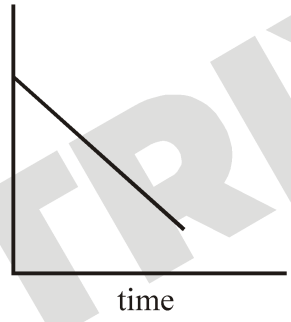
67. For bacterial growth in a cell culture, growth law is very similar to the law of radioactive decay. Which of the following graphs is most suitable to represent bacterial colony growth ?

Where N - Number of Bacteria at any time, N_0 - Initial number of Bacteria.

(1) 

(2) 

(3) 

(4) 

Ans. Official answer NTA (1)

Sol.

Question ID : 656445743

68. Identify correct statements :

(A) Primary amines do not give diazonium salts when treated with $NaNO_2$ in acidic condition.

(B) Aliphatic and aromatic primary amines on heating with $CHCl_3$ and ethanolic KOH form carbylamines.

(C) Secondary and tertiary amines also give carbylamine test.

(D) Benzenesulfonyl chloride is known as Hinsberg's reagent.

(E) Tertiary amines reacts with benzenesulfonyl chloride very easily.

Choose the correct answer from the options given below :

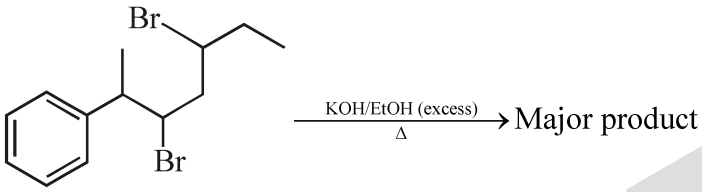
(1) (D) and (E) only (2) (B) and (C) only (3) (B) and (D) only (4) (A) and (B) only

Ans. Official answer NTA (3)

Sol.

Question ID : 656445740

69. The major product of the following reaction is :



(1) 6-Phenylhepta-3,5-diene

(2) 6-Phenylhepta-2,4-diene

(3) 2-Phenylhepta-2,4-diene

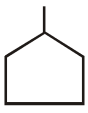
(4) 2-Phenylhepta-2,5-diene

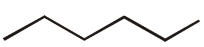
Ans. Official answer NTA (3)

Sol.

Question ID : 656445738

70. Given below are two statements :

Statement (I) :  are  isomeric compounds.

Statement (II) :  NH_2 and  are functional group isomers.

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

Ans. Official answer NTA (1)

Sol.

SECTION – B

Question ID : 656445750

71. The spin only magnetic moment (μ) value (B.M.) of the compound with strongest oxidising power among Mn_2O_3, TiO and VO is _____ B.M. (Nearest integer).

Ans. Official answer NTA (5)

Sol.

Question ID : 656445747

72. Electrolysis of 600 mL aqueous solution of NaCl for 5 min changes the pH of the solution to 12 . The current in Amperes used for the given electrolysis is _____ (Nearest integer).

Ans. Official answer NTA (2)

Sol.

Question ID : 656445748

73. Total number of molecules/species from following which will be paramagnetic is _____.

$O_2, O_2^+, O_2^-, NO, NO_2, CO, K_2[NiCl_4], [Co(NH_3)_6]Cl_3, K_2[Ni(CN)_4]$

Ans. Official answer NTA (6)

Sol.

Question ID : 656445746

74. Consider the following data :

Heat of formation of $CO_2(g) = -393.5\,kJ\,mol^{-1}$

Heat of formation of $H_2O(l) = -286.0\,kJ\,mol^{-1}$

Heat of combustion of benzene $= -3267.0\,kJ\,mol^{-1}$

The heat of formation of benzene is _____ $kJmol^{-1}$.

(Nearest integer)

Ans. Official answer NTA (48)

Sol.

Question ID : 656445749

75. A group 15 element forms $d\pi - d\pi$ bond with transition metals. It also forms hydride, which is a strongest base among the hydrides of other group members that form $d\pi - d\pi$ bond. The atomic number of the element is _____.

Ans. Official answer NTA (15)

Sol.