JEE Main January 2025

Question Paper With Text Solution

24 January | Shift-2

CHEMISTRY

MATRIX

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

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JEE MAIN JANUARY 2025 | 24TH JANUARY SHIFT-2

SECTION – A

Question ID : 656445506

51. Based on the data given below :

$E^0_{Cr_2O_7^{2-}/Cr^{3+}} = 1.33V$ $E^0_{Cl_2/Cl^{(-)}} = 1.36V$

$E^0_{MnO_4^-/Mn^{2+}} = 1.51V$ $E^0_{Cr^{3+}/Cr} = 0.74V$

the strongest reducing agent is :

(1) MnO_4^- (2) Cr (3) Mn^{2+} (4) Cl^-

Ans. Official answer NTA (2)

Sol.

Question ID : 656445514

52. The successive 5 ionisation energies of an element are 800, 2427, 3658, 25024 and 32824 kJ / mol, respectively. By using the above values predict the group in which the above element is present :

(1) Group 14 (2) Group 13 (3) Group 2 (4) Group 4

Ans. Official answer NTA (2)

Sol.

Question ID : 656445502

53. For hydrogen atom, the orbital/s with lowest energy is/are :

(A) 4s (B) $3p_x$ (C) $3d_{x^2-y^2}$

(D) $3d_{z^2}$ (E) $4p_z$

Choose the correct answer from the options given below :

(1) (A) only (2) (A) and (E) only

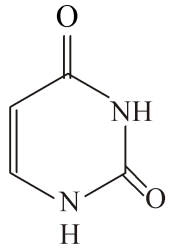
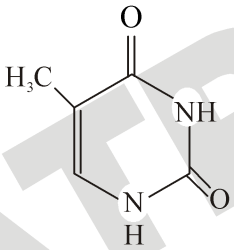
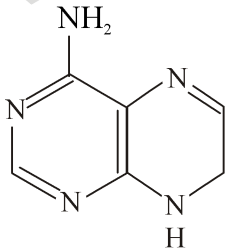
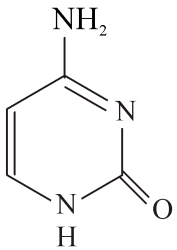
(3) (B), (C) and (D) only (4) (B) only

Ans. Official answer NTA (3)

Sol.

Question ID : 656445520

54. Match List - I with List - II :

List-I	List-II
(A) Adenine	(I) 
(B) Cytosine	(II) 
(C) Thymine	(III) 
(D) Uracil	(IV) 

Choose the correct answer from the options given below :

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

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

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

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

Ans. Official answer NTA (2)

Sol.

Question ID : 656445510

55. When Ethane-1,2-diamine is added progressively to an aqueous solution of Nickel (II) chloride, the sequence of colour change observed will be :

(1) Green → Pale Blue → Blue → Violet (2) Violet → Blue → Pale Blue → Green

(3) Pale Blue → Blue → Violet → Green (4) Pale Blue → Blue → Green → Violet

Ans. Official answer NTA (1)

Sol.

Question ID : 656445504

56. $S(g)+\frac{3}{2}O_2(g)\rightarrow SO_3(g)+2x\ kcal$

$SO_2(g)+\frac{1}{2}O_2(g)\rightarrow SO_3(g)+y\ kcal$

The heat of formation of $SO_2(g)$ is given by :

(1) 2x + y kcal (2) y – 2x kcal (3) $\frac{2x}{y}$ kcal (4) x + y kcal

Ans. Official answer NTA (2)

Sol.

Question ID : 656445509

57. Find the compound 'A' from the following reaction sequences.

$A\xrightarrow{aqua-regia}B\xrightarrow[(2)AcOH]{(1)KNO_2NH_4OH}$ yellow ppt :

(1) ZnS (2) CoS (3) NiS (4) MnS

Ans. Official answer NTA (2)

Sol.

Question ID : 656445512

58. Match List - I with List - II :

List - I (Transition metal ion)	List-II (Spin only magnetic moment (B.M.))
(A) Ti^{3+}	(I) 3.87
(B) V^{2+}	(II) 0.00
(C) Ni^{2+}	(III) 1.73
(D) Sc^{3+}	(IV) 2.84

Choose the correct answer from the options given below :

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

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

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

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

Ans. Official answer NTA (1)

Sol.

Question ID : 656445513

59. Given below are two statements :

Statement (I) : The first ionization energy of Pb is greater than that of Sn.

Statement (II) : The first ionization energy of Ge is greater than that of Si.

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

Ans. Official answer NTA (4)

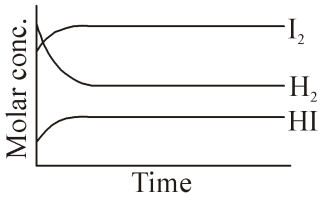
Sol.

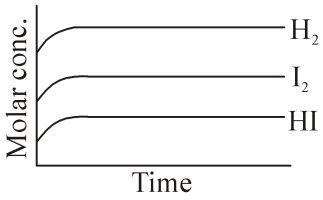
Question ID : 656445505

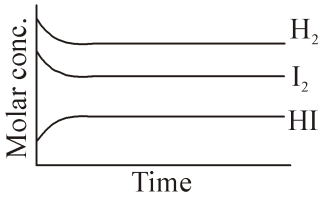
60. For the reaction,

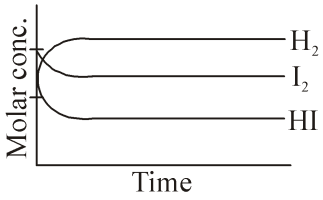
$$H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$$

Attainment of equillibrium is predicted correctly by :

(1) 

(2) 

(3) 

(4) 

Ans.

Ans. Official answer NTA (3)

Question ID : 656445501

61. The elemental composition of a compound is 54.2 % C, 9.2 % H and 36.6 % O.
If the molar mass of the compound is 132 g mol^{-1}, the molecular formula of the compound is :
[Given : The relative atomic mass of C : H : O = 12 : 1 : 16] :

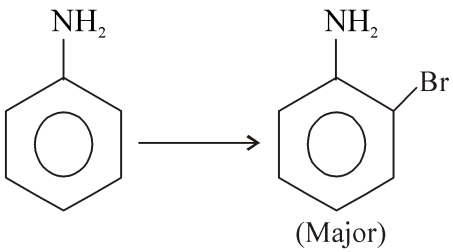
(1) $C_6H_{12}O_6$ (2) $C_4H_9O_3$ (3) $C_6H_{12}O_3$ (4) $C_4H_8O_2$

Ans. Official answer NTA (3)

Sol.

Question ID : 656445519

62. For reaction



The correct order of set of reagents for the above conversion is :

(1) $Br_2, FeBr_3, H_2O(\Delta), NaOH$ (2) $H_2SO_4, Ac_2O, Br_2, H_2O(\Delta), NaOH$

(3) $Ac_2O, Br_2, H_2O(\Delta), NaOH$ (4) $Ac_2O, H_2SO_4, Br_2, NaOH$

Ans. Official answer NTA (2)

Sol.

Question ID : 656445516

63. Identify correct statement/s :

(A) $-OCH_3$ and $-NHCOCH_3$ are activating group.
(B) –CN and –OH are meta directing group.
(C) –CN and $-SO_3H$ are meta directing group.
(D) Activating groups act as ortho - and para directing groups.
(E) Halides are activating groups.

Choose the correct answer from the options given below :

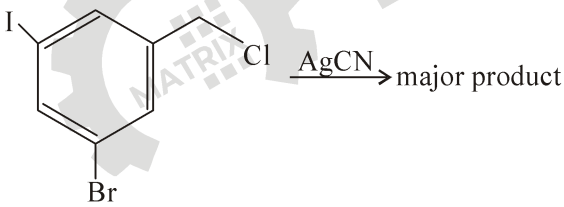
(1) (A) only
(2) (A), (B) and (E) only
(3) (A), (C) and (D) only
(4) (A) and (C) only

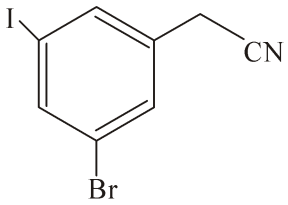
Ans. Official answer NTA (3)

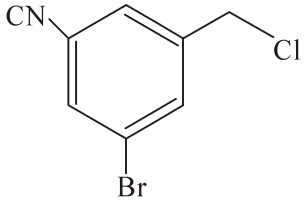
Sol.

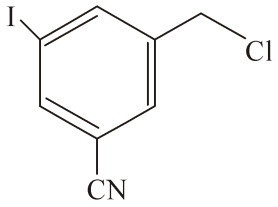
Question ID : 656445517

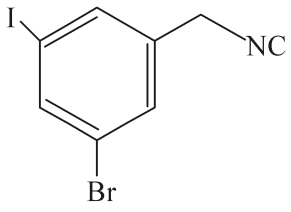
64. The structure of the major product formed in the following reaction is :



(1) 

(2) 

(3) 

(4) 

Ans. Official answer NTA (4)

Answer by Matrix is (2)

Sol.

Question ID : 656445508

65. Given below are two statements :

Statement (I) : Experimentally determined oxygen-oxygen bond lengths in the O_3 are found to be same and the bond length is greater than that of a O = O (double bond) but less than that of a single (O – O) bond.

Statement (II) : The strong lone pair-lone pair repulsion between oxygen atoms is solely responsible for the fact that the bond length in ozone is smaller than that of a double bond (O = O) but more than that of a single bond (O – O).

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

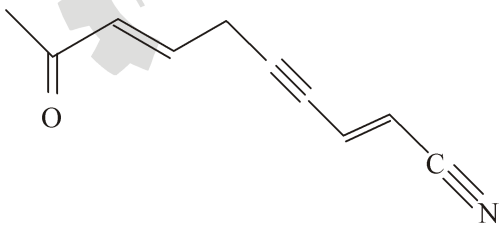
(4) Statement I is false but Statement II is true

Ans. Official answer NTA (3)

Sol.

Question ID : 656445515

66. In the given structure, number of sp and sp^2 hybridized carbon atoms present respectively are :



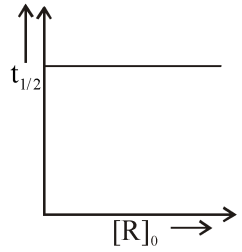
(1) 3 and 6 (2) 3 and 5 (3) 4 and 5 (4) 4 and 6

Ans. Official answer NTA (2)

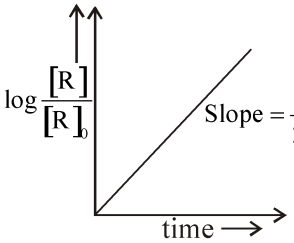
Sol.

Question ID : 656445507

67. Given below are two statements :

Statement (I) : 

is valid for first order reaction.

Statement (II) : 

is valid for first order reaction.

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

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

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

(3) Both Statement I and Statement II are false

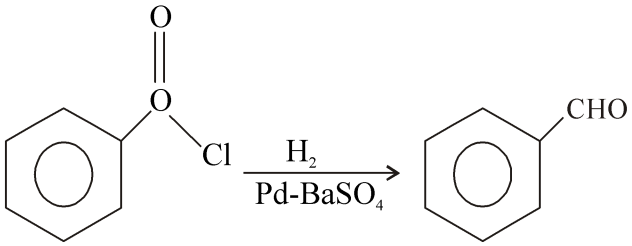
(4) Both Statement I and Statement II are true

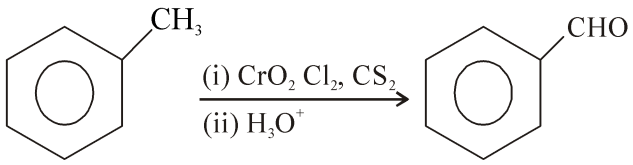
Ans. Official answer NTA (1)

Sol.

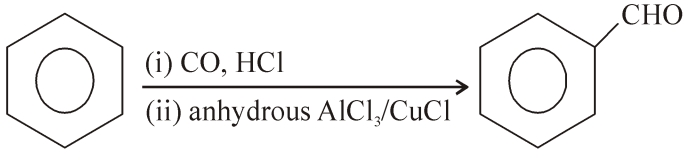
Question ID : 656445518

68. Match List - I with List - II :

List-I	List-II
(A) $RCN \xrightarrow[(ii)\ H_3O^+]{(i)\ SnCl_2,\ HCl} R\ CHO$	(I) Etard reaction
(B) 	(II) Gatterman-Koch reaction

(C) 

(III) Rosenmund reduction

(D) 

(IV) Stephen reaction

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

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

Ans. Official answer NTA (4)

Sol.

Question ID : 656445511

69. The conditions and consequence that favours the $t_{2g}^3 e_g^1$ configuration in a metal complex are :

(1) weak field ligand, high spin complex (2) weak field ligand, low spin complex

(3) strong field ligand, high spin complex (4) strong field ligand, low spin complex

Ans. Official answer NTA (1)

Sol.

Question ID : 656445503

70. Which of the following mixing of 1 M base and 1 M acid leads to the largest increase in temperature :

(1) 50 mL HCl and 20 mL NaOH (2) 30 mL HCl and 30 mL NaOH

(3) 45 mL CH_3COOH and 25 mL NaOH (4) 30 mL CH_3COOH and 30 mL NaOH

Ans. Official answer NTA (2)

Sol.

SECTION – B

Question ID : 656445522

71. Consider a complex reaction taking place in three steps with rate constants k_1, k_2 and k_3 respectively. The overall rate constant k is given by the expression $k = \sqrt{\frac{k_1 k_3}{k_2}}$. If the activation energies of the three steps are

60, 30 and 10 kJ mol^{-1} respectively, then the overall energy of activation in kJ mol^{-1} is _____ .(Nearest integer)

Ans. Official answer NTA (20)

Sol.

Question ID : 656445524

72. The hydrocarbon (X) with molar mass 80g mol^{-1} and 90% carbon has _____degree of unsaturation :

Ans. Official answer NTA (3)

Sol.

Question ID : 656445521

73. The observed and normal molar masses of compound MX_2 are 65.6 and 164 respectively. The percent degree of ionisation of MX_2 is _____ %. (Nearest integer)

Ans. Official answer NTA (75)

Sol.

Question ID : 656445523

74. In Carius method of estimation of halogen, 0.25 g of an organic compound gave 0.15 g of silver bromide (AgBr). The percentage of Bromine in the organic compound is _____ $\times 10^{-1}$ % (Nearest integer).
(Given : Molar mass of Ag is 108 and Br is 80 g mol^{-1})

Ans. Official answer NTA (255)

Sol.

Question ID : 656445525

75. The possible number of stereoisomers for 5-phenylpent-4-en-2-ol is _____.

Ans. Official answer NTA (4)

Sol.