JEE Main January 2026

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 2026 | 28 JANUARY SHIFT-2

SECTION – A

Question ID : 8606541034

51. Given below are two statements :

Statement I: Elements 'X' and 'Y' are the most and least electronegative elements, respectively among N, As, Sb and P . The nature of the oxides X_2O_3 and Y_2O_3 is acidic and amphoteric, respectively.

Statement II: BCl_3 is covalent in nature and gets hydrolysed in water. It produces $\left[B(OH)_4\right]^-$ and $\left[B\left(H_2O\right)_6\right]^{3+}$ in aqueous medium.

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

क

(1) Both Statement I and Statement II are false

(2) Both Statement I and Statement II are true

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

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

Ans. Official answer NTA (4)

Sol. $N > P > As > Sb$

↓ most EN ↑ least EN

$X = N$ $X_2O_3 = N_2O_3$ (Acidic)

$Y = Sb$ $Y_2O_3 = Sb_2O_3$ (Amphoteric)

$BCl_3 + 3H_2O \rightarrow B(OH)_3 + 3HCl$

So, Statement I is true but Statement II is false

Question ID : 8606541028

52. At T(K), 100 g of 98% H_2SO_4 (w/w) aqueous solution is mixed with 100 g of 49% H_2SO_4 (w/w) aqueous solution. What is the mole fraction of H_2SO_4 in the resultant solution?

(Given : Atomic mass $H = 1u; S = 32u; O = 16u$).

(Assume that temperature after mixing remains constant)

क

(1) 0.663 (2) 0.1 (3) 0.9 (4) 0.337

Ans. Official answer NTA (4)

Sol. Total wt. of $H_2SO_4 = \left(100 \times \frac{98}{100}\right) + \left(100 \times \frac{49}{100}\right) = 147\,g$

Total wt. of $H_2O = 200 - 147 = 53$ g

$$\text{mole fraction of } H_2SO_4 = \frac{\frac{147}{98}}{\left(\frac{147}{98} + \frac{53}{18}\right)} = 0.337$$

Question ID : 8606541041

53. The dibromo compound [P] (molecular formula : $C_9H_{10}Br_2$) when heated with excess sodamide followed by treatment with dilute HCl gives [Q]. On warming [Q] with mercuric sulphate and dilute sulphuric acid yield [R] which gives positive Iodoform test but negative Tollen's test. The compound [P] is :

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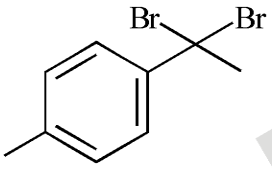
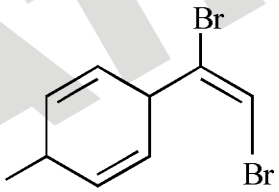
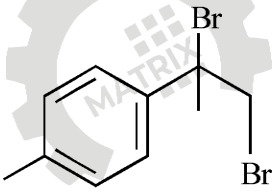
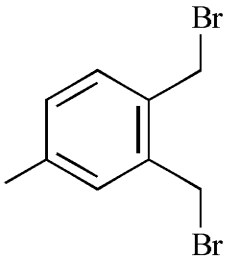
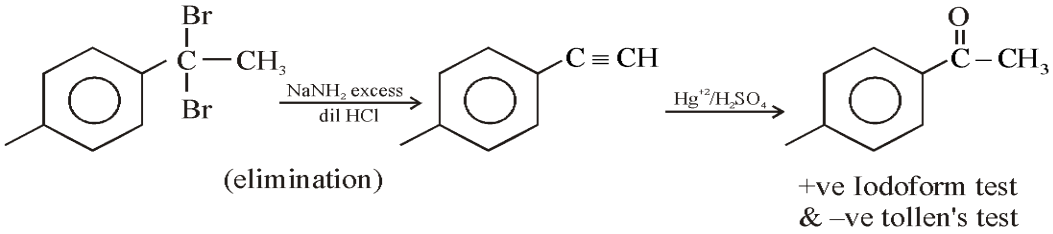
(1) 

(2) 

(3) 

(4) 

Ans. Official answer NTA (1)

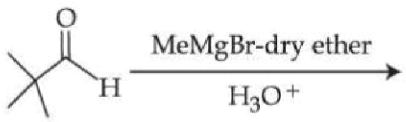
Sol. (1) 

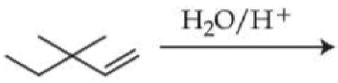
(elimination)

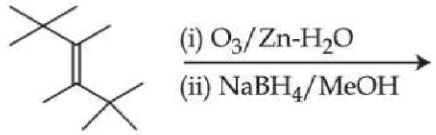
+ve Iodoform test
& –ve tollen's test

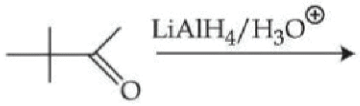
Question ID : 8606541043

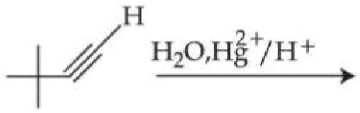
54. 3,3-Dimethyl-2-butanol cannot be prepared by :

A. 

B. 

C. 

D. 

E. 

Choose the correct answer from the options given below :

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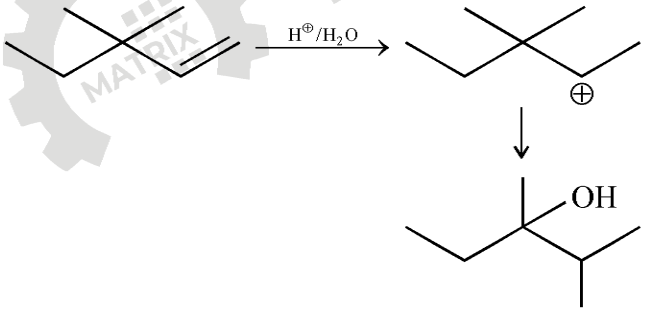
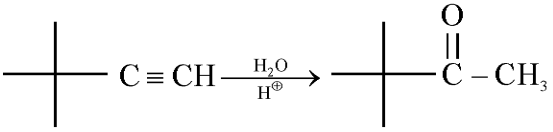
(1) B and E Only (2) B Only (3) B, C and E Only (4) B and C Only

Ans. Official answer NTA (1)

Sol. (B) 

(E) 

Question ID : 8606541029

55. Which of the following mixture gives a buffer solution with pH = 9.25 ?

Given : $pK_b\left(NH_4OH\right)=4.75$

(1) $0.2MNH_4OH(0.5L)+0.1MHCl(0.5L)$

(2) $0.2MNH_4OH(0.4L)+0.1MHCl(1L)$

(3) $0.5MNH_4OH(0.2L)+0.2MHCl(0.5L)$

(4) $0.4MNH_4OH(1L)+0.1MHCl(1L)$

क

Ans. Official answer NTA(1)

Sol. $pOH=pK_b+\log\frac{Salt}{Base}$

$4.75=4.75+\log\frac{Salt}{Base}$

$NH_4OH \quad + \quad HCl \quad \rightarrow \quad NH_4Cl \quad + \quad H_2O$

0.2 M, 0.5 l 0.1 M, 0.5 l

100 m mole 50 m mol

50 m mole — 50 m mol

milimole of NH_4OH = milimole of NH_4Cl

Question ID : 8606541036

56. $\left[Ni\left(PPh_3\right)_2Cl_2\right]$ is a paramagnetic complex. Identify the INCORRECT statements about this complex.

A. The complex exhibits geometrical isomerism.

B. The complex is white in colour.

C. The calculated spin-only magnetic moment of the complex is 2.84 BM .

D. The calculated CFSE (Crystal Field Stabilization Energy) of Ni in this complex is $-0.8\Delta_o$.

E. The geometrical arrangement of ligands in this complex is similar to that in $Ni(CO)_4$.

Choose the correct answer from the options given below :

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

Ans. Official answer NTA(1)

Sol. $\left[Ni\left(PPh_3\right)_2Cl_2\right]$

paramagnetic complex hence it must be tetranedral, so splitting,

$\underline{\uparrow\downarrow}\ \underline{1}\ \underline{1}$ t_2

$\underline{\uparrow\downarrow}\ \underline{\uparrow\downarrow}$ e

$Ni^{2+} = [Ar]3d^8$

(A) Tetrahedral complex not show geometrical isomerism

(B) Complex is blue colour

(C) $\mu = \sqrt{n(n+2)} = \sqrt{2(4)} = 2.83$

(D) $CFSE = -0.6\Delta_t(4) + 0.4\Delta_t(4)$

(E) $Ni(CO)_4$ also tetrahedral

Question ID : 8606541033

57. Given below are two statements :

Statement I : $C < O < N < F$ is the correct order in terms of first ionization enthalpy values.

Statement II: $S > Se > Te > Po > O$ is the correct order in terms of the magnitude of electron gain enthalpy values.

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

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(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 (1)

Sol. C < O < N < F

$2p^2$ $2p^4$ $2p^3$ $2p^5$

$Z_{eff} \uparrow$ I.E. $\uparrow$

Both statements are correct.

Question ID : 8606541042

58. The compound A, $C_8H_8O_2$ reacts with acetophenone to form a single product via cross-Aldol condensation. The compound A on reaction with conc. NaOH forms a substituted benzyl alcohol as one of the two products.

The compound A is :

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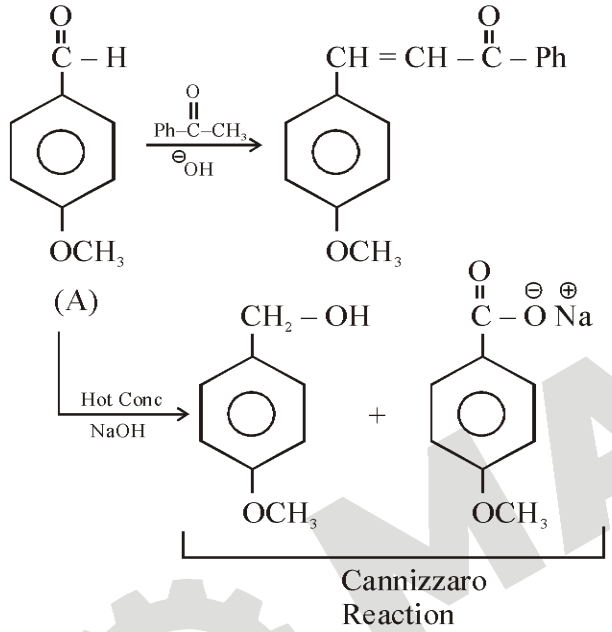
(1) 4-methoxy benzaldehyde
(2) 4-hydroxy benzylaldehyde
(3) 4-methyl benzoic acid
(4) 2-hydroxy acetophenone

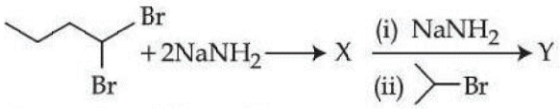
Ans. Official answer NTA (1)

Sol.



Question ID : 8606541040

59. Consider the following reaction :



The product Y formed is :

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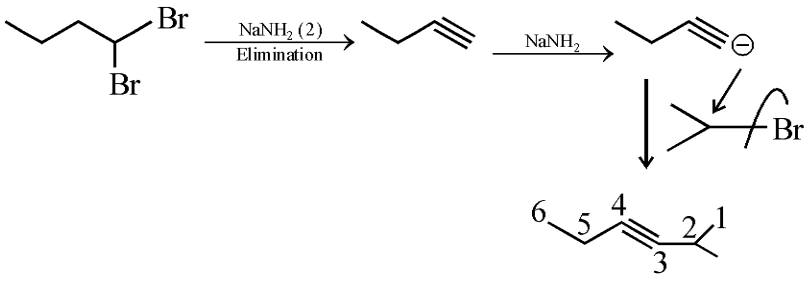
(1) 2-methylhex-2-yne (2) 2-methylhex-3-yne
(3) Isopropylbut-1-yne (4) 5-methylhex-2-yne

Ans. Official answer NTA (2)

Sol.



Question ID : 8606541027

60. The energy of first (lowest) Balmer line of H atom is $_{x}$ J . The energy (in J) of second Balmer line of H atom is :

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(1) 1.35x (2) $\frac{x}{1.35}$ (3) x^2 (4) 2x

Ans. Official answer NTA (1)

Sol. $n_1 = 2, n_2 = 3$ (I[st] Balmer Line)

$$\Delta E = x = 13.6(1)^2\left(\frac{1}{2^2}-\frac{1}{3^2}\right) \quad ...(I)$$

$n_1 = 2, n_2 = 4$ (2[nd] Balmer Line)

$$\Delta E = 13.6\left(1^2\right)\left[\frac{1}{2^2}-\frac{1}{4^2}\right] \quad ...(II)$$

$$\frac{(II)}{(I)} = \frac{DE}{x} = \frac{\frac{1}{4}-\frac{1}{16}}{\frac{1}{4}-\frac{1}{9}} = \frac{27}{20}$$

$(\Delta E = 1.35x)$

Question ID : 8606541032

61. Among H_2S, H_2O, NF_3, NH_3 and $CHCl_3$, identify the molecule (X) with lowest dipole moment value. The number of lone pairs of electrons present on the central atom of the molecule (X) is :

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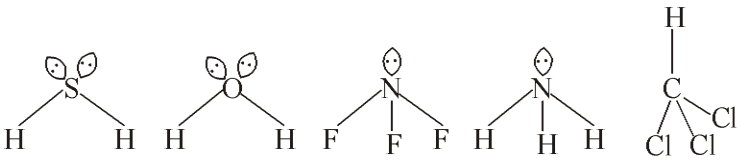
(1) 1 (2) 2 (3) 3 (4) 0

Ans. Official answer NTA (1)

Sol.

Molecule	Dipole moment
H_2S	0.95

H_2O	1.85
NF_3	0.23 (minimum)
NH_3	1.47
$CHCl_3$	1.04



Question ID : 8606541037

62. Identify the correct statements :

A. Hydrated salts can be used as primary standard.

B. Primary standard should not undergo any reaction with air.

C. Reactions of primary standard with another substance should be instantaneous and stoichiometric.

D. Primary standard should not be soluble in water.

E. Primary standard should have low relative molar mass.

Choose the correct answer from the options given below :

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(1) A, B and C Only

(2) A, B, C and E Only

(3) D and E Only

(4) A, B and E Only

Ans. Official answer NTA (1)

Sol. Primary standard must be soluble for standard solution formation.

(A) True, some hydrated salt are very stable & have fixed composition. Ex : $Na_2CO_3 \cdot 10H_2O$ (used as primary standard)

(B) True, otherwise mass change

(C) True, for accurate titration

–fast reaction

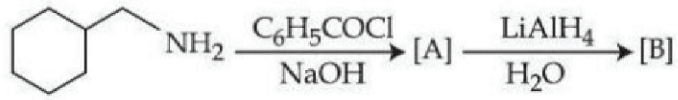
–complete reaction

–known stoichiometry

(D) It must be soluble for titration.

(E) It should have high molar mass to reduce weighing error.

Question ID : 8606541044

63. 

The final product [B] is :

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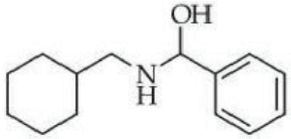
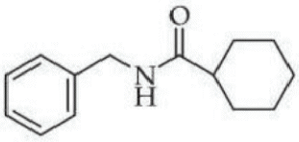
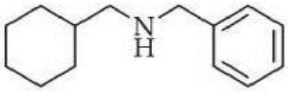
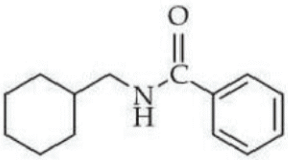
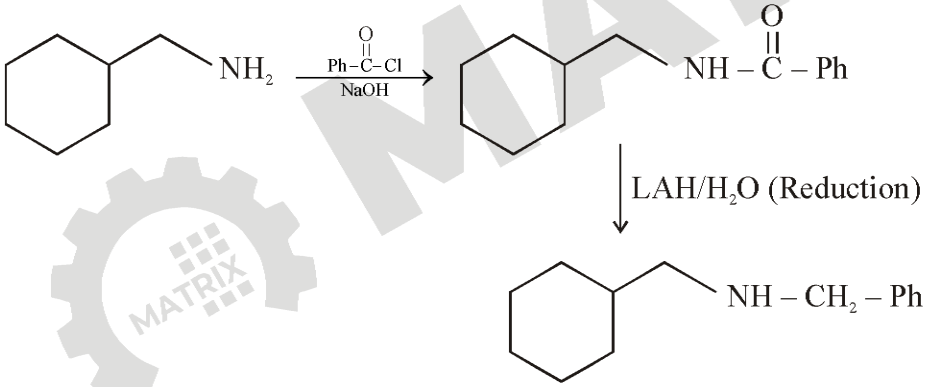
(1) 

(2) 

(3) 

(4) 

Ans. Official answer NTA (3)

Sol. 

Question ID : 8606541031

64. Correct statements regarding Arrhenius equation among the following are :

A. Factor $e^{-Ea/RT}$ corresponds to fraction of molecules having kinetic energy less than Ea .

B. At a given temperature, lower the Ea, faster is the reaction.

C. Increase in temperature by about $10^{\circ}C$ doubles the rate of reaction.

D. Plot of $\log k$ vs $\frac{1}{T}$ gives a straight line with slope $= -\frac{Ea}{R}$.

Choose the correct answer from the options given below :

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

Ans. Official answer NTA (2)

Sol. (A) K.E. greater then E_a.

(B) Lower activation energy means a larger function of molecule can react, leading to a faster reaction rate.

(C) Yes, increase in temperature by about 10°C double the rate of reaction.

(D) It is not straight line.

Question ID : 8606541035

65. Given below are two statements :

Statement I : The first ionization enthalpy of Cr is lower than that of Mn .

Statement II: The second and third ionization enthalpies of Cr are higher than those of Mn .

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

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(1) Both Statement I and Statement II are false

(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 (4)

Sol. Cr = [Ar] $3d^5 4s^1$

Mn = [Ar] $3d^5 4s^2$

IE_1 Cr < Mn

IE_2 Cr > Mn

IE_3 Cr < Mn

Question ID : 8606541045

66.

List - I	List - II
Reaction of Glucose with	Product formed
A. Hydroxylamine	I. Gluconic acid
B. Br_2 water	II. Glucose pentacetate
C. Excess acetic anhydride	III. Saccharic acid

D. Concentrated HNO_3 IV. Glucoxime

Choose the correct answer from the options given below :

क

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

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

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

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

Ans. Official answer NTA (4)

Sol. Glucose + Hydroxyl Amine = Gluoxine

Glucose + Br_2 + H_2O = Gluconic Acid

Glucose + Acetic anhydride = Glucose Pentacetate

Glucose + cone HNO_3 = Saccharic acid

Question ID : 8606541026

67. $A + 2B \rightarrow AB_2$

36.0 g of 'A' (Molar mass : $60\,g\,mol^{-1}$) and 56.0 g of 'B' (Molar mass : $80\,g\,mol^{-1}$) are allowed to react. Which of the following statements are correct ?

A. 'A' is the limiting reagent.

B. 77.0 g of AB_2 is formed.

C. Molar mass of AB_2 is $140\,g\,mol^{-1}$.

D. 15.0 g of A is left unreacted after the completion of reaction.

Choose the correct answer from the options given below :"

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(1) B and D Only

(2) A and B Only

(3) A and C Only

(4) C and D Only

Ans. Official answer NTA (1)

Sol.

	A	+	2B	$\rightarrow AB_2$
moles	$\frac{36}{60}$		$\frac{56}{80}$	
=	0.6		0.7	

0.25 – 0.35

(A) Molecular wt. of AB_2 is $= 60 + 2 \times 80 = 220$ g/mol

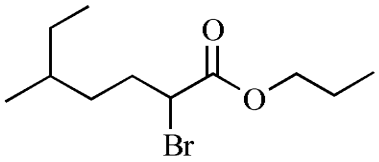
(B) L.R. is AB

(C) Wt. of A remaining $= 0.25 \times 60 = 15$ g

(D) Wt. of AB_2 formed $= 0.35 \times 220 = 77$ g

Question ID : 8606541039

68. The IUPAC name of the following compound is :



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(1) n-propyl-2-bromo-5-methylheptanoate

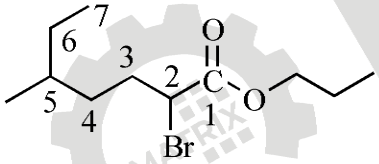
(2) 2-bromo-5-methylhexylpropanoate

(3) n-propyl-1-bromo-4-methylhexanoate

(4) 2-bromo-5-methylpropanoate

Ans. Official answer NTA (1)

Sol.



Question ID : 8606541038

69. When 1 g of compound (X) is subjected to Kjeldahl's method for estimation of nitrogen, 15 mL 1 M H_2SO_4 was neutralized by ammonia evolved. The percentage of nitrogen in compound (X) is :

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(1) 0.42 (2) 0.21 (3) 21 (4) 42

Ans. Official answer NTA (4)

Sol. eq. fo H_2SO_4 = eq. of ammonia

$$\frac{15 \times 1 \times 2}{1000} = n \times 1$$

moles of ammonia = moles of N

$$\text{wt. of N} = \frac{15 \times 1 \times 2}{100} = 0.42$$

$$\% \text{ wt. of N} = \frac{0.42}{1} \times 100 = 42\%$$

Question ID : 8606541030

70. Consider the following reduction processes :

$Al^{3+} + 3e^- \rightarrow Al(s), E^\circ = -1.66\,V$

$Fe^{3+} + e^- \rightarrow Fe^{2+}, E^\circ = +0.77\,V$

$Co^{3+} + e^- \rightarrow Co^{2+}, E^\circ = +1.81\,V$

$Cr^{3+} + 3e^- \rightarrow Cr(s), E^\circ = -0.74\,V$

The tendency to act as reducing agent decreases in the

क

(1) $Al > Cr > Fe^{2+} > Co^{2+}$

(2) $Al > Cr > Co^{2+} > Fe^{2+}$

(3) $Al > Fe^{2+} > Cr > Co^{2+}$

(4) $Cr > Fe^{2+} > Al > Co^{2+}$

Ans. Official answer NTA (1)

Sol. $\text{Reducing power} \propto \frac{1}{\text{Reduction potential}}$

SECTION – B

Question ID : 8606541048

71. Consider $A \xrightarrow{k_1} B$ and $C \xrightarrow{k_2} D$ are two reactions. If the rate constant (k_1) of the $A \rightarrow B$ reaction can be expressed by the following equation $\log_{10} k = 14.34 - \frac{1.5 \times 10^4}{T/K}$ and activation energy of $C \rightarrow D$ reaction (Ea_2) is $\frac{1}{5}$ th of the $A \rightarrow B$ reaction (Ea_1), then the value of (Ea_2) is _____ $kJmol^{-1}$. (Nearest Integer)

क

Ans. Official answer NTA (57)

Sol. $\log K = \log A - \frac{Ea}{2.303RT}$

$\frac{Ea_1}{2.303R} = 1.5 \times 10^4$

$Ea_1 = 1.5 \times 10^4 \times 2.303 \times 8.314$

$= 28.7207\ J$

$= 287.207\ kJ$

$Ea_2 = \frac{Ea_1}{5} = \frac{287.207}{5} = 57.44kJ \approx 57kJ$

Question ID : **8606541047**

72. Consider the following electrochemical cell : $Pt|O_2(g)(1bar)|HCl(aq)||M^{2+}(aq,1.0M)|M(s)$

The pH above which, oxygen gas would start to evolve at anode is _____ (nearest integer).

[Given: $E^{\circ}_{M^{2+}/M} = 0.994\ V$, $E^{\circ}_{O_2/H_2O} = 1.23\ V$} standard reduction potential

and $\frac{RT}{F}(2.303) = 0.059V$ at the given condition]

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Ans. Official answer NTA (4)

Sol. For spontancity $E_{cell} > 0$

$H_2O \rightarrow 2H^+ + \frac{1}{2}O_2 + 2e^-$

$E = E^{\circ} - \frac{0.059}{2}\log\left[\frac{\left[H^+\right]^2 \times \left(p_{O_2}\right)^{\frac{1}{2}}}{1}\right]$

$-0.097 = -1.23 + 0.059 \times pH$

$pH = 3.94 \approx 4$

Question ID : **8606541049**

73. Among the following oxides of 3d elements, the number of mixed oxides are _____.

$Ti_2O_3, V_2O_4, Cr_2O_3, Mn_3O_4, Fe_3O_4, Fe_2O_3, Co_3O_4$

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Ans. Official answer NTA (3)

Sol. $\left.\begin{matrix} Mn_3O_4 = MnO.Mn_2O_3 \\ Fe_3O_4 = FeO.Fe_2O_3 \\ Co_3O_4 = CoO.Co_2O_3 \end{matrix}\right]$ Mixed oxide

Question ID : **8606541050**

74. The mass of benzanilide obtained from the benzoylation reaction of 5.8 g of aniline, if yield of product is 82%, is _____ g (nearest integer).

(Given molar mass in $gmol^{-1}$ H : 1, C : 12, N : 14, O : 16)

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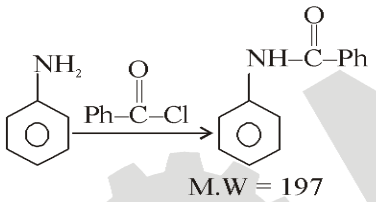
Ans. Official answer NTA (10)

Sol.



M.W = 197

5.8 g

$n = \frac{5.8}{93}$ $\quad n = 0.0623 \times \frac{82}{100}$

$= 0.0623$ $\quad$ mass = 0.051 × 197 = 10.047

(M.W.)

Question ID : 8606541046

75. If the enthalpy of sublimation of Li is $155\,kJ\,mol^{-1}$, enthalpy of dissociation of F_2 is $150\,kJ\,mol^{-1}$, ionization enthalpy of Li is $520\,kJ\,mol^{-1}$, electron gain enthalpy of F is $-313\,kJ\,mol^{-1}$, standard enthalpy of formation of LiF is $-594\,kJ\,mol^{-1}$. The magnitude of lattice enthalpy of LiF is _____ $kJmol^{-1}$. (Nearest Integer)

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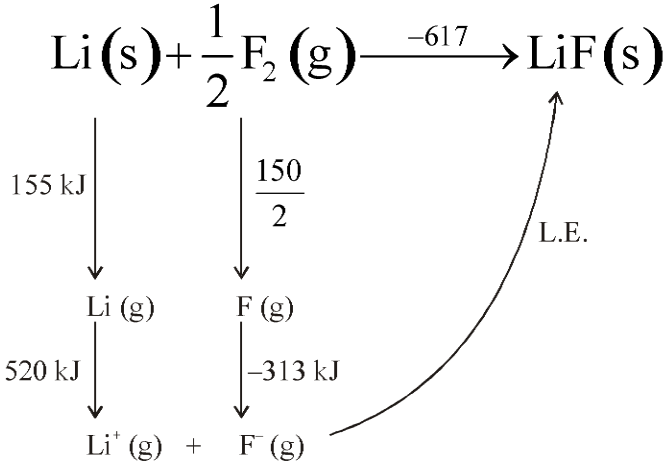
Ans. Official answer NTA (1031)

Sol.



$$-594 = 155 + 520 + \frac{150}{2} - 313 + \text{L.E.}$$

$$\text{L.E.} = -1031\ \text{kJ/mol}$$