JEE Main January 2026

Question Paper With Text Solution

21 January | Shift-2

CHEMISTRY

JEE MAIN JANUARY 2026 | 21 JANUARY SHIFT-2

SECTION – A

Question ID : 860654888

51. Given below are two statements :

Statement I: Compound (X), shown below, dissolves in $NaHCO_3$ solution and has two chiral carbon

atoms
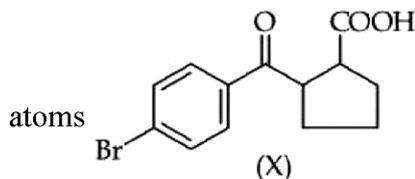
Statement II: Compound (Y), shown below, has two carbons with sp^3 hybridization, one carbon with sp^2 and one carbon with sp hybridization
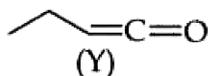
In the light of the above statements, choose the correct answer from the options given below :

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

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

(3) Both Statement I and Statement II are true

(4) Both Statement I and Statement II are false

Ans. Official answer NTA (3)

Sol.
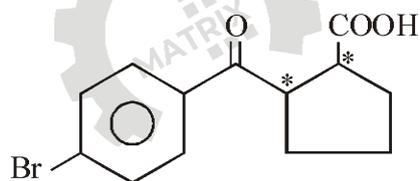
Soluble in $NaHCO_3$, because of COOH group
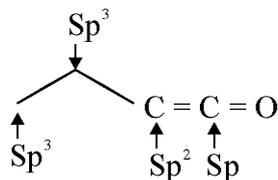
Question ID : 860654878

52. The correct increasing order of $C - H(A), C - O(B), C = O(C)$ and $C \equiv N(D)$ bonds in terms of covalent bond length is :

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(1) $A < B < C < D$ (2) $D < C < B < A$ (3) $A < D < C < B$ (4) $D < C < A < B$

Ans. Official answer NTA (3)

Sol. C – H 107 pm

C – O 143 pm

C = O 121 pm

$C \equiv N$ 116 pm

Question ID : 860654881

53. Decomposition of A is a first order reaction at T(K) and is given by $A(g) \rightarrow B(g) + C(g)$.

In a closed 1 L vessel, 1 bar A(g) is allowed to decompose at T(K). After 100 minutes, the total pressure was 1.5 bar. What is the rate constant (in min^{-1}) of the reaction ? ($\log 2 = 0.3$)

क

(1) 6.9×10^{-2} (2) 6.9×10^{-1} (3) 6.9×10^{-4} (4) 6.9×10^{-3}

Ans. Official answer NTA (4)

Sol.
$$
\begin{array}{llll}
 & A & \rightarrow B & + C \\
t = 0 & 1 & O & O \\
t = 100 & 1-x & x & x \\
1 + x = 1.5 & x = 0.5 & &
\end{array}
$$

$$\ell n \left(\frac{1}{0.5} \right) = K \times 100$$

$$K = 6.9 \times 10^{-3}$$

Question ID : 860654890

54. Given below are four compounds :

(a) n-propyl choride   (b) iso-propyl chloride

(c) sec-butyl chloride   (d) neo-pentyl chloride

Percentage of carbon in the one which exhibits optical isomerism is :
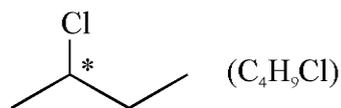
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(1) 52   (2) 40   (3) 56   (4) 46

Ans. Official answer NTA (1)

Sol. Here sec-butyl chloride isoptically active

(C_4H_9Cl)

percentage of carbon = $\dfrac{48}{92.5} \times 100 = 51.9\%$

Question ID : 860654889

55. Match List - I with List - II.

List - I

Pair of Compounds

A. 2-Methylpropene and but-1-ene

B. Cis-but-2-ene and trans-but-2-ene

C. 2-Butanol and diethyl ether

D. But-1-ene and but-2-ene

List - I

Type of Isomers

I. Stereoisomers

II. Position isomers

III. Chain isomers

IV. Functional group isomers

Choose the correct answer from the options given below :

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

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

Ans. Official answer NTA (1)

Sol.

(A) & → chain isomer

(B) & → stereo isomer

(C) & → functional group

(D) & → position isomer
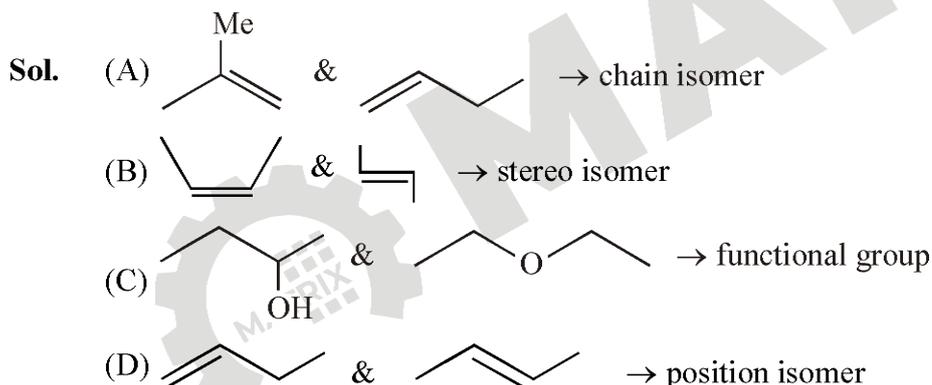
Question ID : 860654879

56. Consider the following data:

$\Delta_f H^\ominus$ (methane, g) $= -X kJ mol^{-1}$

Enthalpy of sublimation of graphite $= Y kJ mol^{-1}$

Dissociation enthalpy of $H_2 = Z kJ mol^{-1}$

The bond enthalpy of C – H bond is given by :

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(1) $X + Y + Z$ (2) $\dfrac{X + Y + 4Z}{2}$ (3) $\dfrac{X + Y + 2Z}{4}$ (4) $\dfrac{-X + Y + Z}{4}$

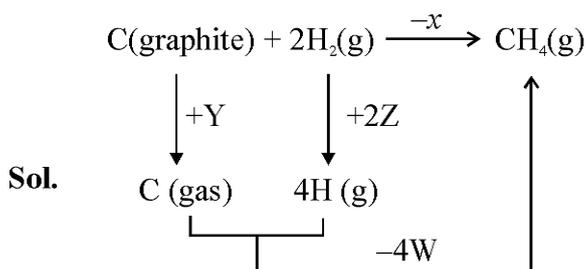**Ans.** Official answer NTA (3)

Sol.

$$C(graphite) + 2H_2(g) \xrightarrow{\ -x\ } CH_4(g)$$

with $+Y$ and $+2Z$ going down to $C\ (gas)$ and $4H\ (g)$, and $-4W$

$$Y + 2Z - 4W = -x$$

$$W = \frac{x + y + 2z}{4}$$

Question ID : 860654894

57. The correct statements are :

A. Activation energy for enzyme catalysed hydrolysis of sucrose is lower than that of acid catalysed hydrolysis.

B. During denaturation, secondary and tertiary structures of a protein are destroyed but primary structure remains intact.

C. Nucleotides are joined together by glycosidic linkage between C_1 and C_4 carbons of the pentose sugar.

D. Quaternary structure of proteins represents overall folding of the polypeptide chain.

Choose the correct answer from the options given below :

क

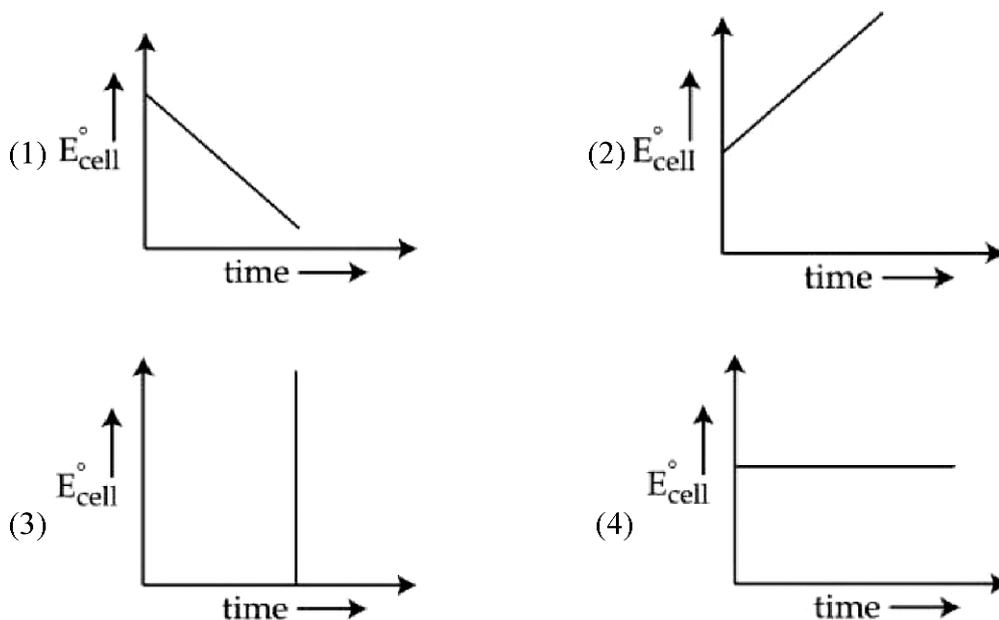(1) B and C Only   (2) A,B and D Only   (3) A,C and D Only   (4) A and B Only

Ans. Official answer NTA (4)

Sol. As per NCERT Theory

Question ID : 860654880

58. For a closed circuit Daniell cell, which of the following plots is the accurate one at a given temperature?

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Ans. Official answer NTA (4)

Sol. E°_{cell} of daniel cell, doesn't depend on time

Question ID : 860654883

59. Given below are two statements :

Statement I : The correct order in terms of bond dissociation enthalpy is $Cl_2 > Br_2 > F_2 > I_2$.

Statement II : The correct trend in the covalent character of the metal halides is $[SnCl_4 > SnCl_2]$, $[PbCl_4 > PbCl_2]$ and $[UF_4 > UF_6]$.

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) Statement I is true but Statement II is false

(3) Both Statement I and Statement II are true

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

Ans. Official answer NTA (2)

Sol. Statement I : given correct is correct

Statement II : Covalent character in UF_6 is more than UF_4

Question ID : 860654895

60. On heating a mixture of common salt and $K_2Cr_2O_7$ in equal amount along with concentrated H_2SO_4 in a test tube, a gas is evolved. Formula of the gas evolved and oxidation state of the central metal atom in the gas respectively are:

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(1) $Cr_2O_2Cl_2$ and $+6$

(2) $Cr_2O_2Cl_2$ and $+3$

(3) CrO_2Cl_2 and $+6$

(4) CrO_2Cl_2 and $+5$

Ans. Official answer NTA (3)

Sol. $Cl^{\ominus}(s) + K_2Cr_2O_7 + H_2SO_4 \rightarrow CrO_2Cl_2\,(+6)$

deep red

Question ID : 860654882

61. Given below are two statements :

Statement I : The correct order in terms of atomic/ionic radii is $Al > Mg > Mg^{2+} > Al^{3+}$.

Statement II: The correct order in terms of the magnitude of electron gain enthalpy is $Cl > Br > S > O$.

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

क

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

(2) Both Statement I and Statement II are false

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

(4) Both Statement I and Statement II are true

Ans. Official answer NTA (1)

Sol. Statement I : wrong because $r_{mg} > r_{Al}$

Statement II : given order is correct

Question ID : 860654885

62. Given below are two statements :

Statement I : Crystal Field Stabilization Energy (CFSE) of $[Cr(H_2O)_6]^{2+}$ is greater than that of $\left[Mn(H_2O)_6\right]^{2+}$.

Statement II: Potassium ferricyanide has a greater spin-only magnetic moment than sodium ferrocyanide.

In the light of the above statements, choose the correct answer from the options given below :
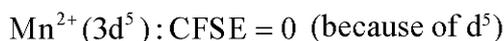
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(1) Both Statement I and Statement II are false

(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 (3)

Sol. Statement I :

$Cr^{2+}(3d^4) : CFSE = -0.6\,\Delta_0$

$Mn^{2+}(3d^5) : CFSE = 0$ (because of d^5)

Statement II :

Patassium ferricyanide $\rightarrow Fe^{3+}(\mu = \sqrt{3})$

Sodium ferrocyanide $\rightarrow Fe^{2+}(\mu = O)$

Question ID : 860654876

63. Aqueous HCl reacts with $MnO_2(s)$ to form $MnCl_2(aq)$, $Cl_2(g)$ $H_2O(l)$. What is the weight (in g) of Cl_2 liberated when 8.7 g of $MnO_2(s)$ is reacted with excess aqueous HCl solution ?

(Given Molar mass in g mol^{-1} Mn = 55, Cl = 35.5, O = 16, H = 1)
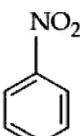
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(1) 14.2   (2) 71   (3) 7.1   (4) 21.3

Ans. Official answer NTA (3)

Sol. $MnO_2 + 4HCl \rightarrow MnCl_2 + Cl_2 + 2H_2O$
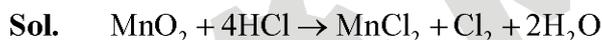
$n_{MnO_2} = n_{Cl_2} = \dfrac{8.7}{87} = 0.1$

mass of Cl_2 = 0.1 × 71 = 7.1

Question ID : 860654893

64.

NO$_2$
(1) Br$_2$/FeBr$_3$/Δ
(2) Sn/HCl/Δ
(3) pH neutralisation $\rightarrow$ Major Product (P)
(4) Br$_2$/H$_2$O
(5) NaNO$_2$/HBr, 0 – 5°C
(6) CuBr/NaBr

Consider the above sequence of reactions. The number of bromine atom(s) in the final product (P) will be :

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

Ans. Official answer NTA (4)

Sol.
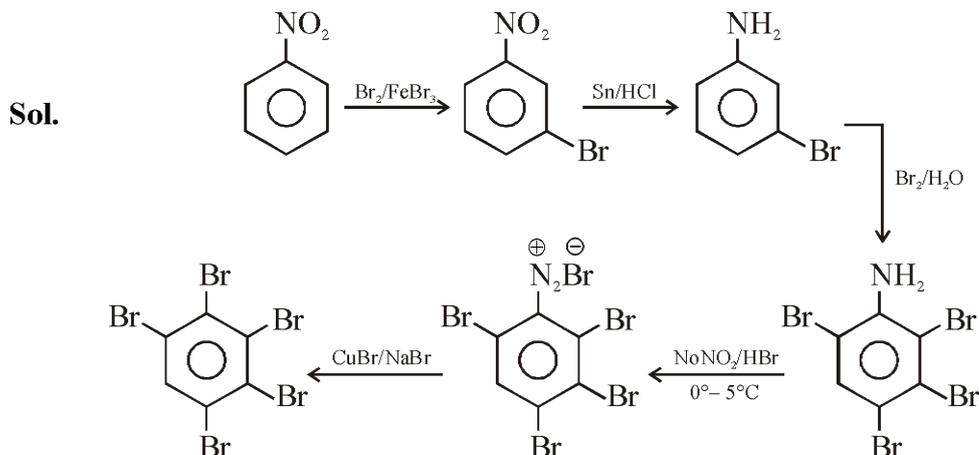
Question ID : 860654892

65. Match list - I with List - II.

List - I	List - II
Reagents	Reaction Name (Involving aldehydes)
A. $H_2, Pd - BaSO_4$	I. Etard Reaction
B. $SnCl_2, HCl$	II. Rosenmund Reduction
C. CrO_2Cl_2, CS_2	III. Gatterman - Koch Reaction
D. CO, HCl, Anhyd. $AlCl_3$	IV. Stephen Reaction

Choose the correct answer from the options given below :

क

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

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

Ans. Official answer NTA (2)

Sol. (A) $H_2, Pd - BaSO_4 \rightarrow$ Rosenmund Reduction

(B) $SnCl_2, HCl \rightarrow$ Stephen Reaction

(C) $CrO_2Cl_2, CS_2 \rightarrow$ Etard Reaction

(D) CO, HCl, Anhyd. $AlCl_3 \rightarrow$ Gatterman - Koch Reaction

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Page No. 9

Question ID : 860654877

66. Consider the following spectral lines for atomic hydrogen :

A. First line of Paschen series

B. Second line of Balmer series

C. Third line of Paschen series

D. Fourth line of Bracket series

The correct arrangement of the above lines in ascending order of energy is :

क

(1) $D < A < C < B$ (2) $D < C < A < B$ (3) $C < D < B < A$ (4) $A < B < C < D$

Ans. Official answer NTA (1)

Sol. $\Delta E \propto \left(\dfrac{1}{n_1^2} - \dfrac{1}{n_1^2} \right)$ value
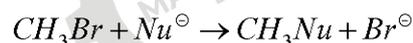
(A) $\rightarrow n_1 = 3$ $n_2 = 4$

(B) $\rightarrow n_1 = 2$ $n_2 = 4$

(C) $\rightarrow n_1 = 3$ $n_2 = 6$

(D) $\rightarrow n_1 = 4$ $n_2 = 8$

Question ID : 860654887

67. The correct order of the rate of the reaction for the following reaction with respect to nucleophiles is :

$$CH_3Br + Nu^{\ominus} \rightarrow CH_3Nu + Br^{\ominus}$$

क

(1) $PhO^- > -OH > CH_3COO^- > ClO_4^-$

(2) $ClO_4^- > CH_3COO^- > -^-OH > PhO^-$

(3) $CH_3COO^- > PhO^- > -OH > ClO_4^-$

(4) $^-OH > PhO^- > CH_3COO^- > ClO_4^-$

Ans. Official answer NTA (4)

Sol. more the stability of negative charge lesser will be nucleophilicity

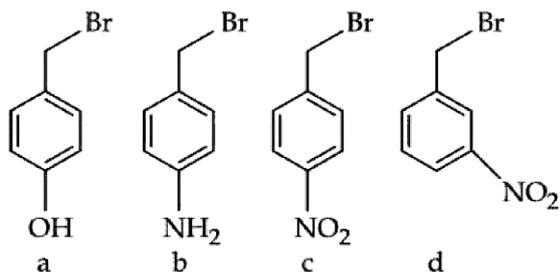Stability order $\rightarrow ^-OH < PhO^- < CH_3COO^- < ClO_4^-$

Question ID : 860654891

68. The correct order of reactivity of the following benzyl halides towards reaction with KCN is :

क

(1) $a > b > d > c$ (2) $b > a > d > c$ (3) $b > a > c > d$ (4) $a > b > c > d$

Ans. Official answer NTA (2)

Sol. R·O·R $\propto$ stability of Reac^n Intermediate

Stability order →
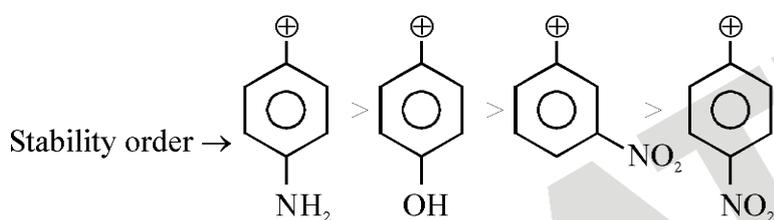
Question ID : 860654886

69. By usual analysis, 1.00 g of compound (X) gave 1.79 g of magnesium pyrophosphate. The percentage of phosphorus in compound (X) is : (nearest integer)

(Given, molar mass in $gmol^{-1} : O = 16, Mg = 24, P = 31$)

क

(1) 20 (2) 30 (3) 40 (4) 50

Ans. Official answer NTA (4)

Sol. $n_{Mg_2P_2O_7} = \dfrac{1.79}{222}$

$n_p = \dfrac{1.79}{222} \times 2$

$w_p = \dfrac{1.79}{222} \times 2 \times 31 = 0.5$

$\% \text{ of } p = \dfrac{0.5}{1} \times 100 = 50\%$

Question ID : 860654884

70.   Given below are some of the statements about Mn and Mn_2O_7. Identify the correct statements.

A. Mn forms the oxide Mn_2O_7, in which Mn is in its highest oxidation state.

B. Oxygen stabilizes the Mn in higher oxidation states by forming multiple bonds with Mn .

C. Mn_2O_7 is an ionic oxide.

D. The structure of Mn_2O_7 consists of one bridged oxygen.

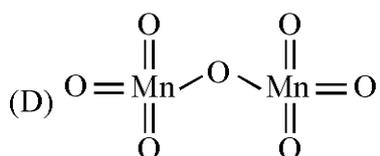Choose the correct answer from the options given below :

क

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

Ans.   Official answer NTA (2)

Sol.   (A) Highest O.N of Mn is +7

(B) Mn generally form stable comp. in highest O.N with oxygen.

(C) Mn_2O_7 is covalent because of Higher O.N.

(D) $\overset{\displaystyle O}{\underset{\displaystyle O}{\overset{\|}{\underset{\|}{O=Mn}}}}\diagdown O\diagup\overset{\displaystyle O}{\underset{\displaystyle O}{\overset{\|}{\underset{\|}{Mn=O}}}}$

SECTION – B

Question ID : 860654896

71.   A substance 'X' (1.5 g) dissolved in 150 g of a solvent 'Y' (molar mass = 300 g mol^{-1}) led to an elevation of the boiling point by 0.5 K . The relative lowering in the vapour pressure of the solvent 'Y' is _____ $\times$ 10^{-2}. (nearest integer)

[Given : K_b of the solvent = 5.0 K kg mol^{-1}]

Assume the solution to be dilute and no association or dissociation of X takes place in solution.

क

Ans.   Official answer NTA (3)

Sol. $\Delta T_b = i\,k_b m$

$0.5 = i \times m \times 5$
$m = 0.1$

$\dfrac{P_O - P_s}{P_O} = \dfrac{m \times M_{solvent}}{1000} = \dfrac{0.1 \times 300}{1000} = 0.03$
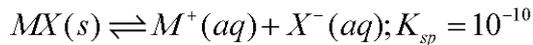
Question ID : 860654899

72. MX is a sparingly soluble salt that follows the given solubility equilibrium at 298 K .

$$MX(s) \rightleftharpoons M^+(aq) + X^-(aq); K_{sp} = 10^{-10}$$

If the standard reduction potential for $M^+(aq) \xrightarrow{+e^-} M(s)$ is $\left(E^\ominus_{M^+/M}\right) = 0.79V$, then the value of the standard reduction potential for the metal/metal insoluble salt electrode $E^\ominus_{X^-/MX(s)/M}$ is _____ mV. (nearest integer)

[Given : $\dfrac{2.303RT}{F} = 0.059V$]

क

Ans. Official answer NTA (200)

Sol. $E^o_{Cl^-|Agd|Ag} = E^o_{Ag^+|Ag} - \dfrac{.059}{1}\log\dfrac{1}{k_{sp}}$

$= 0.79 - .059\log10^{10}$

$= 0.2\,\text{volt}$

$= 200\,\text{mV}$

Question ID : 860654897

73. The osmotic pressure of a living cell is 12 atm at 300 K . The strength of sodium chloride solution that is isotonic with the living cell at this temperature is _____ g L^{-1}. (Nearest integer)

Given : R = 0.08 L atm K^{-1} mol $^{-1}$

Assume complete dissociation of NaCl

(Given : Molar mass of Na and Cl are 23 and 35.5 g mol^{-1} respectively.)

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Ans. Official answer NTA (15)

Sol. $\pi = iMRT$

$12 = 2 \times M \times .08 \times 300$
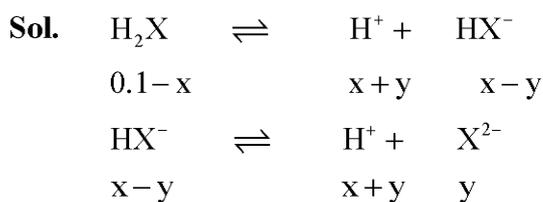
$M = \dfrac{1}{4}\dfrac{\text{mole}}{\text{lit}}$

$M = \dfrac{1}{4} \times 58.5\dfrac{\text{g}m}{\text{lit}}$

$$M = 14.62 \frac{gm}{lit}$$

Question ID : 860654898

74. The first and second ionization constants of H_2X are 2.5×10^{-8} and 1.0×10^{-13} respectively. The concentration of X^{2-} in 0.1 M H_2X solution is _____ $\times 10^{-15}$ M. (Nearest Integer)

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Ans. Official answer NTA (100)

Sol.

$$H_2X \rightleftharpoons H^+ + HX^-$$
$$0.1 - x \qquad x + y \qquad x - y$$

$$HX^- \rightleftharpoons H^+ + X^{2-}$$
$$x - y \qquad x + y \qquad y$$

$$\frac{(x+y)(x+y)}{0.1-x} = 2.5 \times 10^{-8}$$

$$\frac{(x+y)(y)}{(x-y)} = 10^{-3}$$

$$x >>> y$$

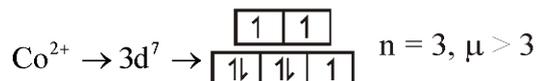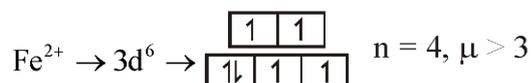$$\left[X^{2-}\right] = y = 10^{-13}$$

Question ID : 860654900

75. Identify the metal ions among $Co^{2+}, Ni^{2+}, Fe^{2+}, V^{3+}$ and Ti^{2+} having a spin-only magnetic moment value more than 3.0 BM . The sum of unpaired electrons present in the high spin octahed ral complexes formed by those metal ions is _____ .

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Ans. Official answer NTA (7)

Sol. Only Fe^{2+} and Co^{2+} can form high spin octahedral complex

$$Fe^{2+} \rightarrow 3d^6 \rightarrow \boxed{\begin{array}{cc} 1 & 1 \end{array}}$$
$$\boxed{\begin{array}{ccc} 1\!\downarrow & 1 & 1 \end{array}} \quad n = 4, \mu > 3$$

$$Co^{2+} \rightarrow 3d^7 \rightarrow \boxed{\begin{array}{cc} 1 & 1 \end{array}}$$
$$\boxed{\begin{array}{ccc} 1\!\downarrow & 1\!\downarrow & 1 \end{array}} \quad n = 3, \mu > 3$$

$$= 3 + 4 = 7$$