

Sol. $\frac{1}{(\lambda_1)_P} = R_H Z^2 \left(\frac{1}{9} - \frac{1}{16} \right)$

$$\frac{1}{(\lambda_2)_P} = R_H Z^2 \left(\frac{1}{9} - \frac{1}{25} \right)$$

$$\frac{(\lambda_2)_P}{(\lambda_1)_P} = \frac{7}{\frac{16 \times 9}{25 \times 9}} = \frac{25 \times 7}{16 \times 16}$$

$$(\lambda_2)_P = \frac{25 \times 7}{16 \times 16} \times 720$$

$$(\lambda_2)_P = 492 \text{ nm}$$

54. The number of correct statement/s from the following is _____.

A. Larger the activation energy, smaller is the value of the rate constant.

B. The higher is the activation energy, higher is the value of the temperature coefficient.

C. At lower temperatures, increase in temperature causes more change in the value of k than at higher temperature.

D. A plot of $\ln k$ vs $\frac{1}{T}$ is a straight line with slope

equal to $-\frac{E_a}{R}$

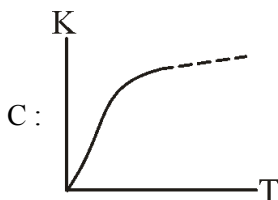
Official Ans. by NTA (3)

Ans. (3)

Sol. **A :** $k = A e^{-\frac{E_a}{RT}}$

As E_a increases k decreases

B : Temperature coefficient = $\frac{k_{T+10}}{k_T}$



Option (C) is wrong. Δk may be greater or lesser depending on temperature.

D : $\ln k = \ln A - \frac{E_a}{RT}$

55. At 298 K, a 1 litre solution containing 10 mmol of $\text{Cr}_2\text{O}_7^{2-}$ and 100 mmol of Cr^{3+} shows a pH of 3.0.

Given : $\text{Cr}_2\text{O}_7^{2-} \rightarrow \text{Cr}^{3+}$; $E^0 = 1.330 \text{ V}$ and

$$\frac{2.303 RT}{F} = 0.059 \text{ V}$$

The potential for the half cell reaction is $x \times 10^{-3} \text{ V}$. The value of x is _____.

Official Ans. by NTA (917)

Ans. (917)

Sol. $\text{Cr}_2\text{O}_7^{2-} + 14\text{H}^+ + 6\text{e}^- \rightarrow 2\text{Cr}^{3+} + 7\text{H}_2\text{O}$

$$E = 1.33 - \frac{0.059}{6} \log \frac{(0.1)^2}{(10^{-2})(10^{-3})^{14}}$$

$$E = 1.33 - \frac{0.059}{6} \times 42 = 0.917$$

$$E = 917 \times 10^{-3}$$

$$x = 917$$

56. When $\text{Fe}_{0.93}\text{O}$ is heated in presence of oxygen, it converts to Fe_2O_3 . The number of correct statement/s from the following is _____.

A. The equivalent weight of $\text{Fe}_{0.93}\text{O}$ is $\frac{\text{Molecular weight}}{0.79}$.

B. The number of moles of Fe^{2+} and Fe^{3+} in 1 mole of $\text{Fe}_{0.93}\text{O}$ is 0.79 and 0.14 respectively.

C. $\text{Fe}_{0.93}\text{O}$ is metal deficient with lattice comprising of cubic closed packed arrangement of O^{2-} ions.

D. The % composition of Fe^{2+} and Fe^{3+} in $\text{Fe}_{0.93}\text{O}$ is 85% and 15% respectively.

Official Ans. by NTA (4)

Ans. (4)

Sol. **A :** $\text{Fe}_{0.93}\text{O} \rightarrow \text{Fe}_2\text{O}_3$

$$nf = \left(3 - \frac{200}{93} \right) \times 0.93$$

$$nf = 0.79$$

$$\text{B : } 2x + (0.93 - x) \times 3 = 2$$

$$x = 0.79$$

$$\text{Fe}^{2+} = 0.79, \text{Fe}^{3+} = 0.21$$

C : Fact

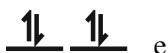
$$\text{D : } \% \text{Fe}^{2+} = \frac{0.79}{0.93} \times 100 = 85\%; \text{Fe}^{3+} = 15\%$$

57. The d-electronic configuration of $[\text{CoCl}_4]^{2-}$ in tetrahedral crystal field is $e^m t_2^n$. Sum of 'm' and 'number of unpaired electrons' is _____.

Official Ans. by NTA (7)

Ans. (7)

Sol. $\text{Co}^{2+} : 3d^7 4s^0$, $\text{Cl}^- : \text{WFL}$



Configuration $e^4 t_2^3 : m = 4$

Number of unpaired electrons = 3

So, answer = 7

58. For independent process at 300 K.

Process	$\Delta H/\text{kJ mol}^{-1}$	$\Delta S/\text{J K}^{-1}$
A	-25	-80
B	-22	40
C	25	-50
D	22	20

The number of non-spontaneous process from the following is _____.

Official Ans. by NTA (2)

Ans. (2)

Sol. $\Delta G = \Delta H - T\Delta S$

A : $\Delta G (\text{J mol}^{-1}) = -25 \times 10^3 + 80 \times 300 : -ve$

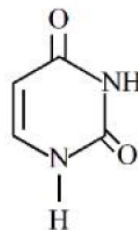
B : $\Delta G (\text{J mol}^{-1}) = -22 \times 10^3 - 40 \times 300 : -ve$

C : $\Delta G (\text{J mol}^{-1}) = 25 \times 10^3 + 300 \times 50 : +ve$

D : $\Delta G (\text{J mol}^{-1}) = 22 \times 10^3 - 20 \times 300 : +ve$

Processes C and D are non-spontaneous.

59. Uracil is base present in RNA with the following structure. % of N in uracil is _____.



Given :

Molar mass N = 14 g mol^{-1} ; O = 16 g mol^{-1} ; C = 12 g mol^{-1} ; H = 1 g mol^{-1} ;

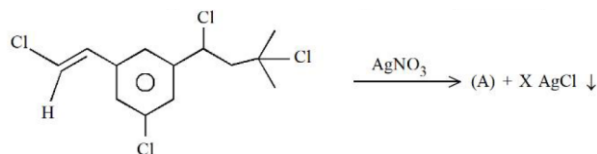
Official Ans. by NTA (25)

Ans. (25)

Sol. Mol. Wt of $\text{C}_4\text{N}_2\text{H}_4\text{O}_2 = 112$

$$\%N = \frac{28}{112} \times 100 = 25\%$$

60. Number of moles of AgCl formed in the following reaction is _____.



Official Ans. by NTA (2)

Ans. (2)

Sol. Benzylic and tertiary carbocations are stable.