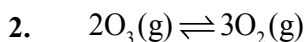




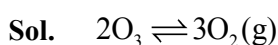
$$\% X = \frac{6}{14} \times 100 = 42.8 \simeq 43\%$$



At 300 K, ozone is fifty percent dissociated. The standard free energy change at this temperature and 1 atm pressure is (-) ___ J mol⁻¹ (Nearest integer)

[Given: $\ln 1.35 = 0.3$ and $R = 8.3 \text{ J K}^{-1} \text{ mol}^{-1}$]

Ans. (747)



$$\frac{2}{5} = \frac{3}{5}$$

$$k_p = \frac{P_{O_2}^3}{P_{O_3}^2}$$

$$k_p = 1.35$$

$$\Delta G^\circ = -RT \ln k_p$$

$$= -8.3 \times 300 \times \ln 1.35$$

$$= -747 \text{ J/mol}$$

3. The osmotic pressure of blood is 7.47 bar at 300 K. To inject glucose to a patient intravenously, it has to be isotonic with blood. The concentration of glucose solution in gL⁻¹ is _____ (Molar mass of glucose = 180 g mol⁻¹)

$$R = 0.083 \text{ L bar K}^{-1} \text{ mol}^{-1} \text{ (Nearest integer)}$$

Allen Ans. (54)

Sol. $\pi = C.R.T$

$$7.47 = C \times 0.083 \times 300$$

$$C = 0.3 \text{ M}$$

$$= 0.3 \times 180 \text{ gL}^{-1}$$

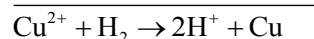
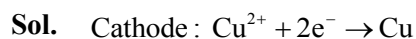
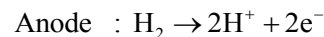
$$= 54 \text{ gL}^{-1}$$

4. The cell potential for the following cell



is 0.576 V at 298 K. The pH of the solution is ____ (Nearest integer)

Ans. (5)

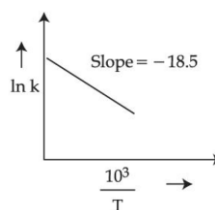


$$E_{\text{cell}} = E_{\text{cell}}^0 - \frac{0.06}{2} \log \frac{[H^+]^2}{[Cu^{2+}]}$$

$$0.576 = 0.34 - \frac{0.06}{2} \log \left\{ \frac{[H^+]^2}{(0.01)} \right\}$$

$$+ 3.93 - \log(H^+) + \log 0.1 \Rightarrow \text{pH} = 4.93 \simeq 5$$

5. The rate constants for decomposition of acetaldehyde have been measured over the temperature range 700 – 1000 K. The data has been analysed by plotting $\ln k$ vs $\frac{10^3}{T}$ graph. The value of activation energy for the reaction is ___ kJ mol⁻¹. (Nearest integer) (Given : $R = 8.31 \text{ J K}^{-1} \text{ mol}^{-1}$)



Ans. (154)

Sol. $\ln k = \ln A - \frac{E_a}{10^3 RT} \times 10^3 = \ln A + \frac{10^3}{T} \left[-\frac{E_a}{10^3 RT} \right]$

From the graph

$$\frac{-E_a}{10^3 \times R} = -18.5$$

$$E_a = 153.735 \text{ kJ/mol}$$

$$\sim 154$$

6. The difference in oxidation state of chromium in chromate and dichromate salts is _____

Official Ans. by NTA (0)

Allen Ans. (0)

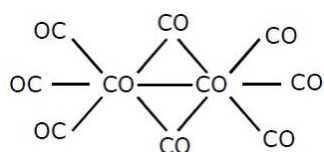
Sol. CrO_4^{2-} , $\text{Cr}_2\text{O}_7^{2-}$ difference is zero

7. In the cobalt-carbonyl complex: $[\text{Co}_2(\text{CO})_8]$, number of Co-Co bonds is "X" and terminal CO ligands is "Y". $X + Y = \underline{\hspace{2cm}}$

Official Ans. by NTA (7)

Allen Ans. (7)

Sol.



$$X = 1$$

$$Y = 6$$

8. A 0.166 g sample of an organic compound was digested with cone. H_2SO_4 and then distilled with NaOH. The ammonia gas evolved was passed through 50.0 mL of 0.5 N H_2SO_4 . The used acid required 30.0 mL of 0.25 N NaOH for complete neutralization. The mass percentage of nitrogen in the organic compound is $\underline{\hspace{2cm}}$.

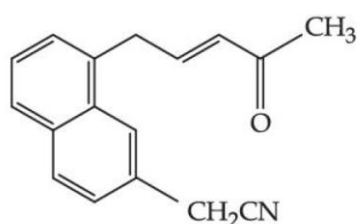
Official Ans. by NTA (63)

Allen Ans. (Bonus)

Sol. m_{eq} of NaOH used = 30×0.25
 m_{eq} of H_2SO_4 taken = 50×0.5
 $\therefore m_{\text{eq}}$ of H_2SO_4 used
 = $50 \times 0.25 \times 30 \times 0.25 = 17.5$ m mol of NH_3
 $\therefore \% \text{N} = \frac{17.5 \times 10^{-3} \times 14}{0.166} \times 100 = 147.59\%$

(Not possible)

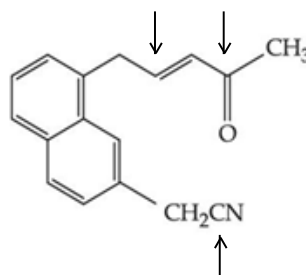
9. Number of electrophilic centre in the given compound is $\underline{\hspace{2cm}}$



Official Ans. by NTA (3)

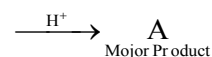
Allen Ans. (3)

Sol.



10. The major product 'A' of the following given reaction has $\underline{\hspace{2cm}}$ sp^2 hybridized carbon atoms.

2,7 - Dimethyl - 2, 6 - octadiene



Official Ans. by NTA (2)

Allen Ans. (2)

Sol. Answer (2)

