D.B. College (Jaynagar) Lect:-30
Akhilesh kumar Singh
Chemistry department B.SC (Hons) Part-I
Mob:-8750390927

Ex.23 The half-life of the nucleide ^{220}Rn is 693 s. what mass of radon is equivalent to a 1 millicurie (mci)?

Soln $t_{1/2} = \frac{0.693}{\lambda} \Rightarrow \lambda = \frac{0.693}{t_{1/2}} = \frac{0.693}{693} 10^{-3} s^{-1}$

1 mci $= 3.7\ 10^{7}$ disintegration $s^{-1} = -\frac{dN}{dt} \Rightarrow -\frac{dN}{d}$

$= \lambda N$

$N = -\frac{dN/dt}{\lambda} = \frac{3.7 \times 10^{7}\ s^{-1}}{6.022 \times 10^{23}} = 1.35\ 10^{-11}\ g = 1.06$

$10^{-14}\ kg$

Ex.24 For the reaction $A \longrightarrow B + C$

Time	t	∞
Total Pressure of (B+C)	P_2	P_3

Calculate K.

Sol^{n}

	$A \longrightarrow$	B	$+ C$
At $t=0$	P_1	0	0
At $t=t$	P_1-X	X	X
At $t=\infty$	0	P_1	P_1

$\therefore 2P_1 = P_3$

$\Rightarrow P_1 = \frac{P_3}{2}$

$2X = P_2 \Rightarrow X = \frac{P_2}{2}$

$\therefore P_1 - X = \frac{P_3}{2} - \frac{P_2}{2} = \frac{P_3 - P_2}{2}$

$\therefore k = \frac{1}{t} \ln \frac{[A]_0}{[A]_t} = \frac{1}{t} \ln \frac{P_3}{(P_3 - P_2)}$

Ex.25 Derive a relation between $t_{1/2}$ and temperature for an n^{th} order reaction where $n > 2$?

Sol^{n} $\ln k = \ln A - \frac{E_a}{RT}$ (Arrhenius equation) ---(i)

$t_{1/2} = \frac{(2^{n-1} - 1)}{k(n-1)a_0^{n-1}}$ ——— (ii)

$\therefore \ln(t_{1/2}) = \ln \frac{2^{n-1} - 1}{(n-1)a_0^{n-1}} - \ln k$ ---- (iii)

From the Eqs. (i) and (iii)

$$\ln(t_{1/2}) = \ln \frac{2^{n-1} - 1}{(n-1)a_0^{n-1}} - \ln A + \frac{E_a}{RT}$$

$$\Rightarrow \ln(t_{1/2}) = \ln A + \frac{E}{RT}$$

where $A = \dfrac{2^{n-1} - 1}{(n-1)a_0^{n-1} \times A}$

That is $t_{1/2}$ decreases with increase in temperature.

A plot of $t_{1/2}$ vs $\frac{1}{T}$ gives a straight line with slope E_a.