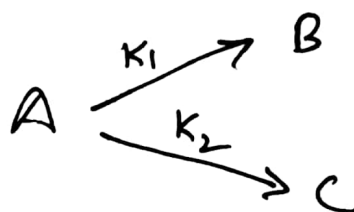


$$r_{\text{ate}} = k[A]^2 \times 2 \times 10^3$$

$$r_{\text{ate}} = k' [A]^2 \Rightarrow k' = 5 \times 10^{-5} \times 2 \times 10^3 = 10^{-1}$$

$$t_{1/2} = \frac{1}{0.2 \times 10^{-1}} = 50 \text{ min}$$

②



$$k' = k_1 + k_2$$

$$A' e^{-\frac{E'}{RT}} = A_1 e^{-\frac{E_1}{RT}} + A_2 e^{-\frac{E_2}{RT}}$$

Differentiating w.r.t $\left(\frac{1}{T}\right)$:

$$A' e^{-\frac{E'}{RT}} \left(\frac{-E'}{R} \right) = A_1 e^{-\frac{E_1}{RT}} \left(\frac{-E_1}{R} \right) + A_2 e^{-\frac{E_2}{RT}} \left(\frac{-E_2}{R} \right)$$

$$k' E' = k_1 E_1 + k_2 E_2$$

$$E' = \frac{k_1 E_1 + k_2 E_2}{k'} = \frac{k_1 E_1 + k_2 E_2}{k_1 + k_2}$$

3

$$\ln 3 = \frac{E_a}{R} \left[\frac{1}{280} - \frac{1}{300} \right]$$

$$E_a = 9.24 \text{ Kcal/mol}$$

$$27^\circ\text{C} (300\text{K}) \rightarrow 64 \text{ hr}$$

$$47^\circ\text{C} (320\text{K}) \rightarrow t \text{ hr.}$$

$$\ln \left(\frac{64}{t} \right) = \frac{9240}{2} \left[\frac{1}{300} - \frac{1}{320} \right]$$

$$t = 25.6 \text{ hr.}$$

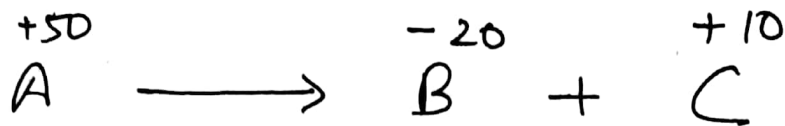
$$\textcircled{16} \textcircled{4} \log\left(\frac{x \times 4}{t \times x}\right) = \frac{23.8 \times 1000}{2} \left[\frac{1}{340} - \frac{1}{350} \right]$$

$$\log\left(\frac{4}{t}\right) = 1$$

$$t = \frac{4}{10} \text{ hr.} = 1440 \text{ sec.}$$

11

~~4~~ 5



$t=0$ let a

100 min $(a-x)$ x x .

$$50(a-x) - 20x + 10x = 0$$

$$50a - 60x = 0 \quad x = \frac{5a}{6}$$

$$k = \frac{1}{100} \ln \left(\frac{a}{a/6} \right) = \frac{\ln 6}{100}$$

$$t = \frac{100}{\ln 6} \ln \left(\frac{100}{100 - \frac{875}{9}} \right) = 200 \text{ min}$$

~~4~~ 6

$$t_{1/2} \propto \frac{1}{a^{n-1}}$$

$$10 \times 40^{n-1} = 160 \times 10^{n-1}$$

$$4^{n-1} = 16 = 4^2$$

$$n=3$$

~~4~~ 7

Start with zero-order: $k = \frac{A_0 - A_t}{t} \Rightarrow t = \frac{A_0 - A_t}{k}$

$$k = \frac{A_0}{t_{7/8}} = \frac{A_0 - A_0/8}{t_{7/8}}$$

$$t_{1/4} = \frac{A_0 - 3A_0/4}{k} : \frac{t_{7/8}}{t_{1/4}} = \frac{7}{2}$$

8

$$(t_{1/2})_I = \frac{\ln 2}{k_I} \Rightarrow k_I$$

$$(t_{1/2})_{II} = \frac{0.1}{2 k_{II}} \quad \text{given: } (t_{1/2})_I = (t_{1/2})_{II}$$

$$\frac{\ln 2}{k_I} = \frac{0.1}{2 k_{II}}$$

$$\frac{k_I}{k_{II}} = \frac{2 \ln 2}{0.1} = 14$$

9

$$0.04 = k [A]_{10}$$

$$0.03 = k [A]_{22}$$

$$\Rightarrow \frac{4}{3} = \frac{[A]_{10}}{[A]_{22}}$$

$$k = \frac{1}{(22-10)} \ln \left(\frac{4}{3} \right) \text{ min}^{-1} = 0.025 \text{ min}^{-1}$$

$$t_{1/2} = \frac{0.7}{0.025} \text{ min} = 1680 \text{ sec}$$

~~27~~ (10)

$$\text{rate} = k[A]^n$$

rate doubled when conc. is 4 times.

$$n = 1/2$$

for n^{th} order ($n \neq 1$).

$$t = \frac{1}{k(n-1)} \left[\frac{1}{A_t^{n-1}} - \frac{1}{A_0^{n-1}} \right]$$

$$t_{1/2} = \frac{-2}{k} \left[\sqrt{A_t} - \sqrt{A_0} \right] \quad A_t = \frac{A_0}{2}$$

$$t_{1/2} = \frac{2}{k} \left[\sqrt{A_0} - \frac{\sqrt{A_0}}{\sqrt{2}} \right] = 8\sqrt{2} \quad \text{--- (1)}$$

$$t_{3/4} = \frac{2}{k} \left[\sqrt{A_0} - \frac{\sqrt{A_0}}{2} \right] = t \quad \text{--- (2)}$$

from $\frac{\text{(1)}}{\text{(2)}} \Rightarrow t = 8$