Subject _____

MON TUE WED THR FRI SAT SUN

Now (ii) − (i)

$$kt_2 - kt_1 = 2.303 \log \frac{a}{(a-x_2)} - 2.303 \log \frac{a}{(a-x_1)}$$

$$k(t_2 - t_1) = 2.303 \left\{ \log \frac{a}{a-x_2} - \log \frac{a}{a-x_1} \right\}$$

$$k(t_2 - t_1) = 2.303 \left\{ \log \frac{a}{a-x_2} \times \frac{a-x_1}{a} \right\}$$

$$\Rightarrow k\Delta t = 2.303 \log \frac{a-x_1}{a-x_2}$$

$$\boxed{k = \frac{2.303}{\Delta t} \log \frac{c_1}{c_2}}$$

your writing partner

$\therefore k = \frac{2.303}{t} \log \frac{a}{a-x}$

$\boxed{k \propto \frac{1}{t}}$

Higher value of k faster will be the rate of rxn lower the value of k slower will be the rate of rxn.

# Rate constant of 1st order rxn at two different time interval:-

$$\boxed{k = \frac{2.303}{t_2 - t_1} \log \frac{c_1}{c_2}}$$

| | Reactant | ⟶ Product |
|---|---|---|
| $t = 0$ | a mol/lit | 0 |
| $t = t_1$ | $(a-x_1) = c_1$ | $x_1$ |
| $t = t_2$ | $(a-x_2) = c_2$ | $x_2$ |

We know 1st order rxn

$$k = \frac{2.303}{t} \log \frac{a}{a-x}$$

$$k = \frac{2.303}{t_1} \log \frac{a}{a-x_1} \Rightarrow kt_1 = 2.303 \log \frac{a}{a-x_1} \quad \text{——— (i)}$$

Similarly,

$$k = \frac{2.303}{t_2} \log \frac{a}{a-x_2} \Rightarrow kt_2 = 2.303 \log \frac{a}{a-x_2} \quad \text{——— (ii)}$$

Here k is a constant which is called rate reactio constt or specific rate constt.

$$\frac{dx}{dt} = k.(a-x)$$

$$\Rightarrow \frac{dx}{(a-x)} = k\,dt$$

Now integrating on both side.

$$\int \frac{dx}{a-x} = k \int dt$$

$$-\log(a-x) = kt + I \quad \text{——— (i)}$$

Now, putting initial value.

$t = 0$, $x = 0$

$$\Rightarrow -\ln(a-0) = k \times 0 + I$$

$$\Rightarrow -\ln a = I$$

Now putting the value of I in eq$^n$ :-

$$-\ln(a-x) = kt + (-\ln a)$$

$$\Rightarrow -\ln(a-x) = kt - \ln a$$

$$\Rightarrow \ln a - \ln(a-x) = kt$$

$$\Rightarrow \frac{\ln a}{a-x} = kt$$

$\because \ln a = 2.303 \log^a$

$\ln e^a = 2.303 \log_{10}^a$

$$2.303 \log \frac{a}{a-x} = kt$$

$$\boxed{k = \frac{2.303}{t} \log \frac{a}{a-x}}$$

This is expression for the rate constt of 1st order rkn.