Hence the order of reaction is Two.

$$r = K \cdot (C)^n$$

$$2.40 \times 10^{-4} = K \cdot (2 \times 10^{-3})^2$$

$$K = 0.6 \times 10^{2}\ M s^{-1}$$

2. Integration method :- OR (Hit & trial method) :→

$$K = \frac{A_0 - A}{t} \quad \text{for zero order reaction.}$$

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

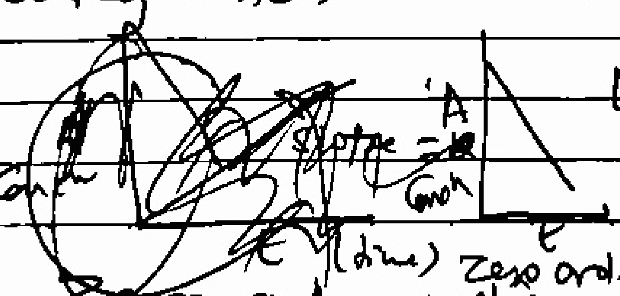
OR $$K = \frac{2.303}{t} \log \frac{A_0}{A_t}$$ for 1st order reacn.

$$K = \frac{1}{t} \cdot \left[\frac{1}{A} - \frac{1}{A_0}\right]$$ for ~~2nd Order rea~~n

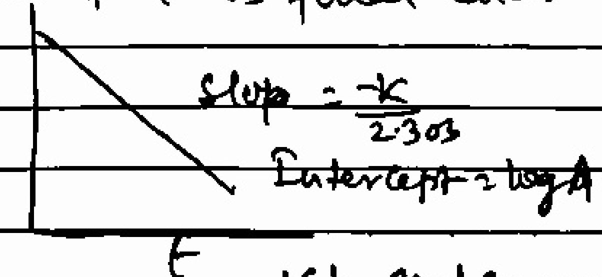
By using the substitution of data in the above Kinetic equation we can find the order of reaction, that Kinetic equation in which K is Constant that determine the order of react

3. graphical method :→

~~Confirmation of order of reaction by using integration method~~: ~~Graph of t Vs final Conc^n.~~

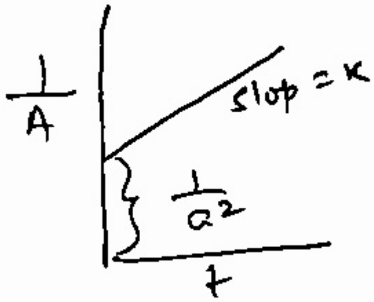


Zero ord rec^n.
~~Zero order reaction~~

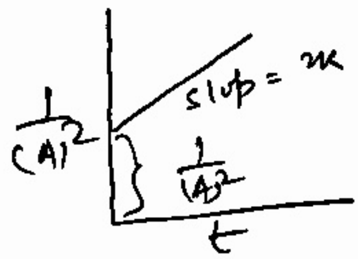


1st order reac^n

Teacher's Signature :

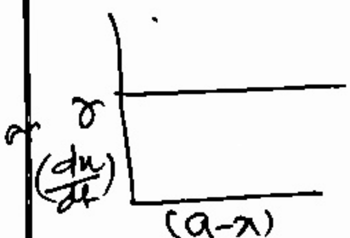


2nd order reach

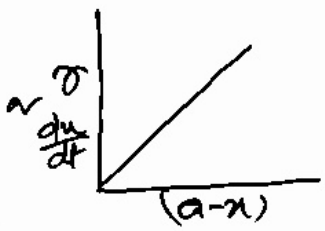


3rd order reaction.

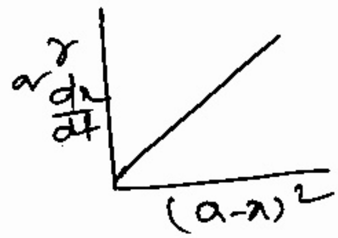
<u>Rate (r) vs final conch: graph:</u>



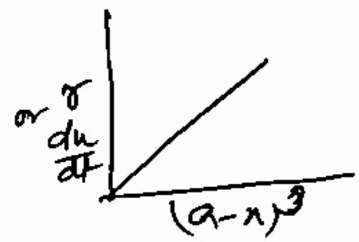
zero-order



first order



Second order



third order

4) <u>Half life method:</u> →

Half life for different order of reactions are as follows:

$$t_{1/2} = \frac{A_0}{2K} \quad \text{for zero order reach}$$

$$t_{1/2} = \frac{0.693}{K} \quad \text{for first order reach}$$

$$t_{1/2} = \frac{1}{K \cdot A_0} \quad \text{for second order reach}$$

By using these relations between $t_{1/2}$ and K we can make a general equation

i.e $\quad t_{1/2} = (A_0)^{1-n}$ or $t_{1/2} = \left(\frac{1}{A_0}\right)^{n-1}$

Hence $\quad \frac{(t_{1/2})_1}{(t_{1/2})_2} = \left(\frac{(A_0)_1}{(A_0)_2}\right)^{1-n}$

$$\frac{(t_{1/2})_1}{(t_{1/2})_2} = \left(\frac{A_{01}}{A_{02}}\right)^{1-n} \text{ or } \frac{(t_{1/2})_2}{(t_{1/2})_2} = \left(\frac{A_{02}}{A_{01}}\right)^{n-1}$$

Use any one only by which we can save ourself by confusion.

One more formula we can use by using above expressions to find order i.e

$$n = \frac{\log (t_{1/2})_1 / (t_{1/2})_2}{\log (A_2 / A_1)} + 1$$

In solving numerical try to remove the former formula because use of log is difficult if log table is not provided.

4) Ostwald Isolation method :-

This method is used for complex or complicated reactions for the determination of order of reactions. In this method we find total order of reaction. Consider a chemical reaction i.e

$$aA + bB + cC \longrightarrow \text{Product}$$

Now consider concentration of all the reacting species in large excess except A, by which excess concentration will be used as constant.

$$r \propto [A]^n$$

or $r = K \cdot [A]^n$, where n represent the concentration with respect to A.

Note In objective question by the help of unit of K we can find out the order of recn. $Mol^{1-n}, lit^{n-1} time^{-1}$.

Teacher's Signature :