Tutorial-1

Chemical Kinetics

1. The half life of $^{226}Ra_{88}$ is 1600 years. How many disintegrations per second would be undergone by 1g of Ra

2. At 400 K, the rate of decomposition of a gaseous compound initially at a pressure of 12.6 kPa was 9.71 $Pa.s^{-1}$ when 10% had reacted and 7.67 $Pa\ s^{-1}$ when 20 % had reacted. Determine the order of the reaction.

3. Consider the following elementary reaction. $A+B \rightarrow C+D$

   Rate constant k= 0.2 $M^{-1}s^{-1}$. Calculate the concentrations of 'A' and 'B' after 2 minutes, if the reaction mixture had initial concentrations of [A]=[B]=0.1 M

4. Show that that ratio of half life to the three-quarter life $t_{1/2}/t_{¾}$ for a reaction of n^{th} order in reactant A can be written as a function of 'n' alone.

5. Plot $[A]/[A]_0$ Vs time and $\ln[A]/[A]_0$ for first order reactions with rate constants 0.25 0.05, 0.1 s^{-1}

6. Plot $[A]_0/[A]$ vs time for second order reactions with rate constants

   0.25 0.05, 0.1 $M^{-1}s^{-1}$

7. Consider the decomposition of N_2O_5. Concentrations of the reactant at different time intervals are given. Find out the order, rate constant and half life.

t/min	0	1	2	3	4	5
$[N_2O_5]$ M	1	0.705	0.497	0.349	0.246	0.173

8. 5 ml of ethyl acetate was added to a flask containing 100 ml of 0.1 MHCl placed in a thermostat maintained at 30 °C. 5 ml of the reaction mixture was withdrawn at different intervals of time and after chilling, titrated against a standard alkali. From the data given, show that the hydrolysis of ethyl acetate is a first order reaction.

t/min	0	75	119	183	infinity
Vol of alkali used (ml)	9.62	12.10	13.10	14.75	21.05

9. Consider the reaction A+B→P. Find out rate constant and half life of 'A' and 'B' if the initial concentrations of 'A' and 'B' were 0.05 M and 0.06 M respectively and the concentration of 'A' had fallen to 0.01 M after 2.0 h (order with respect to 'A' and 'B' is one.

10. Consider the reaction A+2B→P. Derive the integrated rate law. (Order with respect to 'A' and 'B' is '1')

11. A second order reaction of the type A+2B→P was carried out in a solution that was initially 0.075 M in 'A' and 0.08 M in'B'. After 1.0 h the concentration of 'A' had fallen to 0.045 M. Find out the rate constant and half life of the reactants.