

TEST PAPER NO. 4

TOPIC : CHEMICAL KINETICS

M.M. 50

TIME: 3 HRS.

Name of Student _____ Roll No. _____

Q.NO. 1-10 carries 1 mark, 11-20 2 marks, 21-25 carries 3 marks, 26 carries 5 marks.

1. In a reaction, $2A \rightarrow \text{Products}$, the concentration of A decreases from 0.5 mol L^{-1} to 0.4 mol L^{-1} in 10 minutes. Calculate the rate during this interval?
2. For a reaction, $A+B \rightarrow \text{Product}$, the rate law is given by, $r=k[A]^{1/2}[B]^2$ what is the order of reaction?
3. What will be the effect of temperature on rate constant?
4. What is meant by pseudo first order reaction?
5. What is meant by order of reaction?
6. Derive the steps of reaction for a reaction:
 $2\text{N}_2\text{O}_5 \rightarrow 4\text{NO}_2 + \text{O}_2$ Rate = $k [\text{N}_2\text{O}_5]^1$
7. What is meant by molecularity of reaction?
8. By what factor a reaction with reaction coefficient 2 increases when the temperature is increased from 300 K to 400 K?
9. What is the effect of catalyst on rate of reaction?
10. The decomposition of NH_3 on platinum surface is zero order reaction. What are the rates of production of N_2 and H_2 if $k = 2.5 \times 10^{-4} \text{ mol L}^{-1}$?
11. What are the different factors which affect the rate of reaction?
12. A reaction is second order with respect to a reactant. How is the rate of reaction affected if the concentration of the reactant is:
a. Doubled b. Reduced to half
13. The rate constant for a first order reaction is 60 s^{-1} . How much time will it take to reduce the initial concentration of the reactant to its $1/16^{\text{th}}$ value?
14. For a first order reaction, show that time required for 99% completion is twice the time required for the completion of 90% of reaction.
15. A first order reaction takes 40 min. for 30% decomposition. Calculate $t_{1/2}$.
16. The decomposition of hydrocarbon follows the equation
 $k = (4.5 \times 10^{11} \text{ s}^{-1}) e^{-28000\text{K}/T}$ Calculate E_a .
17. The decomposition of A into product has a value of k as $4.5 \times 10^3 \text{ s}^{-1}$ at 10°C and energy of activation 60 kJ mol^{-1} . At what temperature would k be $1.5 \times 10^4 \text{ s}^{-1}$?
18. The time required for 10% completion of a first order reaction at 298 K is equal to that required for its 25% completion at 308 K. If the value of A is $4 \times 10^{10} \text{ s}^{-1}$. Calculate k at 318 K and E_a .
19. The rate of a reaction quadruples when the temperature changes from 293 K to 313 K. Calculate the energy of activation of the reaction assuming that it does not change with temperature.
20. Sucrose decomposes in acid solution into glucose and fructose according to the first order rate law, with $t_{1/2} = 3.00 \text{ Hrs}$. What fraction of a sample of sucrose remains after 8 hours?

21. A reaction is first order in A and second order in B:
 i. Write the differential rate equation
 ii. How is the rate affected on increasing the concentration of B three times?
 iii. How is the rate affected when the concentrations of both A and B are doubled?
22. The rate constants of a reaction at 500 K and 700 K are 0.02 s^{-1} and 0.07 s^{-1} respectively. Calculate the values of E_a and A.
23. The first order rate constant for the decomposition of ethyl iodide by the reaction: $\text{C}_2\text{H}_5\text{I}_{(g)} \rightarrow \text{C}_2\text{H}_4_{(g)} + \text{HI}_{(g)}$ at 600 K is $1.60 \times 10^{-5} \text{ s}^{-1}$. Its energy of activation is 209 KJ/mol. Calculate the rate constant of the reaction at 700 K.
24. Prove: $10 t_{1/2} = t_{99.9}$
25. During nuclear explosion, one of the products is ^{90}Sr with half-life of 28.1 years. If 1 μg of ^{90}Sr was absorbed in the bones of a newly born baby instead of calcium, how much of it will remain after 10 years and 60 years if it is not lost metabolically.
26. What is meant by Average rate and Instantaneous rate.

Determine the Rate law and order of reaction for A and B from the given data:

EXPERIMENT	Conc. [A] mol/litre	Conc. [B] mol/litre	Rate of reaction mol/litre/sec
I	0.1	0.2	2×10^3
II	0.2	0.2	4×10^3
III	0.1	0.4	8×10^3

Also determine value of rate constant. And find the rate if the conc. Of [A] = 0.7 mol and [B] = 0.3 mol.