

BHARATIYA VIDYA BHAVAN'S V M PUBLIC SCHOOL, VADODARA

QUESTION BANK

L-4 Chemical Kinetics

1 Mark Questions:

- Q1. Define order of a reaction.
- Q2. Identify the reaction order from the following rate constant $k = 2.3 \times 10^{-5} \text{ L mol}^{-1} \text{ s}^{-1}$
- Q3. Why does the rate of reaction not remain constant throughout the reaction process?
- Q4. Define rate of reaction.
- Q5. Give two differences between order and molecularity of the reaction
- Q6. For a reaction $A+B \rightarrow P$, the rate law is given by, $r = k [A]^{1/2}[B]^2$. What is the order of this reaction?
- Q7. A first order reaction is found to have a rate constant $= 5.5 \times 10^{-14} \text{ s}^{-1}$. Find the half life of a reaction.
- Q8. Oxygen is available in plenty in air fuels do not burn by themselves at room temperature. Why?
- Q9. Write the rate equation for the reaction $2A+B \rightarrow C$ if the order of the reaction is zero.
- Q10. Define specific rate of reaction.

2 Marks Questions:

- Q1. A reaction is of second order with respect to a reactant. How is its rate affected if the concentration of the reactant is i) doubled? ii) reduced to half?
- Q2. Express what do you understand by rate expression and rate constant of a reaction?
- Q3. Discuss four factors which affect the rate of a chemical reaction. Q4. For a chemical reaction, what is the effect of a catalyst on the following? i) Activation energy of the reaction. ii) Rate constant of the reaction.
- Q5. What is meant by pseudo first order reaction? Give an example of pseudo first order reaction and write the rate equation for the same.
- Q6. A first order of reaction has a rate constant of 0.0051 min^{-1} . If we begin with 0.10 M concentration of the reactant, what concentration of reactant will remain in solution after 3 hours?
- Q7. Show that in case of a first order reaction the time required for 99.9% of the reaction to take place is about ten times than that required for half the reaction.
- Q8. What are the units of the rate constant for a pseudo first order reaction?
- Q9. Give an example of a reaction where order and molecularity are equal. Q10. Give an example of zero order reaction.

3 Marks Questions:

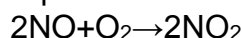
- Q1. The rate of reaction, $2\text{NO} + \text{Cl}_2 \rightarrow 2\text{NOCl}$ is doubled when concentration of Cl_2 is doubled and it becomes eight times when concentration of both NO and Cl_2 are doubled. Deduce the order of the reaction.

Q2. A first reaction is 20% Complete in 10 minutes. Calculate the time for 75% completion of reaction.

Q3. The half life radioactive decay of ^{14}C is 5730 years. An archaeological artifact contained wood that had only 80% of the ^{14}C found in living tree. Estimate the age of the sample.

Q4. Calculate the half life of a first order reaction from their rate constants given below:
i) 200s^{-1} ii) 2min^{-1}

Q5. Following reaction takes place in one step:



How will the rate of the above reaction change if the volume of the reaction vessel is reduced to one third of its original volume? Will there be any change in the order of the reaction with reduced volume?

Q6. In general it is observed that the rate of a chemical reaction doubles with every 100 rise in temperature. If this generalization holds good for a reaction in the temperature range 295 K and 305K, what would be the value of activation energy for this reaction? ($R=8.314\text{JK}^{-1}\text{mol}^{-1}$)

5 Marks Questions:

Q1. a) A reaction is first order in A and second order in B.

i) Write differential rate equation.

ii) How is the rate affected on increasing the concentration of B three times?

iii) How is the rate affected when concentration of both A and B is doubled?

b) Show that the time required for 99% completion of a first order reaction is twice the time required for the completion of 90%.

Q2. a) The rate constant for a first order reaction is 60s^{-1} . How much time will it take to reduce the initial concentration of the reactant to its $1/16^{\text{th}}$ value?

b) The rate constant for the decomposition of N_2O_5 at various temperatures is given below:

$T^\circ\text{C}$	0	20	40	60	80
$10^5 \times k^{-1}$	0.0787	1.70	25.7	178	2140

Draw a graph between $\ln K$ and $1/T$ and calculate the values of A and E_a . Predict the rate constant at 30°C and 50°C

Q3. The time required for 10% completion of a first order reaction at 298 K is equal to that required for its 25% completion at 308K. If the value of A is $4 \times 10^{10}\text{s}^{-1}$, calculate K at 318 and E_a .

