

Class: 12
Subject: Chemistry
Topic: Chemical kinetics
No. of Questions: 27

- Why we prefer instantaneous rate of reaction over average rate of reaction?
- Define rate of a reaction.
- Define specific rate constant.
- The following reaction was carried out in water. $\text{Cl}_2 + 2\text{I}^- \longrightarrow 2\text{Cl}^- + \text{I}_2$.
 The initial concentration of I^- was 0.50 mol l^{-1} and concentration after 10 minutes was $0.46 \text{ mole lit}^{-1}$. Calculate the rate of disappearance of I^- and rate of appearance of iodine.
- For the reaction $\text{A} + 2\text{B} \longrightarrow \text{AB}_2$, the rate constant is $1.26 \times 10^{-3} \text{ L mol}^{-1}\text{s}^{-1}$. What is the order of the reaction?
- For a reaction,
 $2\text{NO}_2 + \text{F}_2 \longrightarrow 2\text{NO}_2\text{F}$
 The experimental rate law is $r = k[\text{NO}_2][\text{F}_2]$. Propose the mechanism of the reaction.
- The experimental data for the reaction
 $2\text{A} + \text{B}_2 \longrightarrow 2\text{AB}$ is

Experiment	[A] mole/lit	[B ₂] mol/lit	Initial rate
1.	0.50	0.50	1.6×10^{-4}
2.	0.50	1.00	3.2×10^{-4}
3.	1.00	1.00	3.2×10^{-4}

Write the rate law equation.

- Give any one example of
 - zero order reaction
 - first order reaction
- For decomposition of N_2O_5 in CCl_4 solution at 320 K.
 $2\text{N}_2\text{O}_5 \longrightarrow 4\text{NO}_2 + \text{O}_2$

Show that the reaction is of first order and also calculate the rate constant:

Time in min	10	15	20	25	∞
Vol. of O ₂ Evolved (in ml)	6.30	8.95	11.40	13.50	34.75

- 10 Differentiate between the rate of reaction and the rate constant.
- 11 Define order of a reaction. Can it be a fractional value? If yes then give an example of a fractional order reaction.
- 12 Differentiate between order and molecularity of a reaction.
- 13 How would you compare chemical reactions and the nuclear reactions?
- 14 Calculate the rate constant of a reaction at 293 K when the energy of activation is 103 KJ mol^{-1} and the rate constant at 273 K is $7.87 \times 10^{-7} \text{ sec}^{-1}$.
- 15 The rate law for the reaction,
 $2\text{Cl}_2\text{O} \longrightarrow 2\text{Cl}_2 + \text{O}_2$ at 200°C is found to be $\text{rate} = K[\text{Cl}_2\text{O}]^2$,
(a) How would the rate change if $[\text{Cl}_2\text{O}]$ is reduced to one third of its original value?
(b) How should the $[\text{Cl}_2\text{O}]$ be changed in order to double the rate?
Id the rate change if $[\text{Cl}_2\text{O}]$ is raised to three fold of its original value?
- 16 Explain in brief the collision theory of reaction rates.
- 17 What is the difference between ${}^0_{-1}\text{e}$ and ${}^0_{-1}\beta$?
- 18 How are the radioactive decay series distinguished? Which one of the decay series is not natural but artificial?
- 19 Explain the following:
(i) Mass defect (ii) Binding energy
- 20 Decomposition of N_2O_5 is expressed by the equation, $\text{N}_2\text{O}_5 \longrightarrow 2\text{NO}_2 + \frac{1}{2}\text{O}_2$
If during a certain time interval, the rate of decomposition of N_2O_5 is $1.8 \times 10^{-3} \text{ mol lit}^{-1} \text{ min}^{-1}$, what will be the rates of formation of NO_2 and O_2 during the same interval?
- 21 The conversion of molecules X to Y follows the second order of kinetics. If concentration of X is increased 3 times, how will it affect the rate of formation of Y.?
- 22 The rate law for a reaction is
 $\text{Rate} = K[\text{A}][\text{B}]^{3/2}$
Can the reaction be an elementary process? Explain.

23. If the decomposition of nitrogen oxide is represented as
$$2N_2O_5 \rightarrow 4NO_2 + O_2$$
follows a first order kinetics.
- (i) Calculate the rate constant for a 0.05 M solution if the instantaneous rate is 1.5×10^{-6} mol/l/s.
24. Write the difference between order and molecularity of reaction.
25. A first order reaction takes 69.3 min for 50% completion. Set up an equation for determining the time needed for 80% completion.
26. The decomposition of NH_3 on platinum surface is zero order reaction. What are the rate of production of N_2 and H_2 ? The rate constant is $2.5 \times 10^{-4} \text{ mol}^{-1} \text{ sec}^{-1}$
27. Time required to decompose SO_2Cl_2 to half of its initial amount is 60 minutes. If the decomposition is a first order reaction, calculate the rate constant of the reaction.