CHEMISTRY

BOOKS - OSWAAL PUBLICATION

CHEMISTRY (KANNADA ENGLISH)

CHEMICAL KINETICS

Topic 1 Rate Of Chemical Reaction And Factors Affecting Rate Of Reaction Very Short Answer Type Questions

1. For the reaction $2HI \rightarrow H_2 + I_2$ .Write its molecularity.

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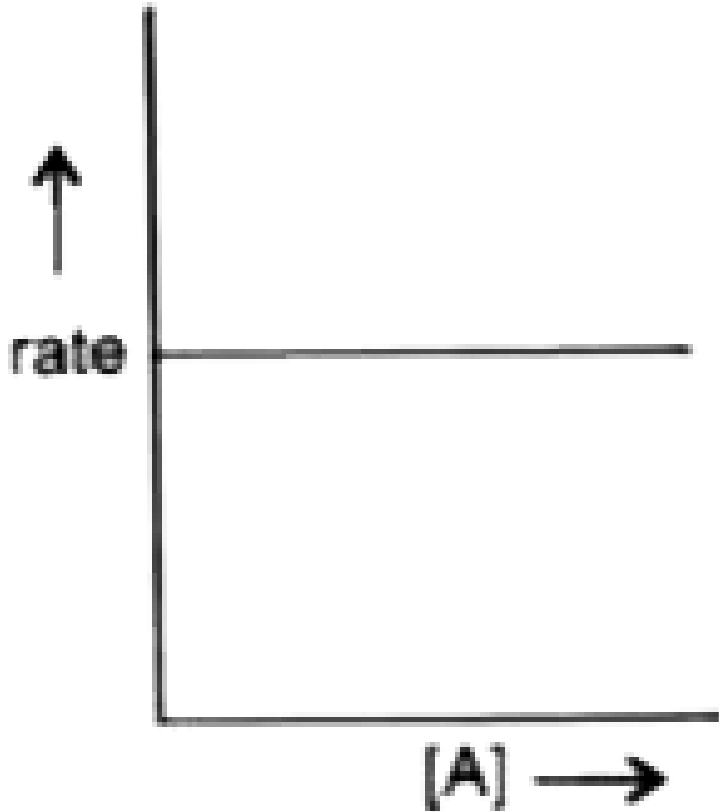**2.** Give an example for a zero order reaction with suitable condition.

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3. The reaction $A + B \rightarrow C$ follows first order kinetics with respect to A and second order kinetics with respect to B. What is the overall order of the reaction ?

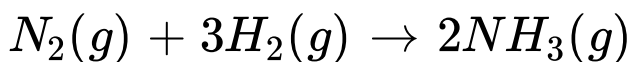**4.** For a reaction the graph of the rate of the reaction against molar concentration of the reactant is as shown :

What is the order of the reaction ?

5. Express the rate of the following reaction in terms of the formation of ammonia :

$$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$$

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6. Define rate of a reacion.

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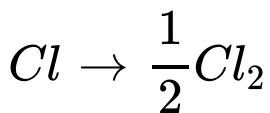**7.** Why does the rate of reaction not remain constant throughout the reaction process ?

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8. Mention the factors affecting the rate of reaction.

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9. What is the molecularity of this reaction ?

$$Cl \rightarrow \frac{1}{2}Cl_2$$

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1. A reaction is first order with respect to reactant A and second order with respect to reactant B in a reaction $A + B \rightarrow$ product.

i) Write the differential rate equation.

ii) How is the rate of the reaction affected on increasing the concentration of B by two times?

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2. Mention two factors that decide order of the reaction.

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3. Explain Ostwald's isolation method for the determination of order of a reaction.

4. Mention two factors that decide order of the reaction.

5. Define the order of reaction. Give one example for fraction order reaction.

6. What is meant by rate of a reaction ? Differentiate between average rate and instantaneous rate of a reaction.

7. Explain the terms :

(i) Rate determining step of a reaction,

(ii) Molecularity of a reaction.

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8. Define the following :

(i) Elementary step in a reaction,

(ii) Rate of the reaction.

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9. A reaction is of first order in reactant A and of second order in reactant B. How is the rate of this reaction affected when (i) the concentration of B alone is increased to three times, (ii) the concentrations of A as well as B are doubled ?

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1. A reaction is first order in A and second order in B.

(i) Write differential rate equation.

(ii) How is rate affected when concentrated of B is tripled ?

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

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2. What is molecularity of a reaction ?

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3. Nitrogen pentoxide decomposes according to equation :

$$2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g).$$

This first order reaction was allowed to proceed at $40°C$ and the data below were collected :

$[N_2O_5]M$	Time (min.)
0.400	0.00
0.289	20.0
0.209	40.0
0.151	60.0
0.109	80.0

(a) Calculate the rate constant. Include units with your answer.

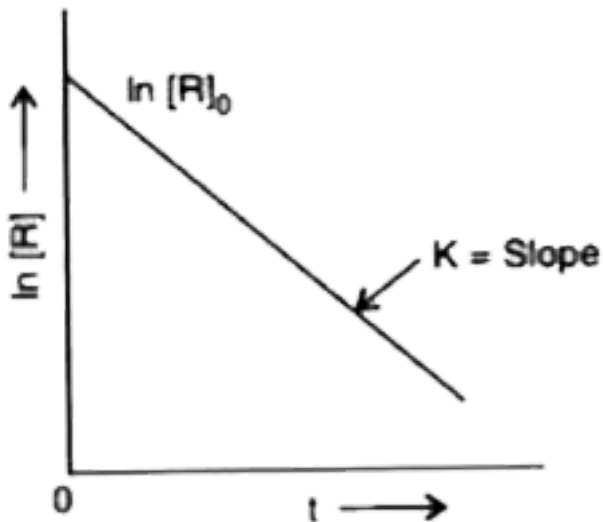(b) What will be the concentration of N_2O_5 after 100 minutes ?

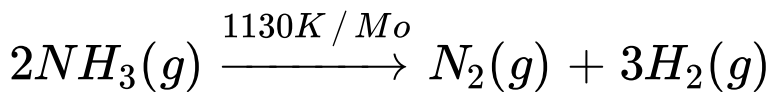(c) Calculate the initial rate of reaction ?

Topic 2 Order Of A Reaction Integrated Rate Equations And Half Life Of A Reaction Very Short Answer Type Questions

1. From the following plot, predict the order of the reaction.

Graph with y-axis labeled $\ln [R]$ and x-axis labeled $t \longrightarrow$. Line starts at $\ln [R]_0$ and decreases with $K = \text{Slope}$.

2. What is the order for the reaction

$$2NH_3(g) \xrightarrow{1130K \, / \, Mo} N_2(g) + 3H_2(g)$$

3. For the reaction $A + B \rightarrow$ products. The rate becomes doubled when concentration of only A is increased by two times, the rate is increased by four times, when the concentration of B alone is double. What is the order of the reaction ?

4. If the rate constant of a reaction is $k = 3 \times 10^{-4}s^{-1}$, then identify the order of the reaction.

5. Write the unit of rate constant for a zero order reaction.

6. Define "Order of a reaction".

7. Rate constant for a reaction is $1.85 \times 10^2 s^{-1}$. Give the order of reaction.

8. In Which order of reaction, rate of reaction becomes equal to specific reaction rate ?

9. For a reaction , $A + B \rightarrow$ product, the rate law is given by $r = k[A]^{\frac{1}{2}}[B]^2$. What is the order of the reaction ?

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1. Define the following terms :

(i) Pseudo first order reaction

(ii) Half life period of a reaction $\left(t_{1/2}\right)$.

2. Write two differences between 'order of reaction' and 'molecularity of reaction'.

3. Explain the following terms :

(i) Rate constant (k)

(ii) Half life period of reaction $\left(t_{1/2}\right)$.

4. What do you understand by the rate law and rate constant of a reaction ? Identify the order of a reaction if the units of its rate constant are :

(i) $L^{-1}mols^{-1}$

(ii) $Lmol^{-1}s^{-1}$

5. What is pseudo first order reaction? Give an example.

6. Identify giving reasons, the reaction order from each of the following rate constants :

(i) $k = 2.3 \times 10^5 Lmol^{-1}s^{-1}$

(ii) $k = 3 \times 10^{-4}s^{-1}$

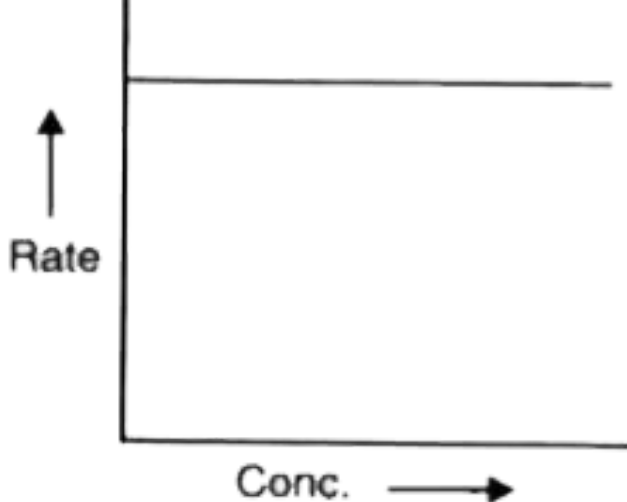**7.** The rate constant for a reaction of zero order in A is 0.0030mol $L^{-1}s^{-1}$. How long will it take for the initial concentration of A to fall from 0.10 M to 0.075 M ?

8. For a chemical reaction variation in rate with conc. Is shown below :

(i) What is the order of the reaction ?

(ii) What are the units of rate constant k for the reaction ?

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1. Derive the integrated rate equation for rate constant of Zero order reaction.

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2. Derive an intergrated rate for the first order reaction.

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3. Thermal decomposition of a compound is of first order. If 50% of the compound is decomposed in 120 minute, how much time it take for the 90% decomposition of the compound ?

4. Rate constant of a first order reaction A products is $0.016 \ min^{-1}$. Calculate the time

required for 80% of the reaction to be completed.

5. The following data were obtained during the first order thermal decomposition of SO_2Cl_2 at a constant volume :

$$SO_2Cl_2(g) \rightarrow SO_2(g) + Cl_2(g)$$

Experiment	Time/s^{-1}	Total pressure/atm
1	0	0.4
2	100	0.7

Calculate the rate constant.

[Given : log 4 = 0.6021, log 2 = 0.3010]

6. Rate constant k for a first order reactions has been found to be $2.54 \times 10^{-3} \sec^{-1}$. Calculate its $3/4^{th}$ life. (log 4 = 0.6020)

7. With the help of a diagram, explain the physical significance of energy of activation (E_a) in chemical reactions.

8. The rate of a reaction becomes four times when the temperature changes from 293 K to 313 K. Calculate the energy of activation (E_a) of the reaction aassuming that it does not change with temperature.

9. The rate of most reactions becomes double when their temperature is raised from 298 K

to 308 K. Calculate their activation energy.

10. Rate constant of reaction at 300 K and 400 K are $0.0345S^{-1}$ and $0.1365S^{-1}$ respectively. Calculate the activation energy for the reaction.

[Given : $R = 8.314JK^{-1}mol^{-1}$]

11. The rate constant of a first order reaction at 300 K and 310 K are respectively $1.2 \times 10^3 s^{-1}$ and $2.4 \times 10^3 s^{-1}$. Calculate the energy of activation. $\left(R = 8.314 JK^{-1} mol^{-1}\right)$

12. Define energy of activation. Draw a diagram of energy profile to show the influence of a

positive catalyst on the energy of activation of a reaction.

13. Half life of a first order reaction completes in 5 minutes. What persent of reactant reacts after 40 minutes ?

14. With graphical representation explain the effect of temperature on the rate of reaction.

15. What will be the effect of temperature on rate constant ?

16. The decomposition of A into products has a value of k as $4.5 \times 10^3 s^{-1}$ at $10°C$ and energy of activation $60 kJmol^{-1}$. At what temperature would k be $1.5 \times 10^{-4} s^{-1}$?

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17. In general it is observed that the rate of a chemical reaction doubles with every 10 degree rise in temperature. If the generalization holds good for the reaction in

the temperature range 295 K to 305 K, what would be the value of activation energy for this reaction ? $\left[R = 8.314 mol^{-1}JK^{-1}\right]$

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1. The half-life period of a certain reaction is directly proportional to initial concentration of the reactant. Predict the order of the

reaction and white the expression to calculate the half-life period of the reaction.

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2. Define half life period for a reaction and how it is related to the order of a reaction.

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3. a) The rate of a particular reaction doubles when the temperature changes from 300 K to

310 K. Calculate the energy of activation of the reaction. [Given : $R = 8.314 \, \text{JK}^{-1} \, \text{mol}^{-1}$].

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4. b) Show that the half - life period of a first order reaction is independent of initial concentration of reacting species.

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