Chapter-6
Chemical Kinetics Marks-4 with option- 6

Multiple choice questions (1 Mark)

i) A First order reaction is 50% complete in 69.3 minutes. Time required for 90% completion for the same reaction is

a) 100 b)125 mins c) 230 mins **d) 230.3 mins**

ii) Time required for 100% completion of a zero order reaction is ____

a) a/k b) a/2k c) a.k d) 2k/a

iii) Rate constant of a reaction is 3.6×10^{-3} S^{-1}. The order of reaction is _____

a) First b) Second c) Third d) Zero

iv) The rate law relates to the rate of a chemical reaction in terms of _____

a) Concentration of catalyst b) Temperature c) Potential energy **d) mol/L of reactants**

v) For first order reaction the rate constant for decomposition of N_2O_5 is 6×10^{-4} s^{-1}. The half-life period for decomposition in seconds is _____

a)1.155 b) 11.55 c) 115.5 **d) 1155**

vi) Order of reaction for which unit of rate constant is mol $dm^{-3}s^{-1}$ is ___

a) 0 b) 1 c) 2 d)3

vii) The rate of catalyzed reaction is larger than the unanalyzed reaction as ___

a) E_a (catalyzed) $>E_a$ (uncatalyzed) **b) E_a (catalyzed) $<E_a$ (uncatalyzed)**

c) E_a (catalyzed) $=E_a$ (uncatalyzed) d) E_a (catalyzed) $>>E_a$ (uncatalyzed)

viii) Which of the following is a unimolecular reaction?

a) $2HI \rightarrow H_2 + I_2$

b) $N_2O_5 \rightarrow N_2O_4 + ½\ O_2$

c) $H_2 + Cl_2 \rightarrow 2HCl$

d) $PCl_3 + Cl_2 \rightarrow PCl_5$

ix) Effect of catalyst in a chemical reaction is to change the

a) Activation energy b) Equilibrium concentration c) Final products d) Heat of a reaction

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Very short answer questions (1 Mark)

i) Write the unit of rate constant for the first order reaction.

ii) Write order of the following reaction:

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

iii) Write molecularity of following reaction:

$C_2H_5I(g) \rightarrow C_2H_4(g) + HI(g)$

iv) Rate constant for the reaction $2N_2O_5 \rightarrow 4NO_2 + O_2$ is $4.98 \times 10^{-4}\ s^{-1}$. Find the order of reaction?

(Ans: First order)

v) Write a mathematical expression for integrated rate law for zero order reaction.

vi) Write the equation for half life and rate constant of the first order reaction.

vii) Give one example of zero order reaction.

viii) For the reaction $2NO(g) + 2H_2(g) \rightarrow N_2(g) + 2H_2O(g)$. The rate law is rate = $k[NO]^2[H_2]$.

What is the overall order of reaction?

ix) Write a unit of rate constant of zero order reaction.

x) Write only the equation of integrated rate law for the first order reaction in solutions.

Short answer questions (Type- I) (2 Marks)

1) What is half-life of first order reaction if time required to decrease concentration of reactants from 0.8M to 0.2M is 12 hrs. **(Ans: 6 hrs)**
2) Distinguish between order of reaction and molecularity.
3) For the reaction $2NOBr \rightarrow 2NO_2 + Br_2$, the rate law is rate = $k[NOBr]^2$. If the rate of a reaction is 6.5×10^{-6} $molL^{-1}s^{-1}$, when the concentration of NOBr is 2×10^{-3} $molL^{-1}$. What would be the rate constant of the reaction? **(Ans: 1.625 $Lmol^{-1}s^{-1}$)**
4) Explain pseudo first order reaction with a suitable example.
5) Define order of reaction with suitable examples.
6) Explain with the help of a potential energy diagram that the catalyst increases the rate of the reaction.
7) Explain the integrated rate law for zero order reactions.

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Short answer questions (Type- II) (3 Marks)

1) Derive an integrated rate law expression for first order reaction: $A \rightarrow B + C$
2) Define molecularity. The rate constant of the first order reaction is $1.386 min^{-1}$. Calculate the time required for 80% reactant to decompose? (**Ans:1.162 min. OR 69.7 s**)
3) A reaction occurs in the following steps:
   a) $NO_2(g) + F_2 \rightarrow NO_2F(g) + F(g)$ (slow)
   b) $F(g) + NO_2(g) \rightarrow NO_2F$ (Fast)
   i) Write the equation of overall reaction ii) Write the rate law iii) Identify reaction intermediate
4) Define the half-life of a reaction. Write units of rate constants for:
   a) First order reaction b) Zero order reaction
5) Write an expression for the instantaneous rate of reaction: $2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g)$.
   What is the order of reaction?
6) Why is molecularity applicable for only elementary reactions whereas order of reaction is applicable for elementary and complex reactions? Explain with suitable examples.
7) For a zero order reaction molecularity can never be equal to zero. Explain.
8) For the reaction $2A + B \rightarrow C$, rate of disappearance of A $0.076 mols^{-1}$.
   a) What is the rate of formation of C?
   b) What is the rate of consumption of B?
   c) What is the rate of the overall reaction?
   (**Ans: a. 0.038 mol s^{-1} b. 0.038 mol s^{-1} c. 0.038 mol s^{-1}**)

Long answer questions (4 Marks)

1) In a first order reaction $A \rightarrow B$, 60% of a given sample of a compound decomposes in 45 mins. What is the half-life of a reaction? Also write the rate law equation for the above first order reaction.
   (Ans: $t_{1/2}$ = 34.02min)
2) Derive an expression for the relation between half-life and rate constant for first order reaction. The half-life period for first order reaction is 1.7 hrs. How long will it take for 20% of the reactant to disappear?
   (Ans: t = 0.5475 hrs. or 32.86 min)
3) Write one example of the reaction where order and molecularity are the same. Mention any two factors that influence the rate of chemical reaction. If for the reaction $A \rightarrow$ products, a straight line graph passing

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