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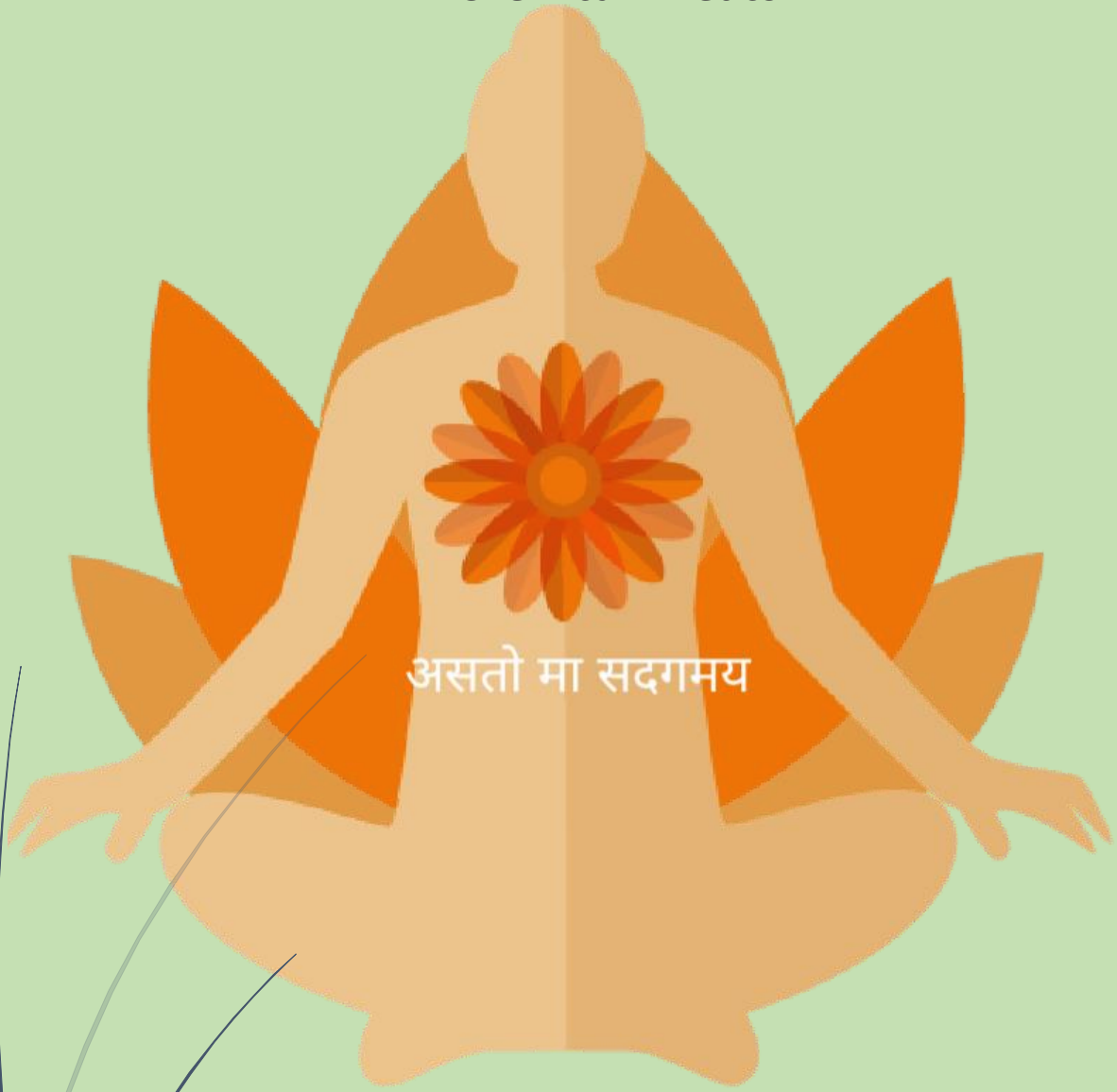
XII Unit 4

Chemical Kinetics



Mahesh Lath's
CHEMISTRY MANTRA

Unit 1

Short Answer Question - Chemical Kinetics

Q.1 Define molecularity of a reaction.
Answer: Number of reacting molecules colliding simultaneously to give product is called molecularity.
Q.2 In what condition order and molecularity of a reaction become equal?
Answer: In elementary reaction (single step process) order and molecularity are same.
Q.3 In which type of reaction order and molecularity are different?
Answer: In complex reaction (multi-step process) order and molecularity are different.
Q.4 What do you mean by rate determining step?
Answer: Order of overall reaction is order of slowest step. This is called rate determining step.
Q.5 What is collision frequency?
Answer: The number of collisions per second per unit volume of the reaction mixture is known as collision frequency.
Q.6 What is effective collision?
Answer: Collision of reactant molecules having energy greater than or equal to threshold energy in a proper orientation in which actually the bond breaking and bond formation takes place is called effective collision.
Q.7 Mention differences between order and molecularity of a reaction.
Answer:

Order of reaction	Molecularity of reaction
Sum of powers of concentration of reactants present in rate equation.	Number of reactant molecules which collide simultaneously to give product is called molecularity.
It is an experimental property.	It is a theoretical property.
It may be zero or fractional.	It can not be zero or fractional.
Order is applicable to both elementary and complex reaction.	Molecularity is not applicable to complex reaction.

Q.8. What is zero order reaction? Give one example of zen order reaction.
Answer: A reaction in which rate is independent of concentration of reactants is called zero order reaction. e.g. thermal decomposition of HI on gold surface.
Q.9 Write expression for rate constant of first order reaction. Mention unit of rate constant of a first order reaction.

Answer: The reaction in which rate is proportional to first power of the concentration of the reactant, e.g. all natural and artificial radioactive decays follow first order kinetics.

Q.10 What is intermediate complex theory of catalysis?

Answer: A catalyst is a substance which alters the rate of a reaction without itself undergoing any permanent chemical change. It increases the rate of reaction by decreasing the activation energy.

Q.11 How does a catalyst increase the rate of a reaction?

Answer: According to this theory, a catalyst participates in a chemical reaction by forming temporary bonds with the reactants resulting in an intermediate complex. This has a transitory' existence and decomposes to yield product and catalyst.

Q.12 What is the drawback of collision theory?

Answer: Catalyst provides an alternate pathway by reducing the activation energy between reactant and product and hence lowering the potential energy barrier,

Q.13 Mention the necessary condition for collision of reaction molecules to give product.

Answer: It considers atoms/molecules to be hard spheres and ignores their structural aspects.

Q.14 Reaction having molecularity greater than three is not observed. Explain.

Answer: The probability that more than three molecules can collide and react simultaneously is very small. Hence, the molecularity greater than three is not observed,

Q15. Catalyst does not affect the equilibrium rather helps in quick attainment of equilibrium. Explain this statement.

Answer: Catalyst does not change the equilibrium constant of a reaction rather, it helps in attaining the equilibrium faster, that is, it catalyses the forward as well as the backward reaction to the same extent so that the equilibrium state remains same but is reached earlier.

Q.16 What are the limitations of a catalyst?

Answer: Catalyst cannot initiate a non spontaneous reaction rather it alters the rate of a spontaneous reaction.

Q.17 What is reaction rate?

Answer: Reaction rate is the change in molar concentration of any of the reactant or product species per unit time.

Q.18 Identify the reaction order from each of the following rate. (i) $k=2.3\times10^{5}Jmol^{-1}s^{-1}$ (ii) $k=3.1\times10^{-4}s^{-1}$

Answer: (i) Second order (ii) First order.

Q.19 Name the photosensitizer in the photosynthesis of plants.

Answer: Chlorophyll is the photosensitizer which carries photosynthesis in plants.

Q.20 For a reaction $A+H_2O \rightarrow B$; Rate $k \propto [A]$. What is its (i) Molecularity (ii) Order?

Answer: (i) Pseudo uni-molecular reaction

(ii) order = 1.