

**Department of Chemistry**  
**B. N. College Bhagalpur**

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**Assignments** (*Chapter: Chemical Kinetics  
& colloidal states*)

Assignment prepared by:  
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**Time Allowed: 3 Hours**

**Maximum Marks: 50**

**Note: Attempt all questions (All terms have their usual meaning)**

**SECTION: A**

**(Marks: 10x1 = 10)**

**Objectives**

- [1] [i] The reactions of high molecularity are rare because
- (a) many body collisions have a low probability
  - (b) many body collisions are not favoured energetically
  - (c) activation energy of many body collision is very high
  - (d) activation energy of many body collision is very low
- [ii] The rate at which a substance reacts is proportional to its
- (a) equivalent weights
  - (b) molecular weights
  - (c) number of moles
  - (d) number of moles per litre
- [iii] Which of the following represents the relationship between rate constant,  $k$  and absolute temperature  $T$ , as predicted by Arrhenius equation?
- (a) A plot of  $\log k$  against  $1/T$  will be linear
  - (b) A plot of  $\log k$  against  $T$  will be linear
  - (c) A plot of  $k$  against  $T$  is linear with a negative slope
  - (d) A plot of  $k$  against  $T$  is linear with a positive slope
- [iv] The rate of chemical reaction (except zero order)

- (a) decreases from moment to moment      (b) remains constant throughout  
(c) depends upon the order of reaction      (d) none

[v] The acid hydrolysis of ester is

- (a) 1<sup>st</sup> order reaction      (b) bimolecular reaction  
(c) Pseudo unimolecular reaction      (d) none

[vi] The rate constant of a second order reaction has units

- (a) mole litre<sup>-1</sup>sec<sup>-1</sup>      (b) litre mole<sup>-1</sup> sec  
(c) litre mole<sup>-1</sup>sec<sup>-1</sup>      (d) none of the above

[vii] If 'a' is the initial conc of a substance which reacts according to zero order kinetic and 'k' is rate constant, the time for the reaction to go to completion is

- (a). a/k      (b) 2/ka      (c) k/a      (d) 2k/a

[viii] A drug suspension decomposes by zero-order kinetics with a rate constant of 2 mg mL<sup>-1</sup>month<sup>-1</sup>. If the initial concentration is 100 mg mL<sup>-1</sup>, what is the **shelf life** (t<sub>10%</sub>)?

- (a) 2 months    (b) 3 months    (c) 4 months    (d) 5 months

[ix] What is the size of colloidal particles?

- (a) 10-20 nm      (b) More than 20 nm  
(c) Less than 10 nm      (d) 30 to 50 nm

[x] What is called a dispersion medium?

- (a) It is where the dispersed phase settles  
(b) It is where the solute particles settle  
(c) It is where the dispersed phase is suspended  
(d) It is the primary medium

*(Subjective)*

- [2] Derive an expression for the rate constant of a first order reaction, when the initial rate constant are same. Also show mathematically half life period of a first order kinetics is independent of concentration terms [3+2]
- [3] Write Arrhenius equation showing the effect of temperature on the reaction rates. How does it help to calculate the activation energy of a reaction? [3+2]
- [4] What is order of a reaction of a reaction? Name three methods to determine the order of a reaction. Explain one method in detail. [5]
- [5] What do you mean by homogeneous and heterogeneous catalysis? Explain briefly [5]
- [6] What are emulsions? Describe the methods used in finding the type of an emulsion. How emulsions prepared? [5]
- [7] A drug has the initial concentration of  $5.0 \times 10^{-3} \text{ g cm}^{-3}$  in aqueous solution. After 24 months, the concentration drops to  $3.48 \times 10^{-3} \text{ g cm}^{-3}$ . This degradation process is known to follow first-order kinetics. Calculate the rate constant for this reaction. [2]
- (b) Find the new temperature if the rate constant at that temperature is  $15 \text{ M}^{-1}\text{s}^{-1}$  while at temperature 389K the rate constant is  $7 \text{ M}^{-1}\text{s}^{-1}$ . the Activation Energy is 600 kJ/mol [3]
- [8] Write short notes on any five of the following: [10]
- (a) Enzyme catalysis
  - (b) Transition state theory
  - (c) Zero order reaction
  - (d) Activation energy
  - (e) Collision frequency
  - (f) Half life period
  - (g) Hardy-Schulze law
  - (h) Gold number