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Reg. No. :

Code No. : 5424

Sub. Code : ZCHM 43

M.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2024.

Fourth Semester

Chemistry

Core – CHEMICAL KINETICS PHOTOCHEMISTRY
AND SURFACE CHEMISTRY

(For those who joined in July 2021–2022)

Time : Three hours

Maximum : 75 marks

PART A — ($10 \times 1 = 10$ marks)

Answer ALL questions.

Choose the correct answer.

1. On increasing the temperature of a gas, the mean free path
 - (a) Decreases
 - (b) Increases
 - (c) Remains unaffected
 - (d) Decreases exponentially

The total energy of a molecule is equally distribution among different degrees of freedom. This law is _____

- (a) Law of conservation energy
- (b) Law of Equipartition of energy
- (c) Maxwell's distribution Law
- (d) Postulates of kinetic theory of gases

Activation energy of a chemical reaction can be determined by

- (a) Determining the rate constant at standard temperature
- (b) Determining the rate constant at two temperature
- (c) Determining the probability of collision
- (d) Using a catalyst

Which of the following statements is incorrect about the collision theory of chemical reaction?

- (a) It considers reacting molecules or atoms to be hard spheres and ignores their structural features
- (b) Number of effective collisions determines the rate of reaction
- (c) Collision of atoms or molecules possessing sufficient threshold energy results into the product formation
- (d) Molecules should collide with sufficient threshold energy and proper orientation for the collision to be effective

5. What happens when molecules collide with energy less than the activation energy needed for the reaction?

- (a) They stick together but do not react
- (b) They react but more slowly
- (c) They react if the bonds are arranged in the correct orientation
- (d) They do not react they simply bounce off of each other

6. In a series of reactions, which is the rate determining step?

- (a) The simplest reaction
- (b) The main reactions involving the major reactant
- (c) The slowest reaction
- (d) The fastest reaction

7. Which of the following are excited state property?

- (a) Dipolemoment
- (b) PK_a
- (c) Redox potential
- (d) All of these

The phenomenon which stops as soon as incident light radiations cut off is _____

- (a) Phosphorescence
- (b) Luminescence
- (c) Fluorescence
- (d) Chemi luminescence

According to Langmuir's gases adsorbed by a solid surface forms _____

- (a) Monolayer
- (b) Double layer
- (c) Triple layer
- (d) Multi layer

10. In physical adsorption the adsorbate molecules are held on the surface of the adsorbent by _____ forces

- (a) Cohesive
- (b) Centrifugal
- (c) Chemical
- (d) Vander waal

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Write short notes on principle of equipartition energy.

Or

(b) What are the factors influencing mean free path?

12. (a) State and explain simple collision theory.

Or

(b) Write short notes on kinetics of chain reactions.

13. (a) Explain Hinshelwood theory of unimolecular reactions.

Or

(b) Write short notes on acidity functions.

14. (a) Write short notes on the hydrated electron and its reactions.

Or

(b) Explain phosphorescence.

15. (a) Explain Gibbs adsorption isotherm.

Or

(b) Write down the factors affecting the CMC of surfactants.

PART C — ($5 \times 8 = 40$ marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

- (a) Give a brief account of Maxwell's distribution of molecular velocities. What is the effect of temperature on the distribution of velocities?

Or

- (b) How will you derive Poiseuille's equation?

- (a) Discuss in detail about H_2O_2 explosive reaction.

Or

- (b) Discuss about the theory of Absolute reaction rate.

- (a) Explain the theory of unimolecular reactions of RRKM.

Or

- (b) Discuss Michaelis – Menten kinetics of enzyme catalysis.

19. (a) Write down the difference between fluorescence and phosphorescence.

Or

- (b) Write short notes on the following :

- (i) Photosensitization.
- (ii) Chemiluminescence.

20. (a) Write short notes on :

- (i) Micelles.
- (ii) Zeta potential.

Or

- (b) Explain Langmuir's adsorption isotherm.
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