22CHP315

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION DECEMBER 2023
(Third Semester)

Branch – **CHEMISTRY**

CHEMICAL KINETICS AND STATISTICAL THERMODYNAMICS

Time: Three Hours Maximum: 50 Marks

SECTION-A (5 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (5 x 1 = 5)

1. In RRK theory the collision that produce A^* molecule is
   (i) strong collision (ii) weak collision
   (iii) both strong and weak collision (iv) None of these

2. Which is not a fast reaction?
   (i) Flow method (ii) relaxation method
   (iii) Flash photolysis (iv) Hydrolysis

3. BET method can be used to determine the _____ of a porous catalyst.
   (i) solid density (ii) pore volume
   (iii) surface area (iv) all of the above

4. The term partition function represents
   (i) no.of energy levels
   (ii) the relative population in two energy levels
   (iii) sum of particles in all energy levels
   (iv) all the above

5. Protons obey _____ statistics.
   (i) Fermi Dirac (ii) Maxwell-Boltzmann
   (iii) Bore-Einstein (iv) Pauli statistics

SECTION - B (15 Marks)
Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks (5 x 3 = 15)

6. a) Bring out clearly the main features of the collision theory of reaction rates.
   OR
   b) Explain Steady state principle.

7 a) Discuss application of ARRT to solution kinetics.
   OR
   b) Describe the kinetics of acid-base catalysis.

8. a) How surface area is measured by BET adsorption isotherm?
   OR
   b) Define G-value in Radiolysis of water and explain the mode of reactions of hydrated electrons.

9. a) Define microstate and macro state of the thermodynamic system.
   OR
   b) Derive Translational partition function in statistical thermodynamics.

10. a) Write note on: Heat capacity of diatomic gases.
   OR
   b) What is negative absolute temperature in statistical thermodynamics?

Cont...

SECTION -C (30 Marks)

Answer **ALL** questions
ALL questions carry **EQUAL** Marks (5 x 6 = 30)

11. a) Explain Lindemann's kinetic theory of unimolecular reactions and its modification.

OR

b) Describe $H_2 - Br_2$ thermal reactions.

12. a) Derive Michelis -Menten's equation for enzyme catalysis reaction and explain the effect of temperature on rate.

OR

b) Explain the flow methods to study the chemical kinetics of fast reactions in solution.

13. a) Discuss the Langmuir – Ridel mechanism for bimolecular reactions.

OR

b) Outline the photochemical mechanism and kinetics of $H_2 - Cl_2$ reactions.

14. a) Derive the expression for Sekur-Tetrode equation of heat capacity.

OR

b) Write the significance of SSA and explain internal energy in vibrational partition function.

15. a) Describe Einstein and Debye model of specific heat capacity of solids.

OR

b) What is Fermi Dirac statistics? Explain in detail.

Z-Z-Z END