M.Sc DEGREE (CSS) EXAMINATION, OCTOBER 2024

Third Semester

M.Sc CHEMISTRY

CORE - CH010301 - CHEMICAL KINETICS, SURFACE CHEMISTRY AND CRYSTALLOGRAPHY

2019 ADMISSION ONWARDS

2BD38A51

Time: 3 Hours

Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. Define steric factor. How is it related to activation energy?

2. Explain the mechanism of cationic polymerization.

3. Distinguish between prototropic and protolytic mechanism with examples.

4. How does pH and temperature affect enzyme catalysis?

5. Write short note on thermodynamics of surfaces.

6. Explain the applications of AFM for surface studies.

7. Write a note on electrical double layer in colloids.

8. Write a short note about osmotic pressure method for determining molecular weight of polymers.

9. List the space groups of monoclinic system

10. Explain briefly about reciprocal lattice.

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. Briefly describe the flash photolysis methods for studying fast reactions.

12. Discuss the brusselator model of oscillating reactions.

13. Explain different methods used for the measurements and interpretation of surface potential.

14. Briefly explain the principle and applications of Auger electron spectroscopy.

15. Differentiate Eley-Rideal and Langmuir-Hinshelwood mechanism for surface catalysed reactions.

16. Compare the structure of NaCl and KCl by powder crystal method.

17. β-Galactosidase enzyme catalyzed hydrolysis of lactose at 298K has Michealis constant of 0.075 $molL^{-1}$. At a substrate concentration of 0.75 mol L^{-1}, the reaction rate is found to be 3.15 mol L^{-1} s^{-1}. Calculate the maximum velocity.

18. A monolayer of N_2 molecule (effective area $0.162nm^2$) is adsorbed on the surface of 1 g of Fe/Al_2O_3 catalyst, nitrogen occupies 2.86 cm^3 at $25^{\circ}C$ and 1 atm pressure. What is the surface area of the catalyst?

(6×2=12 weightage)

Part C (Essay Type Questions)
Answer any **two** questions.
Weight **5** each.

19. Discuss on the mechanisms proposed by Lindemann and then by Hinshelwood to explain the kinetics of unimolecular reactions.

20. Discuss on the Rice Herzfeld mechanisms of organic decomposition of acetaldehyde involving 3 different termination steps.

21. Derive BET equation. Explain the use of BET equation for surface area analysis.

22. Explain structure factor. How is structure of a unit cell determined by fourier synthesis?

(2×5=10 weightage)