

**FIRST SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2021  
(Regular/Improvement/Supplementary)**

**CHEMISTRY  
FCHE1C04 – THERMODYNAMICS, KINETICS AND CATALYSIS**

**Time: 3 Hours**

**Maximum Weightage: 30**

**Section A: Short answer questions. Answer any *eight* questions. Each carries *one* weightage.**

1. State Nernst heat theorem.
2. Mention the importance of partial molar quantities.
3. State the law of Raoult's ebullioscopy.
4. What is molecular beam? Mention its use.
5. What is meant by explosion limit?
6. How the steady state approximation is useful in deriving the rate equation?
7. Why conventional methods are inadequate in studying the kinetics of fast reactions?
8. What is London equation? Mention its use.
9. Comment on the energy of activated complex. How does it vary along the reaction coordinate?
10. What is meant by a diffusion controlled reaction?
11. What are the assumptions of Langmuir model of adsorption?
12. Arrive at the equation for  $\frac{1}{2}V_{max}$  for an enzyme catalyzed reaction starting from Michaelis-Menten equation.

**(8 × 1 = 8 weightage)**

**Section B: Short essay questions. Answer any *four* questions. Each carries *three* weightage.**

13. Derive Duhem-Margules equation. Mention its applications.
14. What is meant by chemical potential? Discuss its dependence on temperature and pressure.
15. Define electrokinetic effect. What are the applications of  $\zeta$  potential measurements?
16. Differentiate between attractive and repulsive potential energy surfaces.
17. Show that unimolecular gas phase reactions follow first order kinetics at low pressure and second order kinetics at high pressure.

**(P.T.O.)**

18. What is the significance of heat of adsorption? How is it determined?
19. What is meant by an oscillating reaction? Explain the Lotko–Volterra mechanism of an oscillating reaction.

**(4 × 3 = 12 weightage)**

**Section C: Essay questions. Answer any *two* questions. Each carries *five* weightage.**

20. Derive BET equation and discuss its significance.
21. Distinguish between Langmuir-Hinshelwood and Eley-Rideal models for bimolecular gas phase reaction on solid surfaces.
22. Discuss the applications of Onsager reciprocal relations.
23. Explain the primary and secondary salt effect.

**(2 × 5 = 10 weightage)**