QP CODE: 25022463

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Reg No : .....

Name : .....

M.Sc DEGREE (CSS) SPECIAL REAPPEARANCE EXAMINATION, APRIL 2025

Third Semester

M.Sc ANALYTICAL CHEMISTRY

CORE - CH020301 - SELECTED TOPICS IN PHYSICAL CHEMISTRY

2019 ADMISSION ONWARDS

7E6140F5

Time: 3 Hours Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. How does the transition state theory differ from the collision theory?
2. What is entropy of activation $\Delta S^{\ddagger}$? Give its significance with respect to deciding the rate of the reaction.
3. Explain the validity of DHO in non-aqueous solvents.
4. Explain what is meant by mean ionic activity coefficient? How it can be expressed?
5. Describe the quantitative test for DHLL.
6. Give a brief description of development of potential at electrode – electrolyte interface.
7. Explain different applications of Donnan Membrane equilibrium.
8. Briefly discuss the working of solar cells.
9. Write a note on thermoelectric phenomena.
10. Write a note on glycolysis.

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. Explain how flow and shock methods can be used in studying the kinetics of fast reactions.
12. β-Galactosidase enzyme catalyzed hydrolysis of lactose at 298K has Michaelis 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.

13. Explain Drude and Nernst Electrostriction theory.

14. Explain the term 'decomposition potential'. On what factors the decomposition potential depends?

15. Give Eley-Rideal mechanism of adsorption.

16. Explain surfactants and cleansing action of soap.

17. For 900 seconds, light of 436 nm was passed into CCl_4 solution containing bromine and cinnamic acid, the average intensity of light absorbed was 19.2×10^{-4} J/s. Some of the bromine reacted to give dibromide and in this experiment, the total bromine content was decreased by 3.83×10^{19} molecules. a) Calculate the quantum efficiency and b) State whether or not a chain reaction was involved.

18. What do you mean by local equilibria? What are the conditions for establishing local equilibria?

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

*Weight **5** each.*

19. Describe the H_2-Br_2 thermal reaction by deducing the rate expression. How is it different from the photochemical reaction?

20. Derive Butler-Volmer equation. Discuss.

21. Explain Kinetic and statistical derivation of Langmuir theory.

22. Discuss on the phenomenon of quenching of fluorescence and arrive at an expression detailing its kinetics. Analyse the graphical representation also.

(2×5=10 weightage)