TM243332Q

Reg. No :.....

Name :.....

MASTER'S DEGREE (C.S.S) EXAMINATION, NOVEMBER 2024

2020, 2021, 2022 ADMISSIONS SUPPLEMENTARY

SEMESTER III - CORE COURSE CHEMISTRY ,

CH3C11TM20 - Chemical Kinetics, Surface Chemistry and Photophysics

Time : 3 Hours **Maximum Weight : 30**

Part A

I. Answer any Eight questions. Each question carries 1 weight **(8x1=8)**

1. Discuss temperature jump method used to determine the rate of fast reactions.
2. Discuss the factors that affect the kinetics of enzyme catalyzed reaction.
3. Relate linear free energy relationship with rate constant.
4. Define potential energy surface. Explain its significance.
5. Presence of H_2S is essential in As_2S_3 sol, though H_2S ionizes. Explain.
6. Define surfactants. Explain their important uses.
7. Enumerate the applications of STM.
8. Pyridine, quinoline and acridine which are isoelectronic N-analoges of benzene, napthalene and anthracene are nonfluorescent in hydrocarbon solvents. Justify.
9. List the important characteristics of excimers. Give one example.
10. Explain the terms photosensitization and quenching.

Part B

II. Answer any Six questions. Each question carries 2 weight **(6x2=12)**

11. Explain kinetics of H_2-Br_2 reaction taking place thermally.
12. Derive the microcanonical rate constant of unimolecular reactions using RRKM theory.
13. Explain the oscillatory reaction, Oregonator.
14. Explain the mechanism of decomposition of acetaldehyde. Applying steady state approximation, prove that the order of the reaction is 3/2.
15. Explain the Eley-Rideal Mechanism of surface catalyzed reactions.
16. List the surface selection rules of surface enhanced raman scattering.
17. (a) Biacetyl triplets have a quantum yield of 0.22 for phosphorescence and a measured lifetime of the triplet state of 10 milliseconds. The phosphorescence is quenched by a compound Q with a diffusion controlled rate of 10^{10} l $mol^{-1}s^{-1}$. What concentration of Q is required to reduce the phosphorescence yield to half?
    b) Explain Greenhouse effect.
18. Discuss fluorescence. Structural variations in molecules influence the property of fluorescence. Justify.

Part C

III. Answer any Two questions. Each question carries 5 weight **(2x5=10)**

19. (a) Explain the salient features of RRKM theory. (b) Discuss the effect of pH on enzyme catalyzed reaction.
20. (a) Explain the lower and upper explosion limits in $H_2 - O_2$ reaction. (b) Describe flash photolysis method for studying fast reactions.
21. Explain the postulates of Langmuir adsorption isotherm and derive it. Suggest a method for verification of the isotherm.

22. Explain (a) Different types of solar cells and their working (b) Flash photolysis Vs Pulse radiolysis.