

F 5071

(Pages : 2)

Reg. No.....

Name.....

M.Sc. DEGREE (C.S.S.) EXAMINATION, JANUARY 2016

Third Semester

Faculty of Science

Branch III : Chemistry

CH 3C 11—CHEMICAL KINETICS, SURFACE CHEMISTRY AND PHOTOCHEMISTRY

(2012 Admission onwards)

Time : Three Hours

Maximum Weight : 30

Section A

Answer any ten questions.

Each question carries a weight of 1.

1. Explain the significance of rate determining step in a multistep reaction.
2. Explain the principle of SEM.
3. Distinguish between activated complex and transition state.
4. Write London equation for calculating activation energy.
5. Explain Bioluminescence with example.
6. Define Zeta potential.
7. How does temperature influences photochemical reaction ?
8. What is the condition under which BET isotherm approximates to Langmuir adsorption isotherm ?
9. Write Stern-Volmer equation. Represent graphically.
10. Explain with one example anionic surfactants.
11. Write Gibb's adsorption isotherm. Explain the term involved.
12. Unimolecular gas phase reaction follows 1st order kinetics at high pressure and 2nd order at low pressure. Why ?
13. What is potential energy surface ? Explain its significance.

(10 × 1 = 10)

Section B

Answer any five questions by attempting not more than 3 questions from each bunch.

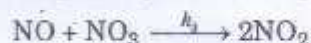
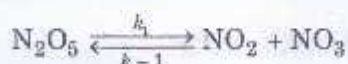
Each question carries a weight of 2.

BUNCH 1 (SHORT ESSAY TYPE)

14. Explain the principle of Surface Enhanced Raman Spectroscopy.
15. Describe the stabilizing action of surfactants.

Turn over

16. The decomposition of N_2O_5 takes place according to the following mechanism. Derive the rate law.



17. Explain primary and secondary kinetic salt effect.

BUNCH 2 (PROBLEM TYPE)

18. Biacetyl triplets have a quantum yield of 0.25 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 $10^{10} \text{ l mol}^{-1} \text{ s}^{-1}$. What concentration of Q is required to reduce the phosphorescence yield to half?

19. The relaxation time for attaining equilibrium in $A + B \xrightleftharpoons[k_{-1}]{k_1} C$ has been found to be 100 μs .

The equilibrium constant of the reaction is 10^{10} . Evaluate the rate constants k_1 and k_{-1} .

20. In an experiment to measure quantum efficiency of a photochemical reaction, the absorbing substance was exposed to 490 nm light from a 100 W source for 45 minutes. The intensity of transmitted light was 40 % of the intensity of the incident light. As a result of irradiation, 0.344 mol of the absorbing substance decomposed. Determine the quantum efficiency.
21. The intrinsic viscosity of a solution of poly isobutylene at 20°C is 180 cm^3 per gram. If $[\eta]$ is related to the viscosity-average molar mass M_{visc} by the expression, $[\eta] = 3.6 \times 10^{-2} (M_{\text{visc}})^{0.64}$, calculate the molar mass of the polymer.

(5 × 2 = 10)

Section C

Answer any two questions.

Each question carries a weight of 5.

22. (a) Explain the principle of Lasers in the study of photochemical kinetics.
(b) Derive Michaelis-Menten equation for an enzyme catalysed reaction.
23. (a) Explain the principle of Auger and ESCA.
(b) Write a note on dimerization of anthracene.
24. (a) Greenhouse effect.
(b) Eley-Rideal mechanism.
25. (a) What are the assumptions in Transition state theory? Following the theory derive an equation for rate constant.
(b) Compare Transition state theory with Collision theory.

(2 × 5 = 10)