

F 7071

(Pages : 2)

Reg. No.....

Name.....

M.Sc. DEGREE (CSS) EXAMINATION, JANUARY 2014

Third Semester

Faculty of Science

Branch III—Chemistry

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

Time : Three Hours

Maximum Weight : 30

Section A

Answer any ten questions.

Each question carries a weight of 1.

1. What do you understand by the isoenergetic lines in potential energy contour ?
2. Explain the term optical pumping.
3. Explain the mechanism of cationic polymerization ?
4. What is an exciplex ? Give one example for an exciplex.
5. What is bioluminescence ? Give one example.
6. Explain secondary salt effect with one example.
7. Define quantum yield. How it is determined ?
8. Distinguish between general and specific H^+ ion catalysis.
9. What happens when a small amount of oil soluble dye is added to milk ?
10. Write down Bronsted- Bjerrum equation and explain the terms involved.
11. Define Electrophoretic mobility.
12. What do you know by the term turn over number in enzyme catalysis ?
13. What are HLB numbers ?

(10 × 1 = 10)

Section B

Answer five questions attempting not more than three questions from each bunch.

Each question carries a weight of 2.

Bunch 1 (Short Essay Type)

14. Explain the Rice Herzfeld mechanism of organic decomposition reactions of acetaldehyde (in the absence of third body) with special reference to Gold finger, Niclacuse and Letort rule.
15. What is the effect of dielectric constant of a medium on the rate of ionic in solutions. Derive the equation for the rate constant ?
16. Derive Stern-Volmer equation.
17. Explain the principle of SEM in the study of surfaces.

Turn over

Bunch 2 (Problem Type)

18. 150 ml of N_2 (1 atm pressure at $0^\circ C$) was required to form a monolayer on the surface of silica gel. Calculate the surface area of the solid. The cross-sectional area of N_2 is 0.162 (nm)^2 .
19. An XPS electron was found to have a kinetic energy of 1073.5 eV using X-ray source of 9.89. Calculate the binding energy of the electron.
20. In a photochemical reaction, the absorbing substance was exposed to 320 nm radiation from 87.5 W source for 28 min; The intensity of transmitted light was 0.257 that of the incident light. As a result of irradiation 0.324 mol of the absorbing substance decomposed. Determine the quantum efficiency.
21. The enzyme catalyzed conversion of a substance at $25^\circ C$ has Michealis constant of 0.042 mol L^{-1} . The rate of reaction is $2.45 \text{ mol L}^{-1} \text{ s}^{-1}$ when the substrate concentration is 0.890 mol L^{-1} ? What is the maximum velocity of this enzymolysis?

 $(5 \times 2 = 10)$ **Section C**

*Answer any two questions.
Each question carries a weight of 5.*

22. Derive the rate constant following the activated complex theory. Show that ACT agrees with simple collision theory.
23. (a) Explain the principle of surface enhanced Raman scattering.
(b) Briefly explain the principle and application of STM.
24. (a) Explain the Eley- Rideal mechanism for the bimolecular reactions on the surface of solids.
(b) Explain the lower and upper explosion limits in $H_2 - O_2$ reaction.
25. Describe the mechanism of $H_2 - Br_2$ photochemical reaction by deducing the rate expression. How is it different from the thermal reaction?

 $(2 \times 5 = 10)$