



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – CHEMISTRY

SECOND SEMESTER – APRIL 2018

CH 2957- CATALYSIS

Date: 27-04-2018
Time: 01:00-04:00

Dept. No.

Max. : 100 Marks

Part-A

Answer ALL questions.

(10 × 2 = 20)

1. What is turn over frequency of a catalyst?
2. Differentiate physisorption from chemisorption.
3. State Hammett - Zucker hypothesis.
4. Distinguish between protolytic and prototropic mechanisms in acid-base catalysis.
5. Define Hammett acidity function. Mention its significance.
6. Write any two examples of organic reactions that are carried out by photosensitised metal oxides.
7. What is meant by phosphorescence?
8. What are the advantages of AFM over other imaging techniques?
9. State Hammond's postulate.
10. Write Scherrer equation. Mention its use.

Part-B

Answer any EIGHT questions.

(8 × 5 = 40)

11. Discuss the various types of adsorption isotherms.
12. Explain the potential energy diagrams for a catalysed reaction proceeding through van't Hoff and Arrhenius type intermediates.
13. Write a note on phase transfer catalysis.
14. Show that Bronsted catalytic law is a special form of linear free energy relationship.
15. Explain the role of Ziegler-Natta catalyst in the manufacture of polymers.
16. Derive Stern-Volmer equation for quenching of fluorescence.
- 17a. What are the advantages of TiO₂ as a photocatalyst?
b. Write the mechanism of photodegradation of dyes by TiO₂. (2+3)
18. Discuss the mechanism of covalent enzyme catalysis with a suitable example.
19. Write the mechanism of metal ion catalysis with a suitable example.
20. What are the applications of temperature programmed techniques in catalysis?
- 21a. Describe the parameters used to measure the porosity of porous solids.
b. How are porous catalysts classified? (3+2)
22. Discuss the t-plot method as applicable for the study of pore size distribution.

Part-C

Answer any **FOUR** questions.

(4 × 10= 40)

- 23a. Discuss the Langmuir-Hinshelwood mechanism for bimolecular surface reaction.
b. Write BET equation and explain the terms involved in it. (6+4)
- 24a. Explain the significance of Skrabal plots in acid-base catalysis.
b. Explain the unique shape selectivity exhibited by zeolites. (5+5)
- 25a. Discuss the kinetics of H₂-Cl₂-chlorine photochemical chain reaction.
b. Explain how semiconductors act as photocatalysts. (5+5)
- 26a. Describe the construction of Honda cell for the photo electrolysis of water.
b. Write a note on photocatalytic reduction of dinitrogen. (6+4)
- 27a. Write the mechanism of general acid and base catalysis using enzymes with suitable example.
b. What are the advantages of using organic solvents in biocatalysis? (5+5)
28. Explain the principle and applications of SEM and TEM.
