



**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**

**M.Sc. DEGREE EXAMINATION – CHEMISTRY**

**SECOND SEMESTER – APRIL 2015**

**CH 2957 - CATALYSIS**

Date : 23/04/2015

Dept. No.

Max. : 100 Marks

Time : 01:00-04:00

**Part-A**

*Answer all questions. Each question carries two marks.*

*(10x2=20)*

1. How are adsorption isobar and adsorption isostere expressed graphically?
2. Write two examples for phase transfer catalysts.
3. How are dissociation constants related to rates in alkaline hydrolysis of ethyl benzoates?
4. What are the roles of catalyst promoter and catalyst poison in catalysis?
5. Write Hammond's postulate.
6. How are the pores of a catalyst classified based on their diameter? Cite examples.
7. Write the factors that affect the photocatalytic activity of metallised semiconductors.
8. What is sensitised fluorescence?
9. Why is photoreduction of dinitrogen more difficult than water?
10. What are the advantages of AFM in characterising catalysts over other microscopic techniques?

**Part-B**

*Answer any eight questions. Each question carries five marks.*

*(8x5=40)*

11. Describe the catalytic activity of an enzyme with an example.
12. How is Ziegler-Natta polymerization performed using a homogenous catalyst?
13. Write a detailed note on the production of any two petrochemicals.
14. Compare the potential energy diagrams of catalysed reactions for Arrhenius and van't Hoff intermediates.
15. Highlighting the assumptions, expression for the area adsorbed and influence of pressure conditions, explain Langmuir adsorption isotherm.
16. Explain the significance of Harkin-Jura Equation.
17. Describe the processes that take place on the photoexcited semiconductor surface and bulk.
18. Explain how t-plot method is applied for the study of pore size distribution in a material?
19. Discuss the kinetics of quenching of fluorescence.
20. Describe the construction of Honda – Fujishima cell for the photo electrolysis of water.
21. How are temperature programmed techniques useful in characterising catalysts?
22. Write the advantages of using organic solvents in enzyme catalysis.

**Part-C**

*Answer any four questions. Each question carries ten marks.*

*(4x10=40)*

- 23a. Derive an expression for the determination of surface area of multilayer adsorption . (6)  
b. Explain Freundlich adsorption isotherm. (4)
- 24a. Mention the applications of ZSM-5 in catalysis. (5)  
b. How are hydroformylation reactions catalysed? (5)
- 25a. Geometric arrangements affect  $k_{cat}$  value of enzyme. - Produce evidence. (3)  
b. Apply Hammett-Zucker treatment to A2 mechanism and explain how deviations in Hammett-Zucker plots corrected. (7)
26. Explain the kinetics of photochemical  $H_2-Br_2$  reaction.
- 27a. Outline the working of solar energy conversion devices and explain the storage. (6)  
b. Write the role of aminotransferases in the production of  $\alpha$ -amino acids. (4)
- 28a. Explain how hysteresis loop helps in finding the shape of pores in porous solids. (6)  
b. What are the major interactions of electron beam with the sample in TEM? (4)

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