LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

SECONDSEMESTER – APRIL 2018

17/16PCH2ES02- SURFACE CHEMISTRY AND CATALYSIS

Date: 25-04-2018 Dept. No. Max. : 100 Marks

Time: 01:00-04:00

Part-A

Answer ALL questions. **(10 × 2= 20)**

1. Enumerate the differences between physisorption and chemisorption.
2. How are the constants K and n in the Freundlich adsorption isotherm determined graphically?
3. Define Kraft point.
4. What are elastic and non-elastic gels?
5. Comment on catalytic strengths and acid strengths of $HOOC(CH_2)_nCOOR$ and $HOOC(CH_2)_nCOO^-$.
6. Define symmetry number with an example.
7. Write any two advantages of TiO_2.
8. How is a chirallactone formed via enzymatic Baeyer-Villiger reaction?
9. Write the principle of XRF.
10. Why is an Auger spectrum presented as a derivative plot?

Part-B

Answer any EIGHT questions. **(8 × 5= 40)**

11. What are the assumptions of Langmuir adsorption isotherm? Derive the isotherm equation.
12. Derive the rate equation for a bimolecular reaction occurring by Langmuir-Hinshelwood mechanism.
13. The volume of nitrogen gas at 1 atm and 273K required to cover 1g of the silica gel is 0.129 dm^3. Calculate the surface area of the gel if each nitrogen molecule occupies an area of 16.2×10^{20} m^2.
14. Describe the role of surfactants in the synthesis of mesoporous materials.
15. What are emulsions? How are they classified and prepared?
16. Describe three different types of poisoning generally observed in the case of heterogenous catalysts.
17. Describe the correlation between the effectiveness of a catalyst and its strength as an acid or base.
18. Write a detailed note on the production of petrochemicals from catalytic cracking of heavy petroleum. Mention the advantages of catalytic cracking over thermal cracking.
19. Illustrate the role of enzymes in catalyzing sulfoxidation and reversal of oxidative deamination.
20. How do geometry and entropy affect enzymecatalysed organic reactions?
21. How is surface area of solid adsorbent determined using BET equation?
22. Explain how is temperature programmed desorption technique applied to determine surface acidity?

Part-C

Answer any FOUR questions. **(4 × 10= 40)**

23. What is an adsorption isotherm? Deduce BET adsorption isotherm.

24a. What is CMC? Explain the effect of surfactant chain length and temperature on CMC.

b. Write a short note on micellar catalysis. (5+5)

25a. Explain the classification of surfactants with suitable examples.

b. How is BJH method applied for the study of pore size distribution in a material? (5+5)

26a. Derive an expression to show that log k is a function of pH in a reaction of acid-base catalysis.

b. Sketch Skrabal diagram for mutarotation of glucose and inversion of sucrose. (6+4)

27a. What are the salient features of TiO_2? Discuss the solar energy conversion and storage in Honda's Cell.

b. State the factors that affect the photocatalytic degradation of yes. (6+4)

28. Explain the principle of XPS. Discuss its applications in surface analysis.

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