

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 1214

Roll No.

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B. Tech.

(Semester II) Even Semester Theory Examination, 2012-13

ENGINEERING CHEMISTRY

Time : 3 Hours]

[Total Marks : 80

Note : Attempt questions from each Section as per instructions.

Section-A

Attempt *all* parts of this question. Each part carries 2 marks.

2×9=18

1.
 - (a) What are micelles? Give two examples of micellar systems.
 - (b) Explain racemic modification.
 - (c) Give all the stereoisomers of 2, 3-dichloro butane. Identify the mesoform.
 - (d) Two isomeric compounds A and B having the molecular formula. C_5H_8 absorb at λ_{max} 223 nm and λ_{max} 178 nm respectively. Write the structures of the two isomers.
 - (e) Describe inductive and electrometric effect with suitable examples.
 - (f) What is Calgon conditioning? Explain.
 - (g) Define the following terms :
 - (i) Water recovery
 - (ii) Solute rejection
 - (h) Discuss the structure of methyl free radical.
 - (i) What is Langelire Index (LI)? Mention its significance.

Section-B

Attempt any *five* parts of this question. Each part carries 4 marks.

4×5=20

2. Give an account of the following:
 - (a) Adsorption and Partition Chromatography
 - (b) Asymmetric synthesis

(1)

P. T. O.

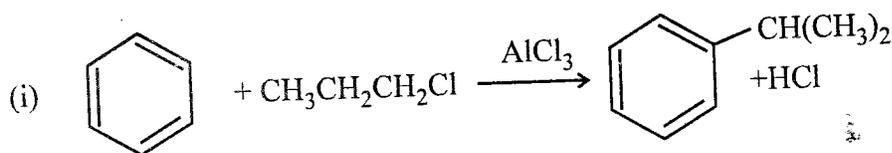
- (c) Regioselective reaction
- (d) Biomedical polymers
- (e) Nanotechnology
- (f) Reverse osmosis
- (g) Synthetic lubricants

Section-C

Attempt any *seven* questions of this Section. Each question carries 6 marks.

6×7=42

3. (a) Write the basic principle of NMR and explain the following terms :
 (i) Chemical shift
 (ii) Spin-spin splitting.
- (b) An organic compound C_3H_6O contains a carbonyl group $C=O$. How will its NMR spectrum decide whether it is an aldehyde or ketone?
- (c) Discuss the significance of following in relation to IR spectroscopy :
 (i) Group frequency region
 (ii) Fingerprint region.
4. (a) State and explain Lambert Beer's law of photometry.
 (b) Explain the following terms :
 (i) λ_{max}
 (ii) ϵ
 (iii) Bathochromic effect
 (iv) Hypsochromic effect.
- (c) What percentage of light will be transmitted through two cells put together in the path of light if their individual transmissions are 60% and 30% respectively?
5. Discuss the mechanism of the following reactions:



- (ii) Cationic polymerization of propylene
- (iii) Walden inversion reaction.

6. (a) Define (i) temperature coefficient and (ii) energy of activation of a chemical reaction and mention their significance.
- (b) A bottle of milk stored at 30° C sours in 36 hours, stored in refrigerator at 5°C sours after one week. Assuming the rate constant to be inversely related to the souring time, estimate the activation energy of the chemical reaction involved in souring reaction. Given $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$.
- (c) Explain with reasons Acid catalyzed hydrolysis of ethyl acetate is a first order reaction while alkaline hydrolysis is a second order reaction.
7. (a) The $t_{1/2}$ of a reaction is doubled as the initial concentration of the reactant is doubled. Calculate the order of this reaction.
- (b) What is meant by number-average molar mass (M_n) and weight-average molar mass (M_w) and polydispersity index of a polymer?
- (c) Equal masses of polymer molecules with molar masses 10,000 and 100,000 are mixed. Calculate M_n and M_w .
8. (a) Define corrosion. How does it differ from rusting?
- (b) Discuss the electrochemical theory of corrosion. How does this theory explain the mechanism of rusting?
- (c) What are corrosion inhibitors? Explain the mechanism of their action.
9. (a) What are fuel cells? Draw schematic diagram of a simple $\text{H}_2\text{-O}_2$ fuel cell. Write the electrode reactions and net cell reaction.
- (b) Calculate the efficiency of a $\text{H}_2\text{-O}_2$ fuel cell if its EMF is 1.23 V and $\Delta H = -68.3 \text{ Kcal mol}^{-1}$. What will be the effect of temperature on efficiency of this cell.
- (c) What are the advantages and limitations of fuel cells?
10. (a) What is shape selective catalysis? Write the reactions in which following catalysts are used :
- (i) ZSM-5
- (ii) BiMoO_4
- (iii) Ziegler Natta.

- (b) Write the basic principles of Valence Bond theory.
- (c) Draw the Molecular Orbital diagram of HF molecule and comment on the stability and polarity of the covalent bond between H and F.