Printed Pages : 6 AS-103

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

PAPER ID : 1108 Roll No.

B. Tech.

(Semester-I) 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. 2×8=16

1. (a) What are the short comings or drawbacks of valence bondtheory in the case of coordination compounds?

   (b) Define the terms chromophore and auxochrome.

(c) Discuss the terms– carbocations, carbanion, free radical, electrophilic and nucleophilic reagents.

(d) Explain why metals are malleable and ductile.

(e) What is a chiral molecule? Give two examples.

(f) What is E- and Z- nomenclature? Why is it better than cis- and trans-nomenclature?

(g) Standard hard water contains 15 g of $CaCO_3$ per litre. 10 ml. of this required 50 ml of EDTA solution. Calculate the temporary hardness in the given sample of water.

(h) An exhausted zeolite softener was regenerated by passing 150 litres of NaCl solution, having strength– 150 g/litre of NaCl. How many litres of hard water sample having a 600 ppm can be softened using this softener?

Section-B

Attempt any *three* parts of this question. Each part carries 8 marks. 8×3=24

2. (a) A gaseous hydrocarbon 'A' on passing through a quartz tube heated at 600°C gave a colorless liquid, compound 'B' (Molecular weight, 78 amu). The latter compound was found to undergo electrophilic substitution reactions. It gave the following data on analysis :

The infrared spectrum exhibited a characteristic absorption band at $3040 cm^{-1}$ and a UV absorption at 204 nm, due to π-π^* electronic transitions.

The ^1H-NMR spectrum displayed downfield singlet (6H) at 7.3 tan. Identify the compounds 'A' and 'B' and give your reasoning.

(b) Discuss the reactions involved in charging and discharging of a lead storage cell.

(c) Outline the various advantages of thin-layer-chromatography.

(d) Justify the statement that benzene molecule exhibits resonance.

(e) What is meant by intermolecular and intramolecular hydrogen bonding?

Section-C

Attempt *all* questions of this Section. Each question carries 8 marks. $8\times5=40$

3. Attempt any two parts of the following : $4\times2=8$

   (a) Outline the various methods used for the determination of order of a chemical reaction.

   (b) With the help of energy profile diagram discuss the conformation of normal butane.

   (c) Which method is employed to investigate whether or not the chemical reaction proceeds by $S_{N}1$ or $S_{N}2$ mechanism? Illustrate your answer with suitable examples.

4. Attempt any two parts of the following : $2\times4=8$

   (a) What is inductive effect? Give two examples where this effect is operative.

   (b) What are various types of nanocomposite materials?

   (c) What are the conditions which make the polymer conducting?

5. Attempt any two parts of the following : 4×2=8

(a) What is electrochemical corrosion? Outline the mechanism-involved in electrochemical corrosion.

(b) Write the chemical structure of polyisoprene. How would you crosslink the chains of polyisoprene?

(c) Briefly discuss the structural information obtainable from IR, UV and proton-NMR data.

6. Attempt any two parts of the following : 4×2=8

(a) How would you obtain syndiotactic and isotactic polymers from propylene?

(b) Outline the various methods used for the determination of order of a chemical reaction.

(c) Mention briefly the type of van der Waal's forces.

7. Attempt any two parts of the following : 4×2=8

(a) How valence bond theory account for the following :

$[Ni(CN)_4]^{2-}$ is diamagnetic and square planar, $[NiCl_4]^{2-}$ is paramagnetic and tetrahedral, $[Ni(CO)_4]$ is diamagnetic and tetrahedral.

(b) What is optical activity? Give the structure of stereoisomers of 3, 3-dihydroxy –1, 4-dioic acid. How do you account for the lack of optical activity in meso and racemic mixture?

(c) Describe the properties of hydrogen bond and consequence of hydrogen bonding.