Printed Pages : 7 EAS-102

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

PAPER ID : 9603 Roll No. | | | | | | | | | | |

B. Tech.

(Semester-I) Theory Examination, 2011-12

ENGINEERING CHEMISTRY

Time : 3 Hours] *[Total Marks : 100*

Note : Attempt the questions from each Section as indicated.

Section-A

1. Attempt *all* parts of the following : 2×10=20

(i) What is Bragg's law?

(ii) Define calorific value of a fuel.

(iii) Define the order of a reaction.

(iv) What is a salt bridge? Write its role in a galvanic cell.

(v) What is – I effect? Write the halogens in decreasing order of their–I effect.

(vi) Define the terms 'monomers' and 'functionality'.

(vii) What is a cation exchange resin? Give one example.

(viii) Define homopolymer and copolymer. Which of the following are homopolymers ?

Nylon-6, Nylon-6, 6, Starch and Terylene.

(ix) Phenolphthelein indicator gives pink colour in basic media but colourless in acidic media, why?

(x) Define condensation polymerization.

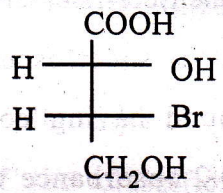
Section-B

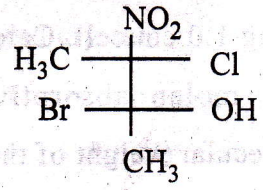
2. Attempt any *three* parts of the following : 10×3=30

(a) (i) Define the term 'corrosion'. Discuss in brief the electrochemical theory of corrosion.

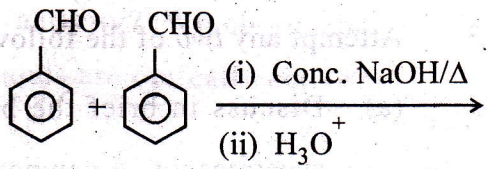
(ii) Explain the paramagnetic behaviour of Oxygen based on molecular orbital theory.

(b) (i) Assign R or S configuration of each of the following compounds :

(1) 

(2) 

(ii) Identify and complete the following name reactions :

(1) 

(2) $CH_3CHO + CH_3CHO + \xrightarrow[\Delta]{NaOH}$.

(c) What do you understand by equivalent and non-equivalent protons? Define chemical shift in NMR spectroscopy. How many signals will be obtained in the NMR spectrum of the following compounds ?

CH_3-O-CH_3; $CH_3-CH_2-CH_3$; CH_3COOH and $CH_3-CH_2-CH_2-CH_3$.

(d) Write a brief note on biodegradable polymers.

(e) Write the Beer-Lambert law (Absorption law) of UV-Vis spectroscopy. The solution of a compound having concentration 0.1 g/l, gave 0.2 absorbance value when measured using 1.0 cm cell. Calculate its absorptivity and molar absorptivity values. Given, molecular weight of the compound = 200.

Section-C

All questions are compulsory : $10 \times 5 = 50$

3. Attempt any *two* of the following :

(a) Discuss in brief the basic principle of IR spectroscopy. A compound having molecular formula $C_2H_4O_2$ while studied for its IR analysis resulted the following peaks in its spectrum : 2900–2950 cm^{-1}, 1710 cm^{-1} and 3500–3650 cm^{-1}. The compound also gave effervences with Na_2CO_3. Suggest structure of the compound.

(b) What is chirality? Write its implications.

(c) Explain the intermolecular hydrogen bonding. How does it differ from the intramolecular hydrogen bonding?

4. Attempt any *two* of the following :

(a) Discuss in brief the classification and applications of liquid crystals.

(b) Copper has an FCC structure and its radius is 1.28 Å. Calculate its density. Given :

Atomic weight of Cu = 63.5 and Avogadro number $= 6.02 \times 10^{23}$.

(c) What is optical activity? Which of the following compounds are optically active? Explain, why?

n-propanol, n-butanol, allenes and 2-chloro-butane.

5. Attempt any *two* of the following :

(a) Write a brief note on fullerenes and discuss their applications.

(b) What are electrochemical cells? Discuss their working principle with suitable examples.

(c) Derive an equation for half life of a firs order reaction. Show that in case of firs order reaction, the time required t complete 99.9% reaction is about ten time of its half life.

6. Attempt any *two* of the following :

(a) Write the structural requirements fo hyperconjugation. Explain the application o hyperconjugation in deciding the stability o alkyl carbocations. Write the following ir the decreasing stability order and justify : 7.

$$CH_3-\overset{\overset{CH_3}{|}}{\underset{}{C^+}}-CH_3 \qquad CH_3-CH_2^+ \qquad CH_3-CH^+-CH_3$$

(b) Discuss the mechanism of the following reaction :

$$C_2H_5CONH_2 + Br_2 + 3KOH \xrightarrow{H_2O} C_2H_5NH_2 + 2KBr + NaHCO_3 + H_2O.$$

(c) Define second order reactions. In the saponification reaction of ethyl acetate the

following results were obtained using equal concentrations of ester and alkali :

t, min	Acid used, ml
0	47.65
4.89	38.92
10.07	32.62
23.66	22.58
∞	11.84

Show that the reaction is second order.

7. Attempt any *two* of the following :

(a) Compare the merits and demerits of ion exchange process and zeolite process used for water softening.

(b) What parameters are determined in the proximate analysis of coal? Explain each. Write the properties of a good fuel.

(c) What is natural rubber? Write its limitations. Discuss the vulcanization process of rubber.