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

PAPER ID : 9612

B.Tech.
(SEMESTER-II) CARRY OVER EXAMINATION, 2012-13
ENGINEERING CHEMISTRY

Time : 3 Hours) [ Total Marks : 100

Note : Attempt questions from each Section as per directions.

SECTION – A

1. Answer all questions : 10 x 2 = 20
   (a) What is the importance of hydrogen bonding in polypeptides ?
   (b) Distinguish between Bonding and Anti bonding molecular orbitals.
   (c) Distinguish between order and molecularity of a reaction.
   (d) What are the factors which effect corrosion ?
   (e) What are chemical fuels ? How they are classified ?
   (f) The order of stability of alkyl free radical is \( \text{CH}_3 < 1^\circ < 2^\circ < 3^\circ \). Comment.
   (g) What are addition and condensation polymers ?
   (h) What are organometallic compounds ? Give examples.
   (i) What are complexometric titrations ? What is its significance ?
   (j) What are chromophores and auxochromes ? Give examples.

SECTION – B

2. Answer any three parts of the following : 3 x 10 = 30
   (a) (i) What is metallic bond ? Explain it on the basis of band theory.
       (ii) An element crystallizes in a structure having an FCC unit cell of an edge
            200 pm. Calculate its density if 200g of this element contains \( 24 \times 10^{23} \) atoms.
(b) State and explain Phase Rule. Discuss the salient features of phase diagram of water system.

(c) Give the mechanism of the following reactions:
(i) Diels-Alder reaction
(ii) Aldol condensation

(d) (i) Distinguish between homopolymers and copolymers. Give examples.
(ii) What are zeolites? Explain the zeolite method for softening water with a flow chart.

(e) (i) A sample of coal was found to have the following percentage composition: C = 70%, H = 6%, O = 12%, N = 3.2% and ash = 4.5%. Calculate the minimum air required for complete combustion of 1Kg of coal.
(ii) Describe in brief about conducting polymers with their applications.

SECTION – C

Answer all parts of following: 10 x 5 = 50

3. Answer any two of the following:
(a) What is importance of IR spectroscopy in finger print region?
(b) Discuss the electronic transitions caused by energy absorbed in the UV region.
(c) Write the reaction mechanism of Beckhman rearrangement.

4. Answer any two of the following:
(a) Predict the number of signals, splitting and intensity in the NMR spectra of the following compounds.
   (i) \( \text{CH}_3 - \text{CH}_2 - \text{Br} \)
   (ii) \( \text{CH}_3 - \text{O} - \text{CH}_2 - \text{CH}_3 \)
(b) Derive a rate expression for second order reaction, when the reactants are different.
(c) What are fullerenes? Discuss their applications.
5. Answer any two of the following:

(a) What do you mean by EMF? Discuss chemical and concentration cells.

(b) A sample of coal contains 92% C, 5% H and 3% ash. When this coal was tested for its calorific values in the bomb calorimeter, the following results were obtained.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight of the coal burnt</td>
<td>0.95g</td>
</tr>
<tr>
<td>Water equivalent of bomb calorimeter</td>
<td>2000g</td>
</tr>
<tr>
<td>Acid correction</td>
<td>60.0 Cal</td>
</tr>
<tr>
<td>Fuse wire correction</td>
<td>10.0 Cal</td>
</tr>
<tr>
<td>Weight of the water taken</td>
<td>700g</td>
</tr>
<tr>
<td>Increase in temperature</td>
<td>2.48 °C</td>
</tr>
<tr>
<td>Cooling correction</td>
<td>0.02 °C</td>
</tr>
</tbody>
</table>

Calculate GCV and NCV of coal. Given latent heat of condensation of steam = 587 cal/g.

(c) Discuss the conformations of n-butane with the help of its potential energy diagram.

6. Answer any two of the following:

(a) What is electrochemical corrosion? Write down the mechanism involved in it.

(b) Discuss the estimation of Carbon and Hydrogen in the ultimate analysis of coal sample.

(c) Discuss the stereochemistry of tartaric acid.

7. Answer any two of the following:

(a) Describe the preparation, properties and applications of Nylon 6, 6 and polyethylene.

(b) Discuss the general methods for the preparation of organometallic compounds with examples.

(c) An organic compound having molecular formula C₃H₆O shows an IR band at 2950 cm⁻¹ but not near 3300 cm⁻¹ and 1720 cm⁻¹. Deduce the structure of the compound.