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

PAPER ID : 9612 Roll No. | | | | | | | | | | |

B. Tech.

(SECOND SEMESTER) THEORY EXAMINATION, 2011-12

ENGINEERING CHEMISTRY

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

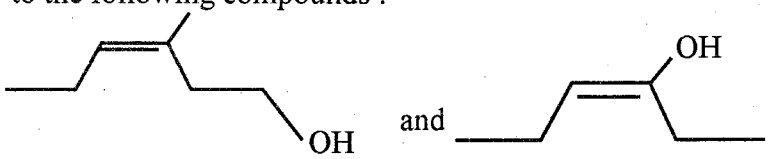
Note : Attempt the questions from each Section as indicated.

Section – A

1. Attempt **all** the following questions : **10 × 2 = 20**
   (i) Define intra molecular hydrogen bonding. Give example.
   (ii) Why does graphite show conduction property ?
   (iii) Write the equation for $t_{1/2}$ of first order reaction.
   (iv) What do you understand by equilibrium potential ?
   (v) Define mesomeric effect.
   (vi) What is hyperconjugation ? Write the structural requirements for hyperconjugation.
   (vii) What are thermosetting resins ?
   (viii) Why does soap not give lather with hard water ? Write chemical reactions in support of your answer.
   (ix) Convert 50 ppm hardness of water in terms of mg/L and degree French.
   (x) Define chromophores.

Section – B

2. Attempt any **three** questions of the following : **3 × 10 = 30**
   (a) (i) What are concentration cells ? Discuss in brief.
   (ii) A pure metal rod half immersed vertically in water starts corroding at the bottom. Explain why ?
   (b) (i) What do you understand by E-Z nomenclature ? Assign E, Z configuration to the following compounds :



   (ii) Complete the following reaction and discuss its mechanism.

$$C_6H_5CHO + HCHO \xrightarrow{\text{Conc. NaOH}} \ ?$$

(c) (i) What do you understand by electronic transitions in UV-VIS spectroscopy ? Write the various electronic transitions in the order of increasing energy.

(ii) What is basic principle of NMR spectroscopy ? An organic compound having molecular formula C_3H_7Cl gives two triplets and one hexet, write its structural formula and justify.

(d) Write a note on conductive polymers.

(e) Discuss the mechanism of Beckmann rearrangement reaction and also write its applications.

Section-C

All questions are compulsory : **5 × 10 = 50**

3. Attempt any **two** of the following:

(i) Discuss the fundamental modes of molecular vibrations in IR spectroscopy. How do IR spectra help in differentiating the following compounds ?

(a) Aldehyde and ketone; (b) Carboxylic acid and ester.

(ii) What is phase rule ? Write its applications in one component system (water).

(iii) What do you mean by rate of a reaction ? Discuss the factors affecting the rate of reaction.

4. Attempt any **two** of the following :

(i) Derive and discuss the Bragg's equation.

(ii) Define optical isomerism. Why do allenes show optical isomerism in spite of the fact that they do not contain achiral carbon ?

(iii) Derive the equation for first order reaction.

5. Attempt any **two** of the following :

(i) What do you understand by a metallic bond ? Discuss it on the basis of molecular orbital theory.

(ii) Write a note on fuel cells.

(iii) In a first order reaction, the rate constant is observed 8.5×10^{-7} at 8°C and 9.2×10^{-4} at 58 °C. Calculate the energy of activation of the reaction.

6. Attempt any **two** of the following :

(i) Describe the conformational isomers of n-butane. Also discuss the relative stabilities of the conformers.

(ii) Discuss the working principle of Zeolite process for softening of hard water. Also write its merits and demerits.

(iii) Write the drawbacks of raw rubber. Discuss the process of vulcanization of rubber.

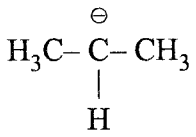
7. Attempt any **two** of the following :

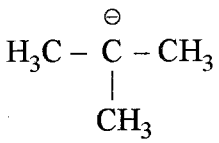
(i) Define high and low calorific values of a solid fuel. The analysis data of a solid fuel using Bomb calorimeter are given below :

Weight of crucible = 3.5 g; Weight of crucible and coal = 4.9 g; Water equivalent of calorimeter = 570 g; Water taken in calorimeter = 2100 g; Observed rise in temperature = 2.4 °C; Cooling correction factor = 0.045 °C; Acid correction factor = 50 Cal; Fuse wire correction factor = 3.5 Cal; Cotton thread correction factor = 1.5 Cal. Calculate HCV and LCV of coal sample.

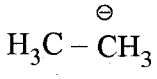
Given: %H content = 1.0 and Latent heat of steam = 580 Cal/g.

(ii) Define carbanions. Arrange the following according to decreasing stability.

(a) 

(b) 

(c) 

(d) 

(iii) Complete the following reaction and discuss its mechanism.