

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

**PAPER ID : 9928**

Roll No.

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## B.Tech.

(SEM II) EVEN SEMESTER THEORY EXAMINATION,  
2009-2010

## CHEMISTRY

Time : 3 Hours

Total Marks : 100

**Note :** (i) Attempt **ALL** the questions.

(ii) All questions carry **equal** marks.

1. Attempt any four parts of the following :

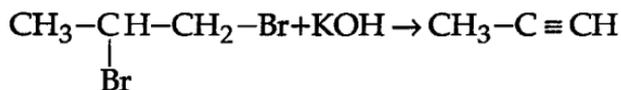
- Write down the molecular orbital diagram of carbon mono - oxide molecule and calculate its bond order.
- With the help of metallic bond (band theory) show the difference between conductor and insulator.
- Describe applications and formation of fullerenes.
- With suitable examples differentiate intra - and inter molecular hydrogen bonds.
- A crystalline compound is formed by two elements X and Y. It crystallises to give a body centred cubic crystal such that X is situated at the centre of the cube and Y atoms are at the eight corners of the cube. What will be simplest formula of the compound ?

2. Attempt any four parts of the following :

- (a) For a non - linear molecule  $AX_2$ , show different types of stretching and bending modes of vibrations in IR.
- (b) Two organic compounds have same molecular formula  $C_2H_6O$ . In NMR spectra one shows only one signal while the other has three signals. Identify them with proper explanation.
- (c) With suitable examples classify polymers based on :
  - (i) structure and shape and
  - (ii) behaviour towards heat
- (d) Discuss the applications along with the structures of Nylon - 6 and polyacrylonitrile.
- (e) Write short note on synthetic rubbers.

3. Attempt any three parts of the following :

- (a) (i) Classify the following reactions as to whether they are of the substitution, addition or elimination type :



- (ii) Discuss the stability of carbocations
- (b) Discuss the mechanism and one application of Beckmann rearrangement.

- (c) Explain :
- Optical activity
  - Enantiomers
  - Racemization
  - Resolution
- (d) (i) Explain the term conformation.
- (ii) Write down different conformations of n- butane
- (iii) Sketch the energy profile of rotation along C(2) - C(3) bond in n - butane. With the help of this diagram show the stability of different conformations of n - butane.

4. Attempt any three parts of the following :

- (a) Derive formula for the rate constant of a second order reaction when the initial concentrations of both the reactants are different. Under what condition a second order reaction behaves like a first order one ?
- (b) (i) Define the terms - phase, component and degree of freedom with examples.
- (ii) With a neat phase diagram of one component water system explain triple point.
- (c) (i) Define standard electrode potential.
- (ii) Calculate the potential of a zinc electrode at 25°C when it is dipped in 0.096 M solution of ZnSO<sub>4</sub> (assuming the dissociation of ZnSO<sub>4</sub> as 100%). ( $E^0_{Zn^{++}/zn} = 0.76$  V).
- (d) What is activation energy ? Describe the effect of catalyst on activation energy.

5. Attempt any three parts of the following :

- (a) (i) Define the terms, scale and sludge.  
(ii) A water sample is analysed and found to contain the following in ppm :

$\text{Ca}(\text{HCO}_3)_2 = 11$ ,  $\text{Mg}(\text{HCO}_3)_2 = 12$ ,  
 $\text{CaCl}_2 = 8.2$  and  $\text{MgSO}_4 = 2.6$ . Calculate total hardness.

[Given : Ca = 40, C = 12, H = 1, Mg = 24, Cl = 35.5, S = 32 and O = 16]

- (b) What is reverse osmosis ? Describe its application for getting pure water.
- (c) (i) Differentiate between 'gross' and 'net' calorific value of a fuel.  
(ii) Describe in brief the method of preparation of Biogas. Discuss the advantages of Biogas.
- (d) (i) Name three pollutants of air and describe the effect of any one of them. What are the methods to reduce air pollution ?  
(ii) Define chemical shift in Nuclear Magnetic Resonance (NMR) spectroscopy.

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