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

PAPER ID : 9928 / 9914 Roll No. | | | | | | | | | | |

B.Tech.

SECOND SEMESTER EXAMINATION, 2005-2006

CHEMISTRY

Time : 3 Hours *Total Marks : 100*

Note : *(i) Attempt **ALL** questions.*
(ii) All questions carry equal marks.
(iii) In case of numerical problems assume data wherever not provided.
(iv) Be precise in your answer.

1. Attempt ***any four*** parts of the following : **(5x4=20)**

(a) With the help of molecular orbital diagram, explain, why hydrogen forms diatomic molecule, while helium remains monoatomic.

(b) Explain, why o-nitrophenol can be separated from p-nitrophenol by steam distillation.

(c) Discuss the electrical conductivity of solids based on 'band theory'.

(d) An element crystallises into a structure which may be described by a cubic type of unit cell having one atom on each corner of the cube and two atoms on one of its diagonal. If the volume of the unit cell is 24×10^{-24} cm^3 and density of the element is 7.2 gm cm^{-3}, calculate the number of atoms present in 100 gm of the crystal.

(e) Explain the preparation, properties and application of fullerene.

(f) Calculate the limiting radius-ratio for trigonal solids.

2. Attempt *any two* parts of the following : **(10x2=20)**

(a) Explain the NMR spectrum of CH_3 CH_2 OH molecule. What is spin-spin coupling, explain with the help of splitted signals of the above molecule ?

(b) (i) What are necessary conditions required for a molecule to absorb IR radiation ?

(ii) Discuss the possible electronic transions in the ultraviolet region, giving examples.

(c) State the differences between addition and condensation polymerisation

OR

Give the structure and application of any two of the following polymers.

(i) Methyl methacrylate

(ii) Buna - S

(iii) Nylon - 6

3. Attempt *any four* parts of the following : **(5x4=20)**

(a) Explain SN^1 reactions, with example.

(b) Write the mechanism of following reactions

(i) Aldol condensation

(ii) Hofmann rearragement

(c) Describe the different conformations of n-butane with energy diagrams

(d) Write short note on :

(i) Meso compounds

(ii) Racemisation

(e) Explain with example the E-Z nomenclature of organic compounds

(f) Explain the structure of :

(i) Carbonium ion

(ii) Free radical

4. Attempt *any two* parts of the following : **(10x2=20)**

(a) Derive the rate equation for a second order chemical reaction. The specific rate constant for the decomposition of formic acid is 5.5×10^{-4} sec^{-1} at 413 K. Calculate the specific rate constant at 458 K if the energy of activation is 2.37×10^4 cal mol^{-1}.

(b) Define phase, component and degree of freedom as applied to phase rule. Explain the application of phase rule to water system.

(c) Explain the mechanism of hydrogen evolution and oxygen absorption in electrochemical corrosion.

5. Attempt *any two* parts of the following : **(10x2=20)**

(a) (i) Calculate the amount of lime and soda required to soften 20,000 litre of water having following analysis

$Ca(HCO_3)_2 = 3.50$ ppm, $Mg(HCO_3)_2 = 6.28$ ppm

$CaSO_4 = 3.92$ ppm $MgCl_2 = 2.9$ ppm $MgSO_4 = 7.4$ ppm

(ii) Explain the reverse osmosis process for softening of saline water.

(b) With the help of neat sketch, explain construction, principle and working of a bomb calorimeter. Why there is difference in net and gross calorific value of a fuel ?

(c) (i) What are the pollutants responsible for acid rain ? (Give chemical equation) What are its deleterious effects on material and terrestrial ecosystem ?

(ii) What is the effect of ozone layer depletion ? How does it occur ?

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