NAS 102/NAS 202

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

PAPER ID : 199124

Roll No.

B. Tech.

(SEM. I) (ODD SEM.) THEORY EXAMINATION, 2014-15

ENGINEERING CHEMISTRY

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

I   Attempt any **FOUR** parts :   5×4=20

1.   Explain the conductivity of polymers with conjugated π-electron system. How is this Conductivity enhanced by doping?

2.   What are fibers and their important properties? Give different types of fibers with examples.

3.   How do natural biodegradable polymers undergo biodegradation?

4.   What is the necessary condition for a monomer to undergo condensation polymerization?

5.   Explain the synthesis of phenol-formaldehyde resins.

6.   What is vulcanization? How does it improve the properties of raw rubber?

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II   Attempt any **TWO** parts :   10×2=20

1. Discuss the principle, working and applications of liquid crystals in LCDs:
    (a) Nematic phase
    (b) Chiral nematic phase
    (c) Sematic phase

2. (a) What is Bragg's law? Derive Bragg's   7
         equation for diffraction of X-rays by crystals.

    (b) The distance between layers of NaCl   3
         crystal is 282 pm. X-rays are diffracted from these layers at an angle of 23.0^0 with first order diffraction. Calculate the wavelength of X-rays in nm.

3. (a) Sodium chloride crystals into a face   5
         centered cubic lattice which has edge length of 564 pm.
         If the density is $2.163×10^3$ Kg/m³ and atomic mass 58.5 g/mole. Compute the Avagadro's number from the data.

    (b) Explain the structure of graphite.   5

III   Attempt any **TWO** parts :   10×2=20

1. (a) Explain bimolecular elimination.   6
    (b) Comment on the following.   4
         (i)   Effect of bulky group on S_N1 reactions.
         (ii) Elimination Vs Substitution

2. (a) How are diastereomers related in terms of   4
         their physical and chemical properties?
    (b) Discuss the optical isomerism of chiral   6
         organic compounds using the example of Tartaric acid.

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3. (a) Explain the following in IR spectroscopy.   6
   (i) Radiation sources and (ii) sampling techniques.

   (b) One of the fundamental vibrational modes   4
   of H_2O occurs at 3652 cm^{-1}. What would be the
   frequency of the corresponding vibration for D_2O.

IV Attempt any TWO parts :   10×2=20

1. (a) What are ion-exchange resins? How will   5
   you purify water by using the resins ?

   (b) Calculate the lime and soda needed for   5
   softening 50,000 L of water containing The
   following salts. $CaSO_4$=13.6 mg/l; $MgCl_2$=9.5
   mg/l; $Mg(HCO_3)_2$=7.3 mg/l; $Ca(HCO_3)_2$ =16.2
   mg/l. Given that the molar mass of $Ca(HCO_3)_2$ is
   162 and that of $MgCl_2$ is 95.

2. (a) Discuss the different methods of internal   5
   treatment for boiler feed water.

   (b) Explain reverse osmosis process.   5

3. (a) How many components are present in the   3
   following systems ?
   (i)   water $\leftrightarrow$ water vapour
   (ii) $Fe_{(s)}+H2O_{(g)} \leftrightarrow FeO_{(s)}+H2_{(g)}$
   (iii) $NaCl_{(s)} \leftrightarrow NaCl_{(aq)}$

   (b) Discuss the application of phase rule to the   7
   sulphur system. Draw a labeled diagram.

V Attempt any TWO parts :   10×2=20

1. (a) Define calorific value. What are gross and   5
   net calorific values ?

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(b) Calculate the gross and net calorific values   5
of a coal sample containing 84% of Carbon, 1.5%
sulphur, 6% nitrogen, 5.5% hydrogen and
8.4%oxygen. The Calorific values of carbon,
hydrogen, sulphur are 8080 Kcal/Kg, 34500
Kcal/Kg and 2240 Kcal/Kg respectively, and
latent heat of steam is 587 Cal/g.

2. (a) What are the essential components of a   5
biogas plant and their functions? List three important
applications of biogas.

(b) The analysis of the coal in a boiler trial   5
was C=88%, H=3.6%, O=4.8% other matters-
3.6% and the flue gas analysis by volume was
CO_2=10.9%, CO=1%, O_2=7.1%, N_2=81%. Find
the proportion of carbon burned to CO and the
air required for kg of fuel for the combustion as
it actually occurred and also the weight of flue
gas per kg of fuel burned.

3. (a) Describe the process of manufacture of   7
Portland cement with the help of schematic
diagram.

(b) What are flash and fire points ?   3

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