

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

Paper ID : 199221

Roll No. 

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**B. TECH.****Theory Examination (Semester-II) 2015-16****ENGINEERING CHEMISTRY****Time : 3 Hours****Max. Marks : 100****Section-A**

**Q.1 Attempt all parts. All parts carry equal marks. Write answer of each part is Short. (2×10=20)**

- a. Boiling Point of water ( $H_2O$ ) is higher than that of dry hydrogen fluoride ( $HF$ ). Explain why.
- b. Define the Symmetry elements of a crystal. Explain the lattice plane and the unit cell in sodium chloride crystals.
- c. Account for the fine structure in H-NMR Spectrum of C-H protons in ethanol ( $CH_3$ ,  $CH_2$ ,  $OH$ ).
- d. Natural Rubber needs vulcanizations. Give Reasons.

- e. Differentiate between addition polymerization and condensation polymerization with suitable example.
- f. State the significance of Triple point.
- g. IR spectra is often characterised as molecular finger prints Comment on it.
- h. Why is calgon conditions better than phosphate conditioning?
- i. What is meant by calorific value of a fuel?
- j. Write short note on biomass.

### Section-B

**Q.2 Attempt any five parts from the following (10×5=50)**

- a. The density of NaCl is 2.163 g/cc. Calculate the edge of its cubic cell, assuming that four molecules of NaCl are associated per unit cell.
- b. Calculate the mass of air needed for complete combustion of 5.0 kg of coal containing 80% carbon 15% hydrogen and rest oxygen.
- c. Explain the corrosion phenomenon involving oxide film growth law.

(2)

- d. What are copolymers? How does Buna-s differs from Buna-N?
- e. How do you prepare the following polymers  
(i) Bakelite (ii) Nylon-6 (iii) Nylon66 (iv) Dacron.
- f. A water sample contains the following impurities  $\text{Ca}^{++}=20\text{ppm}$ ,  $\text{Mg}^{2+}=18\text{ppm}$ ,  $\text{HCO}_3^- = 183\text{ppm}$  and  $\text{SO}_4^{2-} = 24 \text{ ppm}$ . Calculate the amount of lime and soda needed for softening.
- g. (i)  $\text{S}_\text{N}^1$  lead by racemic mixture. Where as  $\text{S}_\text{N}^2$  gives rise to inverted product.  
(ii) Optical isomerism of lactic acid.
- h. Define infrared spectroscopy? Describe the various molecular vibrations in the technique.

### Section-C

**Q.3 Attempt any two questions from this section (15×2=30)**

- (a) What are the fullerenes? Discuss their properties and uses.
- (b) Calculate the bond order of  $\text{N}_2^-$ , CO, NO, and  $\text{O}_2^+$ .

(3)

- Q.4 (a) How is the calorific value of a solid fuel determine using bomb calorimetes experiments?
- (b) Why is it conventional of express hardness of water in terms of  $\text{CaCO}_3$  at the international level? Write other units also.
5. (a) What are corrosion unhibitor? Explain with examples how anodic and cathodic inhibitor provide protection against corrosion.
- (b) Sample of coal contains C=93%, H=6% and ash=1%. The following data was obtained when the above coal was tested in bomb calorimeter.
- (i) Wt. of coal burnt=0.92 g
  - (ii) Wt of water taken=2200g.
  - (iii) Water equivalent of bomb calorimetes=550g
  - (iv) Rise in temperature=2.42°C
  - (v) Fuse wire correction = 10.0 cal
  - (vi) Acid correction = 50.0 cal.
- Calculate gross and net calorific value of the coal, assuming the latent heat of condensation of steam as 580 cal/g.
- (c) Explain Zeolite process of water softening.