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B. TECH.

THEORY EXAMINATION (SEM–II) 2016-17

ENGINEERING CHEMISTRY

Time : 3 Hours ***Max. Marks : 70***

Note : *Be precise in your answer. In case of numerical problem assume data wherever not provided.*

SECTION-A

1 Attempt all seven parts in brief. All parts carry equal marks. (7x2=14)

a) What are equivalent and non equivalent protons?

b) Why is a block of magnesium attached through an insulated metallic wire to an underground iron pipeline?

c) Define Gross Calorific Value and Net Calorific Value?

d) Give the chemical reactions for the formation of Nylon-6, 6 and Buna- S.

e) A sample of water was found to contain 40.5 mg/L $Ca(HCO_3)_2$, 46.5 mg/L $Mg(HCO_3)_2$, 32.1 mg/L $CaSO_4$, 27.6 mg/L $MgSO_4$, 22.45 mg/L $CaCl_2$, 19.0 mg/L $MgCl_2$ and 4.8 mg/L NaCl. Calculate the temporary hardness of water sample.

f) How are greases prepared?

g) What is the composition of Biogas and the raw materials that can be used for generation of biogas?

SECTION – B

2. Attempt any five parts of the following question: 5 x 7 = 35

(a) (i) Discuss the structure and applications of Fullerenes.

(ii) What are stoichiometric and non-stoichiometric defects? Explain Frenkel and Schottky defects found in solids.

(b) (i) Write a brief note on conducting polymers.

(ii) How is Grignard reagent prepared? Give the reaction of CH_3CH_2MgBr with HCHO, CH_3CHO and $(CH_3)_2C0$?

(c) (i) Discuss the principle and working of a galvanic cell.

(ii) Explain setting and hardening of cement.

(d) (i) Discuss the process of reverse osmosis.

(ii) Explain the process of scale and sludge formation in boilers. How can this be prevented?

(e) (i) How can corrosion be minimized by proper design?

(ii) Give the structure of graphite and explain its lubricating properties.

(f) Explain proximate analysis of coal. On burning 0.3 gm of a solid fuel in a bomb calorimeter, the temperature of 3500 gm of water increased from 26.5° C to 29.2° C. Water equivalent of calorimeter and latent heat of steam are 385.0 gm and 587.0 cal/ gm, respectively. If the fuel contains 0.7% hydrogen, calculate its gross and net calorific value.

(g) Explain the principle of IR spectroscopy. For XY_2 bent molecule show various types of stretching and bending vibrations in IR spectroscopy. Discuss the significance of Finger print region.

(h) Why Tetra Methyl Silane is used as an internal indicator in NMR spectroscopy? Give the number of ^1H NMR signals and their splitting pattern in the following compounds:

(i) $(CH_3)_3COCH_3$

(ii) $CH_3CH(Cl)CH_2Cl$

(iii) $CH_3CH_2CH_2OH$

(iv) $CH_3CHCHCHO$

SECTION-C

Attempt any two questions from this section. (2x10.5=21)

3. (i) State the phase rule and discuss its application to water, vapour and ice system. Is it possible to have a quadruple point in one component system?

(ii) A zeolite softener was 90% exhausted by removing the hardness completely when 10,000 litres of hard water sample passed through it. The exhausted zeolite bed required 200 litres of 3% NaCl solution for its complete regeneration. Calculate the hardness of water solution.

4. (i) Discuss the mechanism of the preparation of polypropylene using a combination of an organometallic compound and transition metal halide. What are the advantages of this process over free radical polymerization?

(ii) Write a note on polymer composites.

5. (i) Discuss the mechanism of electrochemical corrosion of iron with absorption of oxygen. How can anodic and cathodic metallic coatings help in protection against corrosion?

(ii) Draw the molecular orbital diagrams of $N_{2,}$ and 0_2. Calculate their bond orders.