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B TECH (REGULAR+CARRYOVER)
(SEM I) THEORY EXAMINATION 2017-18
ENGG. CHEMISTRY

Time: 3 Hours ***Total Marks: 70***

Note: 1. Attempt all Sections. If any missing data is required, then choose suitably.

SECTION- A

1. Attempt *all* questions in brief. 2 x 7 = 14

a. Explain when will the value of GCV=NCV?

b. The standard reduction potential of three metallic cations X,Y,Z are 0.52,-3.03 and -1.18 V respectively, arrange them in decreasing order of their reducing power.

c. Write any two application of nanotechnology.

d. Arrange the following in the increasing order of their bond energy O_2, O_2^{2+}, O_2^{2-}.

e. 100 ml of water sample has hardness equivalent to 12.5 ml of 0.08 N MgSO4 solutions. Calculate *the* hardness of this water sample.

f. Will you prefer to polymerize acrylonitrile under anionic or cationic conditions? Explain.

g. How many NMR signals will be obtained for Mesitylene?

SECTION- B

2. Attempt any *three* of the following: 7 x 3 = 21

a. Draw the Molecular orbital diagram of N_2 molecule. Calculate its bond order and predict its magnetic behavior.

b. Differentiate between (i) Thermoplastic and Thermosetting (ii) Addition and condensation polymerization.

c. Describe the construction and working of Galvanic cell. Calculate the EMF of the following cell and also write the cell reactions.

$Zn \mid Zn2^{+}$ (0.001M) $\| Ag^{+}$ (0.1M) $\mid Ag$

The standard potential of Ag/Ag^{+} half-cell is +0.80 V and Zn/Zn^{2+} is -0.76V.

d. Explain the basic principle of lime-soda process. Calculate the amount of lime and soda required for softening 30000 liters of water, using 20 ppm of sodium aluminate as coagulant. Impurities in water are as follows: Ca^{2+} =160 ppm, Mg^{2+} = 96 ppm, dissolved CO_2 = 34 ppm and HCO_3^- = 403 ppm.

e. What is the basic principle of Bomb calorimeter? A 0.80 g sample of solid fuel was completely combusted in the excess of oxygen using bomb calorimeter. The rise in temperature of water in calorimeter was 2.5°C. Calculate the High calorific value of the

fuel. If water taken in calorimeter is 2000 g and water equivalent of calorimeter is 2200 g. Also calculate low Calorific value. (Given : % Hydrogen in fuel =2.2)

SECTION- C

3. Attempt any *one* part of the following: 7 x 1 = 7

a. Explain the structure, properties and applications of graphite.

b. What are liquid crystals? Differentiate between Nematic and sematic liquid crystal? Write two applications of liquid crystals.

4. Attempt any *one* part of the following: 7 x 1 = 7

a. What are organometallic compounds? Write their classification, preparation and applications.

b. Write the preparation, properties and applications of: (i) Nylon -6 (ii) Bakelite.

5. Attempt any *one* part of the following: 7 x 1 = 7

a. What is Portland cement? Write the reactions involved in setting and hardening of cement.

b. What are lubricants? Explain the theories of lubrication.

6. Attempt any *one* part of the following: 7 x 1 = 7

a) Define Phase rule. Apply phase rule to water system

b) Describe Zeolite process of water softening. A zeolite softener was 90% exhausted by removing the hardness completely when 10,000 litres of hard water was passed through it. The exhausted zeolite bed required 200 litres of 3% sodium chloride solution for its complete regeneration. Calculate the hardness of water sample.

7. Attempt any *one* part of the following: 7 x 1 = 7

a. What is rank of coal? Describe proximate and ultimate analysis of coal.

b. i. Explain shielding and deschielding in NMR spectroscopy.

ii. An aromatic compound (Molecular mass=135) give the following signals in NMR Spectrum.

(i) Singlet (2.09 δ),3H (ii)A distorted singlet (3.09 δ),1H

(iii)A multiplet(7.27 δ),3H (iv)A multiplet (7.75 δ),2H.

Predict the structure of the compound.