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B TECH
(SEM-I) THEORY EXAMINATION 2018-19
ENGINEERING CHEMISTRY

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

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 10 = 20

a. Define meso compounds with example.

b. Why water is a liquid whereas H_2S is a gas?

c. Explain tacticity of polymers.

d. Explain why p-nitro phenol is more soluble than o-nitro phenol in water.

e. Arrange in increasing order of stability

$C_2H_5^-$, $C_6H_5CH_2^-$, $(CH_3)_2CH^-$

f. When is the value of Gross calorific value (GCV) equal to Net calorific value (NCV)?

g. Calculate the order and molecularity of the following reactions:

$CH_3COOC_2H_5 + H_2O$ (excess) $\rightarrow CH_3COOH + C_2H_5OH$

h. Explain why hardness of water is expressed in terms of terms of $CaCO_3$ equivalents.

i. Write any two examples of redox titration.

j. Write down the structure of Ferrocene and Zeise salt.

SECTION B

2. Attempt any *three* of the following: 10 x 3 = 30

a. On the basis of molecular orbital theory explain why N_2 is diamagnetic while O_2 is paramagnetic.

b. Explain the stereochemistry of SN^1& SN^2 reactions.

c. Describe the different conformation of n-butane with potential energy diagram.

d. Derive the equation for half life of second order reaction. For the reaction

$2N_2O_5 \rightarrow 4NO_2 + O_2$

The rate is directly proportional to $[N_2O_5]$. At 45^0C, 90% of the N_2O_5 reacts in 3600 seconds. Find the value of the rate constant k.

e. Write the mechanism of any two of the following:

(i) Diels elder reaction.

(ii) Hoffmann rearrangement reaction.

(iii) Cannizaro's reaction.

SECTION C

3. Attempt any *one* part of the following: 10 x 1 = 10

(a) What is shielding and deschielding? Calculate the number of signal for following Molecules:

(i) Diethyl ether

(ii) Ethyl alcohol.

(b) i)What is hydrogen bonding? Differentiate between intra and intermolecular Hydrogen bonding with suitable examples.

ii) Describe the preparation, properties and application of any two of the PMMA and Bakelite Polymers.

4. Attempt any *one* part of the following: 10 x 1 = 10

(a) Compare Zeolite and Ion Exchange process of softening of water.

(b) Define Chemical shift. A gaseous hydrocarbon 'A' on passing through a quartz tube heated at 600°C gave a liquid compound 'B' (Molecular weight: 78 amu). The later compound was found to undergo electrophilic substitution reactions. It gave the following physical data on analysis. The IR spectrum showed a characteristic absorption band at 3040 cm^{-1} and a UV absorption, due to π-π*transition ,at 204 nm (log_e 3.84). The 'H^1-NMR spectrum displayed a downfield singlet (6H) at 7.3τ. Identify the compound 'A' and 'B' and give your reasoning.

5. Attempt any *one* part of the following: 10 x 1 = 10

(a) Define the terms: Phase, Component and Degree of freedom and apply phase rule to water system.

(b) What are biodegradable polymers? Discuss them in detail with applications.

6. Attempt any *one* part of the following: 10 x 1 = 10

(a) Write the mechanism of electrochemical corrosion. Explain why a pure metal rod half immersed vertically in water starts corroding at the bottom.

(b) What is activation energy? Calculate the energy of activation for a reaction whose rate constant is tripled by 10° C rise in temperature in the vicinity of 27° C.

7. Attempt any *one* part of the following: 10 x 1 = 10

(a) Explain band theory of metallic bonding. Calculate the bond order and predict the magnetic behavior of NO, CO^+, CO^-.

(b) Derive rate law equation for a first order reaction.A solution of H_2O_2 when titrated against $KMnO_4$ solution at different time intervals gave the following results:

Time (min)	0	10	20	
Vol of $KMnO_4$ used for 10 ml H_2O_2		23.8ml	14.7ml	9.1ml

Show that the decomposition of H_2O_2 is a first order reaction.