

Roll No.05.12.19.....

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TCH-101

**B. TECH. (FIRST SEMESTER)
END SEMESTER EXAMINATION, 2019**

(All Branches)

ENGINEERING CHEMISTRY

Time : Three Hours

Maximum Marks : 100

Note : (i) This question paper contains five questions.

(ii) All questions are compulsory.

(iii) Each question carries three parts (a), (b) and (c). Attempt any *two* parts of each question.

(iv) Each part carries 10 marks. Total marks assigned to each question are **twenty**.

1. Attempt any *two* parts of choice from (a), (b) and (c). (10×2=20 Marks)

(a) Write a note on Hydrogen bonding. Also write the conditions for its formation and significances.

(b) Draw the MOT diagram of O₂ molecule. Arrange the O₂, O₂⁺, O₂⁻ and O₂⁻² in increasing order of bond length.

(c) (i) Explain the lime-soda process used for softening the hard water.

(ii) Calculate the temporary and permanent hardness of water whose analysis is as follows :

Mg(HCO₃)₂ = 7.3 ppm,

MgSO₄ = 3.0 ppm,

CaSO₄ = 3.40 ppm and

CaCl₂ = 27.75 ppm

2. Attempt any *two* parts of choice from (a), (b) and (c). (10×2=20 Marks)
- (a) Write short notes on the following :
 - (i) Functionality of Monomer
 - (ii) Conducting polymers
 - (b) Define addition and condensation Polymerization with suitable examples and mechanism.
 - (c) Write short notes on the following :
 - (i) Biogas
 - (ii) Calorific value of a fuel
3. Attempt any *two* parts of choice from (a), (b) and (c). (10×2=20 Marks)
- (a) Write the basic principle and applications of Infra Red spectroscopy.
 - (b) Write the preparation, properties and uses of the following :
 - (i) Bakelite
 - (ii) PVC
 - (c) Define UV-Vis spectroscopy. Also write its principle and applications.
4. Attempt any *two* parts of choice from (a), (b) and (c). (10×2=20 Marks)
- (a) Write short notes on the following :
 - (i) Concentration cells
 - (ii) Electrochemical series with its significances
 - (b) (i) Differentiate between the thermoplastic resins and thermosets. Giving examples.
 - (ii) Write down the mechanism involved in electrochemical corrosion.
 - (c) Determine the potential of a Daniel cell, initially containing 100 L each of 1.00 M Cu^{+2} ion and 1.00 M Zn^{+2} ion, after the passage of 0.1×10^6 coulombs of charge.

(3)

5. Attempt any *two* parts of choice from (a), (b) and (c). (10×2=20 Marks)

(a) Differentiate between the mechanism and stereochemistry of nucleophilic substitution (S_{N1} and S_{N2}) reactions with stereochemistry.

(b) (i) Explain Aromatic electrophilic substitution reaction with the mechanism of nitration.

(ii) Describe the structure of H_2O and NH_3 molecules in terms of VSEPR theory. Explain the decrease in bond angle NH_3 to H_2O .

(c) Define the terms Gross and Net Calorific value of a fuel. Calculate the GCV of the coal in Cal/gm, when tested in the laboratory for its calorific value in the bomb calorimeter, the following data were obtained :

Weight of coal burnt = 9.95 gm, weight of water taken = 500 gm, weight of water equivalent of bomb and calorimeter = 2000 gm, Rise in temperature = $2.48^{\circ}C$, Cooling Correction = $0.02^{\circ}C$, Fuse wire correction = 10 cal. Acid correction = 60 cal.