THE AMERICAN COLLEGE, MADURAI

(An Autonomous Institution Affiliated to Madurai Kamaraj University)

Re-accredited (2nd Cycle) by NAAC with Grade "A", CGPA – 3.46 on a 4-point scale

Backlog Arrear Examination, March 2021

PGC 5526 **PHYSICAL CHEMISTRY-IV** **Max: 75 mks**

Time: 3 hrs

SECTION A **Answer ANY FIVE questions** **(5 X 15 = 75)**

1. Discuss the salient features of the Einstein theory of the heat capacity of monoatomic crystals. How did Debye modify it? Derive appropriate expressions.
2. a) Compare the important features of Maxwell-Boltzmann (MB), Bose-Einstein (BE) and Fermi-Dirac (FD) statistics. (8)

   b) Deduce the BET adsorption isotherm. Describe how the heat of adsorption of gases on solids and surface area of solids can be determined using BET isotherm. (7)
3. a) Discussing the structure of electrode double layer, obtain an expression for 'zeta potential'. (8)

   b) Explaining the basic assumptions employed derive Langmuir adsorption isotherm. (7)
4. Derive the Michaelis –Menten equation for the kinetics of enzyme-catalysed reactions and bring out the significance of K_m and υ. Derive the outcome of Michaelis –Menten equation for enzyme catalysed complicated reactions.
5. In detail explain the importance and steps involved in polycondensation and ring opening polymerization. Give a detailed note on the kinetics and mechanism of free radical polymerization.
6. a) Discuss the steps involved in cationic polymerization and derive the degree of polymerization for the following cases: (i) when rate of termination predominates; (ii) when rate of termination via chain transfer predominates; (iii) both cases (i) & (ii) takes place simultaneously. (8)

   b) Discuss the steps involved in anionic polymerization. Derive the degree of polymerization for anionic polymers when the initiating species is (i) mono-anion and (ii) dianion. (7)
7. a) In detail explain the strength and weakness of molecular mechanics. (8)

   b) Explain the contribution of bond stretching term and the torsional term in calculating the potential energy of the molecule. (7)

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