BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: BE **SEMESTER: VI/ADD**
BRANCH: CHEMICAL/CHEMICAL(P&P) **SESSION : SP/2019**

SUBJECT : CL6001 BIOCHEMICAL ENGINEERING

TIME: 1.5 HOURS **FULL MARKS: 25**

INSTRUCTIONS:
1. The total marks of the questions are 30.
2. Candidates may attempt for all 30 marks.
3. In those cases where the marks obtained exceed 25 marks, the excess will be ignored.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. The missing data, if any, may be assumed suitably.

Q1 (a) At the time zero E.coli has 175 cells. Estimate the number of cells after 22800 seconds. [2]
(b) Describe the structure with which E.coli associates to human body with salient points. Also describe the organelles related to endosymbiotic hypothesis with neat figures and detailed notes. [3]

Q2 (a) A substrate is disappearing at a rate of 20mol/L.hr by the action of 25mg of enzyme with 7U. Determine specific activity of pure enzyme and reaction volume in SI units. Enzyme purity is 80%. [3]
(b) Explain in detail the enzyme purification method that finds application in disease diagnosis. [2]

Q3 10^7 molecules are used by cells per second. Identify and describe the structure, function, working principles and all important features of the molecule. Briefly explain the process in which this molecule is produced with detailed sequence of events pertaining to the gain of the molecules. [5]

Q4 What are the different techniques of enzyme immobilization? Discuss. [5]

Q5 The effect of an inhibitor on an enzyme reaction was studied by measuring the initial rates at three different initial inhibitor concentrations. The obtained Michalis-Menten kinetics parameters are as follows: [5]

Inhibitor (mmol/L)	0	2	4	6
V_{max} (µmol/L)	0.7	0.2	0.11	0.08
M (mmol/L)	5	5	5	5

(a) Write the kinetics model for this enzyme reaction.
(b) Estimate the value of inhibition kinetic parameter.

Q6 When the rate of diffusion is very slow relative to the rate of reaction, all substrate will be consumed in the thin layer near the exterior surface of the spherical particle. Derive the equation for effectiveness of an immobilized enzyme for this diffusion limited case. The rate of substrate consumption can be expressed as a first order reaction. [5]

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