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

CLASS: BE **SEMESTER: VI**
BRANCH: CHEM/C&P **SESSION: SP/2020**

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.
6. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q1 (a) Estimate RCF and predict the type of cellular fractions that can be extracted in isolation processes with following conditions, (i) 8000 rpm & 14 cm (ii) 3000 rpm & 5 cm [2]

(b) A cell has to make proteins and has to be protected from toxins. Describe the related organelles with neat figures. [3]

Q2 (a) After some generations 512 E. Coli cells are present. Determine how many cells were present initially and predict how many cells will be present after 400 min taking the initial no. of cells calculated before. [2]

(b) Discuss the components of bacterial cell associated with the following terms: (i) similar to fins (ii) distinguishes gram +ve & –ve bacteria (iil) desiccation (iv) urinary tract infection [3]

Q3 (a) In a body 10^{13} cells are present, estimate in 15 seconds how many no. of net energy molecules may be produced. Explain the working principle of this molecule. [2]

(b) Describe the process pathway which uses all the basic nutritional chemicals found in a living organism to produce energy molecules with neat diagram and details [3]

Q4 (a) Describe the sections of the primary pathway for producing energy molecules where energy molecules are consumed and produced. [2]

(b) Describe the pathway for production of energy molecules which involves pumping and diffusion with full sequential details and a complete picture [3]

Q5 (a) Determine instantaneous concentration of the complex-ES, if K_M is 1.5×10^{-2}, E_0 is 0.01 mol/l, S is 0.15 mol/l, k_1 is 1.2×10^{-2} and k_2 is 2.5×10^{-5} [2]

(b) A biochemical reaction takes place in the presence of fungi cells. Explain the salient features of the kinetic model that will describe this process closely. Also write the mathematical expressions of related basic models [3]

Q6 (a) Enlist the characteristics of different types of enzyme inhibition mechanisms [2]

(b) Substrate A and enzyme E flow through a mixed flow reactor (V = 6 liters). From the entering and leaving concentrations and flow rate find a rate equation to represent the action of enzyme on substrate [3]

C_{E0}, mol/liter	C_{A0}, mol/liter	C_A, mol/liter	v, liter/hr
0.02	0.2	0.04	3.0
0.01	0.3	0.15	4.0
0.001	0.69	0.60	1.2

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