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B. M. S. College of Engineering, Bengaluru - 560019

Autonomous Institute Affiliated to VTU

August 2024 Supplementary Examinations

Programme: B.E. **Semester: VII**
Branch: Chemical Engineering **Duration: 3 hrs.**
Course Code: 19CH7DCBCE **Max Marks: 100**
Course: Biochemical Engineering

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1. a) Give the classification of microorganisms belonging to the kingdom of protist. Discuss about their structure, reproduction cycle and applications **10**

   b) Describe Watson and Crick model of DNA structure. What is DNA replication? Explain its importance. **10**

UNIT - II

2. a) Derive M-M equation for single substrate enzyme catalyzed reaction stating assumptions and steady state approach. State the assumptions and limitations of equilibrium approach. **10**

   b) At room temperature sucrose is hydrolyzed by the catalytic action of the enzyme. Initial sucrose concentration is 1 M/ L and an enzyme concentration 0.01mM/L. Analysis of samples at regular intervals is as follows. **10**

Time, min	1	2	3	4	5	6	7	8	9	10	11
Substrate mM/L	0.84	0.68	0.53	0.38	0.27	0.16	0.09	0.04	0.018	0.006	0.0025

Check whether the reaction follows MM model and if fits the model, evaluate turn over number.

OR

3. a) Explain the methods for the evaluation of parameters in M-M equation. **10**

   b) The following data have been obtained with a fixed initial enzyme concentrations for an enzyme –catalyzed reaction. **10**

[S] , g/L	20	10	6.7	5.0	4.4	3.2
$[E]_0$ = 0.021 g/L r, g/L min	1.14	0.87	0.7	0.59	0.5	0.44

Evaluate k_2 and Michaelis-Menten constants using Langmuir plot.

UNIT - III

4. a) Explain the reversible competitive inhibition. Obtain the rate expression for the inhibition. How are the parameters determined? **10**

b) Discuss on the effect of temperature on activity of enzymes. **10**

OR

5. a) Enzyme as well the enzyme-substrate complexes are inhibited at the second active site available on the enzyme during an enzymatic reaction. State whether inhibitor has structural resemblance with substrate or not. Prove that the V_{max} of such an inhibition process is lower than reaction in the absence of inhibitor. State the assumptions made. **10**

b) The hydrolysis of urea by urease is an only a partially understood reaction and shows inhibition. Data for the hydrolysis of the reaction are given below. **10**

[S]= 0.2M	1/r L min/mol	0.22	0.33	0.51	0.76	0.88	1.1
	[I] mol	0	0.0012	0.0027	0.0044	0.0061	0.008
[S] = 0.02M	1/r L min/mol	0.68	1.02	1.5	1.83	2.04	2.72
	[I] mol	0.0	0.0012	0.0022	0.0032	0.0037	0.0044

UNIT - IV

6. a) Describe the transient growth kinetics of microorganisms along with the governing equations. **12**

b) Define dilution rate and yield coefficient. Prove that $D=F/V_R$ for a CSTR. **08**

UNIT - V

7. a) With the help of neat flow sheet, explain the components of a typical aseptic aerobic fermentation process. **10**

b) Explain the principle of freeze drying. **05**

c) Write on merits and demerits of affinity chromatography. **05**

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