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Total No. of Pages : 02

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B.Tech. (BT) (2011 Onwards) (Sem.–7,8)

BIOPROCESS TECHNOLOGY

Subject Code : BTBT-701

Paper ID : [A2945]

Time : 3 Hrs. Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt ANY FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt ANY TWO questions.**

SECTION-A

1. Write briefly :

a. Mention two important points need to be considered while producing a product through a bioprocess *vs*. chemical process.

b. Why secondary metabolites are referred as non-growth linked products ?

c. What is *"Cryptic Growth"*?

d. Write a commonly used method for isolation of pure culture of bacterium.

e. Distinguish between continuous and synchronous cultures.

f. Production of citric acid.

g. Microbial groups producing antibiotics.

h. Explain the kinetic implications of endogenous and maintenance metabolism.

i. Production of biopesticides.

j. Define the term *"Bioplastics"*.

SECTION-B

2. Explain industrial fermentation. Write in detail about the raw materials and medium requirements for fermentation process.

3. Discuss the manufacturing of Vitamin A using fermentative methods.

4. Explain the concept of Process Flow Diagrams (PFD), Piping and Instrumentation Drawings (P&ID) and Utility diagrams.

5. What is meant by critical oxygen concentration and its significance with respect to cell growth?

6. Explain the fed batch mode of fermenter operation in terms of features, advantages, disadvantages, concentration time profiles, mass balances and examples.

SECTION-C

7. What are the raw materials for production of ethanol by fermentation process? Describe its manufacturing process in detail from widely available raw material. How would you obtain absolute alcohol?

8. *E. coli* was used for production of recombinant porcine growth hormone. The bacteria are grown aerobically in a batch culture with glucose as growth limiting substrate. Cell and substrate concentration are measured as a function of culture time, the results are listed below.

   a) Plot μ as a function of time

   b) Calculate the value of μ_{max}

   c) Compare the substrate utilization rate of glucose between 1st to 2nd and 2nd to 3rd hour of incubation. Interpret the results.

Time (hours)	Cell conc. (kg/m^3)	Substrate conc. (kg/m^3)
0.0	0.20	25.0
0.3	0.21	24.8
0.5	0.22	24.8
0.75	0.32	24.6
1.0	0.47	24.3
1.5	1.00	23.3
2.0	2.10	20.7
2.5	4.42	15.7
2.8	6.9	10.2
3.0	9.4	5.2
3.1	10.9	1.65
3.2	11.6	0.2
3.5	11.6	0.0
3.7	11.7	0.0

9. Comment on the following :

   a) Microbial production of industrial enzymes.

   b) Industrial process for the production of beta-lactams-penicillin and cephalosporin.