

II B.Tech. II Semester Regular Examinations, April/May -2005
BIO PROCESS ENGINEERING-I
(Bio-Technology)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. Discuss in detail about various microorganisms used as biopesticides
2. After a batch fermentation, the system is dismantled and approximately 75% of the cell mass is suspended in the liquid phase (2 litre), while 25% is attached to the reactor walls and internals as a thick film. Work with radioactive tracers shows that 50% of the target product (intracellular) is associated with each cell fraction. The productivity of this reaction is 2 gm product per litre at the 2 litre scale. What would be the productivity at 20,000 litre scale if both reactors had a height-diameter ratio of 2 to 1.
3. Explain the factors to be considered for developing medium for animal cell culture.
4. Describe Arrhenius plot for the calculation of activation energy and derive an expression for heat sterilisation of a pure culture at a constant temperature.
5. Explain the concept of Degree of Reduction and its application in proton-electron balance in bioreactor.
6. Discuss about the partial oxidation and its end products with an example.
7. (a) Enumerate the difference between the cell growth in batch and continuous cultures
(b) Explain the kinetics of microbial growth
8. Explain the substrate and product inhibition on the product formation with appropriate examples.

II B.Tech. II Semester Regular Examinations, April/May -2005
BIO PROCESS ENGINEERING-I
(Bio-Technology)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. Mention about the Regulatory constraints of bioprocesses.
2. (a) What is aseptic operation and containment?
(b) Describe a typical aseptic, aerobic fermentation process.
(c) What is sparger? Describe different spargers used in fermentors.
3. Determine the amount of $(\text{NH}_4)_2\text{SO}_4$ to be supplied in a fermentation medium where the final cell concentration is 30 gm/lit in a 1000 lit culture volume. Assume that cells are 12% Nitrogen by weight and $(\text{NH}_4)_2\text{SO}_4$ is the only Nitrogen source.
4. (a) What are the important information required for the design of batch sterilisation process.
(b) Define Del factor. Describe the calculation of Del factor during heating and cooling.
5. Discuss the concept of Elemental Balances with example using simplified biological conversion.
6. Briefly discuss the following
 - (a) Energy capture efficiency
 - (b) Oxygen consumption and heat evolution in aerobic cultures
 - (c) Heat generation and yield factor estimation
7. Enumerate in detail various environmental conditions that affect the growth kinetics
8. Explain the difference between:
 - (a) Competitive and non-competitive product inhibition
 - (b) Growth and non-growth associated products

II B.Tech. II Semester Regular Examinations, April/May -2005
BIO PROCESS ENGINEERING-I
(Bio-Technology)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. What do you mean by down stream processes explain with flow chart.
2. Derive an expression for estimating the heat transfer area required to obtain adequate temperature control in a fermentor.
3. (a) Explain the use of water as an important constituent for fermentation.
(b) Describe the use of buffers for media preparation in fermentation.
4. (a) What are the consequences if a foreign microorganism invade a fermentation process.
(b) Explain the methods to avoid this contamination.
5. Determine the rate of oxygen consumption and yield coefficients if rate of growth at exponential phase is $r_x = 0.7$ gdw/l-h in a batch reactor of 5000 liters volume with the growth of yeast on glucose as per the equation given
$$\text{C}_6\text{H}_{12}\text{O}_6 + 3 \text{O}_2 + 0.48\text{NH}_3 \rightarrow 0.48\text{C}_6\text{H}_{10}\text{N}_3 + 4.32\text{H}_2\text{O} + 3.12\text{CO}_2$$

Final yeast concentration of 50 gdw/l is required.
6. Given an overview of
 - (a) Anaerobic and aerobic metabolism
 - (b) Oxygen consumption and heat evolution in aerobic cultures
7. (a) Explain the procedure involved in the determination of cell number density and cell mass concentration
(b) Give a short note on simple unstructured kinetic models for microbial growth.
8. Explain the difference between:
 - (a) Competitive and non-competitive product inhibition
 - (b) Growth and non-growth associated products

II B.Tech. II Semester Regular Examinations, April/May -2005
BIO PROCESS ENGINEERING-I
(Bio-Technology)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. Draw and Explain a typical fermentation process.
2. (a) What is aseptic operation and containment?
(b) Describe a typical aseptic, aerobic fermentation process.
(c) What is sparger? Describe different spargers used in fermentors.
3. Determine the amount of $(\text{NH}_4)_2\text{SO}_4$ to be supplied in a fermentation medium where the final cell concentration is 30 gm/lit in a 1000 lit culture volume. Assume that cells are 12% Nitrogen by weight and $(\text{NH}_4)_2\text{SO}_4$ is the only Nitrogen source.
4. (a) What are the important information required for the design of batch sterilisation process.
(b) Define Del factor. Describe the calculation of Del factor during heating and cooling.
5. Determine coefficients a, b, c and d (where $\text{RQ}=0.66$) along with the biomass yield coefficient and oxygen yield coefficient for aerobic degradation of benzoic acid by a mixed culture of microorganisms as represented by the following overall reaction
$$\text{C}_6\text{H}_5\text{COOH} + a\text{O}_2 + b\text{NH}_3 \longrightarrow c\text{C}_5\text{H}_7\text{NO}_2 + d\text{H}_2\text{O} + e\text{CO}_2$$
6. Given an overview of
 - (a) Anaerobic and aerobic metabolism
 - (b) Oxygen consumption and heat evolution in aerobic cultures
7. Briefly explain the following
 - (a) Steady-state biomass concentration
 - (b) Specific rate of the oxygen consumption
8. Give a short notes on the product kinetics of
 - (a) Growth associated (primary)
 - (b) Non-growth associated (secondary)
