

**B.E. FOOD TECHNOLOGY AND BIO-CHEMICAL ENGINEERING
THIRD YEAR FIRST SEMESTER EXAM 2025**

BIOCHEMICAL ENGINEERING- I

Full Marks: 100

Time: 3 hrs

Part – I (50 Marks)

Group-A

Answer any one question

1×10 = 10

1. Draw a flow chart considering major steps involved in the separation and purification of intracellular enzymes. Purification of intracellular enzyme is more difficult than extracellular enzyme- justify.
2. Write short note on electrophoresis and electrodialysis.

Group-B

Answer any two questions

2×20 = 40

3. (i) Define g value of a centrifuge and centrifugal coefficient. Derive the expression of centrifugal coefficient.
(ii) Yeast cells are recovered from a fermentation broth by using a tubular centrifuge. Sixty percent (60%) of the cells are recovered at a flow rate of 12 l/min with a rotational speed of 4000 rpm. Recovery is inversely proportional to flow rate.
(a) To increase the recovery of cells to 95% at the same flow rate, what should be the rpm of the centrifuge?
(b) At a constant rpm of 4000 rpm, what should be the flow rate to result in 95% cell recovery?
8+12 = 20
4. (i) Derive the equation for extraction percentage in multistage counter current operation.
What are the different types of chromatography processes?
(ii) Biomass present in a fermentation broth is characteristics are given below:
 $A = 50\text{m}^2$; $\Delta P = 0.01\text{N/m}^2$; $C = 15\text{ kg/m}^3$; $\mu = 0.003\text{kg/m.s}$; $\eta = 2\text{m/kg}$.
(a) If rate of filtration has a constant value of $dV/dt = 50\text{ l/min}$, determine the cake and filter resistances at $t = 30\text{ min}$.
(b) Determine the filter surface area required to filter 5000l broth within 60 min with the same pressure drop across the filter.
8+12 = 20
5. Define central dogma. Write short note on cloning process. Write the advantages and disadvantages of genetically modified foods.
2+6+12 = 20
6. Write short note on any four
4×5 = 20
 - (a) Cell disruption by non-mechanical methods
 - (b) Dialysis
 - (c) Reverse osmosis
 - (d) Aqueous two phase extraction
 - (e) Protein precipitation methods

[Turn over

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Part – II (50 Marks)**Answer Q1 and any three from the rests (5 + 15 x 3 = 50)**

1. (a) What is 'specific growth rate' and what is its dimension?
 (b) What do you mean by 'Del factor'?
 (c) Give example of each of liquid and gaseous chemical sterilizer. 2 + 2 + 1

2. Draw the general bacterial growth curve and mention different phases. What do you mean by 'generation time'?
 What is the importance of 'lag phase' and 'log phase' ? What do you mean by ' k_d ' and what is its unit? What is
 'yield coefficient' ? 3+2+4+3+3

3. Name two substrates and two organisms popularly used in solid state fermentation. Write six major differences
 between solid SSF and SmF. Write advantages of batch fermentation. Mention four fundamental differences
 between batch and continuous culture. What do you mean by 'selective media'? Cite one example of it.
3 + 4+ 3+3+2

4. Write the difference between sterilization and disinfection . Why do we require medium sterilization ? What is the
 condition of lab-sterilization using moist heat? Write the advantages of continuous sterilization over batch
 sterilization. Draw neat sketch of a continuous steam injector type direct sterilization system and explain its mode
 of action. 2+ 2+ 2 +3+6

5. Write the equation to relate 'time', 'temperature' and 'Del factor'. A pilot sterilization is carried out in a 1000dm³
 vessel with a medium containing 10⁶ organism per cc, requiring a probability of contamination of '1 in 1000' What
 will be the "del factor" in this case? Write the differences between 'surface filtration' and 'depth filtration' .
 Mention the names of mechanisms by which sterilization is achieved in 'fibrous filtration' medium. What do you
 mean by 'nucleopore membrane' ? Give example of each of ionizing and non-ionizing radiation sterilization.
2 + 5 + 2 + 3 + 2 + 1