

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2025

M.Sc.- II Semester (Microbiology)

COURSE CODE (CREDITS): 21MS1MB211 (03)

MAX. MARKS: 35

COURSE NAME: Enzymes & Bioprocess Technology

COURSE INSTRUCTORS: Dr. Saurabh Bansal

MAX. TIME: 2 Hours

*Note: (a) All questions are compulsory.*

*(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems*

Q. No.	Question	Marks
Q1 a)	Name the organism that is used as a model organism for designing sterilization.	1
Q1 b)	During sterilization of a fermentation medium in a given bioreactor $\nabla_{\text{heating}} = 14.56$ , $\nabla_{\text{cooling}} = 9.52$ and the total value of $\nabla$ required for the whole sterilization process is 56, where $\nabla$ is the design criteria. What is the value of $\nabla$ holding?	1
Q2 a)	What do you understand by scale-up? List the scale-up criteria that can be used for the scale-up of a bioprocess.	2
Q2 b)	Why would the performance of a fungal culture making an antibiotic be so different at 10,000 L than at 10 L?	2
Q3 a)	Draw a schematic diagram of a stirred Tank Bioreactor representing all its important components.	2
Q3 b)	Draw a schematic diagram of an Airlift bioreactor.	2
Q3 c)	Explain the function of the following parts of the fermenter: i) Baffle                      ii) Sparger                      iii) Condenser	3
Q4	Differentiate between the following:	
Q4 a)	Upstream processing and Downstream processing	2
Q4 b)	HPLC and FPLC	2
Q5	Determine the relative centrifugal force applied to the particles when a centrifuge rotates at 5000 rpm with a 10 cm radius.	2



Q6	<p>Select and arrange the unit operations in the form of a flow chart from the following steps (minimum number) to purify the asparaginase enzyme secreted by <i>Aspergillus niger</i> in the production medium.</p> <p>The steps may include: Mechanical Cell lysis, Lysozyme-induced cell lysis, Centrifugation, Filtration, Chromatography, Salt-induced precipitation, Organic acid-based precipitation, Dialysis.</p> <p>Justify your choice of each unit operation.</p>	3
Q7	How does the filtration aid help in improving the filtration?	2
Q8	<p>Explain the key steps of the downstream processing of the following:</p> <p>a) Citric Acid                      b) Penicillin</p>	5
Q9 a)	What are the limitations of natural penicillin?	1
Q9 b)	List the names of two organisms used at an industrial level for the production of lactic acid.	1
Q9 c)	How does the pH during fermentation affect the citric acid production, and what is the suitable pH for optimal production?	2
Q10	How does the <i>Zymomonas mobilis</i> look promising compared to the yeast strains for alcohol production?	2