

(AUTONOMOUS)
MSc DEGREE EXAMINATION MAY 2026
(Fourth Semester)

Branch – BIOTECHNOLOGY

BIOPROCESS TECHNOLOGY

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer ALL questions

ALL questions carry EQUAL marks (10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	Identify the factor maintained in a controlled steady-state concentration automatically in bioreactors whose rate of inflow/outflow, allow for optimal metabolic activity and waste removal. (i) CO ₂ (ii) nutrient (iii) Oxygen (iv) waste	K1	CO1
	2	Find the characteristic factor in the bioprocess, often subjected to parameter disturbances and demands use of fuzzy logical control. (i) Certainties (ii) linearities (iii) Nonlinearities (iv) predictable	K2	CO1
2	3	Name the Mutants requiring specific nutrients for growth due to the loss of a biosynthetic pathway. (i) Auxotrophs (ii) Heterotrophs (iii) Prototrophs (iv) Revertants	K1	CO2
	4	In Kinetics of cell growth find parameter described by Structured models. (i) Balanced (ii) Log Phase (iii) Stationary Phase (iv) Unbalanced	K2	CO2
3	5	What shear thinning behaviour exhibited by a fermentation broth with filamentous microorganisms affects efficiency. (i) Dilatant (ii) Newtonian (iii) Plastic (iv) Pseudoplastic	K1	CO3
	6	Specify the parameter measured in volumetric mass transfer coefficient calculations using the dynamic method. (i) Dissolved CO ₂ (ii) Head head gas (iii) Dissolved O ₂ (iv) Toxic waste	K2	CO3
4	7	Which of the centrifugation techniques is considered rapid for separating large volumes of bacteria. (i) Batch (ii) Continuous flow (iii) Density (iv) Ultra filtration	K1	CO4
	8	In downstream processing, find the factor used to confirm the shelf life of drug products, determine container closure system suitability, and detect evidence of quality changes. (i) Co-solvency (ii) Phase Inversion (iii) Solidification (iv) Stability testing	K2	CO4
5	9	Industrial high-fructose corn syrup is produced using which enzyme? (i) beta amylase (ii) Glucoamylase (iii) Glucose isomerase (iv) Invertase	K1	CO5
	10	Spell the technology used for the creation of antibody-producing cell lines for therapeutic antibodies like Adalimumab. (i) PCR (ii) Hybridoma (iii) Protein Expression (iv) Gene cloning	K2	CO5

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SECTION - B (35 Marks)
 Answer ALL questions
 ALL questions carry EQUAL Marks (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Explain the concept of fermentor and reactor designing. Write notes on types of fermentor STB, Airlift, tower, and deepjet.	K3	CO1
		(OR)		
	11.b.	Describe the process of optimization, mass transfer, heat transfer, mixing in design for Plant and Animal cell reactor.		
2	12.a.	Illustrate Upstream processing and the basic principles of scale up- Sterilization techniques.	K3	CO2
		(OR)		
	12.b.	Outline Strain development methods, preservation of microorganisms and how will you design media for the aerobic, anaerobic fermentation process.		
3	13.a.	Relate the Newtonian and Non Newtonian fluids. Write the effect of scale up on oxygenation, mixing, sterilization, nutrient availability and supply.	K4	CO3
		(OR)		
	13.b.	Show bioreactors scale up based on constant power consumption per volume, mixing time, impeller tip speed (shear) and Oxygen transfer.		
4	14.a.	Rephrase the rheology and scale up of fermentation, downstream processing, removal of microbial cells and solid matter.	K4	CO4
		(OR)		
	14.b.	Infer product stabilization, formulation and storage.		
5	15.a.	Demonstrate mechanism of enzyme function and reactions in enzymatic bioconversions e.g. starch and sugar conversion processes, high-fructose corn syrup; inter esterified fat and hydrolyzed protein.	K5	CO5
		(OR)		
	15.b.	Summarize production of metabolites such as shikonin using plant cell culture.		

SECTION - C (30 Marks)
 Answer ANY THREE questions
 ALL questions carry EQUAL Marks. (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	Describe the principles and strategies for control of bioreactors, feedback, feed forward, adaptive and statistical, fuzzy logic control.	K5	CO1
2	17	Analyse the batch growth, balanced growth, and effect of substrate concentration. How will you determine cell kinetic parameters from batch data.	K6	CO2
3	18	Distinguish measurement of volumetric mass transfer coefficient and Scale-up criteria for bioreactors based on oxygen transfer.	K5	CO3
4	19	Examine product separation, cell disruption, Filtration, centrifugation, precipitation, chromatography - Gel filtration, Ion exchange, affinity, crystallization and drying.	K5	CO4
5	20	Appraise the Production of HBsAg using yeast cultures, erythropoietin using CHO cells, monoclonal antibodies such as Humira using mammalian cells.	K6	CO5

Z-Z-Z END