22BTU524AN

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2025
(Fifth Semester)

Branch - **BIOTECHNOLOGY**

MAJOR ELECTIVE COURSE – I : INDUSTRIAL AND MICROBIAL 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	The most commonly used industrial fermentor is _____. a) Air-lift fermentor b) Tower fermentor c) Stirred-tank bioreactor d) Rotary drum fermentor	K1	CO1
	2	In strain improvement, recombinant DNA technology is used primarily to _____. a) Increase oxygen transfer rate b) Enhance the genetic traits of microorganisms for better product yield c) Prevent foaming in fermentors d) Maintain pH stability in culture	K2	CO2
2	3	The Z-value in thermal death kinetics represents _____. a) Time to kill 90% microbes b) Substrate utilization constant c) Minimum temperature for microbial growth d) Temperature increase required to reduce D-value by 1 log cycle	K1	CO2
	4	Why is fed-batch culture often preferred for antibiotic production? a) It avoids substrate inhibition and prolongs exponential growth b) It eliminates contamination risks c) It requires fewer nutrients d) It allows immediate product recovery	K2	CO2
3	5	Lyophilization is also called: a) Spray drying b) Ultrafiltration c) Freeze drying d) Crystallisation	K1	CO1
	6	GC-MS is commonly used in DSP to: a) Separate and identify volatile metabolites b) Quantify microbial biomass c) Freeze-dry products d) Remove solid impurities	K2	CO2
4	7	Which fermentation type is commonly used for penicillin production? a) Anaerobic batch b) Continuous c) Solid-state d) Submerged fed-batch	K1	CO2
	8	In vitamin C production, why is microbial fermentation preferred over chemical synthesis? a) It produces racemic mixtures b) It is more environmentally friendly and can use renewable substrates c) It is slower and less efficient d) It produces more waste	K2	CO4
5	9	Gibberellins, used as plant growth factors, are produced by: a) *Saccharomyces cerevisiae* *b) Clostridium acetobutylicum* *c) Spirulina spp.* *d) Gibberella fujikuroi*	K1	CO1
	10	Why is anaerobic fermentation preferred for ethanol production using yeast? a) It allows conversion of sugars to ethanol efficiently b) It prevents contamination c) It increases protein content d) It produces antibiotics	K2	CO2

Cont...

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.	Discuss the need for strain improvement in industrial fermentation.	K2	CO3
		(OR)		
	11.b.	Explain how temperature and pH control influence microbial growth and product formation in a fermentor.		
2	12.a.	Explain the use of agro-industrial wastes (molasses, whey, bagasse) as substrates in fermentation.	K2	CO3
		(OR)		
	12.b.	Why is fed-batch culture preferred for secondary metabolite (antibiotic/enzyme) production?		
3	13.a.	Explain the principle and applications of filtration in downstream processing.	K3	CO3
		(OR)		
	13.b.	Describe the process of foam fractionation and how it is used to recover proteins or surface-active compounds.		
4	14.a.	Discuss the production of amylase enzymes using bacterial cultures.	K4	CO4
		(OR)		
	14.b.	Explain how *Aspergillus niger* is used to produce citric acid. Discuss the role of pH and substrate selection.		
5	15.a.	Describe the production, formulation, and marketing of SCP (Spirulina spp.) and its applications.	K4	CO5
		(OR)		
	15.b.	Explain the role of microbial starter cultures in cheese production, including lactose conversion and coagulation.		

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	Compare and contrast the working principles, advantages, and limitations of air-lift fermentors and stirred tank bioreactors.	K4	CO5
2	17	a)Evaluate the role of substrate selection and media design in reducing production cost and. b)How can waste valorization contribute to a circular bioeconomy?	K4	CO5
3	18	Design a downstream process for an intracellular antibiotic and evaluate the steps highlighting strategies to maximize yield and minimize the loss.	K4	CO5
4	19	Examine the role of fed-batch fermentation in industrial bioproducts, using and ethanol production as example.	K4	CO5
5	20	*Saccharomyces cerevisiae* is a boon for Beverages and Baking Industries-Justify.	K4	CO5

Z-Z-Z END