



GIET UNIVERSITY, GUNUPUR – 765022

Ph.D. (Second Semester) Examinations, November – 2023

WPPEBT2012 – Bioprocess Engineering

(Biotechnology)

Time: 3 hrs

Maximum: 70 Marks

The figures in the right hand margin indicate marks.

Answer ANY FIVE Questions

(14 x 5 = 70 Marks)

	Marks
1.a. Write the challenges and opportunities associated with the development of a bioprocess for the production of recombinant-DNA derived products.	7
b. Write the essential elements of an integrated bioprocess, emphasizing both upstream and downstream components.	7
2.a. Provide detailed insights into atomic, molecular, and equivalent weights. How are these calculations essential for designing and optimizing bioprocesses?	7
b. How do dimensional analysis and system units play a crucial role in ensuring the scalability of bio production processes? Provide examples and discuss practical applications.	7
3.a. Evaluate the production of enzymes in submerged and solid-state processes. Discuss the advantages and disadvantages of each method.	7
b. Write about the following factors - substrate utilization, fermentation conditions, and downstream processing in industrial settings.	7
4.a. Define and discuss the available electron balance in bioprocessing. How does this balance influence metabolic pathways and overall cell metabolism? Provide examples to illustrate the concept.	14
5.a. Discuss strategies to minimize maintenance energy requirements in industrial bio production.	6
b. Write about the energetic analysis of microbial growth and product formation. Discuss the thermodynamic efficiency of growth and its implications for bioprocess optimization.	8
6.a. Elaborate on the simple unstructured kinetic models for microbial growth. Discuss their applications and limitations.	8
b. How do these models contribute to the understanding and control of bio production processes?	6
7 a. Differentiate between growth-associated (primary) and non-growth-associated (secondary) product formation kinetics.	7
b. Discuss the factors influencing each type of product formation and their implications for bioprocess design and optimization.	7
8 a. Evaluate the environmental impact of bioprocessing in the biotechnology industry.	6
b. Discuss sustainable practices and technologies that can be implemented to minimize the ecological footprint of bio production processes.	8

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