BRAINWARE UNIVERSITY

Term End Examination 2024-2025
Programme – B.Sc.(BT)-Hons-2023
Course Name – Bioprocess Technology
Course Code - BBT40201
(Semester IV)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A
(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Identify among the following components used primarily in Bioprocess technology to manufacture new
   a) Inorganic materials
   b) Plant tissues
   c) Microbes, plants and animal cells or their parts
   d) Chemical compounds

(ii) Select among the following the major groups of commercially important fermentations
   a) Those that produce microbial cells and microbial enzymes
   b) Those that produce microbial biomass and secondary metabolites
   c) Those that produce microbial metabolites and recombinant products
   d) Those that produce microbial enzymes and transformation products

(iii) Select the main drawback of continuous culture?
   a) Requires high technical skills to maintain steady-state conditions
   b) High risk of contamination
   c) Costly and complex equipment required
   d) Inability to achieve high cell densities.

(iv) Select among the following which is a characteristic of a chemostat.
   a) Operates without any addition of fresh medium
   b) Maintains microbial growth at a constant rate by controlling nutrient supply
   c) Involves periodic removal of culture fluid
   d) Is a type of fed-batch culture

(v) In fed-batch culture, identify the reason is substrate added incrementally.
   a) To prevent substrate inhibition
   b) To maintain a constant cell density
   c) To avoid the need for aeration
   d) To keep the culture volume constant

(vi) Identify the product produced in continuous fermentation.
   a) Primary metabolites like ethanol
   b) Secondary metabolites like antibiotics
   c) Batch-dependent enzymes
   d) Solid-state fermentation products

(vii) Explain the main disadvantage of using baffles in a bioreactor.
   a) They reduce the oxygen transfer rate
   b) They create stagnant zones in the reactor

c) They increase the shear stress, which may affect shear-sensitive cells
d) They completely prevent mixing

(viii) Indicate the standard number of baffles typically used in a cylindrical bioreactor.

a) 2
b) 4
c) 6
d) 8

(ix) Select the use of Cyclone column bioreactors.

a) Large-scale protein production
b) Wastewater treatment
c) Solid-state fermentation
d) High-efficiency aerobic fermentation

(x) Identify what mass transfer coefficient (k) represents?

a) The rate of mass transfer per unit area per unit concentration difference
b) The amount of solute transferred per unit time
c) The viscosity of a liquid
d) The density of a fluid

(xi) Select the instrument used to measure oxygen transfer rate (OTR) in bioprocesses.

a) pH probe
b) Gas chromatography
c) Polarographic DO sensor
d) UV spectrophotometer

(xii) Explain the bioprocess control strategy involveing adjusting inputs based on real-time sensor data.

a) Open-loop control
b) Feedback control
c) Manual adjustment
d) Batch mode operation

(xiii) Select the bacterium known for ethanol production under anaerobic conditions.

a) Zymomonas mobilis
b) Streptococcus lactis
c) Clostridium botulinum
d) Bacillus cereus

(xiv) Identify the main by-product of ethanol fermentation by yeast.

a) Methane
b) Acetic acid
c) Carbon dioxide
d) Lactic acid

(xv) In industrial lactic acid production, explain the role of calcium carbonate ($CaCO_3$)

a) Acts as a carbon source
b) Neutralizes acid to maintain pH
c) Enhances microbial growth
d) Precipitates lactic acid

Group-B

(Short Answer Type Questions) 3 x 5=15

2. State the use of bioprocess in the degradation of industrial pollutants. (3)
3. Explain the term "specific growth rate" in microbial kinetics. (3)
4. Discuss the function of an impeller in a bioreactor. (3)
5. Examine the effect of temperature in oxygen solubility in bioprocessing. (3)
6. Evaluate the purpose of crystallization in product purification. (3)

OR

Assess the role of the role of affinity chromatography in downstream processing. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Examine various stages involved in a bioprocess, from upstream to downstream processing. (5)
8. Discuss the advantages and disadvantages of batch fermentation. (5)
9. Explain the process of pasteurization and its significance in bioprocessing. (5)
10. the advantages and limitations of moist heat sterilization in bioprocessing. (5)
11. Compare chemostat and turbidostat systems in continuous fermentation. (5)
12. Assess Single Cell Proteins (SCPs). Discuss their significance in food and feed industries. (5)

OR

Evaluate the different microorganisms used in Single Cell Protein production. (5)