

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- JUNE-2023

M.Sc.-II Semester (MB)

COURSE CODE(CREDITS): 21MS1MB211 (03)

MAX. MARKS: 25

COURSE NAME: Enzymes & Bioprocess Technology

COURSE INSTRUCTORS: Dr. Saurabh Bansal

MAX. TIME: 2 Hours

Note: All questions are compulsory. Marks are indicated against each question in square brackets.

1. a) What do you understand by volumetric mass transfer coefficient? What is its significance? How the aeration rate and agitation rate affect the value of volumetric mass transfer coefficient? [3]
- b) How the dynamic gassing out method is different from the static gassing out method for measuring the K_{La} ? [2]
2. Why the performance of any culture making a product at large scale (10,000 L) is different compared to the small scale (10 L)? [2]
3. What are major applications (advantages) of scale down of any bioprocess? [2]
4. Draw a suitable diagram representing all kind of forces and its direction act on a particle during its settling. [2]
5. Calculate the relative centrifugal force applying on a particle while its centrifugation at 5000 RPM in a centrifuge of diameter 10 cm. [2]
6. a) How does filter aid help in filtration? [1]
- b) Whether filtration is steady state process? Justify your answer. [2]
- c) Which of the following an example of continuous filtration: Rotary vacuum Filter and Filter press? [1]
7. a) Why removal of nucleic acid from cell lysate is important? [1]
- b) Why non-ionic detergent should prefer in bioprocessing for cell lysis over the ionic detergents? [1]
- c) What is salting out? Why precipitation of proteins using ammonium sulphate should be preferred over other methods of precipitation? [2]

- d) Which method of liquid-liquid extraction is better: Co-current and counter current multistage? Why? [2]
- e) Draw a diagram representing the feed, raffinate and extract stream during liquid-liquid extraction. [1]
8. Differentiate between: [3]
- a) Ion exchange and Hydrophobic Interaction Chromatography
- b) Surface and Depth filtration
9. a) Gel chromatography is to be used for commercial-scale purification of a proteinaceous diphtheric toxoid from *Corynebacterium diphtheriae* supernatant. In the laboratory, a small column of 2 cm inner diameter and height 0.4 m is packed with 10 g dry Sephadex gel; the void volume is measured as 25 ml. A sample containing the toxoid and impurities is injected into the column. At a liquid flow rate of 12 ml min^{-1} , the elution volume for the toxoid is 25 ml; the elution volume for the principal impurity is 40 ml. Which is the larger molecule, the diphtheria toxoid or the principal impurity? [1]
- b) How the Height of Equivalent Theoretical Plate (HETP) in a chromatography column affect the resolution of the peak of any protein? [1]
- c) Suppose you have two columns A and B with a length of 10 and 6 cm respectively which are packed with the same kind of Sepharose resins. Which column will give you better resolution and why? [2]
10. a) Why lactic acid production is not suggested in an iron vessel? [1]
- b) Why *Rhizopus oryzae* fermentation is advantageous over the *Lactobacillus* spp. fermentation for the Lactic acid production? [1]
- c) On what basis many researchers advocate in favor of *Zymomonas mobilis* over the yeast for alcohol production? [2]