

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2023

B.Tech-VI Semester (BT)

COURSE CODE (CREDITS): 18B11BT611 (4)

MAX. MARKS: 35

COURSE NAME: Downstream Processing

COURSE INSTRUCTORS: Dr. Saurabh Bansal

MAX. TIME: 2 Hours

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

[CO2]

1. a) In which phase (Trophophase or idiophase) penicillin production occurs? [1]
b) What are the major limitations of natural penicillin? [1]
c) For the production of penicillin V and penicillin G, which precursors are used? [2]
d) In industries, how does the production of 6-APA take place? Just outline the whole process. [3]
2. Which of the organism is used commercially for the production of following products: [3]
a) Lactic acid b) Gluconic Acid c) Citric Acid
3. a) Why citric acid production is not suggested in an iron vessel? [1]
b) How the iron limitation enhances the citric acid excretion? [1]

[CO3, CO4]

4. a) Protein A with a molecular weight of 80 kDa is hydrophilic in nature whereas other protein B having a molecular weight of 7000 Da and hydrophobic in nature. Which protein will come first out of a Gel Permeation Chromatography and why? [2]
b) Suppose you have two columns A and B with a length of 5 and 10 cm respectively which are packed with the same kind of Sephadex resins. Which column will give you better resolution and why? [2]

[CO4]

5. Gel chromatography is to be used for commercial-scale purification of a proteinaceous diphtheria 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 23 ml. A sample containing the toxoid and impurities is injected into the column. At a liquid flow rate of 14 ml min⁻¹, the elution volume for the toxoid is 50 ml; the elution volume for the principal impurity is 30 ml. A column of height 0.8 m and diameter 0.6 m is available for large-scale gel chromatography. The same

type of packing is used; the void fraction and ratio of pore volume to total bed volume remain the same as in the bench-scale column. The liquid flow rate in the large column is scaled up in proportion to the column cross-sectional area; the flow patterns in both columns can be assumed identical. The water regain value for the packing is given by the manufacturer as $0.004 \text{ m}^3 \text{ kg}^{-1}$ dry gel.

- a) Which is the larger molecule, the diphtheria toxoid or the principal impurity? [1]
- b) Determine the partition coefficients for the toxoid and impurity. [2]
- c) Estimate the elution volumes in the commercial-scale column. [2]

[CO5]

- 6. Differentiate between [4]
 - a) HPLC and FPLC
 - b) HIC and IEC
- 7. a) Why maintaining a pH at 4.5 to 4.7 is important during alcohol production? [1]
- b) Which of the organic solvent is used for making a ternary azeotrope mixture during Alcohol downstream processing? [1]
- c) What are the major advantages of using *Zymomonas mobilis* over the yeast for alcohol production? [2]

[CO6]

- 8. a) Why formulations of different bioproducts are needed? Give four major reasons. [2]
- b) Assume your purified protein product is sensitive towards the oxidation. How will you deal with problem while formulation? [2]
- 9. Draw a flow chart for the downstream processing of gluconic acid. [2]