

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATIONS-2022

B.Tech-V Semester (BT & BI)

COURSE CODE (CREDITS): 18B11BT511(4)

MAX. MARKS: 25

COURSE NAME: Bioprocess Engineering

COURSE INSTRUCTORS: Dr. Saurabh Bansal

MAX. TIME: 1 Hour and 30 Minutes

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

[CO1]

- Q1. What are the advantages of continuous sterilization over batch sterilization? [2]
- Q2. Differentiate between following: [3]
- a) Axial and Radial flow impellers
  - b) Sulphite oxidation and Dynamic gassing out method

[CO2]

- Q3. What are the different factors affecting the cellular oxygen demand? [2]
- Q4. Which system is consumed less mixing power: Gassed and Ungassed fluid? Why? [2]
- Q5. With the increase volume of medium what will happen generally to the following while keeping other factors constant: [3]
- a) Del factor
  - b) Power consumption
  - c) Mixing time

[CO3]

- Q6. If a pilot sterilization is carried out in a 10,000 L vessel with a medium containing  $10^5$  organisms per ml. if the del factors ( $\nabla$ ) for heating, cooling are 9 and 11, and the specific death rate of the contaminating organism is 3.0 min. Calculate the holding time for the effective sterilization with minimal nutrient loss. [3]

[CO4]

- Q7. a) What is the significance of  $K_{La}$ ? [1]
- b) Suppose you are planning to set a fermentation system for a bacterial culture which need a higher oxygen demand. You have 3 different fermenters in your lab having  $K_{La}$  values, 0.1, 0.05 and  $0.75 \text{ sec}^{-1}$ . So which fermenter will you choose for setting up the fermentation? [2]
- c) Which of the method is more accurate and reliable in measuring volumetric mass transfer coefficient and why? [3]
- Q8. A fermentation broth with viscosity  $10^{-2} \text{ Pa s}$  and density  $1000 \text{ kg m}^{-3}$  is agitated in a  $50 \text{ m}^3$  baffled tank using a marine propeller 1.5 m in diameter. The power number for the impeller is 0.4. Calculate the power required for a stirrer speed of  $4 \text{ s}^{-1}$ . [2]
- Q9. A fermentation broth with viscosity 100 centipoise and density  $1000 \text{ kg m}^{-3}$  is agitated in a  $2.7 \text{ m}^3$  baffled tank using a Rushton turbine with diameter 0.5 m and stirrer speed  $2 \text{ s}^{-1}$ . Estimate the mixing time. [2]