

Code: 9A23405

B.Tech II Year II Semester (R09) Supplementary Examinations December/January 2015/2016

BIOPROCESS ENGINEERING

(Biotechnology)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 What is a flow sheet? Give flow sheet for any byproduct and explain the unit operations involved in the process.
- 2 (a) State the law of conservation of mass and write the general mass balance equation.
(b) What are various steps involved in material balance calculations? Discuss them briefly.
- 3 Write short notes on:
(a) General energy balance equation.
(b) Energy balance equation for unsteady state.
- 4 Distinguish between aerobic and anaerobic fermentations with appropriate examples and give their applications.
- 5 (a) Discuss about the various nitrogen sources that are to be considered in formulation of the media.
(b) Why are the other nutrients necessary in the media?
- 6 The growth of baker's yeast (*Saccharomyces cerevisiae*) on glucose may be simply described by the following equation $C_6H_{12}O_6 + 3O_2 + 0.48 NH_3 \rightarrow 0.48 C_6H_{16}NO_3 + 4.32 H_2O + 3.12 CO_2$.
In a batch reactor of volume $10^5 \ell$, the final desired yeast concentration is 50 gdw/lit. Using the above reaction stoichiometry.
(a) Estimate the concentration and total amount of glucose and NH_3 in the nutrient medium.
(b) Estimate the yield coefficients $Y_{x/s}$ and Y_{x/o_2} .
(c) Estimate the total amount of oxygen required.
(d) If the rate of growth at exponential phase is $r_x = 0.7 \text{ gdw/l.h}$, estimate the rate of oxygen consumption ($go_2/\text{l.h}$).
- 7 Write brief notes on:
(a) Energetic analysis of microbial growth and product formation.
(b) Thermodynamic efficiency of growth.
- 8 Discuss different phases of cell growth in batch culture.
