

## DEPARTMENT OF BIOCHEMICAL ENGINEERING & BIOTECHNOLOGY

Major Test , 1<sup>st</sup> Semester 2008-2009  
BEL 810 (Enz. & Microbial Technol.)

Date: 22-11-2008  
Time: 9:30 – 12:30 am  
Venue: I-336  
Marks: 50

1. a) Define a biocell. (2)
  - b) How a unit microbial cell design differs from that of a unit cell of plant and animal? (4)
  - c) How a microbial cell is isolated? Describe inform of flow diagram. (6)
  - d) Explain the importances of cytobiotechnological dimensions of a bacterial cell. (5)
  - e) How you will design a substrate medium for a bacterial cell required for its cultivation? (5)
  - f) Distinguish between a biocell and an enzyme. (3)
- 2(a) In a sterilizable membrane covered amperometric dissolved oxygen probe specify the following: (8)
- i) the thickness of the membrane
  - ii) material of construction of anode and cathode
  - iii) the electrolyte used between anode and cathode and its characteristics
- (b) When a potential difference is applied to the oxygen electrode circuit what one may notice on the dissolve oxygen probe placed in the liquid? What electrochemical reactions are responsible for this observation. Starting from Fick's Law of diffusion of oxygen:

$$dO_2/dt = -D (dC_L/dy)$$

where  $dO_2/dt$  is the quantity of oxygen passing through the diffusion layer,  $dC_L/dy$  is the oxygen concentration gradient in diffusion layer and  $D$  is the diffusivity of oxygen in the solution, how can you show that the current ( $i$ ) produced by the electrode is proportional to the dissolved oxygen concentration ( $C_L$ ) in the bulk liquid. (12)

(c) Explain what is endogenous respiration and flooding in a

3. a) Which enzymes will you use for conversion of cellulosic materials into glucose? Using a fungal strain describe how this enzyme can be produced in a fermenter. Mention the name of the fungal strain. On what factors does the production of this enzyme depend? Explain how pH cycling favours production of this enzyme. (12)

b) State the uses of amylases. (3)

Substrate ( $C_{A0} = 2 \text{ mol/lit}$ ) and enzyme ( $C_{E0} = 0.001 \text{ mol/lit}$ ) are introduced into a batch reactor. They react, conversion is 90% in 4.1 minutes, and the rate equation which represent this behavior is found to be

$$-r_A = 10^3 \frac{C_{E0} C_A}{1 + C_A}$$

It is proposed to build and operate a mixed flow reactor using a continuous feed of substrate ( $C_{A0} = 2 \text{ mol/lit}$ ) with enzyme ( $C_{E0} = 0.001 \text{ mol/lit}$ ). What should be the space time  $T$  to achieve 90% conversion of substrate? (10)