Department of Biochemical Engineering & Biotechnology

Major Examination Sem-II: 2006-07,

BEL-401 (Bioprocess Technology), Slot-E

Date 08.05.2007, Time-1 pm-3 pm, Venue: WS-101

Maximum Marks-50

Q.1 Some yeast strains show greater resistance to high concentration of ethanol in the ethanol production process from molasses. These strains have changed composition of lipid bilayer membrane. Name two components, which are present in the changed lipid bilayer and how do they help in stabilizing the lipid bilayer membrane?

(1+1+1+1=4-marks)

Q.2 In citric acid biosynthesis, by *A.niger*, which anaplerotic reaction occurs and under what condition? Why the concentration of Fe^{++} and Mn^{2+} ions in production medium is critical, and how these are kept under limit when molasses is used as carbon source in production medium. Why the pH of molasses medium is adjusted to 5-7 initially? What is the fermentation requires Zn^{+2} ions

(2+2+2+2+2=10 marks)

Q.3 Name two components, influencing the quality of xanthan gum. Which major factor causes the limitation on oxygen transfer rate in the xanthan gum production? Why the cell growth curve leads the gum production curve? **(1+1+1+7=10-marks)**

Q.4 A fed batch culture is used for production of penicillin-G acylase enzyme using recombinant *E.coli* in a bioreactor (10L maximum working volume). In batch phase, the working volume was 6L and the initial glucose concentration was 1.11 g/L. Following inoculation, at the end of batch phase, 4L of feed medium containing 100g/L glucose and salts was fed, in a programmed manner during the fed-batch phase, to the culture so as to maintain a constant specific growth rate of $0.1h^{-1}$. Assuming a growth yield coefficient ($Y_{X/S}$) of 0.45 and a maintenance coefficient of 0.02:

(a) Derive an expression for feed rate profile with time.
(b) Compute initial and final feed rates in fed-batch phase.
(c) Cell concentration when the total culture volume becomes 10L.

(4+2+2=8 marks)

Q.5 Write down the steps, with reasons, for recovery & purification of the penicillin-G acylase enzyme from the harvested broth. **(1X10=10-marks)**

Q.6 (a) Why the wild type strains do not over produce amino acids?
(b) Write down the pathway for over production of ornithine from glutamate by a mutant of *Cornibaterium glutamicum*.
(c) Name the enzyme at which the mutant will have a block.
(d) Which amino acid will have to be fed in controlled amounts during the fermentation process? and why ? **(2X4=8-marks)**