NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCES

BACHELOR OF SCIENCE HONOURS DEGREE EXAMINATIONS

DEPARTMENT OF APPLIED BIOLOGY AND BIOCHEMISTRY

THEORY: PRINCIPLES OF FERMENTATION TECHNOLOGY SBB 2109

JANUARY 2004

2 HRS 30 MIN. (100 marks)

INSTRUCTIONS

Answer Four (4) Questions. Each question carries 25 marks. Where a question contains subdivisions, the mark value for each subdivision is given in brackets. Illustrate your answer where appropriate with large, clearly labeled diagrams.

1. (a) What are the desirable properties of industrial microorganisms? (7 marks)

   (b) Write short notes on the following:
   (i) lyophilisation as a method of preserving industrial microorganisms. (8 marks)
   (ii) use of mutagenesis and protoplast fusion for improving microbial strains. (10 marks)

2. (a) Discuss the following fermentation substrates with particular reference to their sources, composition and uses in specific fermentations;

   i) corn-steep liquor (6 marks)
   ii) distiller's solubles (5 marks)
   iii) malt (4 marks)
   iv pharmamedia (4 marks)

   (b) Differentiate between defined and undefined media and list the advantages and disadvantages of each. (6 marks)

3. Describe ways for the recovery and purification of fermentation products, focusing on the extraction and concentration of soluble products.

4.(a) Describe and explain the role of the following in fermenters;
   i) impellers
   ii) baffles
   iii) foam separators
   iv) water jackets
   v) air sparger (2 marks each)

   (b) Distinguish between primary and secondary metabolites. ,Illustrate with one example of each of the two categories and state their uses and the microorganisms used in their production. (4 marks)

   (c) Outline the measures taken to ensure the various levels of containment that may be required in fermentation processes. What criteria are used in determining the level of containment? (11 marks)

5.(a) Illustrate the use of solid state, surface, and submerged culture in one named fermentation process. (15 marks)

(b) Compare the three types of fermentations, with respect to requirement for space and labour, process Control and contamination problems. (4 marks)

(c) Define a fed-batch culture and explain its purpose. Describe briefly the methods for achieving a fed-batch culture and name one fermentation process based on the culture method. (6 marks)

6. Describe the use of the following in the treatment of industrial and domestic effluent;
   (a) trickling filter (8 marks)
   (b) activated sludge digestion (8 marks)
   (c) anaerobic sludge digestion (9 marks)

END OF EXAMINATION

even no's