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

DECEMBER 2004

2 1/2 HOURS (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 labelled diagrams.

1.(a) Describe the components or devices used for aeration, agitation, pH and temperature control in an aerobic fermenter. (8 marks)

(b) Explain, with the use of named examples, the relationship between product formation and the growth of microbial cultures in batch, fed-batch and continuous fermentations. (8 marks)

(c) List the criteria that should be met by media for use in industrial fermentations. (5 marks)

(d) Comment briefly on the source, nutritional composition, and potential uses for molasses as a fermentation substrate. (4 marks)

2. Write short notes on the following phenomena or practices, with reference to their relevance in fermentation processes.

(i) ionizing and non-ionizing radiation. (7 marks)

(ii) lyophilisation (5 marks)

(iii) recombinant DNA technology (5 marks)

(iv) screening (4 marks)

(v) scale-up (4 marks)

3. Give a detailed account of the methods and biosynthetic pathways involved in the production of benzyl-penicillin.

.(a) List the factors that are taken into account in selecting extraction methods for the recovery of fermentation products. (5 marks)

(b) Give an outline of the methods that are available for the extraction of intracellular fermentation products from microbial cells. (10 marks)

(c) Describe briefly, each of the following techniques employed in the recovery of soluble products;

(i) reverse osmosis (3 marks)

(ii) ion exchange chromatography (4 marks)

(iii) gel permeation (3 marks)

5. Outline the major steps involved in the production and recovery of citric acid in industrial fermentations.

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6.(a) Define the term 'B.O.D' and explain its significance on the disposal of industrial effluent. (8 marks)

(b) Give a brief account of the principles and major steps in the treatment of effluent by;
(i) trickling filter (8 marks)

(ii) activated sludge digestion (9 marks)

END OF EXAMINATION

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