

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCES
BACHELOR OF SCIENCE HONOURS DEGREE EXAMINATIONS
DEPARTMENT OF APPLIED BIOLOGY AND BIOCHEMISTRY

SUPPLEMENTARY EXAMINATION:
PRINCIPLES OF FERMENTATION TECHNOLOGY SBB 2109

JULY 2005

3 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) Discuss the following, with particular reference to their sources, composition and uses in specific fermentations;
- | | |
|---------------------------|-----------|
| (i) Corn steep liquor | (6 marks) |
| (ii) Distillers' solubles | (5 marks) |
| (iii) Pharmamedia | (4 marks) |
| (iv) Molasses | (4 marks) |
- (b) Differentiate between defined and undefined media, and list the advantages and disadvantages of each. (6 marks)
2. Write brief notes on the following;
- | | |
|---|-----------|
| (a) batch culture | (5 marks) |
| (b) continuous culture | (5 marks) |
| (c) protoplast fision | (4 marks) |
| (d) preservation of inocula | (7 marks) |
| (e) genetic improvement of cultures by mutagenesis with non-ionizing radiation. | (4 marks) |
- 3.(a) Describe and explain the role of the following in fermenters;
- | | |
|-----------------------|----------------|
| (i) impellers | (2 marks each) |
| (ii) baffles | |
| (iii) foam separators | |
| (iv) water jackets | |
| (v) air sparger | |
- (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 achieve the various levels of containment that may be required in fermentation processes. What criteria are used in determining the level of containment? (11 marks)
4. Describe the various methods for the recovery and purification of fermentation products, focusing on the extraction and concentration of extracellular products.

- 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 contrast with batch and continuous culture methods. (6 marks)
6. Describe in detail, three fermentative procedures used in the pre-treatment of industrial and domestic effluent before disposal.

END OF EXAMINATION