NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF APPLIED BIOLOGY AND BIOCHEMISTRY

BACHELOR OF SCIENCE HONOURS DEGREE

ENZYME BIOTECHNOLOGY SBB 4202

MAY 2011
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**

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1. (a) List in a tabular form the applications of any four industrial enzymes **(excluding pectin degrading enzymes)** and four analytical enzymes, indicating the sources of the enzymes and the reactions they catalyze. (15 marks)

(b) Briefly explain four degrees of bioprocessing in a generalized downstream processing of an enzyme/biochemical. **(10 marks)**

2. (a) (i) Define the term "enzyme immobilization" and describe the benefits of enzyme immobilization. **(7 marks)**

(ii) List the methods employed in the immobilization of enzymes, bacteria or cells. **(6 marks)**

(b) Write equations showing the chemical reactions for the cyanogen bromide (CNBr), carbodiimide and 3-aminopropyltriethoxysilane methods of binding enzymes to solid support matrix. **(12 marks)**

3. (a) Briefly describe the insect cell-based systems and indicate the merits and challenges of using this expression system in the production of a biochemical. **(15 marks)**

(b) Describe the advantages and disadvantages of using *E. coli*-based expression systems in the production of recombinant products. **(10 marks)**

4. (a) Describe the application of urokinase in the management of named medical disorders, highlighting the source, purification and challenges encountered in the use of the therapeutic agent. **(15 marks)**

(b) Explain the process of defridement with respect to trypsin, papain collagenase and chymotrypsin, briefly indicating the characteristic and sources of these proteases. **(10 marks)**

5. (a) Briefly outline the molecular architecture of fibrinokinase (tPA) and describe the tPA mediated thrombolytic cascade. **(15 marks)**

(b) Give an overview of the stages in production and purification of a named modified tPA product. **(10 marks)**

6. (a) (i) Briefly describe the classes, names, distribution and mode of action of pectic enzymes. **(8 marks)**

(ii) Give a detailed account of the industrial application of pectin and pectin degrading enzymes. **(9 marks)**

(b) Describe the concept and application of a mobile hetero-bifunctional ligand and include in your answer an illustrative diagram. **(7 marks)**

END OF EXAMINATION