NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCES

BACHELOR OF SCIENCE (HONOURS) DEGREE EXAMINATIONS

DEPARTMENT OF APPLIED BIOLOGY AND BIOCHEMISTRY

THEORY: ENZYME BIOTECHNOLOGY SBB4202

May 2006

3 HOURS (100 marks)

INSTRUCTIONS

Answer **four** (4) questions only. 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. The gene encoding the type I pullulanase from the extremely thermophilic anaerobic bacterium *Fervidobacterium pennavorans* Ven5 was cloned and sequenced in *Escherichia coli*.
    a. Describe how the recombinant extract was made; indicating how overexpression was ensured. (15 marks)
    b. How could recombinant pullulanase be commercially utilized in Zimbabwe? (10 marks)

2. A protein of interest may be synthesized in very small amounts in a cell. Various forms of chromatography are important tools in the isolation/purification of such proteins.
    a. Explain the principles involved in affinity chromatography. (20 marks)
    b. What is the major advantage of affinity chromatography? (1 mark)
    c. What is immunoaffinity chromatography? (2 marks)
    d. Name one advantage and one disadvantage of immunoaffinity chromatography. (2 marks)

3. Milk-fed calves used to be butchered and the fourth stomach removed and processed for the extraction of rennin.
    a. Give a summary of the steps in the manufacture of cheese with special reference to the role of rennin. (5 marks)
    b. Describe the development of recombinant pre-prorennin, prorennin and rennin. (20 marks)

4. Discuss methods of enzyme immobilization and its advantages and disadvantages.

5. The field of biosensors is increasingly becoming important as new devices are developed. Discuss the theory and development of biosensors with reference to the example(s) you studied.

6. If you had to design your own ‘new and improved’ detergent powder, discuss what enzymes you would include and why; indicating any special precautions you would need to take with some enzymes.

END OF EXAMINATION

END OF EXAMINATION