NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCES

BACHELOR OF SCIENCE HONOURS DEGREE EXAMINATIONS

DEPARTMENT OF APPLIED BIOLOGY AND BIOCHEMISTRY

THEORY: INTRODUCTION TO ENZYMOLOGY AND IMMUNOLOGY SBB 2104

JANUARY 2004

3 HOURS (100 marks)

INSTRUCTIONS

Answer Four (4) questions, **two (2) question from Section A and two (2) from Section** B. 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.

SECTION A

1.(a) (i) "The pH optima within a class of enzymes catalyzing very similar reaction may be different" Is this true? (5 marks)

(ii) Describe an experiment which may demonstrate the above statement. (Details of volumes etc are not required) (10 marks)

(b) How would you describe the activity of an enzyme with the E.C. code number of 4.1.1.8. (5 marks)

(c) Define the term "energy of activation" of a reaction and describe how this is affected by an enzyme. (5 marks)

2.(a) Write notes on how enzyme amounts are expressed. In your answer include reason why enzyme amounts are not expressed in grams or moles. (10 marks)

(a) Write a short essay on feedback inhibition as a method of regulating enzyme activity. (15 marks)

3.(a) (i) If substrate concentrations are expressed in moles per litre and reaction rates in seconds, what are the units of the rate constant for a first order reaction? (2 marks)

(ii) For a reaction $E + S \rightleftharpoons ES \rightarrow P$, write, rate equations for ES formation and P formation. (3 marks)

(b) Distinguish between the following:

(i) uncompetitive inhibitor and non-competitive inhibitor. (2 marks)

(ii) product inhibition and endproduct inhibition (2 marks)

(iii) reversible covalent modification and irreversible covalent modification (2 marks)

(iv) apoenzyme and holoenzyme (2 marks)

(c) Five tubes containing 1µg/ml enzyme and 0.2 µmole of a competitive inhibitor. The substrate concentration were varied as shown in the table below. These tubes were incubated and initial rates determined. The K_m of the enzyme when incubated with substrate only was found to be 2.5 x to^{-4}M.

Substrate Concentration (mM)	Reaction Rate with Inhibitor (µmole S converted/minute)
0.1	18
0.15	24
0.20	30
0.50	51
0.75	63
0.76	

(i) Determine graphically V_{max} and K_{mapp} of the inhibited reaction. (3 marks)

(ii) Draw the Lineweaver Burk plot of the unhibited reaction and determine the velocity of the unhibited reaction at a substrate concentration of 0.50mM. (10 marks)

SECTION B

4. Discuss the comparative features of innate and acquired immunity high lighting their integrated response to the introduction of a foreign molecule into a host.

5. Discuss the main tenets of the clonal selection theory and some experimental evidence that supports it to date.

6. Describe the functional features of the immunoglobulin superfamily.

END OF EXAMINATION

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