

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCES

BACHELOR OF SCIENCE HONOURS DEGREE EXAMINATIONS

DEPARTMENT OF APPLIED BIOLOGY AND BIOCHEMISTRY

SUPPLEMENTARY EXAMINATION

INTRODUCTION TO ENZYMOLOGY AND IMMUNOLOGY SBB 1204

AUGUST 2004

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.

SECTION A

Write an essay on how enzyme activity can be regulated. (25 marks)

1.(a) The data below were obtained from an enzyme-catalyzed reaction in the presence and absence of an inhibitor, Y.

[S] Mm	V_o mmol/ml/min	
	Without Y	With Y
0.2	5.0	2.0
0.4	7.5	3.0
0.8	10.0	4.0
1.0	10.7	4.3
2.0	12.5	5.0
4.0	13.6	5.5

- (i) Graphically determine V_{max} and K_m with and without Y using the Lineweaver-Burk plot. (4 marks)
- (ii) What kind of inhibitor is Y? (1 mark)
- (iii) Does Y combine with E, with ES or both? Explain. (5 marks)
- 2.(b) Distinguish between the following:-
- (i) one katal and one international enzyme unit. (2 marks)
- (ii) coenzyme and apoenzyme (2 marks)
- (iii) V_o and V_{max} as used in enzyme kinetics. (2 marks)
- (iv) Suicide inhibitor and irreversible inhibitor (2 marks)
- (v) $[S]_{0.5}$ and K_m (2 marks)
- 3.(c) The Lineweaver-Burk plot and the Dixon plot can be used to determine the inhibitor constants (K_i) for both competitive and non-competitive inhibitors. With the aid of diagrams, briefly discuss how this can be done. (5 marks)
- 4.(a) Sketch diagnostic plots for sequential (single displacement) and ping-pong (double displacement) mechanisms for a bi-substrate enzyme-catalyzed reaction. (6 marks)
- (b) Describe the sequential model as proposed by Koshland, Nemeny and Filmer to explain enzyme allostery. (15 marks)
- (c) Briefly explain how the velocity of an enzyme catalysed reaction is affected by:- (2 marks)
- (i) pH
- (ii) enzyme concentration

SECTION B

Discuss the comparative features of innate and acquired immunity highlighting their integrated response to the introduction of a foreign molecule or microbe into a host.

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

Describe the functional features of the Immunoglobulin superfamily.

END OF EXAMINATION PAPER