



# Technical University of Mombasa

Faculty of Applied and Health Sciences

## DEPARTMENT OF PURE AND APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF  
TECHNOLOGY IN INDUSTRIAL MICROBIOLOGY AND BIOTECHNOLOGY  
BTMBT 11M

### ABT 4308: PROTEIN & ENZYMES II

SEMESTER EXAMINATION

DECEMBER 2013 SERIES

2 HOURS

Instructions to candidates:

This paper consist of **FIVE** questions

Answer question **ONE** (compulsory) and any other **TWO** questions

#### QUESTION ONE

a) Define the following terminologies as used in enzyme kinetics

- (i) Initial rate
- (ii)  $V_{max}$
- (iii) Rate equation

(@ 1mark)

b) Illustrate the following chemical inhibitors

- (i) N-Ethylmaleimide as a cysteine inhibitor
- (ii) Diazo-1, 4-tetrazole as a histidine inhibitor

(@ 2marks)

c) Explain the significances of  $K_m$

(3marks)

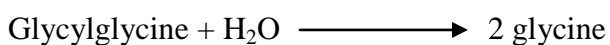
- d) Define Borh Effect (2 marks)
- e) Outline the physiological differences between hemoglobin and myoglobin. (5 marks)
- f) Explain the enzyme active center. (5 marks)
- g) State TWO functions of myoglobin (2 marks)
- h) Use the Michaelis – Menten equation to solve the following:
- (a) When  $V_{max} = 100\mu\text{MS}^{-1}$ , and  $K_m = 10\ \mu\text{M}$ . How much does  $V_o$  increase when substrate concentration [s] is doubled from 0.2 to 0.4 $\mu\text{M}$ . (4 marks)
- (b) Calculate  $V_o$  when substrate concentration [s] = 10 $\mu\text{M}$  (2 marks)

## QUESTION TWO

- a) Write a reaction scheme for the complete non-competitive inhibition. (3 marks)
- b) Derive an initial rate-equation showing the effect of complete non-competitive inhibitor on  $V_{max}$  of a unisubstrate reaction. (7 marks)
- c) Distinguish between Hanes and Woolf-Hoftee plots. (10 marks)

## QUESTION THREE

- a) The following experimental data were collected during a study of the catalytic activity of peptidase with the substrate glycyglycine.



[S] (mM)	$V_o$ ( $\mu\text{mol}/\text{min}$ )
1.5	0.21
2.0	0.24
3.0	0.28
4.0	0.33
8.0	0.40
16.0	0.45

Use graphical analysis to determine the  $K_m$  and  $V_{max}$  for this enzyme preparation and substrate. (10 marks)

- b) Briefly explain the biochemistry of myoglobin (10 marks)

#### **QUESTION FOUR**

- a) Explain FIVE ways by which enzyme lower their activation energy (10 marks)
- b) Describe the mechanism of catalysis of a Zinc protease such as carboxyl peptidase A. (10 marks)

#### **QUESTION FIVE**

- a) Explain the mechanisms of action of chymotrypsin (15 marks)
- b) Explain the structural basis for the allosteric effect of hemoglobin. (5 marks)