KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2008/2009

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF PHARMACY

HMB 110: BIOCHEMISTRY

DATE: Wednesday, 1st April, 2009 TIME: 11.00 a.m. – 1.00 p.m.

SECTION A: Answer any **2** questions (20 marks each)

Q.1 a) Salicylate inhibits the catalytic action of glutamate dehydrogenase.

From the following data:-

i) Determine the type of inhibition by graphical analysis of the data.

ii) Calculate the Km for the substrate

iii) The Ki, the dissociation constant for the enzyme – inhibitor complex.

Assume that the salicylate concentration is held constant at 20mM.

Either or both of the equations below may be necessary.

$$Km^1 = Km\left(1+\frac{[1]}{Ki}\right) \qquad V_{max}{}^1 = \frac{V\max}{\left(1+\frac{[1]}{Ki}\right)}$$

Substance Concentration	Product per minute, mg	
MM	without salicylate	with salicylate
1.5	0.21	0.08
2.0	0.25	0.10
3.0	0.28	0.12
4.0	0.33	0.13
8.0	0.44	0.16
16.0	0.40	0.18

(12 marks)

b) Considering a single substrate enzyme – catalyzed reaction, derive an expression $V = \frac{V\max[S]}{Km+[S]}$

What assumptions have you made to arrive at the equation. (6 marks)

c) Calculate the relationship of Km to [S] when an enzyme catalyzed reaction is operating at 80% of the maximum velocity. (2 marks)

Q.2 a) How does the concept proposed by Arrhenius Bronsted – Lowry & Lewis explain acids and bases? (10 marks)

b) The dissociation constant of two weak acids formic and acetic acid are 21.4×10^{-5} and 1.81×10^{-5} respectively.
Derive a relevant expression and use it to calculate the relative strength of these acids. (10 marks)

Q.3 a) i) Given that Lactic acid (HA) is a weak and dissociates into H^+ and A^-, derive the Henderson-Hasselbalch equation. (6 marks)

ii) Calculate the pKa of lactic acid, given that when the concentration of lactic acid is 0.010M and the concentration of lactate is 0.087 M, the pH is 4.80. (2 marks)

iii) Calculate the ratio of the concentrations of acetate and acetic acid required in a buffer system of pH 5.30. (The pKa of acetic acid is 4.76). (2 marks)

b) Describe and explain the Bicarbonate buffer system that exists between the blood in capillaries and the lung air spaces. (10 marks)

SECTION B:

Answer **ALL** questions: (10 marks each)

Q.4 Indicate the structures and functions of the following biomolecules.

i) Vitamin A

ii) cAMP

iii) Cortisol

iv) Cysteine

v) D-glucose (10 marks)

Q.5 Describe co-operatively in the binding of haemoglobin for oxygen as model for allosteric control of enzymes. (10 marks)

Q.6 a) Distinguish between hydrophobic interactions and van der waals forces. (4 marks)

b) Write briefly on three important properties of water that makes it an ideal medium for living organisms. (6 marks)