Bms/22/13/0162

OLABISI ONABANJO UNIVERSITY
DEPARTMENT OF BIOCHEMISTRY
2013/2014 RAIN SEMESTER EXAMINATION

COURSE CODE: BCH 302 **TIME ALLOWED: 3 HOURS**

COURSE TITLE: ENZYMOLOGY **DATE: MONDAY, 9TH FEB, 2015**

INSTRUCTION: Answer all questions from SECTION A and three (3) questions only from SECTION B.

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SECTION A

Answer all questions

BCH 302 TUTORIALS

1. The following experimental data were collected during a study of the catalytic activity of an intestinal peptidase with the substrate glycylglycine:

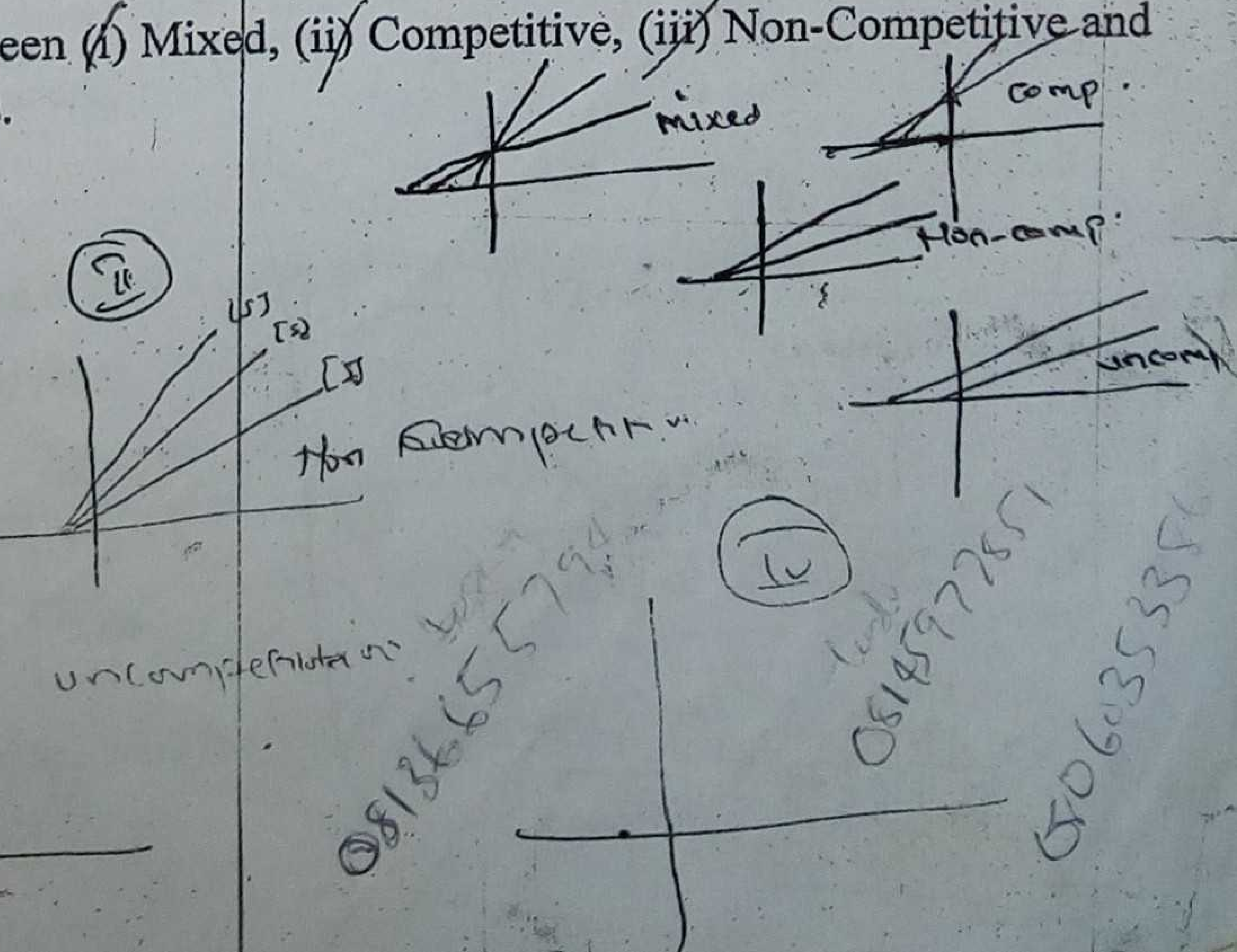
Glycylglycine + H_2O ----------- 2 glycine

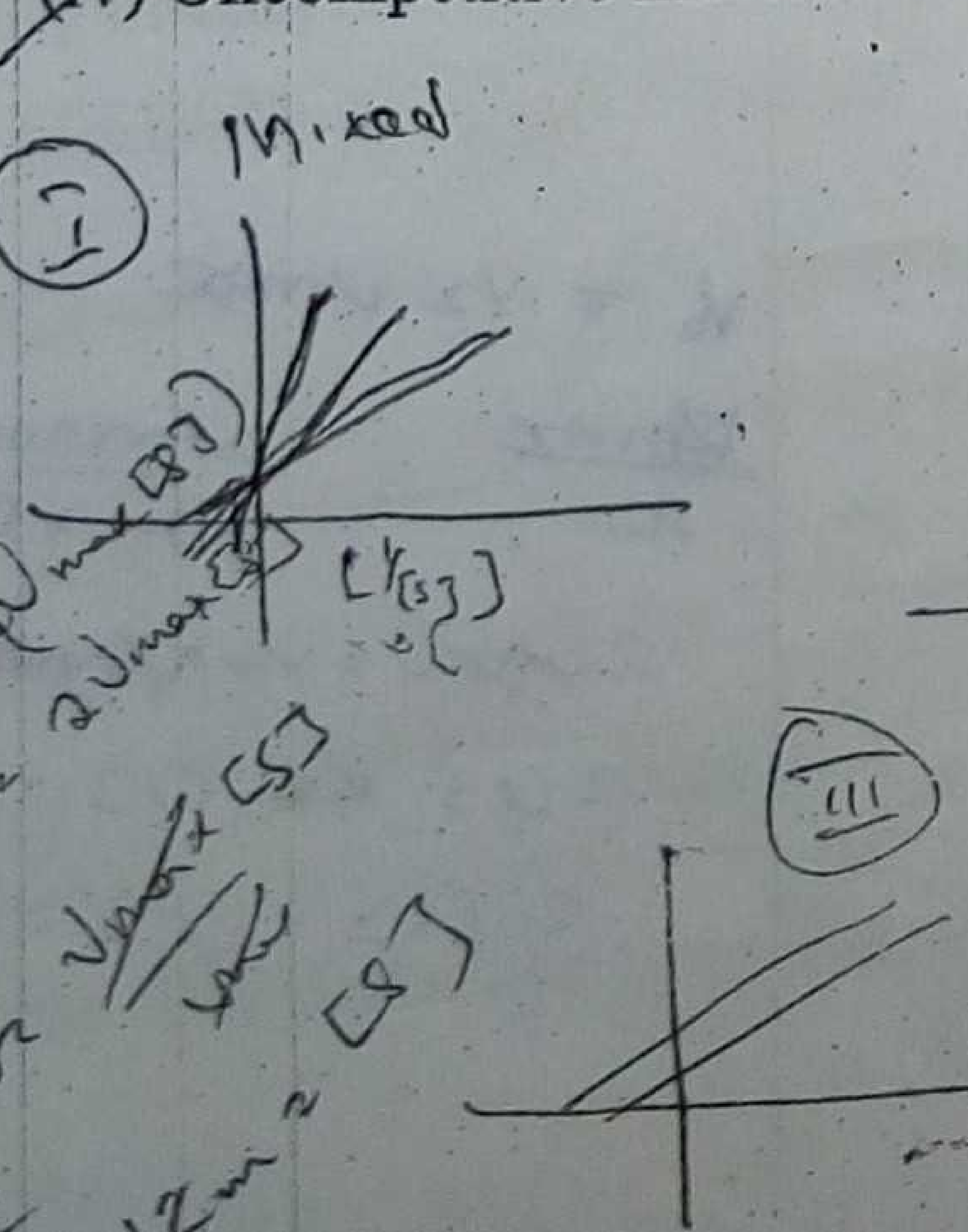
[S] (mM)	Product formed (µmol/min)
1.5 = 0.67	0.21 = 4.76
2.0 = 0.50	0.24 = 4.17
3.0 = 0.33	0.28 = 3.57
4.0 = 0.25	0.33 = 3.03
8.0 = 0.13	0.40 = 2.50
16.0 = 0.06	0.45 = 2.22

Use graphical analysis to determine the K_m and V_{max} for this enzyme preparation and substrate.

2. (a) With the Michaelis and Menten's postulation, briefly explain the steady state kinetics.
(b) From the Michaelis-Menten equation, prove that $K_M = [S]$ at ½Vmax.
(c) Derive the Lineweaver-Burk equation from the Michaelis-Menten equation.
(d) How do you determine the K_M and V_{max} of an Enzyme?

3. Graphically differentiate between (i) Mixed, (ii) Competitive, (iii) Non-Competitive and (iv) Uncompetitive inhibitions.





SECTION B

Answer three (3) questions only

4. (a) Write a short note on the kinetics of allosteric enzyme.

   (b) Explain the models of allosterism.

5. (a) In order for a reaction to occur, reactant molecules must contain sufficient energy to cross a potential energy barrier, the activation energy. Explain this in line with catalysis.

   (b) Explain the models of enzyme binding. ⇒ induced fit model, lock & key model

   (c) Why is the Induced-fit model preferable to the Lock and Key model?

6. (a) Justify the necessity for the classification and nomenclature of enzymes.

   (b) How are enzymes named and classified? Give examples.

7. (a) Enumerate the steps involved in isolating and purifying enzymes to homogeneity.

   (b) Explain (i) Continuous (ii) Discontinuous (iii) Direct and (iv) Coupled Enzyme Assay.

$$\frac{V_0}{V_{max}} = \frac{[S]V_{max}}{K_m + [S]}$$

$y = mx + c$ — (1)

Invert the equation

$$\frac{V_{max}}{V_0} = \frac{[S]V_{max}}{K_m + [S]} \cdot \frac{K_m + [S]}{[S]V_{max}} \quad (2)$$

Divide thru by V_{max}

$$\frac{V_{max}}{V_0 V_{max}} = \frac{[S]V_{max}}{K_m + [S]} \quad (3)$$

$$\frac{1}{V_0} = \frac{[S]V_{max}}{K_m + [S]} \quad (4)$$

Divide through by $\frac{1}{..}$

$$\frac{1}{V_0} = \frac{1}{[S]V_{max}} + (K_m + [S]) \quad (5)$$

$$\frac{1}{V_0} = \frac{K_m}{[S]V_{max}} + \frac{[S]}{[S]V_{max}}$$

(5a) $E + S \underset{K_{-1}}{\overset{K_1}{\rightleftharpoons}} ES \xrightarrow{K_2} E + P$

(6b) Oxido-Reductase; e.g. oxidative rxn

Transferase; Transfer of functional group e.g. methyl, formyl.

Hydrolase; catalysing a rxn by hydrolysis thereby affecting the hydrophilic & hydrophobic part of an enz

lyase;

Isomerase; changes the isomerization of a molecule e.g. lactose

$V_0 = 1/2\ V_{max}$

$$\frac{V_{max}}{2} = \frac{V_{max}}{K_m + [S]}$$

$2V_{max} = V_0$ ~~...~~ $[S]$

$2[S]\ K_m\ [S]$

$2[S] - [S] = K_m$