

CHUKA



UNIVERSITY

UNIVERSITY SUPPLEMENTARY/SPECIAL EXAMINATIONS.

SECOND YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN BIOCHEMISTRY.

BIOC 204: INTRODUCTION TO AMINO ACIDS AND PROTEINS

STREAMS:

TIME: 2 HOURS

DAY/DATE: WEDNESDAY 12/09/2018

8.30 A.M -10.30 A.M

INSTRUCTIONS

- Answer question **ONE (COMPULSORY)** and any other **TWO** questions.
- Sketch diagrams may be used whenever they may help to illustrate your answer.
- Do not write anything on the question paper.
- This is a closed book exam. **No** reference materials are allowed in the examination room.
- There will be **No** use of mobile phones or any other unauthorized materials.

QUESTION ONE [30 MARKS]

- a Identify the polar amino acids, the aromatic amino acids and the sulfur containing amino acids, given a peptide with the following amino acid sequence [9 Marks]

Val – Met – Ser – Ile – Phe – Arg – Cys – Tyr – Leu

- b With a use of a suitable diagram, name and illustrate the amino acid in which the R group contains the following [10 Marks]
- i Hydroxyl group
  - ii A sulfur atom
  - iii An aromatic ring
  - iv An amide group
  - v An amino group

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- c Sketch a titration curve for aspartic acid and indicate the pKa values of all of all titratable groups.also indicate the pH range in which the conjugate acid base pair +1 Asp and 0 Asp will act as a buffer [8 Marks]
- d Indicate the level(s) of protein structure to which each of the following contributes [3 Marks]
- i Amino acid sequence
  - ii  $\beta$ -pleated sheet
  - iii hydrogen bond

### QUESTION TWO [20 MARKS]

- a. What are the sequences of all the possible tripeptides that contain the amino acids aspartic acid, leucine, and phenylalanine? Use the three letter abbreviations to express your answer [9 Marks]
- b. Briefly describe the differences between the  $\alpha$  – helix and  $\beta$  – sheet forms of protein secondary structure [6 Marks]
- c. Briefly discuss the physiologic function of protein in human body [5 Marks]

### QUESTION THREE [20 MARKS]

- a. Differentiate the following terms in each pair below [6 Marks]
- i. Globular and fibrous proteins
  - ii. Simple and conjugated proteins
  - iii. Apoprotein and holoproteins
- b. What is the expected net ionic charge at neutral pH for the peptide Tyr – Lys – Cys – Ala – Asp – His – Gly? [6 Marks]
- (c) Denaturation is the loss of protein function from structural change or chemical reaction. At what level of protein structure or through what chemical reactions does each of the following denaturation agents acts? [8 Marks]
- i. Heat
  - ii. Strong acid
  - iii. Saturated salt solution
  - iv. Organic solvents (e.g alcohol or chloroform)

### QUESTION FOUR [20 MARKS]

- a. Discuss primary, secondary, tertiary and quaternary structures of proteins [8 Marks]

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- b. Arginine has the following  $pK_a$  values:  $pK_1 = 2.17$ ,  $pK_2 = 9.04$   $pK_R = 12.48$  what is the structure and net charge of arginine at the following pH values? 1, 4, 7, 10 and 12. [10 Marks]
- c. With suitable examples, differentiate essential amino acids from non-essential amino acid [2 Marks]
- .....