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 APPLIED CHEMISTRY

ACH 4212 : CHEMISTRY OF CARBOHYDRATES & PROTEINS

SPECIAL/SUPPLEMENTARY EXAMINATION

FEBRUARY 2013 SERIES 2 HOURS

Instructions to candidates:

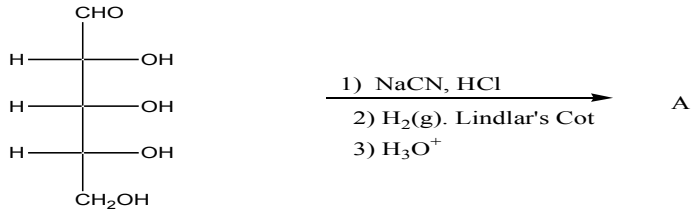
This paper consist of **FIVE** questions
Answer question **ONE** (compulsory) and any other **TWO** questions

Question ONE

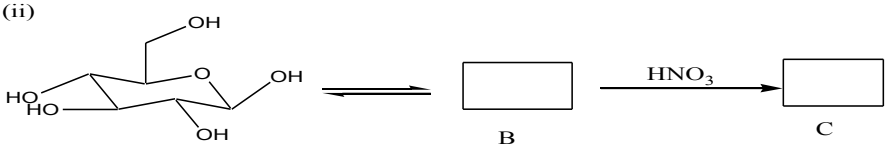
a) Using relevant examples differentiate between epimers and enantiomers. (4marks)

b) Draw the structures of the product or reactants in the following reactions. **(8marks)**

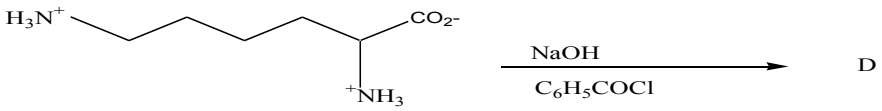
(i)



(ii)



(iii)



c) (i) Draw the structure of a tetra peptide glycyl-phenyl-alanyl-alanine **(4marks)**

(ii) Describe the process of mutarotation using glucose as an example. **(4marks)**

d) Determine the sequence of the following heptapeptide given the following experimental results **(10marks)**

(i) Amino acid analysis of the heptapeptide revealed that the original peptide was composed of: R,V,Y,E,K,A and G.

(ii) Reaction of the heptapeptide with Dansyl-cl and acid hydrolysis gave Dansyl-A

- Carboxypeptidase gave G as the first detectable amino acid
- Trypsin gave free R, a dipeptide (A-K) and a tetrapeptide containing E,G,Y and V.
- Digestion of the tetrapeptide above (derived from the trypsin digestion above) with chymotrypsin gave two dipeptides: V-Y and E-G
- Pepsin gave a tetrapeptide and a tripeptide (Y-E-G)

Question TWO

a) State any FOUR functions of carbohydrates **(4marks)**

b) Draw the Haworth and Fischer projection of β-D-Fructose

(i) Circle the anomeric carbon **(7marks)**

(ii) Determine the number of possible stereoisomers

c) Differentiate between essential and non-essential amino acid giving an example in each

case. **(4marks)**

d) Rate the following amino acid in decreasing order of migration towards the cathode when separated by electrophonesis in a solution of pH = 7.3 **(5marks)**

I) Lysine : PI = 9.87

II) Alanine : PI = 6.02

III) Aspartate : PI = 5.95

Question THREE

a) Discuss the classification of monosaccharide giving an example in each class **(12marks)**

b) State the factors that influence the conformational equilibrium of peptides chains.

(4marks)

c) List any FOUR biological functions of proteins **(4marks)**

Question FOUR

a) Draw a partial structural formula of Amylose (four monsacchade units) and discuss its physical characteristics **(10marks)**

b) State any form properties of proteins **(4marks)**

c) The following peptides are subjected to normal electrophoretice analysis at pH = 6.0. State whether the peptides will migrate towards the cathode or anode and predict the relative rate of migration of each peptide **(6marks)**

(i) Gly.Arg

(ii) Phe.Gly.Arg

(iii) Phe.Glu.Glu

(iv) Phe.Gly. Glu

Question FIVE

a) Describe the FOUR levels of protein structure **(8marks)**

b) (i) Enzymer do not operate at full activity at all times. Give TWO different examples of how the activity of enzymes is regulated in the body. **(4marks)**

(ii) Is all enzyme inhibition reversible? Briefly explain your answer. **(2marks)**

c) The following question relate to the amino acid alanine (Ala) –Show the structure of alanine at each of the pH conditions below: **(6marks)**

(i) As a Zwitterion

(ii) At very low pH (<1)

(iii) At very high pH (>12)