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KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2017/2018 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER
MAIN EXAMINATIONS

FOR THE DEGREE OF BSC (CHEMISTRY)

COURSE CODE: SCH 232

COURSE TITLE: CHEMISTRY OF BIOMOLECULES

DURATION: 2 HOURS

DATE: 27/7/2018 **TIME:** 9-11AM

INSTRUCTIONS TO CANDIDATES

- Answer **QUESTION ONE** (Compulsory) and any other two (2) Questions.
- Indicate **answered questions** on the front cover.
- Start every question on a new page and make sure question's number is written on each page.

This paper consists of 4 printed pages. Please Turn Over



KIBU observes ZERO tolerance to examination cheating

QUESTION ONE [30 MARKS]

a) Define the following terms

(5 marks)

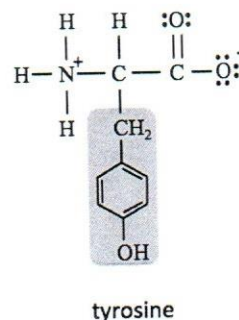
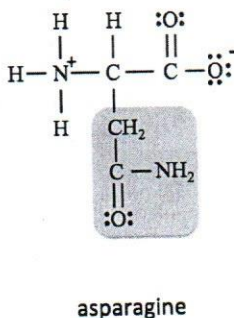
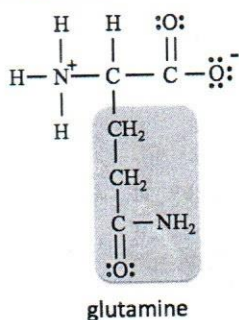
- i) Carbohydrate
- ii) Enzymes
- iii. Nucleotide
- iii. Anomers
- iv. Chiral carbon
- v. Cofactors

bi) Carbohydrates can be divided into three groups, namely.

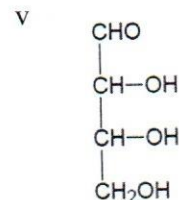
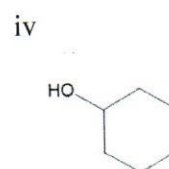
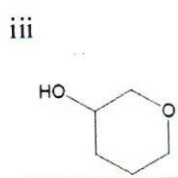
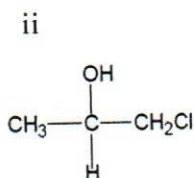
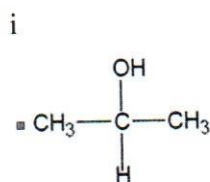
(3 marks)

ii) Give an example in each case (3 marks)

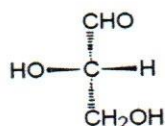
c) The following proteins can be separated using gel filtration chromatography. Explain the order of elution. (3 marks)



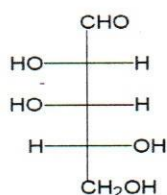
d) Identify the chiral carbons by putting an asterick (*) against it in the following. (4 marks)



e) You are provided with the structure of glyceraldehyde. Draw the Fischer projection of D-glyceraldehyde and L-glyceraldehyde. (4 marks)



f) Carefully study the structure of lyxose below and answer the questions that follow.



- i) Identify whether compound is a D or L isomer. **(1 mark)**
- ii) Draw mirror image of the compound and indicate whether it is a D or L isomer. **(2 marks)**
- iii) How many isomers will the compound above have? **(1 mark)**
- iv) Which direction will the mirror image of lyxose drawn above rotate plane polarised light? Explain. **(2 marks)**
- g) Draw the Haworth projections and chair conformation of an β -D-glucose. **(2 marks)**

QUESTION TWO [20 MARKS]

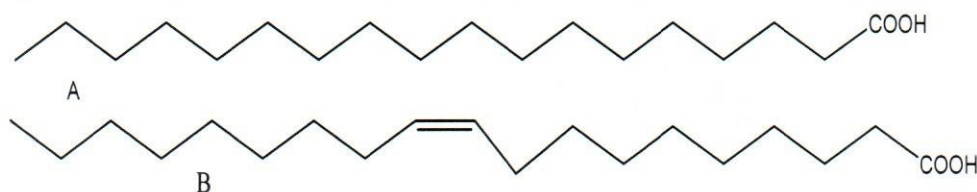
- a) Draw and name three nonpolar amino acids giving their short names abbreviation. **(6 marks)**
- b) Discuss the four interactions in protein structure **(8 marks)**
- i. Hydrophobic Interactions
 - ii. Hydrogen Bonding
 - iii. Salt Bridges
 - iv. Dipole-dipole attractive forces
- c) Explain differential precipitation as an isolation method of protein purification. **(6 marks)**

QUESTION THREE [20 MARKS]

- a) Discuss the role of cell lysis and enzymatic treatment during isolation of nucleic acids.
- i. Cell lysis: **(3 marks)**
 - ii. Enzymatic treatment: **(3 marks)**
- b) Outline the main function of the following macro molecules and indicate in which organism each substance is found: **(6 marks)**
- i) Collagen
 - ii) Cellulose
 - iii) Starch

c) Elaborate the difference among these bonds; a glycosidic bond, peptide bond and a phosphodiester bond **(6 marks)**

d) The boiling point of the fatty acid (A) in the figure below is higher than that of (B). **(2 marks)**



QUESTION FOUR [20 MARKS]

ai) Outline the similarities between amylose and amylopectin. **(3 marks)**

ii) State their structural differences with the aid of a diagram show this concept. **(8 marks)**

b) Unsaturated triglyceride is converted to a saturated triglyceride by reaction with hydrogen in the presence of a catalyst. Draw and explain why the structures of the product formed when H_2 was in limited supply and when it was excess are different. **(4 marks)**

c) To determine the enzyme activity of acetyl choline esterase in the reaction acetylthiocholine \rightarrow thiocholine + acetate (catalyzed by ACHE) and thiocholine + DTNB \rightarrow 5TNB + oxidized thiocholine, in a sample with a protein concentration of 0.34 mg/ml, 30 μ l of the sample are added to a cuvette in final volume of 1 ml containing all the necessary substrates. The A_{405} increases from 0.015 to 0.287 in 10 minutes. The A_{405} of a blank containing all the same reagents except the protein sample goes from 0.014 to 0.073 in 10 minutes. The ϵ_{405} for 5TNB is $13.3 \times 10^3 \text{ litcm}^{-1} \text{mol}^{-1}$. Use this information to answer the questions that follow.

i) Plot a graph for the data from the spectrophotometer. **(2 marks)**

ii) Determine the enzyme activity in the reaction. **(3 marks)**

QUESTION FIVE [20 MARKS]

a) Coenzymes can be termed as holoenzymes or apoenzymes. What is the meaning of these terms?

(4 marks)

b) Discuss five broad classes used to categorize enzymes **(10 marks)**

c) What are the factors that affect catalytic activity of enzymes? **(6 marks)**