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KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2015/2016 ACADEMIC YEAR

FIRST YEAR SECOND SEMESTER
MAIN EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF SCIENCE DEGREE

COURSE CODE: SCH 232

COURSE TITLE: CHEMISTRY OF BIOMOLECULES

DURATION: 2 HOURS

DATE: FRIDAY 29TH APRIL 2016 **TIME:** 8 – 10AM

INSTRUCTIONS TO CANDIDATES

- Answer ALL 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 5 printed pages. Please Turn Over

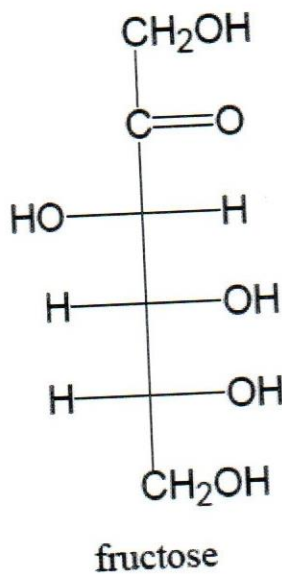
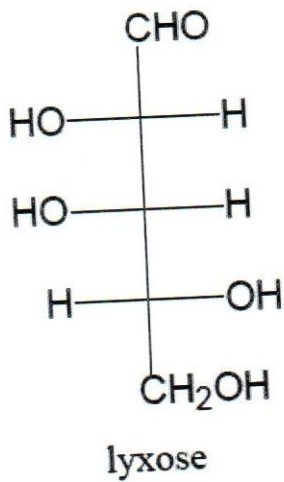


KIBU observes ZERO tolerance to examination cheating

REQUIREMENTS: Calculator, graph paper.

QUESTION ONE [14 MARKS]

- a. Outline three properties of biomacromolecules: **(3 marks)**
- b. Giving an example in each case differentiate the following terms: **(4 marks)**
- Saturated and monounsaturated fatty acids
 - Isomerases and ligases
- c. Identify the following compounds as D or L isomers, draw and label their mirror images as D or L isomers. **(4 marks)**



- d. Briefly explain how antibodies act as protective agents. **(3 marks)**

QUESTION TWO [14 MARKS]

- a. Outline the main function of the following macro molecules and indicate in which organism each substance is found: **(4 marks)**
- Collagen
 - Cellulose
 - Starch

- b. Dehydrogenase activities are easily measured in spectrophotometric assays because of strong absorbance of reduced flavin nucleotides (NADH and NADPH) at 340 nm as compared to the oxidized nucleotides (NAD⁺, NADP⁺). The ϵ_{340} of either NADH or NADPH is 6.22×10^3 liter/cm·mole. Calculate the amount of glutamate dehydrogenase (GDH) activity expressed in μ moles glutamate formed per min per mg protein using the following reaction parameters: the protein concentration in the sample is 0.23 mg/ml; 0.01 ml of sample was measured the final cuvette volume was 1 ml; the A_{340} decreased from 0.60 to 0.52 in 10 minutes; and the A_{340} of a blank (containing no enzyme) decrease from 0.60 to 0.59 in 10 minutes. GDH catalyzes the following reaction: α -ketoglutarate + NH₄⁺ + NADPH \leftrightarrow glutamate + NADP⁺

[5 marks]

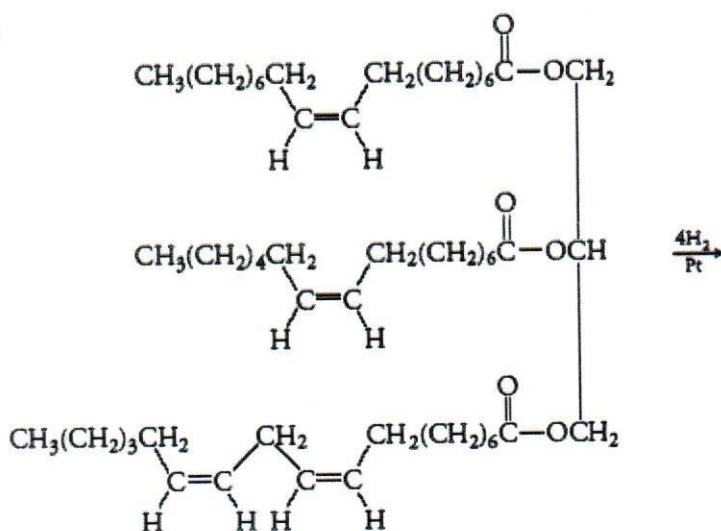
- c. Draw a flow diagram showing the basic components of high performance liquid chromatograph.

[5 marks]

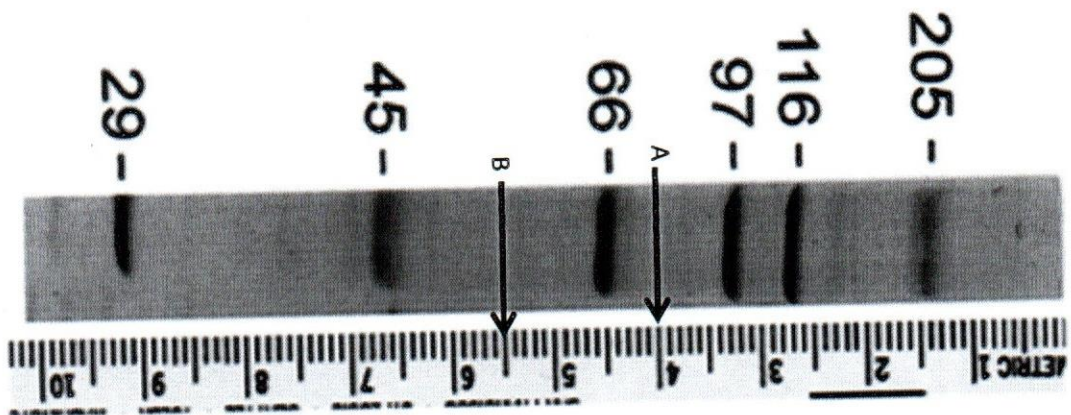
QUESTION THREE [14 MARKS]

- a. 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 H₂ was in limited supply and when it was excess are different.

(4 marks)



- b. In gel electrophoresis, molecular masses of proteins can be estimated by comparing the migration (relative mobility or Rf) of proteins of interest to standards of known size. You are provided with the following diagram showing the migration of proteins with different molecular weight on a gel. Two proteins samples (A and B) were separated under similar conditions and their migration distances are indicated on the gel. Showing the steps involved, determine the molecular weight of A and B. NB: MW is given in x1000 daltons. (10 marks)



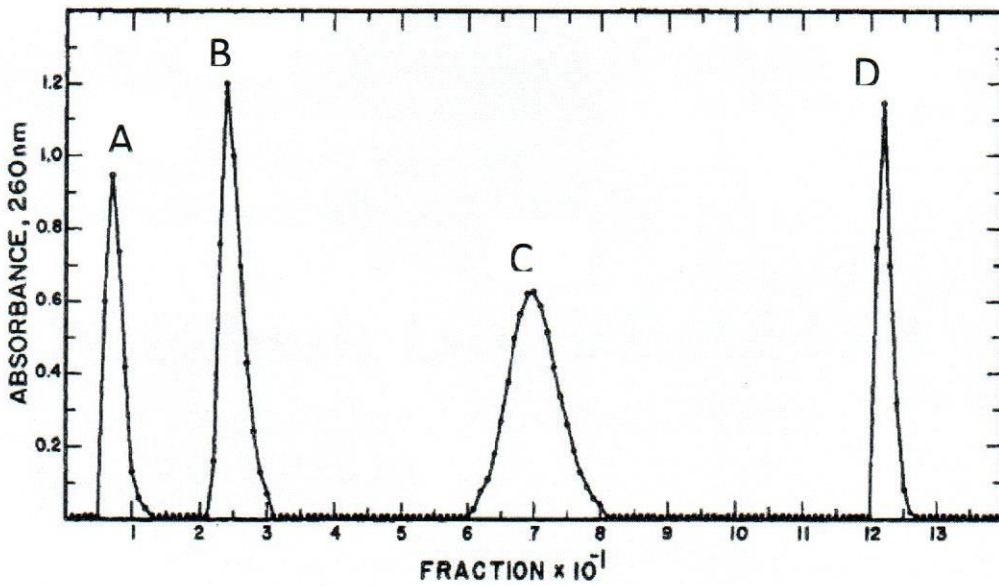
QUESTION FOUR [14 MARKS]

- a. Define the following terms: (3 marks)
- Enzyme cofactor
 - Hydrolases
 - Transferases
- b. Briefly explain three environmental factors that affect UV-Visible absorption by nucleic acid in UV-Vis spectrophotometry. (6 marks)
- c. Penicillins are a class of antibiotics that work by irreversibly inhibiting a bacterial enzyme called DDtranspetidase involved in construction of bacterial cell walls. Briefly explain the mode of action of Penicillins. (5 marks)

QUESTION FIVE [14 MARKS]

- a. List any three functions of membrane proteins: (3 marks)
- b. The following chromatogram was obtained during separation of a mixture of adenine nucleotides containing adenosine, adenosine monophosphate (AMP),

adenosine diphosphate (ADP) and adenosine triphosphate (ATP) using formate as counter ions in ion exchange chromatography. Study the chromatogram and answer the questions that follow.



- i. Name the peaks A, B, C and D. (2 marks)
- ii. Explain the order of elution. (4 marks)
- c. A student was provided with a mixture of proteins. Briefly explain how he could use differential precipitation to separate the protein mixture. (5 marks)