

**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE  
AND TECHNOLOGY**

UNIVERSITY EXAMINATIONS 2013/2014

FIRST YEAR SEMESTER ONE EXAMINATION FOR THE DEGREE OF  
BACHELOR OF PUBLIC HEALTH

(KISII LEARNING CENTRE)

**COURSE TITLE: ORGANIC CHEMISTRY**

**COURSE CODE: SCH 3121**

DATE: DECEMBER 2013

DURATION: 2 HOURS

DAY:

TIME:

**INSTRUCTIONS**

- 1. Answer QUESTION ONE and any other TWO questions**
- 2. Show clearly and neatly all the workings**

## **QUESTION ONE (30MARKS)- COMPULSORY**

1. a) Differentiate the following compounds: (8marks)
  - i. Amino acids and proteins
  - ii. Terpenes and steroids
  - iii. Myoglobin and hemoglobin
  - iv. Complete and incomplete proteins
- b) Explain the following observations: (6marks)
  - i. Amino acids generally have high melting points despite their smaller molecular sizes
  - ii. Cysteine and tyrosine amino acids are considered as semi-essential amino acids
  - iii. In alpha-helix arrangement of secondary structures of protein, each complete turn of the spiral has 3.6 amino acids (3 complete amino acids residues and two atoms from the next one).
- c) i. State the substances that constitute the bacterial cell wall and plant cell wall. (2marks)
- ii. Outline two differences between a bacterial and a plant cell wall. (2marks)
- d) i. What are the weak interactions that hold and maintain the tertiary structures of proteins? (4marks)
- e) i. what are lipid? (1mark)
- ii. Lipids are classified as either hydrolyzable or nonhydrolyzable lipids. Explain the difference between the hydralyzable and nonhydrolyzable lipids (2marks)
- f) i. Outline three features of beta-pleated sheets secondary structures of protein. (3marks)
- ii. State two orientations in which polypeptide chains may organize themselves in beta-pleated secondary structures of protein (2marks)

## **QUESTION TWO (20 MARKS)**

2. a) What is a zwitterions (1mark)
- b) With the help of a chemical equation, explain how the pHof amino acids can be shifted from one extreme to another (4marks)
- c) i. Write the three letter abbreviations of the following amino acids and indicate whether each of them is polar, acidic or basic: Glycine, Proline, Threonine, Aspartate and Lysine (5marks)
- ii. Draw the structure of each of the following peptides. Label the N-terminal and C-terminal amino acids and all the peptide bonds (6marks)
  - I) Val-Glu
  - II) Gly-His-Leu
  - III) M-A-T-T
- d) Explain the following:
  - i) Amino acids are generally soluble in water and insoluble in non-polar organic solvents e.g. hydrocarbons though it is an organic compounds. (2mks)
  - ii) All amino acids are optically active except Glycine. (2marks)

### **QUESTION THREE (20 MARKS)**

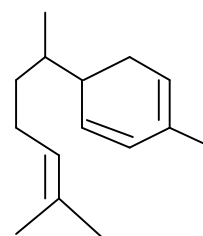
3. a) Terpenes are classified according to the number of isoprene units they contain. For instance, a two isoprene unit terpene is called monoterpene. Complete the table below appropriately. (4marks)

Class of terpene	Number of carbon atoms	Number of isoprene units
	15	
		4
Sesterterpene		
	40	

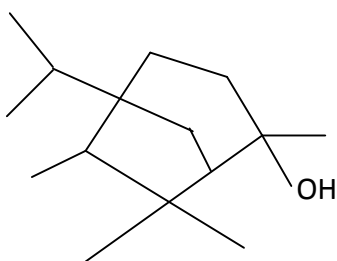
- b) Locate the isoprene units in the following terpenes (4marks)



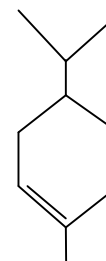
iii.



ii.



iv.



- c)i. Draw the structure of the steroid nucleus. Note the locations of the A, B, C and D steroid rings and number the carbon atoms constituting the steroid nucleus. (3marks)

ii. Testosterone is a male sex hormone with two angular methyl groups and an alcohol group in addition to oxygen attached to carbon-3. Use this information and draw the structure of testosterone hormone. (3marks)

iii. With specific examples of steroids, outline the roles of steroids in living organisms. (6marks)

### **QUESTION FOUR (20 MARKS)**

a) What is protein denaturation?(1mark)

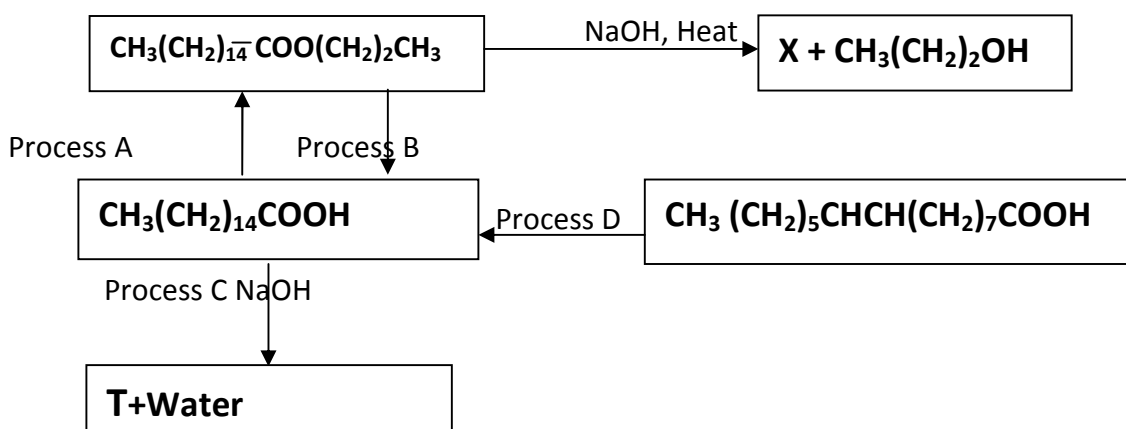
b) Explain how the following factors influence protein denaturation (8marks)

- temperature
- heavy metal
- detergents
- mechanical stress

- c) Explain how the digestion of proteins takes place stating all the appropriate enzymes that aid in digestion at each stage of the digestion (5marks)
- d) Explain three cellular functions of protein (6marks)

### **QUESTION FIVE (20 MARKS)**

- a) Give four characteristics of fatty acids (4marks)
- b) Explain why the melting points of saturated fatty acids are greater than the melting points of unsaturated fatty acids of the same chain length(2marks)
- c) Give three differences between saturated and unsaturated fatty acids. (3marks)
- d) The flow chart below shows various chemical processes involving fatty acids. Study the flow chart and use it to answer the questions that follow.



- a) Identify the processes labeled: A, B, C and D (4 marks)
- b) Draw the structures of the compounds T and X and give their systematic IUPAC names.(4marks)
- c) State the conditions and reagents necessary for processes A, B and D. (3 marks)
- A: Condition:  
Reagent:
- B: Condition:  
Reagent:
- D: Condition:  
Reagent: