CHUKA UNIVERSITY

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN BIOMEDICAL SCIENCE AND TECHNOLOGY

BMET 214: BIOCHEMISTRY OF BIOMOLECULES

STREAMS: B.SC BIOMED SCI & TECH Y2S1 **TIME: 2 HOURS**

DAY/DATE: FRIDAY 13/12/2019 **8.30 A.M. – 10.30 A.M.**

INSTRUCTIONS:

- **Answer Question One and any other Two Questions**
- **Do not write on the question paper**

Question One (30 marks)

a. Translate the following amino acid sequence into one-letter code: Leu-Glu-Ala-Arg-Asn-Ile-Asn-Gly-Ser-Cys-Ile-Glu-Asn-Cys-Glu-Ile-Ser-Gly-Arg-Glu-Ala-Thr. (2 marks)

b. Differentiate between the two broad classes of heterocyclic nitrogenous bases that occur in nucleic acids, and provide a structural example of each. (3marks)

c. Give the structural illustration and indicate whether each of the following sugars consists of anomers, epimers or an aldose – ketose pair. (4 marks)

   i. D-glyceraldehyde and dihydroxyacetone

ii. D-glucose and D-mannose

iii. D-galactose and D-glucose

iv. α-D-glucose and β-D-glucose

d. Glucose reacts slowly with hemoglobin and other proteins to form covalent compounds. Explain why glucose is reactive? What is the nature of the adduct formed? (4 marks)

e. RNA is readily hydrolyzed by alkali, whereas DNA is not. Explain? (5 marks)

f. α -D-Mannose is a sweet-tasting sugar. β-D-Mannose, on the other hand, tastes bitter. A pure solution of α-D-mannose loses its sweet taste with time as it is converted into the β anomer. Draw the β anomer and explain how it is formed from the α anomer. (6 marks)

g. Draw the structure of a 16-carbon fatty acid as saturated, trans monounsaturated, and cis monounsaturated and explain why most unsaturated fatty acids found in phospholipids are in the cis rather than trans conformation. (6 marks)

Question Two (20 marks)

g.i.1.a. A mutation that changes an alanine residue in the interior of a protein to valine is found to lead to a loss of activity. However, activity is regained when a second mutation at a different position changes an isoleucine residue to glycine. How might this second mutation lead to a restoration of activity?
(6 marks)

g.i.1.b. All l amino acids have an *S* absolute configuration except l-cysteine, which has the *R* configuration. Explain why l-cysteine is designated as the *R* absolute configuration. (6 marks)

g.i.1.c. Describe the structure and function of the major proteins in muscle. (8 marks)

Question Three (20 marks)

a. Describe the features of the Watson-Crick model of DNA deduced from the diffraction patterns.

(10 marks)

b. Describe the structural and functional differences between DNA and RNA. (10 marks)

Question Four (20 marks)

a. Monosaccharides are reducing sugars. Describe an experiment that can be used to deduce this. (10 marks)

b. Briefly describe the different classes of lipids. (10 marks)
