TECHNICAL UNIVERSITY OF MOMBASA

Faculty of applied and health sciences

DEPARTMENT OF PURE AND APPLIED SCINCES

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN ANALYTICAL CHEMISTRY

ABT 2101 INTRODUCTION TO BIOCHEMISTRY

END OF SEMESTER EXAMINATION

SERIES:NOV/DEC 2016 PAPER-A

TIME:2HOURS

DATE: 2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

Do not write on the question paper.

This paper consists of FIVE questions.

Answer Question ONE (compulsory) and any other TWO Questions.

QUESTION ONE

(i)Define the term biomolecules 2 marks

(ii) State the difference between glucose and fructose 2 marks

b) Draw an open chain structure of the following;

(i)Fructose 2 marks

(ii)D-Ribose 2 marks

c) Define the following terms;

(i)Anomers 2 marks

(ii)Mutarotation 2 marks

d) State the monosaccharides formed when the following trisaccharides are hydrolysed;

(i) Raffinose 1.5 marks

(ii) Mannotriose 1.5 marks

(iii)Gentiose 1.5 marks

e)State TWO functions of the following;

(i)cysteine 2 mark

(ii)Glycine 2 marks

f) (i)Name TWO types of membrane protein 2 marks

(ii)List TWO types of toxic protein 2 marks

g) (i)Name TWO essential fatty acids 2 marks

(ii)List TWO functions of ribonucleic acid 2 marks

h)Name THREE methods for immobilization of enzyme 1.5 marks

QUESTION TWO

(a)Describe the classification of amino acids 8 marks

(b)Explain the formation of maltose 7 marks

QUESTION THREE

(a)Discuss classification of enzyme 8 marks

(b)Explain the physical properties of carbohydrates 7 marks

QUESTION FOUR

(a)Describe the primary structure of protein 7 marks

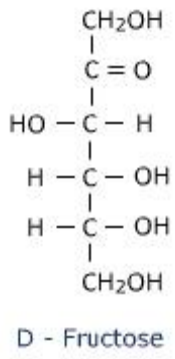
(b)Explain general characteristics of lipids 8 marks

QUESTION FIVE

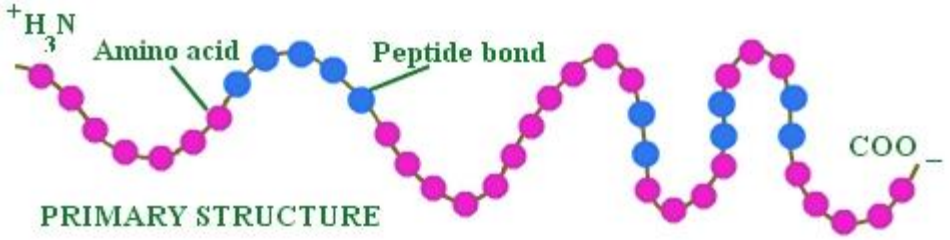
(a)Explain chemical properties of protein 8 marks

(b)Describe the primary structure of deoxyribonucleic acid 7 marks

S/NO	ANSWER	MARKS
a) i	-Biomolecules consists mainly of carbon and hydrogen with nitrogen, oxygen, sulphur, and phosphorus. - Biomolecules are very large molecules of many atoms, that are covalently bound together.	2mks
ii	-glucose in solution forms a 6 atom ring, while fructose makes a 5 atom ring. --- The three-dimensional orientation of the side groups on the ring determines how much sweetness is perceived when it reacts with receptors on your taste	

	buds.	
B i		
ii		
c i	-Differ from each other in the configuration only around C_1 known as anomeric carbon	
ii	-As the change in the specific optical rotation representing the interconversion of alpha and beta forms of d-glucose to an equilibrium mixture	
d i	-One galactose and Two rhamnose units	
ii	-two galactose and One glucose	
iii	-One fructose and Two glucose	
e	(i)- It provides resistance to our body and inhibits the growth of hairs, nails (ii)- It acts as a neurotransmitter and plays a vital role in healing wounds.	
F	(i)- Estrogen receptor, Glucose transporter, Histones, Hydrolases, Oxidoreductases, P_{53}, Rhodopsin, (ii)- snake venom, ricin.	
g)	(i) . Linoleic acid and linolenic acid (ii) –convert genetic information from genes into amino acid sequences of protein -. It carries genetic information sequences between DNA and ribosomes	**4**
h)	- covalent bonding to a solid support -adsorption onto an insoluble substance -entrapment within a gel -encapsulation behind a selectively permeable membrane	**2**
2 (a)	Amino acids are placed into seven groups based on their substituent. -Aliphatic amino acids: Alanine, glycine, isoleucine, leucine, Proline and Valine. -Aromatic amino acids: phenylalanine, tryptophan and tyrosine	

	-Acidic amino acids: aspartic acid and glutamic acid. -Basic amino acids: arginine, histidine and lysine. -Hydroxylic amino acids: serine and threonine. -Sulphur containing amino acids: cytosine and methionine. -Amidic amino acids: asparagines and glutamine.	
(b)	A disaccharide is produced by joining 2 monosaccharide units. ,Two glucose molecules are combined using a condensation reaction, with the removal of water. -In maltose, an alpha 1-4 glycosidic bond is formed between opposite sides of the 2 glucose units.	
3 (a)	-Oxidoreductases - enzymes that catalyze oxidation-reduction reactions. -Transferases – Transferases are the enzymes that catalyze reactions where transfer of functional group between two substrates takes place. -Hydrolases - catalyze the hydrolysis reactions of carbohydrates, proteins and esters. -Lyases – Lyases are enzymes that atalyze the reaction involving the removal of groups from substrates by processes other than hydrolysis by the formation of double bonds. -isomerases – Isomerases are enzymes that catalyze the reactions where interconversion of cis-trans isomers is involved. -Ligases – Ligases are also known as synthases, these are the enzymes that catalyze the reactions where coupling of two compounds is involved with the breaking of pyrophosphate bonds (b) Steroisomerism – Compounds having same structural formula but they differ in spatial configuration. Example: Glucose has two isomers with respect to penultimate carbon atom. They are D-glucose and L-glucose. -Optical Activity - It is the rotation of plane polarized light forming (+) glucose and (-) glucose. -Diastereo isomeers - It the configurational changes with regard to C2, C3, or C4 in glucose. Example: Mannose, galactose. -Annomerism - It is the spatial configuration with respect to the first carbon atom in aldoses and second carbon atom in ketoses.	
4	(a)- Primary structure of protein is the linear sequence of amino acids that make up the polypeptide chain. -This sequence is given by the sequence of nucleotide bases of the DNA in the genetic code. -The amino acid sequence determines the positioning of the different R groups relative to each other. -The positioning determines the way the protein folds and the final structure of	

	the molecule.  	
4b	-Lipids are relatively insoluble in water. -They are soluble in non-polar solvents, like ether, chloroform, methanol. -Lipids have high energy content and are metabolized to release calories. -Lipids also act as electrical insulators, they insulate nerve axons. -Fats contain saturated fatty acids, they are solid at room temperatures. Example, animal fats. -Plant fats are unsaturated and are liquid at room temperatures. -Pure fats are colorless, they have extremely bland taste. -The fats are sparingly soluble in water and hence are described are hydrophobic substances. -They are freely soluble in organic solvents like ether, acetone and benzene. -The melting point of fats depends on the length of the chain of the constituent fatty acid and the degree of unsaturation.	
5	(a) Proteins when hydrolyzed by acidic agents, like conc.HCl yield amino acids in the form of their hydrochlorides. -Proteins when are hydrolyzed with alkaline agents leads to hydrolysis of certain amino acids like arginie, cysteine, serine, etc., also the optical activity of the amino acids is lost. -Proteins with reaction with alcohols gives its corresponding esters. This process is known as esterification. -Amino acids reacts with amines to form amides. -When free amino acids or proteins are said to react with mineral acids like HCl, the acid salts are formed. -When amino acids in alkaline medium reacts with many acid chlorides, acylation reaction takes place. -Sanger's reaction - Proteins react with FDNB reagent to produce yellow colored derivative, DNB amino acid. -Xanthoproteic test - On boiling proteins with conc. HNO_3, yellow color develops due to presence of benzene ring. -Folin's test - This is a specific test for tyrosine amino acid, where blue color develops with phosphomolybdotungstic acid in alkaline solution due to presence of phenol group. (b) Primary structure of nucleic acids is a linear sequence of nucleotides, which are linked to each other by phosphodiester linkages. Nucleotides are made up of three components - Nitrogenous base, 5-carbon sugar and phosphate groups.	

	Nitrogenous base are purines(adenine, guanine) and pyrimidines {cytosine, thymine (present in DNA only), uracil (present in RNA only)}. The 5-carbon sugar is deoxyribose for DNA and and ribose sugar in RNA. The purine bases, form glycosidic bond between their 9' nitrogen and the 9' - OH group of the sugar molecule. The pyrimidine bases, they form glycosidic bond between 1' nitrogen and the 9' -OH of the deoxyribose. In both purine and pyrimidine bases the phosphate group forms a bond with the sugar molecule between one of its negatively charged oxygen groups and the 5' -OH of the sugar. Nucleotides forms phosphodiester linkages between the 5' and 3' carbon atoms, these form the nucleic acids. Nucleotides sequences are complementary to one another. Example of complementary sequence AGCT is TCGA	