NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH AND APPLIED SCIENCES

DEPARTMENT OF NATURAL AND APPLIED SCIENCES

QUALIFICATION: BACHELOR OF SCIENCE	
QUALIFICATION CODE: 07BOSH	LEVEL: 7
COURSE NAME: BIOCHEMISTRY: BIOCHEMICAL PRINCIPLES AND PRACTICE	COURSE CODE: BPP702S
SESSION: JANUARY 2020	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 100

SUPPLEMENTARY/SECOND OPPORTUNITY EXAMINATION QUESTION PAPER	
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MODERATOR	DR PETRINA KAPEWANGOLO

INSTRUCTIONS
1. Answer ALL the questions.
2. Write clearly and neatly.
3. Number the answers clearly.
4. All written work **MUST** be done in **BLUE** or **BLACK** ink.

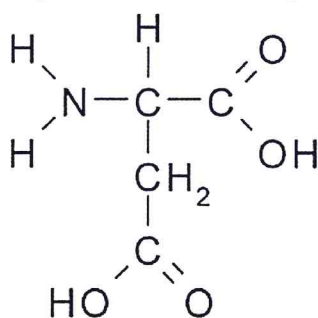## PERMISSIBLE MATERIALS

None

THIS QUESTION PAPER CONSISTS OF FIVE (5) PAGES
(Including this front page)

QUESTION 1   [15]

a) Calculate the pKa of lactic acid, given that when the concentration of free lactic acid is 0.01M and the concentration of lactate is 0.087M, the pH is 4.80   (4)

b) Given the structure of aspartic acid and the pKa values as shown below

$pKa_1 = 1.88$

$pKa_2 = 3.65$

$pKa_3 = 9.68$

Determine the pI value of aspartic acid and show clearly how you arrive at the answer   (6)

c) Briefly discuss the mechanism of surface tension as one of the chemical reactions taking place in living matter, in vivo   (5)

QUESTION 2   [15]

a) Use the structures of the following amino acids to classify these compounds as either nonpolar/hydrophobic, polar/hydrophilic, negatively charged/hydrophilic, or positively charged/hydrophilic   (4)

I. Valine: R = -CH(CH$_3$)$_2$

II. Serine: R = -CH$_2$OH

III. Aspartic acid: R = -CH$_2$CO$_2$H
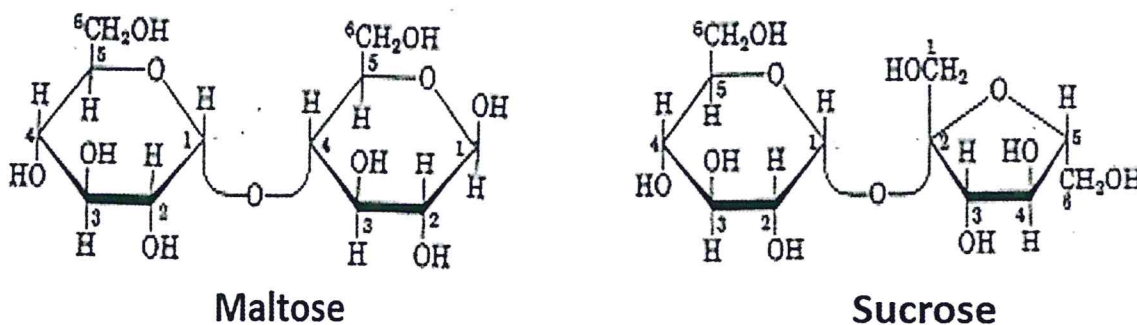
IV. Lysine: R = -(CH$_2$)$_4$NH$_3$

2

b) State **FIVE** (5) main functions of the amino acids Valine (5)

c) Discuss **THREE (3)** important parameters to consider during the planning of an ion exchange-based separation (6)
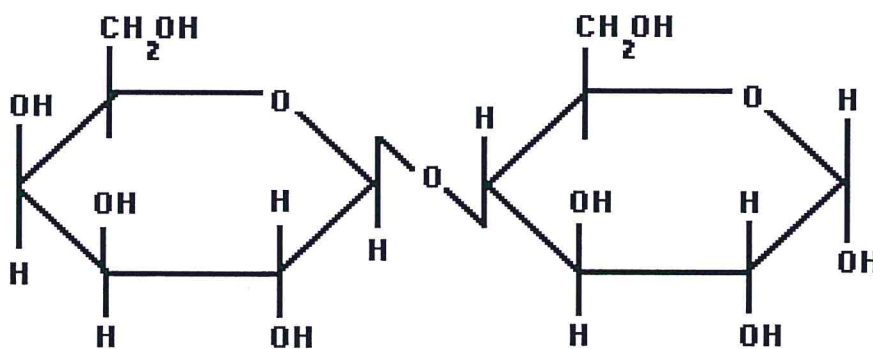
QUESTION 3 [16]

a) Two different disaccharides are shown in the figure below

Maltose   **Sucrose**

Name the monosaccharides that these disaccharides are composed of indicating their stereoisomer form (2)

b) Draw the structures and name the two stereoisomer monosaccharides that form when the disaccharide below is hydrolyzed (4)

c) Give a detailed description of how a DNA molecule is translated into a protein (10)

QUESTION 4 [12]

a) Briefly describe the following mutations; (4)
   I. Nonsense Mutation

   II. Frame shift Mutation

   III. Misense Mutation

   IV. Silent Mutation

b) Distinguish between Positive and Negative Allosterism (4)

c) The Michaelis-Menton equation is frequently rearranged to its reciprocal form to simplify plots to a form known as the Lineweaver-Burk plot. Draw a Lineweaver-Burk plot with a single line, and indicate the values generally plotted on the X and Y axes as well as the values generally located at the X and Y intercepts (4)

QUESTION 5 [14]

a) Outline the **FOUR (4)** enzyme sites that regulate gluconeogenesis (4)

b) Using structural formulas, write the balanced chemical equation for the reactions where GTP is produced in the Kreb cycle (4)

c) Briefly describe the anabolic role of the TCA cycle in fatty acid synthesis (6)

QUESTION 6 [11]

a) Describe **THREE (3)** types of membrane proteins (3)

b) Discuss **THREE (3)** characteristics of the genetic code (3)

c) Give the possible symptoms of deficiency of the following vitamins (5)

   I. Vitamin B_2 (Riboflavin)

   II. Vitamin B_{12}

   III. Vitamin A (Retinol)

   IV. Vitamin K (Phylloquinone)

   V. Vitamin D

QUESTION 7 [17]

a) Outline **FOUR (4)** likely reasons of poor drug absorption according to Lipinski's rules (4)

b) Elaborate on how Inositol triphosphate (IP3) and diacylglycerol (DAG) with the aid of Phospholipase C modulates signal transduction (5)

c) Discuss signal transduction (8)

THE END