TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE & APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR:

BACHELOR OF TECHNOLOGY IN INDUSTRIAL MICROBIOLOGY & BIOTECHNOLOGY

BACHELOR OF SCIENCE IN MOLECULAR BIOLOGY & FORENSIC TECHNOLOGY

ABT 4211: **CARBOHYDRATE METABOLISM**

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: SEPTEMBER 2018

TIME:2HOURS

DATE: Pick DateSep2018

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attemptquestion ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

Question ONE

a) Illustrate the irreversible reactions of glycolysis (6marks)

b) State the catalytic role of the following;
   (i) Phosphofructokinase (1mark)
   (ii) Ribulose 5-phosphate isomerase (1mark)

c) Identify reactions in which the following molecules take part
   (i) Uridine diphosphate glucose (1mark)
   (ii) α -ketoglutarate (1mark)

d) Outline galactose metabolism (5marks)

e) State the implication of aldolase B deficiency in a human being. (3marks)

f) Illustrate pyruvate decarboxylation reactions. (4marks)

g) Differentiate between;

(i) Gluconeogenesis and glycogenolysis (2marks)

(ii) Enthalpy and entropy (2marks)

h) Calculate the standard free-energy change for the following metabolically important enzyme-catalyzed reaction at 25 ^{O}C and pH 7.0. (4 marks)

R = 8.315 J/mol . K

K'eq = -0.0475

Triose phosphate isomerase

Dihydroxyacetone phosphate $\rightleftharpoons$ glyceraldehyde 3-phosphate

Question TWO

(a) With the aid of relevant illustrations, describe the tricarboxylic acid (TCA) cycle. (10marks)

(b) Describe the mitochondrial components of the electron transport chain (ETC). (10marks)

Question THREE

Discuss

a) The light independent reactions of photosynthesis in higher plants. (10marks)

b) The breakdown of glycogen in the liver cells. (10marks)

Question FOUR

(a) Describe the Hexose monophosphate pathway (10marks)

(b) Discuss the process of glycogenesis in the liver cells. (10marks)

Question FIVE

a) The equilibrium constants of two coupled enzymatic reactions at 25^{0}C are as follows;

Glucose 6-phosphate + $H_2O \longrightarrow$ Glucose + P_i K'eq =270

ATP + Glucose $\longrightarrow$ ADP +Glucose 6-phosphate K'eq =890

Gas constant, R = 8.318 J/mol.K

Calculate the standard free energy of hydrolysis of ATP.

(12 marks)

b) Discuss the stages of glycolysis that lead to conversion of glucose to glyceraldehyde 3-phosphate.

(8 marks)