



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

ABT 4211: CARBOHYDRATE METABOLISM

END OF SEMESTER EXAMINATION

SERIES: PickyearDEC 2024

TIME:2HOURS

DATE:Pick DateDecPick Year2024

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

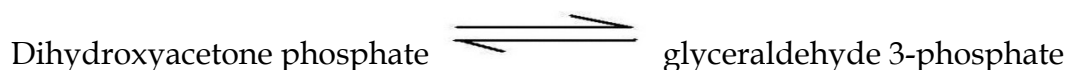
This paper consists of **FIVE** questions. Attemptquestion ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

Question ONE

- a) Differentiate between.
- (i) Gluconeogenesis and glycogenolysis (2 marks)
 - (ii) Enthalpy and entropy (2 marks)
- b) Calculate the standard free-energy change for the following metabolically important enzyme-catalyzed reaction at 25 °C and pH 7.0. (4 marks)
- $R = 8.315 \text{ J/mol} \cdot \text{K}$
- $K'_{eq} = -0.0475$

Triose phosphate isomerase



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

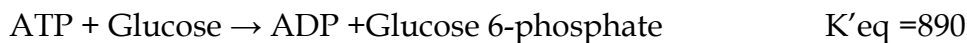
- d) Identify reactions in which the following molecules take part
- (i) Uridine diphosphate glucose (1 mark)
 - (ii) α -ketoglutarate (1 mark)
- e) Describe galactose metabolism (5 marks)
- f) State the consequences of aldolase B deficiency in a human being. (3 marks)
- g) Illustrate pyruvate decarboxylation reactions. (4 marks)
- h) Illustrate the irreversible reactions of glycolysis (6 marks)

Question TWO

- (a) Describe the Hexose monophosphate pathway (10 marks)
- (b) Discuss the process of glycogenesis in the liver cells. (10 marks)

Question THREE

- a) The equilibrium constants of two coupled enzymatic reactions at 25⁰C are as follows.



Gas constant, $R = 8.315 \text{ J/mol.K}$

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)

Question FOUR

- (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). (10 marks)

Question FIVE

Discuss

- a) The light independent reactions of photosynthesis in higher plants. (10 marks)
- b) The breakdown of glycogen in the liver cells. (10 marks)