

CHUKA



UNIVERSITY

**UNIVERSITY EXAMINATIONS**

**EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN  
BIOCHEMISTRY**

**BIOC 425: METABOLISM REGULATIONS AND INTEGRATION**

**STREAMS: BSC BIOC**

**TIME: 2 HOURS**

**DAY/DATE: WEDNESDAY 19/04/2023**

**11.30 A.M – 1.30 P.M**

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**INSTRUCTIONS:**

**Answer question one and any other two questions**

**Do not write on the question paper**

**QUESTION ONE (30 MARKS)**

- (a) Describe the role of the following enzymes in metabolic regulation and integration.
- (i) Pyruvate dehydrogenase complex [2 marks]
  - (ii) Acetyl CoA Carboxylase [2 marks]
- (b) Describe regulation of pyrimidine nucleotide biosynthesis in the liver. [6 marks]
- (c) Outline biochemical basis of diabetes ketoacidosis (DKA) [5 marks]
- (d) Explain the role of fructose -2, 6 biophosphate in regulation of glycolytic and gluconeogenesis pathways. [7 marks]
- (e) Explain why AMP activated protein kinase (AMPK) is usually referred to as master metabolic regulator. [8 marks]

**QUESTION TWO (20 MARKS)**

- (a) Using illustrative diagrams, discuss tryptophan (trp) operon regulation in *Esherichia coli*. [10 marks]

- (b) Using clear illustration, describe factors that control the rate of reaction sequence in the citric acid cycle. [10 marks]

**QUESTION THREE (20 MARKS)**

- (a) The body maintains a relatively large free amino acid pool in the blood, even during fasting.
- (i) Give reasons for this observation. [6 marks]
  - (ii) Describe the mechanism which maintains free amino acid pool in the blood. [7 marks]
- (b) Discuss the Janus kinase – signal transducers and activators of transcription mechanism of leptin signal transduction in the hypothalamus. [7 marks]

**QUESTION FOUR (20 MARKS)**

- (a) Why are metabolic processes highly regulated and integrated in the cell? [8 marks]
- (b) Describe metabolic changes in the adipose tissue during fasting (starvation). [12 marks]
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