

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

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

**BIOC 425: METABOLIC REGULATION AND INTEGRATION**

**STREAMS: BSC. BIOC**

**TIME: 2 HOURS**

**DAY/DATE: TUESDAY 21/09/2021**

**11.30 A.M. – 1.30 P.M.**

**INSTRUCTIONS:**

- *Answer question one and any other two*

**Question one (compulsory) (30 marks)**

- Explain the role of phosphocreatine in skeletal muscles during intense exercise. (3 marks)
- Explain energy requirements for the brain during fed and fasting state. (6 marks)
- Describe the glucose/Alanine cycle as a link between amino acids and carbohydrate metabolism. (5 marks)
- Distinguish between concerted inhibition and enzyme multiplicity as used in allosteric regulation of amino acid biosynthesis. (4 marks)
- Describe allosteric regulation of pyrimidine biosynthesis. (5 marks)
- Describe mechanisms of ammonia toxicity in the brain. (7 marks)

**Question two (20 marks)**

- When an animal confronts a “fight-or-flight” situation, the release of epinephrine promotes glycogen breakdown in the liver, heart, and skeletal muscle.
  - List the end products of glycogen metabolism in the liver and skeletal muscles respectively. (2 marks)

- ii. Justify your answer for the different products of glycogen breakdown in the two tissues in a(i). (4 marks)
- iii. Explain the advantage to an animal that must fight of flee of these specific glycogen breakdown routes. (4 marks)
- b) Explain the different metabolic pathways regulated by insulin clearly stating the target enzyme for each pathways. (10 marks)

**Question three (20 marks)**

- a) Describe the role of glucocorticoids in metabolic regulation and integration. (10 marks)
- b) Discuss the JAK-STAT mechanism of leptin signal transduction in the hypothalamus highlighting its anorexigenic activity. (10 marks)

**Question four (20 marks)**

- a) Describe the different metabolic pathways affected in the liver by excess alcohol consumption and state related health implications. (10 marks)
  - b) Describe the key junction points of the major metabolic pathways. (10 marks)
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