

CHUKA



UNIVERSITY

**SUPPLEMENTARY/ SPECIAL EXAMINATIONS**

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

**BIOC 404/425: METABOLIC REGULATION AND INTERGRATION**

**STREAMS: BSC (BIOC)**

**TIME: 2 HOURS**

**DAY/DATE: THURDAY 04/02/2021**

**11.30 AM – 1.30 PM**

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**INSTRUCTIONS:**

- (i) Answer Question ONE and any TWO questions**
- (ii) 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) Carbomyl phosphate synthetase II (2 Marks)
  - (ii) Phosphofructokinase 1 (2 Marks)
  - (iii) Fatty acid synthase complex (2 Marks)
- (iv)  $\alpha$ -Ketoglutarate dehydrogenase complex (2 Marks)
- (b) Describe regulation of de novo purine nucleotide biosynthesis in the liver. (7 marks)
- (c). Explain metabolic derangements in diabetes mellitus. (6 marks)
- (d) List and describe key Junctions in integration of metabolism. (7 marks)
- (e) Describe ethanol brain toxicity. (3 Marks)

**QUESTION TWO: (20 Marks)**

- (a) Using structural and chemical formulae discuss the urea cycle, highlighting its regulatory mechanism. (13 marks)
- (b) Describe mechanisms that affect ketone body production by the liver. (9 marks)

**QUESTION THREE (20 Marks)**

Excessive ethanol consumption can result in *fatty liver*, *alcohol-induced hepatitis* and *cirrhosis*:

- (a) What is the biochemical basis of above health problems? (7 marks)
- (b) Describe three pathways of ethanol metabolism in the live and hence elucidate amount of ATP produced during ethanol metabolism. (8marks)
- (c) Explain why blood levels of ethanol after consuming beer are normally higher for women than for men. (5 marks)

**QUESTION FOUR (20 Marks)**

- (a) Briefly describe the role of the following hormones in regulation of fuel metabolism:
    - (i) Glucagon (4 Marks)
    - (ii) Ghrelin (3 Marks)
    - (iii) Cortisol (4 Marks)
  - (b) Discuss the JAK-STAT mechanism of **leptin** signal transduction in the hypothalamus highlighting its anorexigenic activity. (10 marks)
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