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**

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) α-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. (8 marks)

(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)
