

CHUKA



UNIVERSITY

**UNIVERSITY EXAMINATIONS**

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

**BIOC 333: MICROBIAL METABOLISM**

**STREAMS: BIOC**

**TIME: 2 HOURS**

**DAY/DATE: MONDAY 08/04/2024**

**11.30 A.M – 1.30 P.M.**

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**INSTRUCTIONS:**

- Answer question ONE and any TWO questions
- Do NOT write on the question paper.

**QUESTION ONE (30 MARKS)**

- Describe methylglyoxal pathway in *Pseudomonas* species. (7 marks)
- Describe the serine pathway in methylotropic bacteria. (6 marks)
- Compare and contrast glucose degradation via the Entner-Doudoroff (ED) pathways in bacteria and the modified branched versions reported for *Archaea*. (6 marks)
- Provide reasons why Voges Proskauer (VP) test classically has been used with the Methyl red test to distinguish between *Enterobacter aerogenes* and *E. coli*. (6 marks)
- Highlight the major properties that make *Azotobacter* an attractive organism for production of agricultural biofertilizers. (5 marks)

**QUESTION TWO (20 MARKS)**

- Describe the classical/oxidative TCA cycle. (8 marks)
- Distinguish between methanotrophs and methylotrophs. (4 marks)
- Discuss organic C-1 dissimilation by methylotrophs. (8 marks)

**QUESTION THREE (20 MARKS)**

- (a) Identify the missing steps of the autotrophic 3-hydroxypropionate  $CO_2$  fixation cycle in *Chloroflexus aurantiacus* as stipulated by Jan Zarzycki. (12 marks)
- (b) Explain how anoxygenic photosynthesis differs from oxygenic photosynthesis. (8 marks)

**QUESTION FOUR (20 MARKS)**

- (a) Define heterotrophic methanogenesis. (2 marks)
  - (b) Give six (6) examples of methanogenic bacteria. (5 marks)
  - (c) Discuss heterolactic (phosphoketolase) pathway. (13 marks)
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