CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHEOR OF SCIENCE IN BIOCHEMISTRY

BIOC 436: APPLIED BIOCHEMISTRY

STREAMS:BSC BIOC **TIME: 2 HOURS**

DAY/DATE: FRIDAY 20/12/2024 **11.30 A.M – 1.30 P.M**

INSTRUCTIONS:

Answer question **ONE** and **ANY TWO** other questions.

Do not write anything on the question paper.

SECTION I (30 MARKS): ANSWER ALL THE QUESTIONS

1. (a) Describe the principle of capillary electrophoresis. (1 marks)

   (b) Explain any two applications of capillary electrophoresis in biological or chemical analysis. (2 marks)

   (c) Outline any six factors that determine the rate of migration of DNA in an agarose gel. (3 marks)

2. (a) Describe the key steps in designing a satisfactory CRISPR gene editing experiment. (4 marks)

   (b) List down two approaches used to deliver the CRISPR machinery (gRNAs and endonucleases) to the experimental system of selection. (2 marks)

3. Discuss any three common problems with bacterial expression systems, outlining possible remedies. (6 marks)

4. Discuss the application of tissue culture in biotechnology. (6 marks)

5. Explain the mechanism by which Transcription Activator-Like Effector Nucleases (TALENs) achieve targeted gene editing. (6 marks)

SECTION II (40 MARKS): ANSWER ANY TWO QUESTIONS

6. Describe how you can apply biotechnology to solve a problem of vitamin A deficiency in a rice reliant community. (20 marks)

7. (a)Briefly describe the steps involved in Polymerase Chain Reaction (PCR). (7 marks)

(b) Discuss any three factors that can affect gene expression levels in a transgenic animal or plant. (6 marks)

(c) Describe how you can separate DNA-DNA using hybridisation probes (7 marks)

8. (a) Illustrate a design of gene constructs for a given transgenic plant. (7 marks)

(b) Describe α-complementation as used to identify bacteria colonies that contain recombinant plasmids. (5 marks)

(c) Discuss the following sequencing strategies:

i. Sequencing by ligation. (4 marks)

ii. Sequencing by synthesis. (4 marks)
