

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

**EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN
BIOMEDICAL TECHNOLOGY**

BMET 341: MOLECULAR BIOLOGY OF GENE

STREAMS: BSC BMET

TIME: 2 HOURS

DAY/DATE: THURSDAY 19/12/2024

11.30 A.M – 1.30 P.M.

INSTRUCTIONS:

- Answer question **ONE (COMPULSORY)** and any other **TWO** questions.
- Sketch diagrams may be used whenever they may help to illustrate your answer.
- Do not write anything on the question paper.
- This is a closed book exam. **No** reference materials are allowed in the examination room.
- There will be **No** use of mobile phones or any other unauthorized materials.
- Write your answers legibly and use your time wisely.

QUESTION 1 (COMPULSORY) (30 MARKS)

- a) In the PCR reaction, you need a three-step reaction cycle, which results in a chain reaction that produces an exponentially growing population of identical DNA molecules. Each step of a reaction cycle is performed at a specific temperature i.e. 95 °C for Step 1, 55 °C for step 2 and 70 °C for Step 3.
- b) (i) Briefly explain why the three steps are performed under different temperatures. (3 Marks)
- (ii) Highlight and briefly explain the functions of the reaction components that you would absolutely need in amplification of a DNA fragment through PCR. (4 Marks)

- c) Compare and contrast the actions of DNA and RNA polymerase. (5 marks)
- d) Illustrate the formation of phosphodiester bond in nucleic acids. (4 Marks)
- e) Briefly discuss the roles of exons and introns. (4 Marks)
- f) Briefly describe how DNA is packaged to fit inside a cell. (4 Marks)
- g) Illustrate the formation of hydrogen bonds between adenine and thymine and between cytosine and guanine. (4 marks)
- h) Explain the difference between conservative and semi conservative DNA replication. (2 marks)

QUESTION 2 (20 MARKS)

- a) (i) Using relevant examples, distinguish between cloning and expression vectors. (8 Marks)
(ii) Briefly explain any TWO common problems associated with bacterial expression systems. (2 Marks)
- b) Contrast translation in prokaryotes and eukaryotes. (10 Marks)

QUESTION 3 (20 MARKS)

- a) Giving specific examples of disease, explain FIVE types of DNA mutations. (10 Marks)
- b) The initiation of transcription by eukaryotic RNA polymerases requires the assembly of a large complex. Outline the order of events that result in the initiation. (10 Marks)

QUESTION 4 (20 MARKS)

- a) Name and briefly describe desirable features of any FIVE cloning vectors. (10Marks)
 - b) Discuss how nucleotide excision repair protects against skin cancer. (10Marks)
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