ALUPE UNIVERSITY

OFFICE OF THE DEPUTY VICE-CHANCELLOR

ACADEMICS, STUDENT AFFAIRS AND RESEARCH

UNIVERSITY EXAMINATIONS

2023 /2024 ACADEMIC YEAR

FOURTH YEAR FIRST SEMESTER REGULAR MAIN EXAMINATION

FOR THE DEGREE OF BACHELOR OF EDUCATION SCIENCE

COURSE CODE: BOT 400E

COURSE TITLE: ADVANCED GENETICS

DATE: 4TH DECEMBER, 2023 **TIME: 9.00 A.M - 12.00 P.M**

INSTRUCTIONS TO CANDIDATES

- SEE INSIDE

THIS PAPER CONSISTS OF 4 PRINTED PAGES PLEASE TURN OVER

BOT 400E

REGULAR –MAIN EXAM

BOT 400E: ADVANCED GENETICS

STREAM: BED (SCIENCE) **DURATION: 3 Hours**

INSTRUCTIONS TO CANDIDATES

i. *Answer **ALL** questions from section A and any **FOUR** from section B.*

ii. *Diagrams should be used whenever they deserve to illustrate the answer.*

iii. *Do not write on the question paper.*

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SECTION A (30 MARKS)

Question One

a. Based on the chromosome morphology, differentiate between the p arm and the q arm. (4 Marks)

b. Define the following terms

i. Gene (2 Marks)

ii. Sex linkage (2 Marks)

iii. Natural selection (2 Marks)

iv. Mutation (2 Marks)

c. Differentiate between cytoplasmic and mendelian inheritance (3 Marks)

Question Two

a. List 5 enzymes involved in DNA replication process (5 Marks)

b. List any four requirements for Polymerase chain reaction? (4 Marks)

c. Highlight the main differences between these terms:

i. Polyploidy, (2 Marks)

ii. Aneuploidy, (2 Marks)

iii. Euploidy. (2 Marks)

SECTION B (40 MARKS)

Question Three

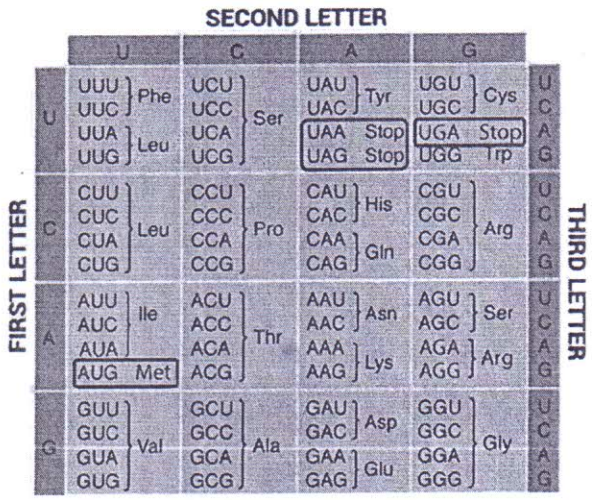
A sequence of a particular gene was given as ATGCCAGCCCTGAAATGCGCTCCTAAG.

Using this sequence, answer the following questions.

a. Is this an RNA or DNA sequence? Give reasons for your answer. (2 Marks)

b. What is the GC content of the sequence above? (3 Marks)

c. Using the genetic code below, translate the genetic sequence above. (5 Marks)



Question Four

An analysis of the sickle cell anemia frequency within Kenya indicated that this disease is mainly prevalent along the malaria belt. What genetic principle could justify this occurrence. Explain the named principle. (10 Marks)

Question Five

Discuss the DNA transcription process. (10 Marks)

Question Six

Using any particular phenotype as an example, describe the incomplete dominance pattern of inheritance. (10 Marks)

Question Seven

a. A pea plant that is pure for purple flowers mates with a pea plant that has white flowers. One of their offspring self-fertilizes and produces 100 offspring. How many would you predict turn out to have purple flowers and how many would you predict turn out to have white flowers? (6 Marks)

b. Of those offspring, 70 are white and 30 are purple. How is this different from your prediction? Is this possible? Why or why not? (4 Marks)

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