



MACHAKOS UNIVERSITY

University Examinations for 2019/2020 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF BIOLOGICAL SCIENCES

FOURTH YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (BIOLOGY)

SBT 417: ADVANCED GENETICS

DATE: 27/10/2020

TIME: 2:00 – 4:00 PM

INSTRUCTIONS

1. Answer Question 1 (compulsory) and **any two** questions in Section B.
2. Use clean well labelled diagrams wherever appropriate.

SECTION A: COMPULSORY

QUESTION ONE (30 MARKS)

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| a) | Outline characteristics of extra-nuclear genes. | (3 marks) |
| b) | Explain maternal inheritance. | (3 marks) |
| c) | Describe characteristic features of multiple alleles. | (3 marks) |
| d) | Explain horizontal gene transfer. | (3 marks) |
| e) | Describe the characteristics of mitochondria and chloroplasts that contain DNA | (3 marks) |
| f) | Explain the mechanisms by which bacteria exchange their genetic material. | (3 marks) |
| g) | Outline characteristics of quantitative traits. | (3 marks) |
| h) | Describe the overall effect of gene migration. | (3 marks) |
| i) | Describe the term “natural selection” | (3 marks) |
| j) | Outline types of mutations. | (3 marks) |

SECTION B: ANSWER ANY TWO QUESTIONS (40 MARKS)

QUESTION TWO (20 MARKS)

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|----|--------------------------------------|------------|
| a) | Discuss cytoplasmic inheritance | (10 marks) |
| b) | Discuss maternal effect on phenotype | (10 marks) |

QUESTION THREE (20 MARKS)

- a) Discuss infectious inheritance (10 marks)
- b) Discuss the barriers to gene flow (10 marks)

QUESTION FOUR (20 MARKS)

The colour of finches has complete dominance relationship where black beaks are dominant (D) over yellow beaks (d). In a population, there are 210 individuals with the genotype DD, 245 individuals with the genotype Dd, and 45 individuals with the genotype dd.

- a) Determine the frequency of dominant and recessive alleles and the frequency of individuals with dominant, heterozygous and recessive traits. (10 marks)
- b) The next generation of finches has a population of 400. There are 336 with black beaks and 64 with yellow beaks. Determine whether the population conforms with Hardy –Weinberg Equilibrium (10 marks)

QUESTION FIVE (20 MARKS)

Discuss natural selection at phenotypic level.