



MACHAKOS UNIVERSITY

University Examinations 2018/2019

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF BIOLOGICAL SCIENCES

FOURTH YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE IN BIOLOGY

SBT 417: ADVANCED GENETICS

DATE: 29/4/2019

TIME: 2.00-4.00 PM

INSTRUCTIONS

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

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) Explain how natural selection Hardy–Weinberg equilibrium. (3 marks)
- b) Explain Horizontal gene transfer. (3 marks)
- c) Describe three main modes of reproduction in plant species. (3 marks)
- d) Outline characteristics of quantitative traits. (3 marks)
- e) Explain factors that affect mutation rates. (3 marks)
- f) Describe the characteristics of mitochondria and chloroplasts that contain DNA. (3 marks)
- g) Explain how genetic rescue can be used to conserve an endangered species. (3 marks)
- h) Describe three general mechanisms of DNA repair. (3 marks)
- i) Describe the overall effect of migration on Hardy–Weinberg equilibrium (3 marks)
- j) Briefly explain mechanisms through which bacteria exchange their genetic material. (3 marks)

QUESTION TWO (20 MARKS)

The beak color of finches has a complete dominance relationship where black beaks are dominant (D) over yellow beaks (d). 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 the 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. Explain whether the population conforms to Hardy-Weinberg Equilibrium (10 marks)

QUESTION THREE (20 MARKS)

Explain the mechanism of transformation in bacteria.

QUESTION FOUR (20 MARKS)

- a) Explain the characteristics of multiple alleles (7 marks)
- b) A farmer is raising rabbits. The average body weight in his population of rabbits is 3 kg. The farmer selects the 10 largest rabbits in his population, whose average body weight is 4 kg, and interbreeds them. If the heritability of body weight in the rabbit population is 0.7, calculate the expected body weight among offspring of the selected rabbits.(3 marks)
- c) Chickens, like all birds, have ZZ-ZW sex determination. The bar-feathered phenotype in chickens results from a Z-linked allele that is dominant over the allele for nonbar feathers. A barred female is crossed with a nonbarred male. The F1 from this cross are intercrossed to produce the F2. Determine the phenotypes and their proportions in the F1 and F2 progeny. (10 marks)

QUESTION FIVE (20 MARKS)

Discuss types of mutations citing appropriate examples