



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE & TECHNOLOGY
SCHOOL OF BIOLOGICAL AND PHYSICAL SCIENCES
DEPARTMENT OF BIOLOGICAL SCIENCES
4th YEAR SECOND SEMESTER 2016/2017 ACADEMIC YEAR UNIVERSITY
EXAMINATION FOR THE DEGREE OF BACHELOR OF EDUCATION (SCIENCE)
WITH IT
REGULAR

COURSE CODE: SBT 408
COURSE TITLE: POPULATION GENETICS
EXAM VENUE: STREAM: (BED. SC.)
DATE: EXAM SESSION:
TIME: 2 HOURS

Instructions:

- 1. Answer ALL questions in Section A and Any two questions in Section B**
 - 2. Candidates are advised not to write on question paper**
 - 3. Candidates must hand in their answer booklets to the invigilator while in the examination room**
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SECTION A: SHORT ANSWER QUESTIONS (30 MARKS)

1. Justify this statement: “The genetic structure of a population is best described by its allelic frequencies rather than its genotypic frequencies”. (3 marks)
2. State three assumptions of the Hardy-Weinberg law. (3 marks)
3. In a population, an autosomal gene has two alleles T and t . If 30% of the individuals are homozygous recessive, calculate the allelic and genotypic frequencies for the population. Assume the population is in Hardy –Weinberg equilibrium. (3 marks)
4. In a certain population the forward and backward mutation rates of 2 alleles A and a were determined to be as follows, $u = 10^{-5}$ and $v = 10^{-6}$. Calculate the equilibrium frequencies of the alleles. (3 marks)
5. Describe the effect of inbreeding on the heterozygote frequency. (3 marks)
6. Citing examples, distinguish between positive and negative assortative mating. (3 marks)
7. Explain the concept of Wahlund effect. (3 marks)
8. Outline the adaptive evolutionary processes that operate during stages of invasion by invasive plant species. (3 marks)
9. Describe the effect of random genetic drift on the allelic frequencies of a population. (3 marks)
10. Outline the causes of genetic variation in natural populations. (3 marks)

SECTION B: ESSAY QUESTIONS (40 MARKS)

11. In an isolated population, the number of people with the A, B , AB and O blood groups are, 1305, 270, 102 and 1323 respectively. If the genotypes of the A–B–O blood type gene are in Hardy–Weinberg proportions, calculate genotypic frequencies for all the possible genotypes. (20 marks)

12. A mark and recapture study was carried out on the peppered white moth (*Biston betularia*) in two environments. The results are shown below.

	Relative Fitness of Light and Dark <i>Biston betularia</i> moths in Birmingham		Relative Fitness of Light and Dark <i>Biston betularia</i> moths in Dorset, England	
Phenotype	Dark	Light	Dark	Light
Genotype	DD/Dd	dd	DD/Dd	Dd
Number released	29	16	406	303
Number recaptured	54	64	1445	603

a) Calculate the relative fitness of the two phenotypes in the two environments.

(8 marks).

b) Using this study as an example, explain the concept of ecological genetics (12 marks)

13. Discuss molecular techniques used in studying genetic variation in populations.(20marks)

14. Discuss the genetic control of insecticide resistance. (20 marks)