



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE & TECHNOLOGY

SCHOOL OF BIOLOGICAL AND PHYSICAL SCIENCES

**UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF
EDUCATION SCIENCE WITH IT**

4th YEAR 2nd SEMESTER 2018/2019 ACADEMIC YEAR

MAIN CAMPUS - REGULAR

COURSE CODE:	SZL 408	
COURSE TITLE:	POPULATION GENETICS	
EXAM VENUE:	BIO LAB	STREAM: (BED)
DATE:	26/04/2019	EXAM SESSION: 9.00-11.00AM
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 (40 MARKS)

1. Describe the two main sources of information on genetic variability in populations. (3 marks)
2. Outline any three sources of genetic variation in a population. (3 marks)
3. Explain why it is better to describe the gene pool of a population using allelic frequencies rather than genotypic frequencies. (3 marks)
4. Derive the formulae for calculating the dominant and recessive allelic frequencies for an X-linked genetic locus. (3 marks)
5. An autosomal genetic locus with two alleles has the following genotypic frequencies: MM = 300, MN = 125 and NN = 75. Calculate the allelic frequency for the two alleles present in the locus. (3 marks)
6. Outline the assumptions of the Hardy-Weinberg law. (3 marks)
7. Explain the reason as to why a population in the Hardy-Weinberg equilibrium cannot evolve. (3 marks)
8. Describe the implication of mutations on equilibrium allelic frequencies. (3 marks)
9. Describe the interactive relationship between survival, reproduction and natural selection. (3 marks)
10. Describe any three barriers to plant invasions that an invasive plant species must overcome prior to its establishment in a new environment. (3 marks)

SECTION B: ESSAY QUESTIONS (40 MARKS)

11. ABO blood-type distribution in 500 students at JOOUST is given as: A = 199, B = 53, AB = 17, and O = 231. Based on this data, calculate:
 - a. Describe the possible genotypes for each blood group (6 marks)
 - b. Calculate the allelic frequency for each allele (6 marks)
 - c. Determine the proportion of the sample that are:
 - i. Homozygous for the I^A allele (2 marks)
 - ii. Homozygous for the I^B allele (2 marks)
 - iii. Heterozygous for the I^A and i alleles (2 marks)
 - iv. Heterozygous for the I^B and i alleles (2 marks)
12. Discuss the effects of migration and random genetic drift on allelic frequencies in a population. (20 marks)
13. Using antibiotic resistance as an example, discuss the tenets of ecological genetics.
14.
 - a. Describe how natural selection can be used to explain both evolution and adaptation (2 marks)
 - b. Using examples, describe three models of natural selection (15 marks)
 - c. The table below gives the comparative efficiency of three genotypes. Use the data to calculate the fitness of the three genotypes. (3 marks)

	A_1A_1	A_1A_2	A_2A_2
Number of zygotes in first generation	40	50	10
Number of zygotes produced by each genotype in the next generation	80	90	10