



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND
TECHNOLOGY
SCHOOL OF BIOLOGICAL AND PHYSICAL SCIENCES
UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF
EDUCATION (SCIENCE)
4TH YEAR 1ST SEMESTER 2013/2014 ACADEMIC YEAR
MAIN – SCHOOL BASED**

COURSE CODE: SZL 408

COURSE TITLE: POPULATION GENETICS

EXAM VENUE: LAB 2

STREAM: (BSc. Science)

DATE: 28/8/14

EXAM SESSION: 9.00 -11.00AM/PM

TIME: 2 HOURS

Instructions:

- 1. Answer ALL questions in Section A and any other 2 questions in Section B.**
- 2. Candidates are advised not to write on the question paper.**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**

SECTION A

- Describe the two main sources of genetic variability in natural populations. (3 marks).
- Explain how allelic frequencies can be used to describe the gene pool of a population. (3 marks).
- State the three assumptions of the Hardy-Weinberg law. (3 marks).
- Explain the implication of changes in the values of inbreeding coefficient on the nature matings in natural populations. (3 marks).
- 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).
- Outline the two definitions of ecological genetics and state what unifies these two definitions. (3 marks)
- Explain why excess fecundity is important to the survival of species. (3 marks).
- Based on the allelic frequencies depicted in the table below, describe Wahlund effect. (3 marks).

	Native Population	Migrant Population	Conglomerate population	
P	0.1	0.9	Expected	Observed
Q	0.9	0.1	0.25	0.41
p^2	0.01	0.81	0.5	0.18
$2pq$	0.18	0.18	0.25	0.41
q^2	0.81	0.01		

- Define the following:
 - Founder effects
 - Random genetic drift
 - Population bottlenecks
- Outline the three primary mechanisms that have been implicated in the resistance to DDT in insects. (3 marks)

SECTION B

- Among a sample of 1000 Kenyans, the number of individuals with each of the MN blood group phenotypes was as follows M : 29%, MN : 48%, N : 23%.
 - Calculate the genotypic frequencies
 - Calculate the frequencies of the M and N alleles in the population
 - Predict the number of each of the genotypes in a sample of 2000 individuals from the same population if mating is random.

(20 marks).

- Discuss molecular techniques through which genetic variation can be investigated in a population. (20 marks)

13.

- Discuss the concept of ecological genetics based on establishment of transgenes in wild populations. (15 marks)
- Describe strategies that can be used to reduce transgene escape risk.

14.

- Describe how natural selection can be used to explain both evolution and adaptation. (3 marks)
- Using examples, describe the three models of natural selection (15 marks)