MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS

2018/2019 ACADEMIC YEAR

FOURTH YEAR SECOND SEMESTER EXAMINATIONS

FOR

THE DEGREE OF BACHELOR OF SCIENCE (BOTANY)

COURSE CODE: BOT 418

COURSE TITLE: POPULATION GENETICS

DATE: 23RD APRIL, 2019 TIME: 1430 – 1630HRS

INSTRUCTIONS TO CANDIDATES

- Answer **All** questions in **Section A** and **ANY TWO** in **Section B**
- Illustrate your answers with suitable diagrams wherever necessary

This paper consists of 2 printed pages. Please turn over.

SECTION A: answer ALL questions (30 marks)

1) Explain why allelic and genotypic frequencies are fundamental calculations central to population genetics. **(3 marks)**

2) Explain why in natural populations, the rate of new mutation is rarely a significant catalyst in shaping allele frequencies. **(3 marks)**

3) A group of 20 individuals migrates and joins the recipient population, which originally had 80 members. The allele frequency of A is 0.7 in the donor population and 0.3 in the recipient population. Calculate the change in allele frequency in the conglomerate population.

4) Describe briefly issues that make polygenic inheritance difficult to study. **(3 marks)**

5) Explain why genetic drift is more significant in small populations. **(3 marks)**

6) Clearly distinguish between allelic, genotypic and Hardy-Weinberg equilibrium, using a specific example to illustrate your answer. **(3 marks)**

7) In a large herd of **5,468** sheep, **76** animals have yellow fat, compared to the rest of the members of the herd, which have white fat. Yellow fat is inherited as a recessive trait.

a) Calculate the frequencies of the white and yellow fat alleles in this population.
(1.5 marks)

b) Approximately how many sheep with white fat are heterozygous carriers of the yellow allele?
(1.5 marks)

8) Define the Hardy-Weinberg's law, and list the underlying assumptions.
(3 marks)

9) Describe what happens to allele frequencies during the bottleneck effect.
(3 marks)

10) State the consequences of inbreeding in a population. **(3 marks)**

SECTION B: ANSWER ANY TWO QUESTIONS (40 MARKS)

11) Discuss barriers to random mating. **(20 marks)**

12) Discuss the similarities and differences among directional, disruptive and stabilizing selection.
(20 marks)

13) The human MN blood group is determined by two codominant alleles, M and N. The following data were obtained from various human populations:

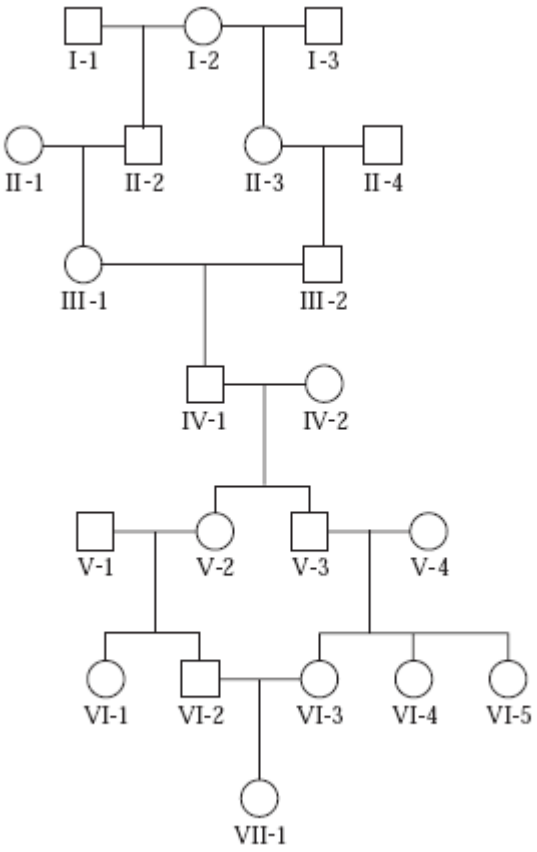
Percentages

Population	Place	MM	MN	NN
Inuit	East Greenland	83.5	15.6	0.9
Navajo Indians	New Mexico	84.5	14.4	1.1
Finns	Karajala	45.7	43.1	11.2
Russians	Moscow	39.9	44.0	16.1
Aborigines	Queensland	2.4	30.4	67.2

a. Calculate the allele frequencies in these five populations.
b. Which populations appear to be in Hardy-Weinberg equilibrium?
c. Which populations do you think have had significant intermixing due to migration?

14)

a) In the pedigree shown here, answer the following questions with regard to individual VII-1:



I. Who are the common ancestors of her parents?
(2marks)

II. What is the inbreeding coefficient? **(8 marks)**

b) Explain how Migrations Between Two Populations Can Alter Allele Frequencies.
(10marks)

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