JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF AGRICULTURAL AND FOOD SCIENCES

SECOND YEAR SECOND SEMESTER UNIVERSITY EXAMINATION FOR THE
DEGREE OF BACHELOR OF SCIENCE IN ANIMAL SCIENCE

2021/2022 ACADEMIC YEAR

COURSE CODE: AAB 1211

COURSE TITLE: POPULATION GENETICS

DATE: **STREAM: BSC. ANIMAL SCIENCE**

TIME: 2 HOURS

Instructions:

1. **Answer ALL questions in Sections A and B and ANY ONE question in Section C.**

SECTION A   [10 MARKS]

Answer ALL Questions from this Section.

1. Differentiate between Mendelian and population genetics.   (2 marks

2. A hypothetical specification of the MN blood group locus of two cattle populations is given in the table below. Explain how the two populations differ in their genetic structure.

(4 marks)

Population	Blood Group			
	MM	MN	NN	Total
1	0.24	0.48	0.28	1.00
2	0.03	0.44	0.53	1.00

3. Differentiate between the following:

   a) complete and incomplete dominance.   (2 marks)

   b) Hardy-Weinberg Law and Hardy-Weinberg equilibrium.   (2 marks)

   c) intra- and inter-locus interactions of alleles.   (2 marks)

4. Define the following as used in population genetics;

   a) random mating   (2 marks)

   b) migration and mutation   (3 marks)

5. State six (6) factors that change gene and genotype frequencies.   (3 marks)

SECTION B   [30 MARKS]

Answer ALL Questions from this Section.

6. Describe the four (4) degrees of dominance with respect to fitness.   (4 marks)

7. What are the two main types of selection? How do they operate?   (4 marks)

8. a) What is assortative mating in population genetics?   (2 marks)

b) Explain the main types of assortative mating. (4 marks)

c) Distinguish between Non-recurrent and recurrent mutations. Illustrate how they operate.

(4 marks)

9. With the aid of a diagram, explain how:

a) Migration may change the gene and genotype frequencies of a population. (5 mark)

b) Genes are transmitted from parents to progeny. (5 marks)

10. Explain the main applications of Hardy-Weinberg Law. (2 marks)

SECTION C [20 MARKS]

Answer ONE Question from this Section.

11. a) Outline the four (4) steps in the proof of Hardy-Weinberg Law. State the assumptions for each step. (12 marks)

b) How long does it take a population to reach equilibrium? (3 marks)

c) Assume there are 2 alleles, B and b, at a locus. If a population of 100 animals are classified genotypically with respect to this locus and the number in each genotype counted as follows: BB =30: Bb = 60; and bb =10.

   i. Calculate the genotype frequencies. (2 marks)
   ii. Calculate gene frequencies. (3 marks)

12. a) Explain the role of natural selection in evolution**.** (2 marks)

b) Discuss the concept of reproductive isolation mechanisms (RIMs) as drivers of

evolution. (18 marks)

13. Write short notes on the following:

   a) Random genetic drift. (4 marks)

   b) Reverse mutation. (4 marks)

   c) Mutation rate. (4 marks)

   d) Frequency of mutation. (4 marks)

   e) Polymorphism. (4 marks)