



# UNIVERSITY OF EMBU

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2017/2018 ACADEMIC YEAR

SECOND SEMESTER EXAMINATIONS

THIRD YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN  
RANGE MANAGEMENT

AAS 303: POPULATION AND QUANTITATIVE GENETICS

**DATE: APRIL 5, 2018**

**TIME: 8:30 - 10:30 AM**

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**INSTRUCTIONS:**

**Answer Question ONE and ANY Other TWO Question**

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**QUESTION ONE (30 MARKS)**

- a) Discuss the main features of one gene inheritance. (3 marks)
- b) Differentiate between founder effect and population bottleneck. (4 marks)
- c) Discuss the three causes of heterosis in nature. (3 marks)
- d) Some members in a population were found to be highly resistant to HIV infection despite repeated exposure, explain. (3 marks)
- e) What is pre-mutation. (3 marks)
- f) What is the difference between cross breeding and inbreeding. (3 marks)
- g) Which phenotypes are formed in these cross,  $AaBbCC \times aabbCc$ , where ABC are dominant over abc. (3 marks)
- h) Assume that we measure the diameter of an orange fruits in a population where the mean diameter  $M$  was larger than the desired 20 mm and that from a population we select a group with the smallest diameter for which the mean  $M_1$  is equal to 10 mm. If plants that yield this

population are outbred and progeny yields a mean M2 of 13 mm. Calculate the narrow sense heritability in order to estimate the potential of artificial selection of orange. What conclusion do you make from your answer? (5 marks)

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i) Explain the difference between mosaicism and trinucleotide repeat disorder. (3 marks)

### **QUESTION TWO (20 MARKS)**

- a) Explain factors that influence genetic equilibrium in a population. (10 marks)
- b) A change in chromosome number can greatly interfere with stability of a population discuss. (10 marks)

### **QUESTION THREE (20 MARKS)**

- a) Discuss outbreeding and its biological significance. (10 marks)
- b) Describe the factors that affect heterosis (10 marks)

### **QUESTION FOUR (20 MARKS)**

Discuss polymorphism. (20 marks)

### **QUESTION FIVE (20 MARKS)**

- a) You are provided with different types of bacteria for culturing where half of the bacteria have allele A and the other half has allele B. Each has allele frequency of 0.5. Four bacteria survived. With the aid of Punnett square, find the probability that any allele combination occurs, when solution shrinks, using a table show the allele's frequency combination and probability. (13 marks)
- b) From the table of alleles in your Punnett square, determine the diameter of a bacteria assigning  $A=1/100$  mm and  $B=2/100$  mm and calculate the diameter of phenotypes using the contribution of alleles for both additive and dominance genetic variance. (7 marks)

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