



MASEÑO UNIVERSITY
UNIVERSITY EXAMINATIONS 2013/2014

**SECOND YEAR FIRST SEMESTER EXAMINATIONS FOR THE
DEGREE OF BACHELOR OF SCIENCE IN ANIMAL SCIENCE,
AGRONOMY AND SOIL SCIENCE WITH INFORMATION
TECHNOLOGY
(MAIN CAMPUS)**

AAG 201: BASIC GENETICS

Date: 21st November, 2013

Time: 11.00am - 1.00pm

INSTRUCTIONS:

- Section A: Answer ALL Questions. Section B: Answer any TWO questions.

INSTRUCTIONS

(Section A: Answer ALL Questions. Section B: Answer any TWO questions.)

SECTION A [30 Marks] (Answer ALL questions)

1. Outline the features of ZW mechanism of chromosomal sex determination. [3 marks]
2. Define heritability in both broad and narrow senses [3 marks]
3. Differentiate between sex limited trait and sex influenced traits.[3marks]
4. What is the difference between a locus and allele? [3 marks]
5. Outline the major components of phenotypic variance in populations. [3 marks]
6. A cross AABB x aabb was made, and the F1 is then backcrossed to the recessive parent. The following results are observed,

<u>Phenotype</u>	<u>Proportion</u>
AB	3/8
Ab	1/8
aB	1/8
ab	3/8

Calculate how far apart the two genes are on the linkage map. [3 marks]

7. Explain why maximum recombination between any pair of linked genes is usually 50 percent. [3 marks]

8. In a population of *Tribolium* (Floor beetles), the body length shows continuous distribution with a mean of 6mm. A group of males and females of body lengths 9 mm are removed and interbred. The body length of their offspring averaged 7.2 mm. From this data calculate the narrow sense heritability for body length in this population. [3 marks]

9. With the aid of a diagram, explain how disruptive selection works. [3 marks]

10. Using an example, explain the meaning of the term overdominance. [3 marks]

SECTION B [40 Marks] (Answer any TWO questions)

1. (a) If we were to self some plants with normal wild-type phenotype of blue, large petals and observed the following number of phenotypes in the progeny:

Blue, large 182

Blue, small 60

White, large 57

White, small 21

(i) Use Chi- square (χ^2) analysis to decide if the results fit a 9:3:3:1 ratio. (6 marks).

(ii) Deduce the dominance relations of the genes involved and the genotype of the selfed plant. (4 marks)

- (b) Two homozygous white maize lines were crossed and all progeny were red seeded. These red-seeded F_1 progeny were selfed, and the population segregated into; 9 red seeded to 7 white-seeded. Explain these results using genetic symbols and give the genotypes of the parents and F_2 individuals. [10 marks]
2. (a) Cod fish have two forms of haemoglobin determined by alleles a and b at a locus. A sample of cod taken off the Norwegian coast had the following frequencies of three genotypes:

AA	Ab	bb	Total
130	763	1698	2591

- (i) Is this codfish population in Hard-Weinberg equilibrium? [7 marks]
- (ii). If not, explain the possible causes of deviation? [5 marks]
- (b) Discuss the features of heterosis and its applications. [8 marks]
3. (a) Describe in detail various types of chromosome mutations. [10 marks]
- (b) Discuss the economic and agricultural applications of polyploidy. [10 marks]
4. Discuss the mechanisms of DNA replication. [20 marks].