



MAASAI MARA UNIVERSITY

**REGULAR UNIVERSITY EXAMINATIONS
2018/2019 ACADEMIC YEAR
THIRD YEAR FIRST SEMESTER EXAMINATIONS**

**FOR
BACHELOR OF SCIENCE (BOTANY) AND BACHELOR
OF SCIENCE (ZOOLOGY)**

COURSE CODE: BOT 3112

COURSE TITLE: ADVANCED GENETICS

DATE: 11TH DECEMBER 2018

TIME: 0830-1030 HRS

INSTRUCTIONS TO CANDIDATES

Answer **ALL** questions in **Section A** and any other **TWO** questions in **Section B**.

This paper consists of 3 printed pages. Please turn over

SECTION A: ANSWER ALL QUESTIONS (30MARKS)

1. Describe the main events in protein synthesis. **(3 marks)**
2. Define the following terms as used in Genetics: **(3 marks)**
 - a. Quantitative traits**(1 mark)**
 - b. Allosteric protein **(1 mark)**
 - c. Gene amplification**(1 mark)**
3. Outline the process of mRNA splicing in eukaryotic cells. **(3 marks)**
4. List **SIX** factors that lead to changes in gene and genotype frequencies. **(3 marks)**
5. Distinguish between the following terms:
 - a) Codominance and Incomplete dominance. **(1 mark)**
 - b) Missense and nonsense mutation. **(1 mark)**
 - c) Euchromatin and heterochromatin. **(1 mark)**
6. A zookeeper has collected a male and female lizard that look like they belong to the same species. They mate with each other and produce phenotypically normal offsprings. However, their offsprings are sterile. Suggest explanations for their sterility. **(3 marks)**
7. Distinguish between cytoplasmic and nuclear types of inheritance. **(3 marks)**
8. Explain multiple allelic inheritance and its significance. **(3 marks)**
9. Distinguish between chromatid disjunction and chromosome disjunction. **(3 marks)**
10. The M-N blood groups in man is determined by two alleles at a locus, and the three genotypes correspond with the three blood groups. The following table gives the blood group frequencies in a population. Calculate gene/allele and genotypic frequencies in this population. **(3 marks)**

Genotype	MM	MN	NN	Total
Population	475	89	5	569

SECTION B: ANSWER ANY OTHER TWO QUESTIONS (40 MARKS)

- 11.** Relate the structure of the DNA molecule to its functions. **(20 marks)**
- 12.** Bean anthracnose is a fungal disease affecting beans. Two different bean varieties **A** and **B**, and the different lines of parasitic fungus α and β are obtained. Fungus α produces disease in bean variety **A** but not in **B**. Fungus line β produces disease in bean variety **B** and not in **A**. A cross between **A** × **B** is made and **F₁** and **F₂** obtained. Both generations are treated with a mixture containing fungus α and β . None of the **F₁** shows any disease reaction. In the **F₂**, the ratio of unaffected to diseased plants is **9:7**. Interpret these results genetically. **(20 marks)**
- 13.** With examples, distinguish between repressible and inducible regulatory mechanisms in *E. coli*. **(20 marks)**
- 14.** An inbred strain of snapdragons with violet flowers was crossed to another inbred strain with white flowers and shiny leaves. The **F₁** plants which had violet flowers and dull leaves were backcrossed with white flowers and shiny leaves, and the following **F₂** plants obtained.
- | | | | |
|------------------------------|----|-----------------------------|----|
| Violet flowers, dull leaves | 50 | White flowers, dull leaves | 10 |
| Violet flowers, Shiny leaves | 12 | White flowers, Shiny leaves | 46 |
- State which of the four classes in the **F₂** are recombinant. **(2 marks)**
 - Highlight the evidence indicating the genes for flower color and leaf texture are linked. **(1 mark)**
 - Illustrate the crosses of this experiment. **(8marks)**
 - Perform a chi-square test to determine if the observed data is consistent with an expected ratio of 1:1:1:1. **(6marks)**
 - Calculate the genetic map distance between these genes. **(3 marks)**