MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS
2019/2020 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: 13TH DECEMBER, 2019   **TIME: 0830 – 1030HRS**

INSTRUCTIONS TO CANDIDATES

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

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 freqencies.
   (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, ther offsprings are sterile. Suggest explainations 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 fnctions. **(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 **AXB** is made and F_1 and F_2 obtained. Both generations are treated with a mixture containing fungus **α** and **β**. None of the F_1 shows any disease reaction. In the F_2, 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 backcrossesd with white flowers and shiny leaves, and the following F_2 plants obtained.

Violet flowers, dull leaves	50	White flowers, dull leaves	10
Violet flowers, Shiny leaves	12	White flowers, Shiny leaves	46

    a) State which of the four classes in the F_2 are recombinant. **(2 marks)**

    b) Highlight the evidence indicating the genes for flower color and leaf texture are linked. **(1 mark)**

    c) Illustrate the crosses of this experiment. **(8marks)**

    d) Perform a chi-square test to deterimine if the observed data is consistent with an expected ratio of1:1:1:1. **(6marks)**

    e) Calculate the genetic map distance between these genes. **(3 marks)**

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