



MACHAKOS UNIVERSITY

University Examinations 2019/2020 academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF BIOLOGICAL SCIENCES

FIRST YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR
BACHELOR OF SCIENCE IN AGRICULTURAL EDUCATION AND EXTENSION
SBC 120: INTRODUCTION TO GENETICS

DATE: 21/1/2021

TIME: 2.00-4.00 PM

INSTRUCTIONS

1. Answer Question 1 (compulsory) and **any two** questions in Section B.
2. Use clean well labelled diagrams wherever appropriate.

SECTION A

QUESTION ONE (30 MARKS)

- a) Explain various types of genetic linkages (3 marks)
- b) Explain the factors that affect recombination frequency (3 marks)
- c) using a diagram explain three zygote condition that may results due abnormal chromosomal numbers. (3 marks)
- d) Explain with details human disorders due to chromosomal mutations (3 marks)
- e) Describe three importances of genetic variation in both plants and animals (3 marks)
- f) Define the following terms (3 marks)
 - i. Founders Effect
 - ii. Genetic Effect
 - iii. Bottleneck Effect
- g) Explain the isolation mechanisms that in speciation . (3 marks)
- h) Explain types of Extranuclear inheritance (3 marks)
- i) Elaborate on the importance of cell division in living things. (3 marks)
- j) Explain the natural selection pressures various organisms must observe to avoid evolution (3 marks)

SECTION B

QUESTION TWO (20 MARKS)

A researcher and a maize breeder at KARI is involved in developing a superior variety of maize. He recently developed a trihybrid maize for yellow seed, thick prop roots and a resistance to stem fungal attack. In the various crosses that he conducted he noted the following

1. When maize of a true breeding for white seed (yy) and a thick prop root (RR) was pollinated by Maize that was a true breeding for yellow seed (YY) and slender Prop(rr) root, the progeny were all yellow seeds and thick Prop roots.
2. When Maize variety that was a true breeding for susceptibility to stem fungal attack (ff) was pollinated by one that was a true breeding for resistance to stem Fungal attack the entire progeny were resistant.

In a new cross the trihybrid (above) was pollinated by a Maize variety that of White seed and is a hybrid for thick prop root and resistance to stem fungal attack.

From the above information

- a) List the dominant and recessive genotypes for all the traits crossed. (2 marks)
- b) What are the genotypes for the trihybrid maize. (3 marks)
- c) What are the genotypes for the pollinator Maize in the new cross. (5 marks)
- d) With a Punnett Square show the genotypes of the progeny from a new cross. (10 marks)

QUESTION THREE (20 MARKS)

Discuss Mendel's principles and non-Mendel's principles of inheritance

QUESTION FOUR (20 MARKS)

- a) Discuss ways through which new species can evolve (10 marks)
- b) Explain five conditions required in order for a population to maintain the Hardy-Weinberg equilibrium (10 marks)

QUESTION FIVE (20 MARKS)

Discuss meiosis