



MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF AGRICULTURAL SCIENCES

DEPARTMENT OF AGRICULTURAL EDUCATION AND EXTENSION

THIRD YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (AGRICULTURAL EDUCATION AND EXTENSION)

AGR 305: PLANT BREEDING

DATE: 11/8/2021

TIME: 2.00-4.00 PM

INSTRUCTIONS:

Answer *ALL* questions from Section A and any other *TWO* from Section B:

SECTION A: COMPULSORY: (30 MARKS)

QUESTION ONE (30 MARKS)

- a) Distinguish between homozygous and heterozygous lines in plant breeding (2 marks)
- b) Explain four negative consequences of plant breeding as a result of variety improvement (4 marks)
- c) Using appropriate illustration, explain the role of the following Mendel's principles in plant breeding
 - i. Principle of segregation (3 marks)
 - ii. Principle of independent assortment (3 marks)
- d)
 - i Distinguish between horizontal and vertical resistance (2 marks)
 - ii Describe how a plant reacts to bacterial infection as a natural way of resistance (3 marks)
- e) Explain three mechanism of self-incompatibility in plants (3 marks)
- f)
 - i Explain three applications of heritability in maize breeding (3 marks)
 - ii Explain two importance of plant breeder's protection rights (2 marks)
- g) Explain three reasons why scientists are interested in germplasm conservation (2 marks)
- h) Explain three methods used in developing hybrids in maize production (3 marks)

SECTION B: Answer any TWO questions (40 Marks)

QUESTION TWO (20 MARKS)

- a) Using an illustration, explain how to develop rust resistance wheat controlled by recessive genes (15 marks)
- b) Explain five ways in which self-incompatibility is overcome in developing brassica varieties (5 marks)

QUESTION THREE (20 MARKS)

- a) Supporting your answer with diagrams, explain two applications of modern breeding methods in improvement of a variety for two different traits (10 marks)
- b) Explain five disadvantages of apomictic lines in improvement of crop varieties (5 marks)
- c) Genetic inheritance is important in plant breeding
- i Describe the expression below in relation to genetic inheritance (2 marks)
- $$P = G + E + GE$$
- ii Explain the role of the expression in (i) above in developing new cultivars in relation to narrow sense heritability (3 marks)

QUESTION FOUR (20 MARKS)

- a) Explain four techniques utilized in breeding cassava clones (12 marks)
- b) Explain the steps to follow as a breeder in developing a new bean cultivar for farmers in areas with moderate rainfall (8 marks)

QUESTION FIVE (20 MARKS)

Assuming you have been employed by ICRISAT Nairobi as a plant breeder and you are tasked with improvement of pigeon peas at the centre.

- a) Describe four ways of creating variation (8 marks)
- b) Explain four methods of developing a high yielding variety for arid and semi-arid lands (12 marks)