

UNIVERSITY OF FORT HARE

PLANT BREEDING
AGC 422

Supplementary Examinations

February 2019

TIME : 3 HOURS

SUBJECT : AGC 422

MARKS : 100

This paper consists of three printed pages including this cover page

Internal Examiner

Prof CS Mutengwa

External Examiner

Prof GE Zharare

INSTRUCTIONS

Answer any **ANY FIVE** questions

Question 1 [20 marks]

a) Inbred lines are very useful in the production of hybrid varieties. In order to determine their usefulness as parents of a successful hybrid, they have to be evaluated. Elaborate on three possible ways of evaluating them. [9]

b) Elaborate on any three external barriers to hybridization. [5]

c) Define the following types of genetic resources and elaborate on their potential value in a breeding programme:

i) obsolete varieties; [3]

ii) wild forms. [3]

Question 2 [20 marks]

a) Write short notes on the following objectives of hybridization:

i) combination breeding; [4]

ii) transgressive breeding. [4]

b) Elaborate on the applications of cytoplasmic male sterility in plant breeding, giving examples where possible. [4]

c) Define any TWO (2) of the following terms that you normally encounter when breeding for disease and insect resistance:

i) durable resistance; [2]

ii) antibiosis; [2]

iii) virulence. [2]

d) Distinguish a primary centre from a secondary centre of diversity. Furthermore, explain why the concept of centres of origin is important to plant breeders. [4]

Question 3 [20 marks]

(a) When using genetic male sterility, illustrate how male sterile lines (*ms ms*) are maintained. [5]

b) Elaborate on any two post-fertilization barriers of distant hybridisation. [6]

c) Explain why interspecific hybrids are normally sterile, and indicate interventions that could make them fertile. [4]

d) Write short notes on self-incompatibility. [5]

Question 4 [20 marks]

a) Elaborate on Johannsen's pure line experiment and indicate its significance in plant breeding. [10]

b) State the nature of control of any three types of male sterility found in plants. [6]

c) Bulk population selection can be accomplished using short-term or long-term bulks. Explain how these two types of methods can be distinguished. [4]

Question 5 [20 marks]

a) What are the genetic consequences of self-pollination? Explain how this influences the type of varieties that should be developed for self-pollinated crops. [5]

b) Explain how a Plant Breeder can develop a variety of a self-pollinated crop species using Single Seed Selection. [8]

c) Write short notes on the following aspects of hybridization for purposes of crop improvement: (i) choice of parents, [4] and (ii) emasculation. [3]

Question 6 [20 marks]

a) Elaborate on the following origins of genetic variation in crop evolution, and give examples where possible.

(i) Mendelian variation; [4]

(ii) Interspecific hybridization; [4]

(iii) Polyploidy. [4]

b) Describe how you would develop a variety of a named self-pollinated crop using the Pure-line breeding method. [8]