



1ST SEM 2013/2014

PAGE 1 OF 3

**UNIVERSITY OF SWAZILAND
FINAL EXAMINATION PAPER**

PROGRAMME: B.Sc. IN AGRONOMY YEAR 3
B.Sc. IN HORTICULTURE YEAR 3.

COURSE CODE: CP 301

TITLE OF PAPER: CROP BREEDING

TIME ALLOWED: TWO (2) HOURS

INSTRUCTIONS: ANSWER QUESTION ONE (1) AND ANY OTHER THREE (3)
QUESTIONS

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CHIEF INVIGILATOR**

QUESTION 1 (THIS IS A COMPULSORY QUESTION)

Based on a project feasibility study by a European based company, it was concluded that commercial wheat (*Triticum aestivum* L.) production is possible in Swaziland, provided a locally bred variety is used. You have been hired by the company to design a wheat breeding program for Swaziland using conventional breeding methods. You have been advised that the variety must meet the following requirements;

- a) High yielding potential
- b) Drought tolerance
- c) Stable yield performance across local growing environments
- d) Tolerance to common insect pests and diseases
- e) Excellent baking qualities

Give a diagrammatic outline of the breeding method you are going to use, taking into consideration of the above requirements. **[25 MARKS]**

QUESTION 2

- a) Describe in detail, the three (3) main floral modifications that facilitate cross pollination crop plants. Your answer on the floral modifications should also include examples of crops involved. **(18 Marks)**
- b) What are the crop breeding implications of cross pollination? **(6 Marks)**

[25 MARKS]

QUESTION 3

Discuss how inbred lines are developed and used in the development of hybrid maize varieties. Support your answer by the different types of maize hybrids that can be developed and their parental composition. **[25 MARKS]**

QUESTION 4

Crop breeders try to select the best plants from the segregating progenies based on the phenotype. Sometimes plants with the best phenotype do not always have the best genes due to the influence of the environment. Because of this problem breeders now rely on MAS to identify plants with desirable genes.

Define MAS and discuss its main advantages in modern crop breeding programmes.

[25 MARKS]

QUESTION 5

- a) The data below was obtained by UNISWA crop breeding students in a maize (*Zea mays* L.) breeding practical at Luyengo Campus.

Quantitative traits	Variability parameters		
	Mean	V_G	V_E
Plant height (cm)	107.28	33.12	13.79
Ear length (cm)	14.91	0.24	1.78
Grain yield (t/ha)	4.37	205.11	72.17

By showing all relevant calculations and well labeled normal distribution curves, calculate the progeny population mean after selection for;

- i. Reduced plant height (6 Marks)
- ii. Increased ear length (5 Marks)
- iii. Increased grain yield (5 Marks)

Your calculations should be based on a selection intensity of 5% ($K=2.063$) and your answers should be on two (2) decimal places.

- b) Which breeding method (s) can you use to improve each of the traits as per the breeding objectives? Justify your answer. (9 Marks)

[25 MARKS]