



1ST SEMESTER 2019/2020

PAGE 1 OF 5

**UNIVERSITY OF ESWATINI
MAIN EXAMINATION PAPER**

**PROGRAMMES: BACHELOR OF SCIENCE IN AGRONOMY YEAR FOUR
BACHELOR OF SCIENCE IN HORTICULTURE YEAR FOUR**

COURSE CODE: CPR 403/CP 301

TITLE OF PAPER: CROP BREEDING

TIME ALLOWED: TWO (2) HOURS

**INSTRUCTIONS: ANSWER QUESTION 1 AND ANY OTHER THREE (3)
QUESTIONS OF YOUR CHOICE**

**DO NOT OPEN THIS PAPER UNTIL PERMISSION HAS BEEN GRANTED BY THE
CHIEF INVIGILATOR**

QUESTION 1 (COMPULSORY QUESTION)

Explain in detail the following crop breeding terms;

- a) Crop germplasm characterisation (3 Marks)
- b) Quantitative traits (3 Marks)
- c) Qualitative traits (3 Marks)
- d) Progeny testing in pure line breeding method (3 Marks)
- e) Hybridisation in self-pollinated crops (4 Marks)
- f) Parents selection criteria when implementing the pedigree breeding method (3 marks)
- g) Advantages of the bulk-population breeding method (3 Marks)
- h) Linkage drag in backcross breeding method (3 Marks)

[25 MARKS]

QUESTION 2

Discuss the following terms as used in reproduction of crop plants.

- a) Microsporocyte (2 Marks)
- b) Megasporocyte (2 Marks)
- c) Microspores (2 Marks)
- d) Megaspores (2 Marks)
- e) Microgametophyte (3 Marks)
- f) Megagametophyte (4 Marks)
- g) Sporophyte (2 Marks)
- h) Sporophytic self-incompatibility (4 Marks)
- i) Sporophytic apomixes (4 Marks)

[25 MARKS]

QUESTION 3

The ANOVA below was obtained by UNESWA crop breeding students in a maize breeding practical at Luyengo Campus. The practical consisted of 10 maize varieties planted in a randomised complete block design (RCBD) with 3 replications and data was collected on plant height, grain yield and days to maturity.

Source of variation	df	Mean Sum of squares of traits		
		Plant height	Grain yield	Days to maturity
Replications	2	0.24	1.11	0.0023
Genotypes	9	0.15	74.57	10.45
Error	18	0.05	1.85	0.39
Population Mean		108.28 cm	4.37 tonnes/ha	65.83 days

By showing all relevant calculations supported with well labelled normal distribution curves, calculate the progeny population mean after selection for;

- a) Reduced plant height (8 Marks)
- b) Increased grain yield (8 Marks)
- c) Early (not late) maturity (9 Marks)

Your calculations should be based on a selection intensity of 5% ($K=2.06$) and all answers should be on two decimal places.

[25 MARKS]

QUESTION 4

- a) Define an inbred line (2 Marks)
- b) Define a hybrid variety (2 Marks)
- c) Define heterosis in hybrid breeding (3 Marks)
- d) Describe two causes of heterosis in hybrid breeding (6 Marks)
- e) Discuss how inbred lines are used in the development of different types of hybrid maize varieties. Support your answer with labelled diagrams. (9 Marks)
- f) List advantages of using hybrid varieties in crop production. (3 Marks)

[25 MARKS]

QUESTION 5

- a) Define molecular markers and give four examples of molecular markers commonly used in crop breeding programmes. (10 Marks)
- b) Discuss uses of molecular markers in crop breeding programmes. (15 Marks)

[25 MARKS]