



*“Investing in Africa’s future”*

**COLLEGE OF HEALTH, AGRICULTURE & NATURAL SCIENCES**

**NACP 405: PLANT BREEDING METHODS AND BIOTECHNOLOGY**

**END OF FIRST SEMESTER FINAL EXAMINATIONS**

**NOVEMBER / DECEMBER 2022**

**LECTURER: MR. TABARIRA J.**

**DURATION: 3 HOURS**

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**INSTRUCTIONS**

Answer any **four** questions

All questions carry equal marks (25).

DO NOT repeat material.

Write legibly.

Credit will be awarded for logical, systematic and neat presentations

- Que**  
**Writ**
- Significance of inbreeding in breeding populations

**[5]**

- Characteristics of an ideal inbred line

**[5]**

- c. Importance of meiosis in plant breeding  
[5]
- d. Environmental benefits of GMO technology  
[5]
- e. Circumstances renders a crop cultivar to be obsolete  
[5]

### Question Two

- a. Discuss in detail Johannsen's classical studies with Princess beans. State the major findings and their applications in plant breeding  
[15]
- b. Explain why marker assisted breeding/selection is becoming more popular than conventional breeding  
[5]

### Question Three

- a. Outline the contribution of plant breeding in achieving global food security by the year 2050  
[8]
- b. A maize breeder developed a new three-way hybrid cultivar of maize from inbreds A, B and C. The yield performances of the breeding materials are as follows:

Inbred A =  $5.8 \text{ t ha}^{-1}$ , Inbred B =  $6.3 \text{ t ha}^{-1}$ , Inbred C =  $5.7 \text{ t ha}^{-1}$ , Hybrid ABC =  $7.5 \text{ t ha}^{-1}$  and Open-pollinated cultivar =  $5.5 \text{ t ha}^{-1}$ .

Using the information provided above, calculate:

- i. Mid-parent heterosis,  
[3]
- ii. High parent heterosis,  
[2]
- iii. Low parent heterosis, and [2]
- iv. Standard heterosis  
[2]
- v. Comment the suitability of this new hybrid for commercial cultivation [3]

### Question Three

- a. State **four** different sources of germplasm and explain the strength of each in a breeding program  
[8]
- b. Suppose you have been appointed plant breeder in a newly established seed company, explain, with justification the choice of the planting method that you will use in your new job  
[12]
- c. Define the following terms:
- i. Tissue culture [1]
  - ii. Landrace [2]
  - iii. Hybrid vigour [2]
  - iv. Biotechnology [2]
  - v. Hybrid [2]

### Question Four

- a. Give an appropriate explanation for each of the following statements:
- i. Selection acts on existing variability,  
[3]
  - ii. Mass selection involves selection and sampling  
[3]
  - iii. Marker assisted selection is an indirect selection procedure ,  
[3]
  - iv. Self-pollinated crop species are made up of homozygous plants in heterogeneous populations, and  
[3]
  - v. Inbreeding depression in single-cross hybrids is greater than in three-way hybrids.  
[3]
- b. Outline perceived benefits for adopting GMO technology in the livestock sector [5]

### Question Five

Provide a detailed justification you would put forward to convince Leaders of African economies to adopt production and utilization of genetically modified organisms (GMOs).  
[25]

### Question six

- a. With the aid of clearly labelled flow diagram, describe how you would develop a new soyabean variety using any Hybridization followed by selection in segregating generations breeding procedure of your choice,  
**[15]**
- b. Briefly explain why hybrids are more in crop production systems  
**[5]**
- c. State and explain two features that promote cross pollination in cross-pollinated crop species  
**[5]**

**END OF EXAMINATION PAPER**