AFRICA UNIVERSITY
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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

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

Question One

a. Discuss in detail circumstances that can alter the genetic equilibrium in breeding populations **[15]**

b. Briefly explain the materials that can be exploited by the breeders for the development of inbred lines **[5]**

Question Two

a. Assume you have been invited for a Plant Breeder position, describe the key activities of a Plant breeder **[12]**

b. State and explain two features promoting self pollination in self-pollinated crop species **[5]**

c. Given a population size of 400 diploid individuals with alleles [A_1 or A_2] at a gene locus and a mixed population of the following genotypes, 220 A_1A_1 plants, 100A_1A_2 and 80 A_2A_2 plants.

Calculate:

i. Total number of A_1 and A_2 alleles **[3]**

ii. Gene frequency A_1 and A_2 alleles in the population **[2]**

iii. Genotype frequency of A_1A_1, A_1A_2 and A_2A_2 genotypes in the population **[3]**

Question Three

a. Write brief notes in support of the following statements:

i) The best yielding cultivar today may be rendered obsolete tomorrow, **[4]**

ii) Broad sense heritability is always higher than narrow sense heritability **[3]**

iii) Plant breeding is both a science and an art **[4]**

iv) A population of cross-pollinated plants has a limitless number of gene combinations within its gene pool. **[3]**

v) Inbreeding depression is greater in single-cross hybrids than in open-pollinated cultivars. **[2]**

Question Three

Discuss in detail the possible reasons why the adoption rate of GMO technology is very low in most African economies **[25]**

Question Four

a. With the aid of clearly labelled flow diagram, describe how you would develop a new soyabean cultivar 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]**

Question Five

a. Explain in detail **five crop** production challenges in your country. **[10]**
b. Outline how plant breeding can be applied to address each of the problems cited above. **[10]**
c. Justify why there are commercial hybrid cultivars of cross-pollinated crops than of self-pollinated crop species **[5]**

Question six

a. With the aid of sketch diagrams, where possible, differentiate between the following:
    i. Half sib mating and full sib mating **[4]**

ii.	Self pollination and back crossing	[4]
iii.	Single cross hybrid and three way hybrid	[4]
iv.	Tissue culture and genetic engineering	[5]
v.	Gene frequency and genotype frequency	[2]
vi.	Inbreeding and heterosis	[2]
vii.	Protandry and protogyny	[2]
viii.	Selection and sampling	[2]

END OF EXAMINATION PAPER