



“Investing in Africa’s future”

COLLEGE OF HEALTH, AGRICULTURE AND NATURAL SCIENCES

NACP 217: GENETICS AND BIOTECHNOLOGY

END OF FIRST SEMESTER EXAMINATIONS

DECEMBER 2023

LECTURER: MR. TABARIRA J.

DURATION: 3 HRS.

INSTRUCTIONS

1. Answer Four questions
2. Read and fully understand the question before answering
3. DO NOT repeat material
4. Credit will be awarded for logical and systematic presentations

Question one

- a. The table below shows blood group types in a court case of disputed parentage.
Determine the probable parent. Clearly show how you determined the parent in all cases.

Blood Group Type				
Mother	Child	Father 1	Father 2	
i. B	O	AB	A	[3]
ii. B	AB	B	A	[3]
iii. AO	B	A	BO	[3]

		Fraternal twins					
iv	O	Twin-1	A	Twin – 2	B	A	B [3]

- b. Discuss the perceived human health challenges of adopting GMO technology [8]

Question two

- a. Colour blindness in humans is caused by a recessive sex-linked gene. If a normal lady whose father was colour blind marries a colour blind man.

What are the possible genotypes of the mother of the colour blind man [2]

- What are the chances that the first child from this marriage will be a colour blind boy [2]
 - Of the girls produced by these parents, what percentage is expected to be colour blind [2]
 - What proportion of children produced from these parents (sex unspecified) is expected to be normal. [2]
- b. Give genetic explanations, giving supporting evidence for the following observations:
- A cross between a tall and dwarf maize plant always produces tall F_1 progeny. [3]
 - A cross between tall maize plants produced a mixture of tall and dwarf progenies [3]
 - A normal man married a colour blind woman produced all colour blind boys and normal girls [3]
 - A cross between two pink flowered plants produced a mixture of red, pink and white flowered plants. [3]

Question three

- a. State and explain **four** non genetic factors influencing the phenotypic expression of an organism. [8]
- b. In squash, fruit colour can be yellow, green or white. The B- and bb alleles produce yellow and green fruits respectively. In the presence of the dominant allele at the A locus the fruit colour becomes white in the presence of either B or b.
If a breeder crosses squash of genotypes AaBb and AaBb, what are the phenotypic proportions of the offsprings from resultant cross? [12]

Question four

- a. Demonstrate your understanding of the possible reasons behind the low adoption rate of GMO technology in developing countries [10]
- b. Given that in protea the allele for red colour is dominant over white and that long flower head is dominant over compact head. The alleles controlling flower colour and flower

shape are known to assort independently of each other. If a breeder crosses pure-breeding red long flowered plants with homozygous white compact flowered plants.

What proportion of phenotypes would you expect from the breeder's work in?

i. F₁ progeny. [2]

ii. F₂ generation [8]

Question five

Write explanatory notes on the following:

i. Importance of meiosis [3]

ii. Sex limited traits [3]

iii. Ethical concerns of the adoption of GMO technology [3]

iv. Double fertilization in flowering plants [4]

v. Incomplete dominance [2]

vi. Complementary base pairing [2]

vii. Sex linked traits [3]

Question Six

(a) Red flower colour in pea plants is a homozygous dominant condition (RR). Pink flowering pea plants were crossed with pink flowering pea plants. The seeds from these plants were harvested and sown, and the new plants produced flowers as shown below:

Number of plants with red flowers 27

Number of plants with pink flowers 56

Number of plants with white flowers 29

i. Using a cross, deduce the genotype of the original pink flowering parents. [5]

ii. Explain how the three flower types shown above resulted from a cross between two pink flowered plants. [5]

iii. What offspring would result if a pink flowering pea plant were crossed with a red flowering pea plant? Describe this cross and state the genotype and phenotype of the offspring produced. [5]

b. Discuss the possible challenges of GMO technology to the Environment [5]

_____END OF EXAMINATION_____