



*“Investing in Africa’s future”*

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

**NACP 217: GENETICS AND BIOTECHNOLOGY**

**END OF SEMESTER EXAMINATIONS**

**APRIL / MAY 2024**

**LECTURER: Mr. Tabarira J.**

**DURATION: 3 HRS**

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**INSTRUCTIONS**

Answer any **four** questions

All questions carry equal marks (25).

### Question one

Provide a detailed explanation on the possible reasons why the production and consumption of GMO products should be encouraged globally. [25]

### 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.

i. Explain characteristics of recessive sex-linked traits [5]

ii. What are the possible genotypes of the mother of the colour blind man [3]

iii. What are the chances that the first child from this marriage will be a colour blind boy [3]

iv. Of the girls produced by these parents, what percentage is expected to be colour blind [3]

v. What proportion of children produced from these parents (sex unspecified) is expected to be normal. [3]

b. Explain the importance of meiosis [8]

### Question three

a. In cattle the allele for producing red coat colour (R) is incompletely dominant over the allele for producing white skin colour (r). The heterozygote being roan-coloured (Rr). The allele for being horned (HH) is completely dominant over the allele for Hornless (polled) (hh). Assume the two gene pairs assort independently of each other.

- i. What would be the phenotype of an  $F_1$  cross involving pure breeding red horned bull and white hornless cow? [2]
- ii. What would be the phenotypes and their proportions of the  $F_2$  generation? [8]
- b. Presence of a gene in an organism does not guarantee its phenotypic expression. Demonstrate your understanding of this statement, giving relevant examples. [15]

#### Question four

- a. Give genetic explanations, giving supporting evidence for the following observations:
- i. A cross between a tall and dwarf maize plant always produces tall  $F_1$  progeny. [3]
- ii. A cross between two pink flowered plants produced a mixture of red, pink and white flowered plants. [3]
- iii. A cross between tall maize plants produced a mixture of tall and dwarf progenies [3]
- iv. A cross between yellow mice gave a 2 yellow : 1 white [4]
- v. A normal man married a colour blind woman produced all colour blind boys and normal girls [4]
- vi. A cross between pure red bull and pure white cow produces roan coloured calves [3]
- b. Write brief notes on the process of transcription [5]

#### Question five

- a. Justify the importance of Genetics in Agriculture [6]

b. Write explanatory notes on the following:

- i. Sex influenced traits, [3]
- ii. Effect of age on phenotypic expression, [4]
- iii. Epistatic gene interaction, [3]
- iv. Incomplete dominance, [2]
- v. DNA replication, and [4]
- vi. Maternal effects. [3]

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End of Examination Paper

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