



“Investing in Africa’s future”

COLLEGE OF HEALTH, AGRICULTURE & NATURAL SCIENCES

NACP 217: GENETICS 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 (20).

DO NOT repeat material.

Write legibly.

Credit will be awarded for logical, systematic and neat presentations

Question One

Write brief notes on the following:

- a. Sex limited traits [4]
- b. Sex linked traits [4]
- c. Sex influenced traits [4]
- d. Effect of nutrition on gene expression [4]
- e. Importance of meiosis [4]

Question Two

- a. Define the following terms:
 - i. Biotechnology [1]
 - ii. Nucleotide [1]
 - iii. Genotype [1]
 - iv. Bivalent [1]
 - v. Hemizygous [1]
 - vi. Partial dominance [1]
- b. In garden peas, long stems are dominant over short stems, and red seeds are incompletely dominant over white seeds. 100 long/red pea plants, all of which had one short/white parent, are bred to each other.
If 2400 progeny were obtained,
 - i. How many long/white pea plants would you expect among the offspring? [2]
 - ii. What ratio of red to white seed colour would you expect among the offspring? [2]

- iii. Give the expected ratio of long to short stems among the offsprings. [2]
- iv. What would be the expected overall phenotypic ratio among the 2400 offspring considering both traits? [8]

Question Three

- a. Demonstrate your understanding on the effects of age and sex on gene expression [6]
- b. With the aid of sketch diagrams, explain the difference between the following:
 - i. Metacentric chromosome and submetacentric chromosome [3]
 - ii. Acrocentric chromosome and telocentric chromosome [2]
 - iii. Telophase I and telophase II [3]
 - iv. Tandem duplication and reverse duplication [3]
 - v. Terminal deletion and interstitial deletion [3]

Question Four

- 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. What are the possible genotypes of the mother of the colour blind man [2]
 - ii. What are the chances that the first child from this marriage will be a colour blind boy [3]
 - iii. Of the girls produced by these parents, what percentage is expected to be colour blind [2]
 - iv. What proportion of children produced from these parents (sex unspecified) is expected to be normal. [3]
- b. Write brief notes on the following:
 - i. Perceived benefits of GMO technology in crop production [5]
 - ii. Characteristics of recessive sex linked characters [5]

Question Five

Provide a detailed explanation on the possible reasons of the low adoption rate of GMO technology in Africa. [20]

Question six

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 Hornless (polled) (HH) is completely dominant over the allele for horned (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 polled bull and white horned cow? [1]

ii. What would be the phenotypes and their proportions of the F_2 generation? [8]

b. Write brief notes on the following:

i. Transcription [4]

ii. Base pairing rules [3]

iii. Importance of mitosis [4]

END OF EXAMINATION PAPER