



“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

INSTRUCTIONS

Answer any **four** questions

All questions carry equal marks (25).

Question one

- 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. State and explain **five** non genetic factors influencing the phenotypic expression of an organism. [15]

Question two

- a. Using sketch diagrams where applicable, to differentiate between the paired terms. **Choose any five pairs only.**
- i. Incomplete dominance and over dominance [3]
- ii. Interstitial deletion and terminal deletion [3]
- iii. Chromosome duplication and chromosome inversion [3]
- iv. Metacentric chromosome and telocentric chromosome [3]
- v. Chromosome and chromatid [3]
- vi. Dominant lethal gene and recessive lethal gene [3]
- vii. Diploid and haploid [3]
- b. Explain the major crop production and food security concerns limiting the adoption of GMO technology in developing countries. [10]

Question three

a. Discuss the fertilization process in flowering plants [12]

b. In roses, the gene for tallness (T) is dominant over dwarfness (t) and that red colour (R) is incompletely dominant over white (r). The genes controlling plant height and flower colour assort independently of each other. If a breeder crosses homozygous tall red flowered plants with homozygous dwarf white flowered plants, what proportion of phenotypes would you expect in:

i. F₁ progeny. [1]

ii. F₂ generation [12]

Question four

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		A	AB [3]
ii. B	AB		A	B [3]
iii. AO	B		A	BO [3]
Fraternal twins				
iv. O	Twin-1 A	Twin – 2 B	A	B [6]

b. Discuss the human health issues that limit the rapid adoption of GMO technology in developing countries. [10]

Question five

Write brief explanatory notes on the following:

- i. Benefits of GMO technology to the environment, [5]
- ii. Importance of mitosis in agriculture, [5]
- iii. Lethal genes, [5]
- iv. Effect of moisture on gene expression and, [5]
- v. Sex limited traits. [5]

End of Examination Paper
