AFRICA UNIVERSITY
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"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

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Give

a. Human health concern of GMO products **[8]**
b. Difference between RNA and DNA **[4]**
c. Effects of temperature on gene expression **[4]**

d. Sex limited characteristics
[4]

Question Two

a. Provide possible gametes from organisms with the following genotypes:
   a. AaBb **[1]**
   b. AaBbCc **[3]**
   c. AaBbCCDd **[4]**

b. In cats, there is a coat color gene located on the X chromosome. This gene has two alleles—orange and black. A heterozygous cat has tortoiseshell color (mixture of orange and black).
Predict the genotypic and phenotypic proportions among the offspring of the following crosses. Pay careful attention to the **genders** of the offspring.

i. Black female X Orange male
[3]
ii. Orange female X Black male
[3]
iii. Tortoiseshell female X Black male
[3]
iv. Tortoiseshell female X Orange male
[3]

Question Three

a. Justify why agriculture students study Genetics **[5]**
b. Write brief notes on maternal effects.
[4]

c. Colour blindness is a recessive X-linked gene in humans. A husband and wife both are normal eyed although their respective fathers were colour blind.

i. Give the genotypes of this couple and justify
[3]
ii. What is the probability that, among the boys from this couple will be colour blind?
[2]
iii. What percentage of males among the children will have normal vision?
[2]
iv. What percentage of girls among the children will be colour blind
[2]

v. What is the expected percentage of children with normal vision (sex unspecified) from this couple?
[2]

Question Four

a. Explain the fertilization process in flowering plants
[8]
b. With the aid of sketch diagrams, explain the difference between the following:
   i. Bivalent and chromatid
   [3]
   ii. Chromosome and chromatid
   [3]
   iii. Metaphase I and metaphase II
   [3]
   iv. Pericentric inversion and paracentric inversion
   [3]

Question Five

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
   [3]
   v. A normal man married a colour blind woman produced all colour blind boys and normal girls
   [3]
b. Demonstrate your understanding of the importance meiosis
[5]

Question six

Provide a detailed explanation on the possible reasons why the adoption of GMO technology should be encouraged globally.

[20]

END OF EXAMINATION PAPER