"Investing in Africa's future"

COLLEGE OF HEALTH, AGRICULTURE AND NATURAL SCIENCES

NACP 217: GENETICS AND BIOTECHNOLOGY

END OF FIRST SEMESTER FINAL EXAMINATIONS

NOVEMBER 2021

LECTURER: MR. TABARIRA J.

DURATION: 5 HRS.

INSTRUCTIONS

Download the Question paper from the Moodle platform and work offline

Choose and Answer **One** question

DO NOT repeat material

Credit will be awarded for logical and systematic presentations

Question One

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? **[4]**
   ii. What are the chances that the first child from this marriage will be a colour blind boy? **[4]**
   iii. Of the girls produced by these parents, what percentage is expected to be colour blind? **[4]**
   iv. What proportion of children produced from these parents (sex unspecified) is expected to be normal? **[4]**
   v. Outline the general characteristics of recessive sex-linked traits. **[4]**

b. Write brief notes on the following:
   i. Contribution of translation and transcription processes to the well being of an organism. **[10]**
   ii. Importance of meiosis. **[10]**
   iii. Sex limited traits. **[10]**
   iv. DNA replication. **[10]**
   v. Lethal genes. **[10]**

c. As Biotechnology expert, explain the practical contribution of GMO technology in addressing food security challenges in Africa. **[30]**

Question Two

a. In rabbits, fur colour is determined by a set of multiple alleles at one locus that have the following relationship:

   C+ (agouti) is dominant to all other alleles.

   C^h (himalayan) is dominant to C^a (albino).

   C^u (chinchilla) shows incomplete dominance with regard to C^h and C^a

   The genotypes C^uC^h and C^uC^a are light-grey phenotypes.

i. What breeding stock would you select if you wished all of the offsprings to be chinchilla? **[5]**

ii. Give the genotypes of rabbits whose offsprings included 4chinchilla, 8 light-grey and 4 himalayan. **[5]**

iii. If in one of the matings you obtained 4 grey bunnies, 2 albino bunnies, and 2 himalayan bunnies. What were the genotypes of the parents? **[5]**

iv. In another mating, the litter contained 3 agouti bunnies and 3 light-grey bunnies. What were the genotypes of the parents of this litter? **[5]**

v. What were the genotypes of parents whose litter comprised of 8 agouti, 4light-grey and 4 himalayan bunnies? **[5]**

b. Explain, giving relevant examples, the positive impacts of Biotechnology in the Agriculture industry. **[40]**

c. 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	**[4]**
ii. B	AB		A	B	**[4]**
iii AO	B		BO	A	**[4]**
	Fraternal twins				
iv O	Twin 1 A	Twin 2 B	**B**	A	**[4]**
v AB	Twin 1 AB	Twin 2 B	**B**	A	**[4]**

vi. Provide a conclusive advice to the court in this matter. If there is need for further tests to be carried out, suggest the nature or type of tests giving proper justification **[15]**

Question Three

a. 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? [15]

b. Giving specific examples, explain in support of the notion that presence of a gene does not guarantee its expression in an organism. [30]

c. Demonstrate your understanding of the importance and applications of genetics in the field of Agriculture. [25]

d. Write explanatory notes on the following:

   i. Recessive sex linked characters. [5]

   ii. Importance of mitosis in agriculture. [10]

   iii. Effects of chromosomal mutation/changes in organisms. [10]

   iv. Complimentary base pairing. [5]

END OF EXAMINATION PAPER