



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF APPLIED SCIENCE
DEPARTMENT OF APPLIED BIOLOGY AND BIOCHEMISTRY
BACHELOR OF SCIENCE HONOURS DEGREE IN APPLIED BIOLOGY AND
BIOCHEMISTRY
GENETICS (SBB1204)

Main Examination Paper

OCTOBER 2024

This examination paper consists of 3 pages

Time Allowed : 3 hours
Total Marks : 100
Special Requirements : Statistical Tables, Calculators
Examiner's Name : MR T. MAGODORA

INSTRUCTIONS

1. Answer four (4) questions. Each question carries 25 marks.
2. Where a question contains subdivisions, the mark value for each subdivision is given in brackets.
3. Illustrate your answer where appropriate with large, clearly labelled diagrams.

MARK ALLOCATION

QUESTION	MARKS
1.	25
2.	25
3.	25
4.	25
5.	25
6.	25
TOTAL	100

- 1.(a) Give a brief review of pre-Mendelian theories on inheritance, highlighting their major weaknesses. (10 marks)
- (b) According to Gregor Mendel, every character in an organism is controlled by one gene which has only two alleles, one of which is dominant while the other one is recessive. However, it is now known that this is not entirely true. Briefly describe, using real life examples and genetic crosses, THREE modern genetic phenomena that contradict the aforementioned Mendelian thinking. (15 marks)
- 2.(a) If a pure breeding (homozygous) black dominant , long- haired (recessive) cat is mated to a pure breeding Siamese short-haired cat, and one of their male offspring is mated to one of their female offspring..Explain the chances of producing a Siamese colored short haired kitten. Use a genetic cross to support your answer. (15 marks)
- (b) Distinguish between penetrance and expressivity in genetics (10 marks)
3. Define aneuploidy and euploidy and discuss their significance in agriculture and medicine.
- 4.(a) In experiments in pea breeding Gregory Mendel obtained the following data relating to 566 peas.
- | | |
|---------------------|-----|
| Round and yellow | 315 |
| Wrinkled and yellow | 101 |
| Round and green | 108 |
| Wrinkled and green | 32 |
- With the aid of a chi squared test determine if these genes assort independently (10 marks)
- (b) Using named examples describe the types of gene interaction that produce the following modified dihybrid ratios
- (i) 9:3:4 (7 marks)
- (ii) 15:1 (8 marks)
5. Describe the different types of chromosomal breaks and reunions that result in variations in chromosome structure.

6.(a) In drosophila, the genes ct (cut wing margin), y (yellow body) and v (vermillion eye colour) are sex linked. Females heterozygous for all three genes were mated with wild types males and the following progeny were obtained.

ct	y	v	4
ct	y	+	93
ct	+	v	54
ct	+	+	349
+	y	v	331
+	y	+	66
+	+	v	97
+	+	+	6

- (i) Determine the genotype of the female parent (3 marks)
- (ii) Determine the order and configuration of these genes on the chromosome (4 marks)
- (iii) Calculate the recombination frequencies between the genes (9 marks)
- (iv) Draw a genetic map of the genes (4 marks)

(b) A couple both carriers of Albinism allele have five children. Determine is the probability that at least one child has Albinism. (5 marks)

END OF EXAMINATION