

UNIVERSITY OF ESWATINI  
RE-SIT EXAMINATION PAPER: NOVEMBER 2019

PROGRAMMES: B.Sc. II  
B. Ed Primary II  
B. Ed Secondary II

TITLE OF PAPER: GENETICS

COURSE CODE: BIO 211

TIME ALLOWED: THREE HOURS

- INSTRUCTIONS:
1. ANSWER ALL QUESTIONS
  2. EACH QUESTION CARRIES TWENTY FIVE (25) MARKS
  3. ILLUSTRATE YOUR ANSWERS WITH LARGE AND CLEARLY LABELLED DIAGRAMS WHERE APPROPRIATE.

SPECIAL REQUIREMENTS: CALCULATOR

THIS PAPER IS NOT TO BE OPENED UNTIL PERMISSION HAS BEEN GRANTED BY  
THE INVIGILATORS

**Question 1**

- (a) Explain the chromosome theory of inheritance (6 marks)
- (b) In what ways does the second division of meiosis differ from mitosis? (4 marks)
- (c) In rabbits, coat colour is a genetically determined characteristic. Some black females always produce black progeny, whereas other black females produce black progeny and white progeny. Explain these observations. (5 marks)
- (d) Assuming that genes assort independently, state the phenotypic ratios produced by the following crosses: (6 marks)
- (i) a selfed monohybrid
  - (ii) a selfed dihybrid,
  - (iii) a test-crossed dihybrid.
- (e) How has genetics affected (a) agriculture (4marks)

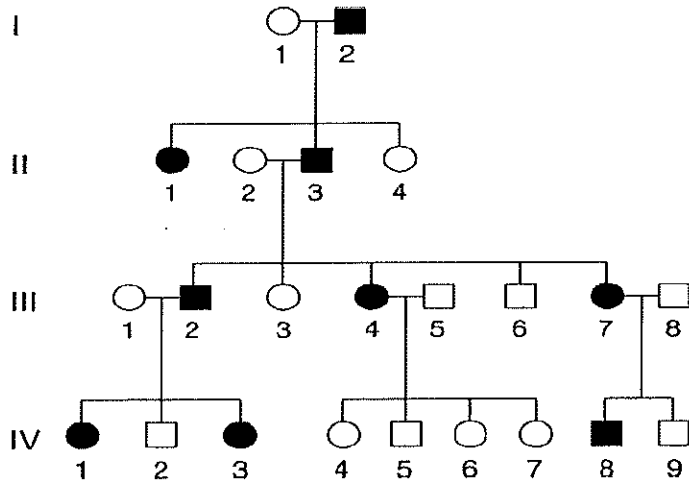
**[Total Marks=25]****Question 2**

- (a) According to Mendel's law, phenotypical characteristics are determined by pairs of factors (alleles) that separate independently in gametes. What are the main types of inheritance that are exceptions to Mendel's rules? (6 marks)
- (b) What are multiple alleles? Is there dominance in multiple alleles? (4 marks)
- (c) Write short notes on the following
- (i) sex-linked inheritance an example of non-Mendelian inheritance
  - (ii) Mitochondrial inheritance
  - (iii) hybridization in genetics (15 marks)

**[Total Marks = 25]**

**Question 3**

The accompanying pedigree is for a rare, but relatively mild, hereditary disorder of the skin.



- (a) How is the disorder inherited? State reasons for your answer. (3 marks)
- (b) Give genotypes for as many individuals in the pedigree as possible. (Invent your own defined allele symbols.) (10 marks)
- (c) Consider the four unaffected children of parents III-4 and III-5. In all four-child progenies from parents of these genotypes, what proportion is expected to contain all unaffected children? (2 marks)

**[Total Marks = 25]**

**Question 4**

In *Drosophila*, curly wings (*k*), black body (*b*), and cinnabar eyes (*c*) result from recessive alleles that are all located on chromosome 2. A homozygous wild-type fly was mated with a curly, black, and cinnabar fly, and the resulting F<sub>1</sub> females were test-crossed with curly, black and cinnabar males. The genotypes and frequencies of F<sub>2</sub> progeny produced from the test-cross are as given below:

<i>k b<sup>+</sup> c</i>	117;	<i>k<sup>+</sup> b<sup>+</sup> c<sup>+</sup></i>	825
<i>k<sup>+</sup> b c</i>	50;	<i>k b c</i>	828
<i>k<sup>+</sup> b<sup>+</sup> c</i>	6;	<i>k<sup>+</sup> b c<sup>+</sup></i>	115
<u><i>k b<sup>+</sup> c<sup>+</sup></i></u>	<u>51;</u>	<u><i>k b c<sup>+</sup></i></u>	<u>8</u>
<b>Total</b>			<b>2000</b>

Use the data above to determine the order of genes on the chromosome, then compute the coefficient of coincidence and gene interference during recombination.

[Total Marks = 25]

**END OF EXAMINATION PAPER**