

**UNIVERSITY OF ESWATINI  
FACULTY OF SCIENCE & ENGINEERING  
DEPARTMENT OF BIOLOGICAL SCIENCES  
RESIT EXAMINATION PAPER 2018/2019**

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**COURSE CODE:** B303/BIO211

**TITLE OF PAPER:** GENETICS

**TIME ALLOWED:** THREE HOURS

**INSTRUCTIONS:**

1. ANSWER QUESTION ONE IN SECTION A  
AND ANY OTHER TWO QUESTIONS IN SECTION B.
2. CANDIDATES MAY USE SCIENTIFIC CALCULATORS.
3. QUESTION 1 CARRIES 50 MARKS AND EACH  
QUESTION IN SECTION B CARRIES 25 MARKS.
4. ILLUSTRATE YOUR ANSWERS WITH LARGE CLEARLY  
LABELLED DIAGRAMS WHERE APPROPRIATE

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CHIEF INVIGILATOR**

**Section A (Compulsory)**  
**Answer ALL questions in this section**

**Question 1**

- (a) Write a sentence/ paragraph which connects the following: allele, phenotype, gene, dominant, genotype, recessive, homozygous, heterozygous, locus. [10 marks].
- (b) Explain the chromosome theory of inheritance, highlight how this agrees with Mendel's findings. [10 marks]
- (c) Assuming that genes assort independently, state the phenotypic ratios produced by the following crosses:
- (i) a selfed monohybrid, [1 mark]
  - (ii) a selfed dihybrid, [1 mark]
  - (iii) a test-crossed dihybrid. [1 mark]
- (d) In rabbits, coat colour is a genetically determined characteristic. Some black females **always** produce black progeny, whereas other black females produce black and white progeny. Explain these observations in genetic terms. [4 marks]
- (e) In sheep, lustrous fleece results from an allele that is dominant over an allele for normal fleece. A ewe (adult female) with lustrous fleece is mated with a ram (adult male) with normal fleece. The ewe then gave birth to a single lamb with normal fleece. From this single offspring, is it possible to determine the genotypes of the two parents? If so, what are their genotypes? If not, why not? [4 marks]
- (f) Holstein cattle are normally black and white. A superb black-and-white bull, Ndoda, was purchased by a farmer for E100,000. All the progeny sired by Ndoda were normal in appearance (black and white). However, certain pairs of his progeny, when interbred, produced red-and-white progeny at a frequency of about 25%. Ndoda was soon removed from the stud lists of the Holstein breeders.
- (i) Explain these observations in genetic terms justifying why Ndoda was removed from the list of Holstein sires. [6 marks]
  - (ii) Half the females produced by a certain kind of mating are calico, and half are black; half the males are orange, and half are black. What are the phenotypes of the parental male and female used in this mating and give genotypes of the male and female progeny. [6 marks]
- (h) Explain any 3 phenomena that cause genetic variation. [7 marks]

**[Total marks = 50]**

**Section B (Answer any two questions)****Question 2**

Discuss the types of gene and chromosomal mutations.

[25 marks]

**Question 3**

Explain the following terms (giving examples)

- (a) Pure breeding, [1 mark]
- (b) Epigenetics, [3 marks]
- (c) Incomplete dominance, [3 marks]
- (d) Codominance, [3 marks]
- (e) Polygenic inheritance, [3 marks]
- (f) Recessive lethal alleles, [3 marks]
- (g) Pleiotropy, [3 marks]
- (h) Variable expressivity, [3 marks]
- (i) Incomplete penetrance, [3 marks]

**[Total marks = 25]**

**Question 4**

Tawanda and Nomathemba are expecting their first baby but have just discovered that each had an uncle with alkaptonuria, a rare autosomal recessive disorder with full penetrance.

- (a) Draw a pedigree and indicate the genotypes of all the people concerned. [10 marks]
- (b) Calculate the probability that their child will have alkaptonuria. [15 marks]

**[Total marks = 25]**

**END OF EXAMINATION PAPER**