



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY**  
**SCHOOL OF AGRICULTURAL AND FOOD SCIENCES**  
**UNIVERSITY EXAMINATION FOR DEGREE OF BACHELOR OF SCIENCE IN**  
**AGRICULTURAL EDUCATION AND EXTENSION.**  
**2<sup>ND</sup> YEAR 1<sup>ST</sup> SEMESTER 2017/2018 ACADEMIC YEAR**  
**REGULAR**

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**COURSE CODE: AHT 3223:**

**COURSE TITLE: PRINCIPLES OF GENETICS:**

**EXAM VENUE:**

**STREAM: (BSc. In AGRICULTURAL  
EDUCATION AND EXTENSION)**

**DATE:**

**EXAM SESSION:**

**TIME:**

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**Instructions**

- 1. Answer ALL questions in Section A (compulsory) and ANY TWO questions in Section B**
  - 2. Candidates are advised not to write on the question paper**
  - 3. Candidates must hand in their answer booklets to the invigilator while in the examination room**
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### **SECTION A: ANSWER ALL QUESTIONS**

1. Briefly describe the Mendelian Laws. (4 Marks).
2. Differentiate the following genetic terms: sex influence traits, sex limited traits, sex linked traits and cytoplasmic traits. (4 Marks)
3. Differentiate the following terms:
  - a. Genotype and phenotype
  - b. Homozygous and heterozygous.
  - c. Dominant and recessive alleles. ( 3 Marks)
4. "Brown eyes (B) are dominant to blue eyes (b). Both of my parents have brown eyes, but I have blue eyes. Since eye colour is genetic, I must be adopted." Do you agree? Explain your answer. (2 Marks).
5. Nucleic acids are genetic materials found within the cell. Name two types of nucleic acid and give at least three differences between them. (4 Marks)
6. In cucumbers, orange fruit colour (R) is dominant over cream fruit colour (r). A cucumber plant homozygous for orange fruits are crossed with a plant homozygous for cream fruits. The F1 are intercrossed to produce the F2. Give the genotypes and phenotypes of the parents, the F1, and the F2. (4 Marks)
7. Colour blindness in humans is mostly due to an X-linked recessive allele. Irene has normal vision but her mother is colour blind. Kioko is colour blind. If Irene and Kioko marry and are expecting a child together. What is the probability that the child will be a daughter and colour blind. (5 Marks).
8. Outline the notion of pangenesis and explain how it differs from the germ-plasm theory. (4 Marks)

### **SECTION B: ANSWER ANY TWO QUESTIONS:**

9. A) In watermelons, bitter fruit (B) is dominant over sweet fruit (b), and yellow spots (S) are dominant over no spots (s). The genes for these two characteristics assort independently. A homozygous plant that has bitter fruit and yellow spots is crossed with a homozygous plant that has sweet fruit and no spots. The F1 are intercrossed to produce the F2.
  - I. What will be the phenotypic ratios in the F2?
  - II. If an F1 plant is backcrossed with the bitter, yellow spotted parent, what phenotypes and proportions are expected in the offspring?
  - III. If an F1 plant is backcrossed with the sweet, nonspotted parent, what phenotypes and proportions are expected in the offspring? (10 Marks)
- B) In the snail *Limnaea peregra*, shell coiling results from a genetic maternal effect. An autosomal allele for a right- handed shell (S), called dextral, is dominant over the allele for a left-handed shell (s), called sinistral. A pet snail called Martha is sinistral and reproduces only female (the snails are hermaphroditic). Indicate which of the

following statements are true and which are false. Explain your reasoning in each case.

- (a) Martha's genotype must be ss.
- (b) Martha's genotype cannot be ss.
- (c) All the offspring produced by Martha must be sinistral.
- (d) At least some of the offspring produced by Martha must be sinistral.
- (e) Martha's mother must have been sinistral. (10 Marks).

10. Describe in details factors that lead to changes in gene frequency in a population. (20 Marks)

11. Describe the exceptions to Mendelian laws and where possible include punnet square to illustrate variation. (20 Marks).

12. Describe the cell cycle leading to the formation of gametes. (20 Marks).