CHUKA UNIVERSITY

**UNIVERSITY EXAMINATIONS**

**FIRST YEAR EXAMINATION FOR THE AWARD OF DEGEE OF BACHELOR OF SCIECE IN BIOLOGY**

**BOTA 111: GENERAL GENETICS**

**STREAMS: B.Sc. (BIOL, CHEM & BED) Y1S1** **TIME: 2 HOURS**

**DAY/DATE: FRIDAY 14/12/2018** **8.30 A.M - 10.30 A.M.**

**INSTRUCTIONS:**

- **Answer ALL questions in Section A and any TWO Questions in Section B**
- **Do not write anything on the question paper**
- **Use illustrations where appropriate to enhance your answers**

**SECTION A: [30 MAKS]**

1. "Every known gene has **two** alleles: one dominant and the other recessive". Comment, providing relevant examples. [5 Marks]

2. A Dorset ram mated to a Suffolk ewe;

   (i) Give the **genotypes** of the parents with regard to the gene determining horn condition. [1 Mark]

   (ii) Show the genotyeps of the $F_2$ offspring from this cross. [3 Mark]

   (iii) Give the proportion of each sex in the $F_2$ offspring. [1 Mark]

3. A student of genetic crossed two *Pisum sativum* plants both heterozygous for three genes, one determining plant height, another determining seed colour and the other determining seed texture. Using the forked-line method, predict the phenotypes of the offspring and show their **phenotypic** ratio. [5 Marks]

4. In a population of 1270 gazelles, 322 are homozygous for the dominant allele (Q) of a given gene; 671 are heterozygous while the rest are homozygotes of the other allele. Calculate the allele frequency for the **recessive** allele. [5 Marks]

5. Draw a portion of the structure DNA showing at least 4 base pairs (including all different bases), the sugars and phosphates. Show covalent bonds as solid lines and hydrogen bonds as dotted lines. [5 Marks]

6. (a) Explain briefly how sex is determined in the honey bee. [1 Mark]

   (b) With illustrations, write explanatory notes on the following with regard to changes in chromosome structure:
   (i) Pericenrtic inversion [2 Marks]
   (ii) Deficiency [2 Marks]

**SECTION B: [40 MARKS]**

7. Explain three models of DNA replication that existed before 1958. [20 Marks]

8. (a) Giving examples, discuss four human disorders resulting from nondisjunction. [20 Marks]

   (b) In each case highlight the chromosome involved, the karyotype of the individual and symptoms associated with the disorder.

9. Experimenting on *Pisum sativum,* a first year student of Chuka University obtained the following counts of the $F_2$ progeny:
   775 plants bearing round, yellow seeds
   279 plant bearing round, green seeds
   285 plants bearing wrinkled, green seeds and
   84 plants bearing wrinkled, green seeds

   (a) Name the type of cross the student made.
   (b) State the expected phonetypic ratio from this cross
   (c) Employ an appropriate method to test whether or not these data are in agreement with the expected outcome according to Mendel's law. [20 Marks]

   SHOW IN DETAIL EVER STEP OF THE METHOD

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