

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

**FIRST YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF
SCIENCE IN AGRICULTURE, AGRICULTURE EXTENSION AND EDUCATION,
ANIMAL SCIENCE AND FOOD SCIENCE AND TECHNOLOGY**

BOTA 111: GENERAL GENETIC

STREAMS: AGRIC, AGED, ANSC & FOST Y1S2

TIME: 2 HOURS

DAY/DATE: WEDNESDAY 18/04/2018

8.30 A.M. – 10.30 A.M.

INSTRUCTIONS:

- **Answer all questions in section A and any ONE question in section B.**
- **Use of calculators and statistical tables is allowed.**
- **Do not write anything on the question paper.**
- **Use illustrations where appropriate to enhance your answers.**

SECTION I (50 MARKS)

- Define the following terms:
 - Locus (1 mark)
 - Homologous chromosomes (1 mark)
 - Serum (1 mark)
 - As a plant breeder, you are faced with a tall garden pea plant whose genotype is not known.
 - Give the possible genotypes of the plant. (1 mark)
 - Describe the procedure you would follow in establishing its genotype. (5 marks)
- Explain why recessive sex-linked traits are more easily noticed in males than in females. (2 marks)
 - Summarize the main accomplishment of meiosis. (3 marks)

- (c) A gene in human beings specifies the production of the factor that enables blood to coagulate. Individuals homozygous for the recessive allele lack that factor and suffer the disorder called hemophilia;
- (i) Write the genotype of a person with this disorder. (1 mark)
 - (ii) State the phenotype of a heterozygote with regard to this gene. (1 mark)
- (d) State Mendel's law of segregation. (2 marks)
- (e) Explain why Mendel is referred to as the "Father of Genetics." (2 marks)
3. A true-breeding *pisum sativum* plant bearing round, yellow seeds is crossed with another true-breeding one bearing green, wrinkled seeds.
- (i) Indicate the genotypes of these plants. (2 marks)
 - (ii) Show the kind of gametes each produces. (2 marks)
 - (iii) Using a suitable method, predict the genotypes of the F_2 offspring from this cross. (6 marks)
 - (iv) Analyze the F_2 offspring with regard to their phenotypic ratio. (2 marks)
4. Study the diagram below and answer the questions that follow:
- (a) Identify the genetic disorder suffered by an individual whose cells have chromosomes as shown. (2 marks)
 - (b) Write the karyotype of this individual. (1 mark)
 - (c) Give the sex of the individual. (1 mark)
 - (d) State the number of Barr bodies in a cell from this individual. (1 mark)
 - (e) Give the symptoms associated with the disorder. (3 marks)

5. (a) Distinguish between the purine and pyrimidine bases with respect to structure. (4 marks)
- (b) A section of a DNA strand has the base sequence A A G C T G C G T A G.
Show:
- (i) the base sequence of its complementary strand. (1 mark)
- (ii) the base sequence of the RNA specified by it. (1 mark)
6. Write short explanatory notes on nondisjunction. (5 marks)

SECTION II (20 MARKS)

7. (a) State the Hardy-Weinberg law. (2 marks)
- (b) A population of 1000 organisms is made of the following individuals:
640 individuals homozygous for the dominant alleles of a certain gene
320 heterozygous individuals and 100 individuals homozygous for the recessive allele.
Calculate the allele frequency of the recessive allele. (4 marks)
- (c) Discuss the assumptions underlying the Hardy-Weinberg principle. (14 marks)
8. The following result were obtained as F_2 phenotypic classes following experiments of crosses using the garden pea plant.
- 321 plants bearing round, yellow seeds
116 plants bearing round, green seeds
110 plants bearing yellow, wrinkled seeds
33 plants bearing yellow, wrinkled seeds
- Suggest a genetic test and apply it to see whether the results are in agreement with Mendel's principles with regard to the control and inheritance of seed shape and seed colour in the garden pea. (20 marks)
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