

CHUKA



UNIVERSITY

**SUPPLEMENTARY / SPECIAL EXAMINATIONS**

**FIRST YEAR EXAMINATION FOR THE AWARD OF BACHELOR DEGREE IN**

**BOTA 111: GENERAL GENETICS**

**STREAMS:**

**TIME: 2 HOURS**

**DAY/DATE: MONDAY 16/11/2020**

**2.30 P.M - 4.30 P.M.**

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**INSTRUCTIONS:**

- Answer all the questions in section A and any **TWO** questions in section B
- Do not write anything on this paper
- Use of calculator is allowed

**SSECTION A (30 MARKS): ANSWER ALL QUESTIONS**

**QUESTION ONE – 30 MARKS (COMPULSORY)**

- (a) Explain the following terms as used in genetics:
- (i) Principle of heredity. (2 Marks)
  - (ii) Repulsive phase. (2 Marks)
  - (iii) Sex-reversal. (2 Marks)
  - (iv) Sex-limited traits (2 Marks)
- (b) Outline the characteristics that can be used to classify chromosomes in any given genome. (4 Marks)
- (c) Outline the types of structural chromosomal aberrations. (4 Marks)
- (d) Consider a cross between two gametes controlling chicken comb type, i.e.,  $RrPp \times RrPp$ ;  
where R-P- Walnut comb, R-pp Rose comb, rrP- Pea comb and rrrp Single comb
- (i) What would be the genotypes of the next generation and their relative proportion? (5 Marks)

- (ii) What would be the phenotypic expectation if a double heterozygous male was back crossed to a single combed female, i.e., RrPp x rrpp? (4 Marks)
- (e) According to some cytophotometric measures, the amount of DNA in a diploid nucleus of each human cell is made up of 5.6 picograms ( $5 \times 10^{-12}$  g) of DNA. How much DNA would be found in the following stages? (5 Marks)
  - (i) Prophase of mitosis
  - (ii) Anaphase II of meiosis
  - (iii) Prophase II of meiosis
  - (iv) Metaphase I of meiosis
  - (v) S stage of mitosis

**SECTION B (40 MARKS): ANSWER ANY TWO QUESTIONS**

**QUESTION TWO (20 MARKS)**

Discuss possible reasons that make gene frequencies depart from the proportions predicted by the Hardy-Weinberg formula.

**QUESTION THREE (20 MARKS)**

- (a) In certain human population, the frequency of albino population is 1 in 10000. Albinism is due to recessive gene.
  - (i) Calculate the frequency of recessive and normal alleles. (4 Marks)
  - (ii) Calculate the genotypic frequencies at equilibrium. (6 Marks)
- (b) Differentiate between mitosis and meiosis. (10 Marks)

**QUESTION FOUR (20 MARKS)**

In a crossing experiment using garden peas (*Pisum sativum*), a testcross between a homozygous recessive parent and heterozygote F<sub>1</sub> produced the following F<sub>2</sub> phenotypic classes:

- 630 plants bearing round/yellow seeds
- 216 plants bearing round/green seeds
- 202 plants bearing wrinkled/yellow seeds
- 64 plants bearing wrinkled/green seeds

Determine if the observed data supports the expected distribution suggested at 5% significance level. Take  $X_{tab}^2 = 7.815$ .

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