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.**

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 x RrPp; where R-P- Walnut comb, R-pp Rose comb, rrP- Pea comb and rrpp 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 (5×10^{-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.

QUERSTION 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_1 produced the following F_2 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$X^2_{tab} = 7.815$.

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