



UNIVERSITY OF EMBU

2019/2020 ACADEMIC YEAR

FIRST SEMESTER EXAMINATIONS

THIRD YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF
EDUCATION

SBT 304: GENERAL GENETICS

DATE: JANUARY 14, 2020

TIME: 2:00 PM – 4:00 PM

INSTRUCTIONS:

Answer Question ONE (Compulsory) and ANY Other TWO Questions

QUESTION ONE (30 MARKS)

i) Explain why the genetic code shows degeneracy. (5 marks)

ii) The following DNA sequence represents part of a transcribed gene.

TACCCCCACGAGTTATATATACGGGGGGTTAAACTCCATCATCAT

If all the nucleotide triplets that contain a C constitutes intron DNA and all others exon,

a) Write down the processed mRNA (4 marks)

b) List the first four amino acids synthesised from the above gene transcript. (2 marks)

iii) In a cross $+r+/w+s \times wrs/wrs$, the following offspring were obtained:

$+r+/wrs$ 360 $w++/wrs$ 90

$wr+/wrs$ 50 $w+s/wrs$ 350



ISO 27001:2013 Certified

Knowledge Transforms



ISO 9001:2015 Certified

wrs/wrs 4 +++/wrs 6

+rs/wrs 100 ++s/wrs 40

- a) Show the groups in the progeny that represent double crossovers. (1 marks)
- b) Give the sequence of the three genes and calculate the map distances between (i) the first and second genes, and (ii) the second and third genes? (4 marks)
- iv) . Describe how you would determine whether a new characteristic, appearing in one individual of an organism used for genetic research, follows Mendelian inheritance or is due to cytoplasmic inheritance. (5 marks)
- v) Predict the genotype of the offspring obtained from a self-fertilised garden pea plant that is heterozygous for the gene determining plant height and seed texture. (4 marks)
- vi) 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?
- a) Prophase of mitosis. (1 mark)
- b) Anaphase II of meiosis. (1 mark)
- c) Prophase II of meiosis. (1 mark)
- d) Metaphase I of meiosis. (1 mark)
- e) S stage of mitosis. (1 mark)

QUESTION TWO (20 MARKS)

Discuss aneuploidy.

QUESTION THREE (20 MARKS)

Discuss the factors that violates Hard-Weinberg equilibrium.



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:

150 plants bearing round/yellow seeds

430 plants bearing round/green seeds

420 plants bearing wrinkled/yellow seeds

145 plants bearing wrinkled/green seeds

Suggesting possible hypothesis, determine if the observed data supports your suggested hypothesis at 5% significance level. Take $\chi^2=7.815$

QUESTION FIVE (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) Discuss point mutations that occur in DNA sequences encoding proteins. (10 marks)

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