



MACHAKOS UNIVERSITY

University Examinations 2018/2019

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF BIOLOGICAL SCIENCES

FIRST YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF SCIENCE IN BIOLOGY

SBC 100: INTRODUCTION TO GENETICS

DATE: 25/9/2019

TIME: 2.00-4.00 PM

INSTRUCTIONS

1. Answer Question 1 (compulsory) and **any two** questions in Section B.
2. Use clean well labelled diagrams wherever appropriate.

SECTION A

QUESTION ONE – COMPULSORY (30 MARKS)

- a) Genes play a vital role in controlling control the growth and development of an organism throughout its life-cycle. Explain (3 marks)
- b) Differentiate between eukaryotic and prokaryotic genomes (3 marks)
- c) What characteristics are exhibited by a cytoplasmically inherited trait? (3 marks)
- d) Assume that in guinea pigs, dark brown fur (B) is dominant to black fur (b). If you mate a black guinea pig with a homozygous brown guinea pig, what proportion of the progeny will be homozygous? Show your work. (3 marks)
- e) Discuss how genetic factors can affect Quantitative Traits (3 marks)
- f) The code is degenerate. Explain (3 marks)
- g) Give characteristic of Pseudoalleles. (3 marks)
- h) Name three differences between DNA and RNA. (3 marks)
- i) Define the following terms as used in genetics
 - i. Genotype
 - ii. Phenotype
 - iii. Quantitative trait (3 marks)
- j) Explain the Hardy-Weinberg Principle. (3 marks)

SECTION B

QUESTION TWO

- a) Illustrate how the *His* operon works (10 marks)
- b) Discuss man-made recombination techniques (8 marks)
- c) Give an example of a qualitative trait and a quantitative trait. Use whatever organism you would like. (2 marks)

QUESTION THREE

- a) What causes Inborn Errors of Metabolism and how are the different forms inherited? (8 marks)
- b) Explain the mechanisms of evolution (12 marks)

QUESTION FOUR

- a) Two average sized parents have three children. The first child is very short, the second child is very tall, and the third child is average sized.
 - i. Explain the inheritance pattern of height in this pedigree. In particular, how is it possible for these parents to have both a very short and a very tall child? (10 marks)
 - ii. The parents decide to have a fourth child. Is it most likely to resemble the first, second, or third child? (2 marks)
- b) Discuss the central dogma of genetics. How are DNA, RNA, and proteins involved in determining the trait of an organism? (8 marks)

QUESTION FIVE

In cucumbers, orange fruit color (R) is dominant over cream fruit color (r). A cucumber plant homozygous for orange fruits is crossed with a plant homozygous for cream fruits. The F1 are intercrossed to produce the F2.

- a) Give the genotypes and phenotypes of the parents, the F1, and the F2. (8 marks)
- b) Give the genotypes and phenotypes of the offspring of a backcross between the F1 and the orange parent. (6 marks)
- c) Give the genotypes and phenotypes of a backcross between the F1 and the cream parent. (6 marks)