



MACHAKOS UNIVERSITY

University Examinations 2022/2023 academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF BIOLOGICAL SCIENCES

Fourth YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (BIOLOGY)

BACHELOR OF EDUCATION

SZL 304 EVOLUTIONARY BIOLOGY

DATE:

TIME:

INSTRUCTIONS

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

SECTION A (COMPULSORY)

QUESTION ONE (30 MARKS)

- a) From the sequence alignment below deduce the evolutionary distance of the different animal species listed in relation to Human. (3 marks)

Human (Hu)	MVHLTPEEKSAVTALWGKVNVDVGGGEALGRLLVVYPWTQRFFESFGDLS
Baboon (Ba)	N.....D.....
Cow (Co)	---A---A---F---K.....
Sheep (Sh)	---A---A---GF---K---A.....H.....
Mouse (Mo)	DA---A---SG.....A.....Y---D.....
Hamster (Ha)	DA---AL---G---A---A---A.....H.....
Chicken (Ch)	...W---A---QLI---G---A---C---A---A---I.....A---N...

- Describe three limitations of the Hardy – Weinburg equilibrium. (3 marks)
- State and explain the importance of Thomas Malthus theory on evolution. (3 marks)
- With illustration distinguish between anagenesis and cladogenesis. (3 marks)
- Evaluate sexual selection in widowbirds. (3 marks)
- Describe the stochasticity nature of evolution. (3 marks)
- Describe 3 features an organism must exhibit to be consider complex in its evolutionary pathway. (3 marks)
- Using equations describe the effects of migrations on the allele frequency. (3 marks)
- Outline three possible outcomes of natural selection. (3 marks)
- Briefly describe how mating among relatives could lead to poor progeny. (3 marks)

SECTION B: ANSWER ANY TWO QUESTIONS
QUESTION TWO (20 MARKS)

Discuss the origin and speciation of Darwin Finches in Galapagos island.

QUESTION THREE (20 MARKS)

Using illustrations discuss different types of natural selections.

QUESTION FOUR (20 MARKS)

- a) Discuss the limitations of Hardy – Weinburg theory to locus with many alleles (10 marks)
- b) The genotype of a defendant in a crime scene was found to be $A_{14}A_{27}$ and that of the tissues sample collected from the same crime scene was $A_{14}A_{27}$. Discuss the probability of this match being a false positive? (10 marks)

QUESTION FIVE (20 MARKS)

The following is a sequence of two Bat species whose evolutionary pathway last shared a common ancestor 80 million years ago. Study the sequence and determine the rate of evolution.

Bat 1: 5'- ATGGCCTGT GGATGCGCCT CCTGCCCCTG CTGGCGCTGC TGGCCCTCAG...

Bat 2: 5'- ATGGCCTGT GGACACGCCT GGTGCCCCTG CTGGCCCTGC TGGCACTCTG...

Bat 1: ACCCCCTGT GAGCGCGTATAT CCTGCCCCTG CTGTGACTGC TGGCCCTATT – 3'

Bat 2: ACGCCCTGT GAGCACGTATAT GGTGCCCCTG CTGTGACTGC TGGCACTAAT -3'