THE OPEN UNIVERSITY OF SRI LANKA

FACULTY OF NATURAL SCIENCES

B.Sc. DEGREE PROGRAMME – LEVEL 04

FINAL EXAMINATION – 2021/2022

BOTANY

BYU4301/BYE4301 – GENETICS and EVOLUTION

DURATION : TWO (02) HOURS

DATE : 30th October 2022 TIME : 1.30 – 3.30 p.m.

ANSWER **FOUR (04)** QUESTIONS SELECTING AT LEAST **ONE (01)** FROM EACH PART

PART A

1.

A) Distinguish between the following pairs of terms

i) Chromosomes and Chromatids.

ii) Sister and non-sister chromatids.

iii) Homologous and nonhomologous chromosomes.

B)

i) What are lethal factors?

ii) A pair of co-dominant alleles is known to govern the cotyledon colour in winged bean. The homozygous genotype A^GA^G produces dark green, the heterozygous genotype A^GA^Y produces light green, and the other homozygous genotype produces yellow cotyledonary leaves so deficient in chloroplasts that seedlings do not grow to maturity.

a) If dark green plants are pollinated only by light green plants, what genotypic and phenotypic ratios would be expected in the mature progeny plants?

b) If light green plants are self-pollinated, determine the phenotypic and genotypic ratios in the seedling progenies.

2.

i) What is Gene Linkage?

ii) Distinguish between Coupling phase and Repulsion phase in gene linkage.

iii) A homozygous claret (*ca* = ruby eye colour), curled (*cu* = upcurved wings), fluted (*fl* = creased wings) fruit fly is crossed to a pure-breeding wild type fly. The F_1 females are testcrossed with the following results:

4	Fluted
173	Claret
26	Curled
24	Fluted, Claret
167	Fluted, Curled
6	Claret, Curled
298	Fluted, Claret, Curled
302	Wild-type

a) Are the loci linked?

b) If the loci are linked, give the gene order and map distance.

c) What were the linkage relationship between alleles at the Fluted & Claret, and Fluted & Curled loci?

3.

A) Corn has a colour gene (*C/c*) and height gene (*T/t*) with the following phenotypes:

CC and *Cc*:	purple	*TT*:	tall
cc:	white	*Tt*:	medium height
		tt:	dwarf

If a dihybrd is selfed, give the resulting proportions of genotypes and phenotypes produced.

B)

i) Explain the difference between dominance and epistasis.

ii) Why did not any pairs of genes used by Mendel show epistasis?

iii) In a plant species plants with either red, yellow, or white coloured flowers occur. A red parent is crossed to a white parent and all the offspring are red. When these offspring are selfed, the following data are obtained:

Red	118
Yellow	32
White	10

Explain the results obtained for the above cross indicating the mode of inheritance of flower colour.

PART B

4. What is meant by Macroevolution?

   With reference to suitable examples give evidence for macroevolution.

5. Referring to suitable diagrams and examples, describe the different modes of natural selection that can occur in nature.

6. Write short notes on **any three** of the following

   a. Allopolyploidy
   b. Hardy Weinberg law
   c. Neanderthal Man
   d. Origin of earth
   e. Darwin's finches