00684

The Open University of Sri Lanka
Faculty of Natural Sciences
B.Sc/ B. Ed Degree Programme

Department	: Botany
Level	: Level 4
Name of the Examination	: Final Examination
Course Title and Code	: Genetics and Evolution BYU4301/BYE4301
Academic Year	: 2020/2021
Date	: 12.12.2021
Time	: 9.30 to 11.30 am
Duration	: 2 hrs

General Instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **six (06)** questions in **four (04)** pages.
3. Answer any **four (04)** questions **selecting at least one (01) from each part.** All questions carry equal marks.
4. Answer for each question should commence from a new page.
5. Draw fully labelled diagrams where necessary
6. Involvement in any activity that is considered as an exam offense will lead to punishment
7. Use blue or black ink to answer the questions.
8. Clearly state your index number in your answer script

Answers to the questions in Part A and Part B should be written in separate answer books

PART A

1.

i) What are sex-linked genes?

ii) In humans, X-linked recessive traits are more prevalent among males than females. Explain your answer.

iii) Give a comparison of sex-linked, sex-limited, and sex-influenced traits.

iv) Explain how it can be determined whether a particular trait is sex-linked or sex-limited.

v) If following were the sex chromosomes of *Drosophila* flies, what would their sex be? Justify your answer.
(Assumption: the number of autosomal chromosome (A) sets are two)

XO XY XXY

XX XXX

2.

A) Three-point test crosses are useful in learning about the nature of gene linkage. Justify this statement.

B) Three recessive genes in the linkage group X of tomato are;

ab - causing absence of anthocyanin pigment,
hp - producing hairless plants,
jf - producing jointless fruit stems (pedicels).

The following phenotypes were observed among 3500 testcross progeny from a trihybrid testcross,:

309 hairless	318 anthocyaninless, jointless, hairless
90 jointless, hairless	1041 anthocyaninless, hairless
1031 jointless	82 anthocyaninless
310 normal	319 anthocyaninless, jointless

i) Give the genotype of each phenotypic class.

ii) How were the genes originally linked in the trihybrid parent?
Your answer should include,
a) whether the genes were in the coupling/repulsion phase and
b) the gene order

iii) Estimate the distance between the genes.

3.

A)

i) What are gene interactions? Briefly explain.

ii) The color of Snapdragon is controlled by two genes with recessive epistasis. Genes at the *B* locus control the development of color and genes at the *A* locus determining expression of genes at the *B* locus. The allele *B* (red) is dominant to *b* (yellow).

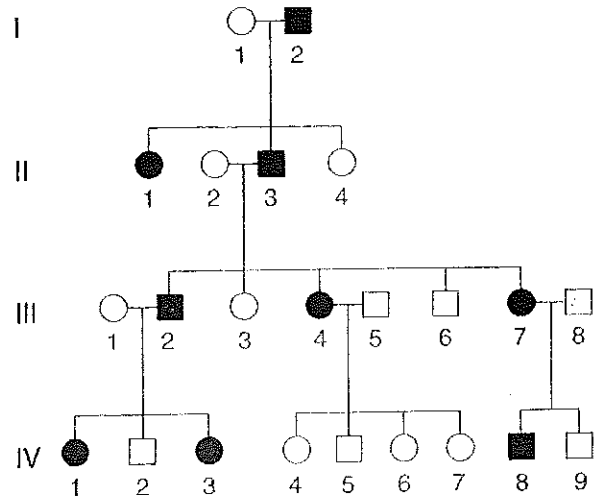
a) What are the genotypes of Yellow, Red and White snapdragon?

b) Explain how you determined the genotypes of each phenotype.

B)

i) Briefly explain the importance of Pedigree Analysis.

ii) Below is a pedigree of a rare human skin disease.



a) Inheritance of the disease by the II-3 male from his father rules out what type of inheritance. Explain your answer.
(Assumption: I-1 does not carry a mutant allele)

b) Who in the pedigree has the same Y chromosome as the II-3 male? Give all possible individuals.

PART B

4. Write an essay on sources of variations in a population.

5. (a) Define the term "speciation".
(b) Giving suitable examples describe the different methods of speciation.

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

a) Evolutionary significance of fossil records
b) Industrial melanism
c) *Homo erectus*
d) The Miller Urey Experiment
e) Anatomical features that distinguish the human skull from the ape skull