

THE OPEN UNIVERSITY OF SRI LANKA

B.Sc. DEGREE PROGRAMME – LEVEL 04

FINAL EXAMINATION – 2017/2018

BOTANY

BYU4301/BYE4301/BOU2101/BOE4101– GENETICS and EVOLUTION



DURATION : TWO (02) HOURS

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DATE: 21<sup>st</sup> September, 2018

TIME : 9.30 – 11.30 a.m.

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

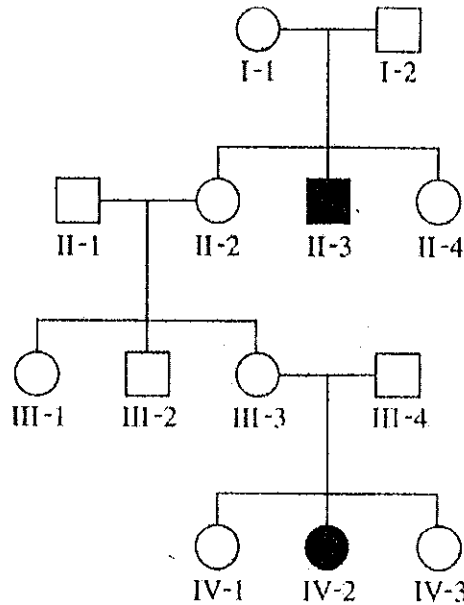
**Answers to the questions in Part A and Part B should be written in separate answer books**

**PART A**

1.

- i) In humans, why are X-linked recessive traits more likely to occur in males than females?
- ii) What are the differences among sex-linked, sex-limited and sex-influenced traits?
- iii) Describe how it can be determined whether a trait is sex-linked or sex-limited.

- iv) The following pedigree illustrates an inherited disease caused by a single gene. If it is assumed that incomplete penetrance is **not** occurring, indicate which modes of inheritance (A – E) are possible / not possible.  
 (Affected individuals are shown as filled symbols)



- A. Recessive
- B. Dominant
- C. X-linked recessive
- D. Sex-influenced, dominant in females
- E. Sex-limited, recessive in females

2.

- i) Explain why three-point crosses are considered a valuable approach to learn about the nature of the linkage of genes.
- ii) Three recessive traits in garden pea plants are as follows:  
 Yellow pods are recessive to green pods, bluish green seedlings are recessive to green seedlings, and creeper is recessive to normal plant.

A true-breeding normal plant with green pods and green seedlings was crossed to a creeper with yellow pods bluish green seedlings.

The F1 plants were then crossed to creepers with yellow pods and bluish green seedlings. The following results were obtained.

- 2059 – green pods, green seedlings, normal  
 151 - green pods, green seedlings, creeper  
 281 - green pods, bluish green seedlings, normal  
 15 - green pods, bluish green seedlings, creeper  
 2041 - yellow pods, bluish green seedlings, creeper  
 157 - yellow pods, bluish green seedlings, normal  
 282 - yellow pods, green seedlings, creeper  
 11 - yellow pods, green seedlings, normal

- a) Are the loci linked?  
 b) Construct a genetic map that describes the map distance between these three genes.

3.

A.

The term “Mendelian Inheritance” describes inheritance patterns that obey two laws; the law of segregation and the law of independent assortment. Based on this definition briefly describe

- i) The different types of Mendelian inheritance patterns associated with a **single gene**.  
 ii) The different types of Mendelian inheritance patterns associated with **two genes**.

B.

- i) What is Epistasis?  
 ii) What is the difference between dominance and epistasis?  
 iii) Purple colour in wheat kernels is produced by the genotype  $P-B-$ , white by the double recessive genotype ( $ppbb$ ). The genotypes  $P-bb$  and  $ppB-$  produce yellow kernels. A homozygous purple variety is crossed to a white variety.  
 a) What phenotypic results are expected in the  $F_1$  and  $F_2$ ?  
 b) What is the mode of inheritance?

**PART B**

4. (a) What are the characters that distinguish apes and humans from the rest of the primates.  
(b) Describe the structural changes that characterize the evolution of modern human from their ape like ancestor and explain the significance of these changes.
5. With reference to suitable examples where appropriate, write an account on Natural Selection.
6. Write short notes on any three of the followings;
  - (a) Mutations
  - (b) Coacervates
  - (c) Extinction of organisms
  - (d) The Miller Urey Experiment
  - (e) Allopolyploidy

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