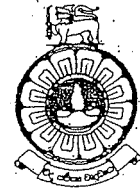


THE OPEN UNIVERSITY OF SRI LANKA  
 DIPLOMA IN PLANT BREEDING - LEVEL 3  
 FINAL EXAMINATION – 2024/2025  
 BYD3321 – CONCEPTS IN GENETICS



DURATION – TWO (02) HOURS

Date – 14.06.2025

Time – 9.00 - 11.00 a.m.

Answer any four (04) questions.

1. In a plant species, red flowers (R) are dominant to white flowers (r) and long fruits (L) are dominant to oval fruits (l). The progeny given below is the result of a cross between a plant bearing red flowers and long fruits with that of red flowers and oval fruits.

Plants with	Red flowers long fruits	- 106
	Red flowers oval fruits	- 104
	White flowers long fruits	- 32
	White flowers oval fruits	- 33

Explain these results.

2. A). Citing suitable examples, describe the following.

- i. Sex-influenced genes
- ii. Sex-limited genes

B). i. Haemophilia is a recessive sex-linked disease in humans. Based on this information, give the genotypes of following individuals.

- a). A woman who does not have haemophilia
- b). A woman with haemophilia
- c). A woman who is a carrier for haemophilia
- d). A man who does not have haemophilia
- e). A man with haemophilia

ii. A woman who is heterozygous for haemophilia marries a normal man. What are the possible phenotypes of their children?

iii. A woman who is a carrier for haemophilia marries a man with haemophilia. Could any of their children have haemophilia? If so, would the child be male or female?

3. A). List five (05) Non-Mendelian type inheritance patterns, and briefly explain any two (02) of these inheritance patterns.
- B). A woman has a daughter. There are three men whom she claims might have been the father of the child. The blood test results of the individuals are given below.
- Mother - Type A; and Daughter - Type O
- Man 1 - Type AB; Man 2 - Type B; Man 3 - Type O
- The mother claims that the Man No. 3 must be the little girl's father. Is the mother correct? Explain your answer.
4. A). Using suitable diagrams only, illustrate the four (04) types of variations in chromosome structure and arrangement.
- B). Name and briefly describe the phases of mitotic cell division. Use appropriate diagrams where necessary.
5. A). What is meant by 'epistasis'?
- B). The colour of onion bulbs is determined by two genes. A true breeding red strain crossed to a true breeding white strain produces an all red F<sub>1</sub>. The F<sub>2</sub> was found to consist of 47 white, 38 yellow and 109 red bulbs.
- What epistatic ratio is approximated by the data?
  - What type of gene interaction is illustrated by the above example?
  - If another F<sub>2</sub> is produced by the same kind of a cross, and 8 bulbs of the F<sub>2</sub> are found to be of the double recessive genotype, how many bulbs would be expected in each phenotypic class?
6. Differentiate between any three (03) of the following.
- Coupling phase and repulsion phase of gene linkage
  - Qualitative characters and quantitative characters
  - Monohybrid cross and dihybrid cross
  - Asexual reproduction and sexual reproduction in organisms