

# BINDURA UNIVERSITY OF SCIENCE EDUCATION

## FACULTY OF AGRICULTURE AND ENVIRONMENTAL SCIENCE

AG109

Department of Crop Science  
BSc Agricultural Science (Honours) Part I Examination  
Principles of Genetics

3 HOURS (100 Marks)

### INSTRUCTIONS

Answer any **FOUR** questions. Each question carries **25 marks**.

1. (a) Define the term genetics. [1 marks]  
(b) The  $F_1$  generation of a given plant was selfed, the  $F_2$  generation produced 1:2:1 ratio for a given trait. Using diagrams give two possible explanations to the ratio. [16 marks]  
(c) Give a brief description of the characteristics of the genetic code. [8 marks]
2. (a) Define the cell cycle. [2 marks]  
(b) Explain the significance of the different stages of the cell cycle. [23 marks]
3. (a) A white flowered plant was used as a female in a cross with a red flowered plant. All the  $F_1$  plants were white flowered. When the reciprocal cross was made all the  $F_1$  plants were red.
  - i. Define a reciprocal cross. [2 marks]
  - ii. State the type of gene interaction shown in this description. [1 mark]
  - iii. Explain this type of gene interaction. [5 marks]  
(b) Outline the structure and function of the following organelles;
  - i. Nucleus [5 marks]
  - ii. Ribosomal complex [5 marks]
  - iii. Golgi apparatus [2 marks]
  - iv. Chloroplast [5 marks]
4. (a) Explain how a chromosome is adapted to its function. [18 marks]  
(b) Outline the function of promoters and regulator gene sequences. [7 marks]

5. (a) The ABO blood group system represents a special type of gene interaction that shows three different types of gene interaction. Explain this statement using your understanding of the system. **[9 marks]**
- (b) Height in soyabeans is controlled by two alleles. *T* gives tall plants and is dominant to *t* which gives dwarf plants. A tall plant can have a heterozygous or homozygous.
- i. Define the terms heterozygous and homozygous. **[4 marks]**
  - ii. Describe, with the aid of diagrams, how the genotype of a tall plant can be determined. **[12 marks]**
6. A deep black rat was crossed to another deep black rat, the offspring produced had the following distribution; 9 deep black:3 dilute black:3 deep brown:1 dilute brown.
- (a) Define modifier genes. **[2 marks]**
  - (b) Compare and contrast modifier genes and epistatic genes. **[6 marks]**
  - (c) Use appropriate diagrams to explain the outcome described above. **[11 marks]**
  - (d) Outline the significance of epistatic and modifier genes to breeding. **[6 marks]**

**End of paper**