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)

JUN 2024

INSTRUCTIONS

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

1. Write notes on the following organelles and process. Use diagrams where possible;
   a) Formation of female gametes in plants, **[10 marks]**
   b) The two endoplasmic reticulum (ERs), **[5 marks]**
   c) Nucleus, **[5 marks]**
   d) Lysosomes and peroxisomes. **[5 marks]**

2. (a) Describe the structure of DNA. **[10 marks]**
   (b) Outline the DNA replication process. **[15 marks]**

3. In soyabean plants, there are two types of flowers; yellow and white. Every time a true to type yellow flowered plant is crossed to a white flowered plant, all offspring in the F_1 will be yellow flowered. When these plants are selfed, the result will be a mixture of yellow and white flowered plants in the F_2 generation.

   a) With the aid of suitable diagrams explain the pattern shown by the soyabean plants in the above description. **[10 marks]**
   b) A yellow flowered plant was drawn at random from the F_2 population, advise how a plant breeder can establish the true genotype of the plant. **[15 marks]**

4. With the aid of suitable examples and diagrams, explain how the following gene interactions violate the Mendelian laws of inheritance;
   a) Codominance, **[5 marks]**
   b) Incomplete dominance, **[5 marks]**
   c) Maternal inheritance, **[5 marks]**
   d) Penetrance and expressivity **[5 marks]**
   e) Polygenes and multiple alleles. **[5 marks]**

5. (a) Describe the prophase I stage of meiosis. **[19 marks]**
   (b) Explain the significance of meiosis to living organisms. **[6 marks]**

6. (a) Outline the importance of studying genetics to agriculture. **[10 marks]**

(b) Red coloured wheat was crossed to white coloured wheat to produce the F_1 generation. The F_1 were selfed to produce an F_2 generation which showed a distribution ratio of 9 red grained plants : 6 brown grained plants : 1 colourless grained plants. Explain this observation using appropriate diagrams. **[10 marks]**

(c) Outline the structure and functioning of a chromosome. **[5 marks]**

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