



**LIFE SCIENCES: PAPER II**

Time: 2 hours

100 marks

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**PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY**

1. This question paper consists of 6 pages and a Source Material Booklet of 21 pages (i–xxi). Please check that your question paper is complete. Remove the Source Material Booklet from the middle of the question paper.
  2. The question paper consists of three questions. Question 1 and Question 2 are case studies and Question 3 is an essay. Read the sources provided in the Source Material Booklet and use this information and your own knowledge to answer Questions 1 and 2.
  3. Source material is also provided in the Source Material Booklet for the essay. Use this information and your own knowledge to first plan and then write your response.
  4. All questions must be answered in the Answer Book provided.
  5. Read the questions carefully.
  6. Please start **each question** on a **new** page and leave lines open between all sub-questions (e.g., 1.1 and 1.2).
  7. Number the answers exactly as the questions are numbered.
  8. Use the total marks that can be awarded for each part of the questions in Question 1 and 2 as an indication of the detail required.
  9. It is in your own interest to write legibly and to present your work neatly.
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**SECTION A****QUESTION 1**

**Refer to pages ii–vi of the Source Material Booklet. Use this information as well as your own knowledge to answer the questions that follow.**

- 1.1 Provide a word from the text that means the same as the following statements:
- 1.1.1 A group of individuals of the same species occurring in the same area. (1)
  - 1.1.2 Organisms that are able to produce fertile offspring with one another. (1)
  - 1.1.3 The number of individuals of a species that can live in an area without environmental degradation occurring. (1)
- 1.2 The word 'niche' is a term used to describe a concept in ecological studies.
- 1.2.1 Explain the meaning of the word *niche*. (2)
  - 1.2.2 The life cycle of Pioneer White butterflies has advantages for their survival. Referring to the process of metamorphosis, suggest and explain some of these advantages. (3)
- 1.3 Study Figure 1.1. One of the butterflies shown is a Pioneer White. Using the data and information in the figure and in the article, decide which butterfly, A, B, C or D, is a Pioneer White. Explain TWO reasons for your answer. (3)
- 1.4 Is the migration of the butterflies from the Kalahari an emigration or an immigration? (1)
- 1.5 Use the information in the sources to explain ONE reason why the Shepherd Bush provides an ideal place for the butterfly to lay its eggs. (2)
- 1.6 Use the information in the text and your own knowledge to explain the possible effect of climate change on the future numbers of Pioneer White butterflies migrating from the Kalahari. (3)
- 1.7 Quadrats are an indirect method used to assess population numbers of organisms.
- 1.7.1 What is meant by an "indirect" sampling method of population assessment? (2)
  - 1.7.2 Evaluate the reliability of the placement of the sampled quadrats in **each** site A, B and C. In your evaluation, state clearly the site where the most reliable method of sampling was used. (4)

- 1.8 Study Figure 1.5 showing the rainfall in the Kalahari between 2017 and 2020, as well as the population fluctuations of Pioneer White butterflies and robber flies in the area.
- 1.8.1 Identify the organism represented by line A. (1)
- 1.8.2 Use the graph to explain how rainfall is a limiting factor for the population numbers of robber flies. (2)
- 1.9 What might a game ranger in the Mokala National Park observe about Shepherd Bushes that indicate that the carrying capacity of the Pioneer White butterflies has been reached? (1)
- 1.10 Consider the "windscreen study" in Figure 1.10. Provide THREE reasons why the data collection will not lead to valid results. (3)
- [30]**

**QUESTION 2**

**Refer to pages vii–xi of the Source Material Booklet. Use this information as well as your own knowledge to answer the questions that follow.**

- 2.1 Provide a term for the following statements taken from the article.
- 2.1.1 "plants ... first to colonise the area"
  - 2.1.2 "change from one community to a different plant community"
  - 2.1.3 "final species present in the area" (3)
- 2.2 Telecoprid dung beetles are able to roll dung balls that are much heavier than themselves. Use the information in the text regarding the mass of the beetle to calculate the mass of a dung ball. Show your working. (2)
- 2.3 Study Figure 2.2 as well as the information in the text. This shows four different methods of dung usage by the beetles at the dung pile.
- 2.3.1 How does the behaviour of dung beetles illustrate the concept of interspecific competition? (3)
  - 2.3.2 Explain how the use of the dung by the different types of dung beetles is an example of resource partitioning. (2)
  - 2.3.3 Compare and explain how the body structures of each of the two dung beetles in Figure 2.3 are adapted to their different use of dung. (4)
- 2.4 Study Figure 2.5 showing the movement of seven dung beetles in and around a dung pile. Refer to the diagram and the information in the sources to provide a number of a beetle (1–7) which fits the description of a(n):
- (i) telecoprid
  - (ii) endocoprid
  - (iii) kleptocoprid (3)
- 2.5 Although dung beetles can occur in large groups in a single area, they are not socially organised.
- 2.5.1 Name ONE social insect that you have studied. (1)
  - 2.5.2 Discuss the social organisation of the insect you mentioned in Question 2.5.1. (4)
- 2.6 List FOUR ways in which dung beetles are important for maintaining a healthy ecosystem. (4)
- 2.7 Even though dung beetles are important for ecosystem functioning, they do not get as much attention when it comes to conservation. Suggest why this is so. (2)

- 2.8 Many species of dung beetle were considered for export to Australia. Suggest TWO criteria scientists would have used for selecting suitable types of beetles.

(2)  
**[30]**

**60 marks**

**SECTION B**

Refer to pages xii–xxi of the Source Material Booklet.

**QUESTION 3**

Consider the following statement:

**"Traditional hunting practices are still a valid part of modern society."**

Using the source material provided as well as your own knowledge, discuss your opinion on the statement in the form of an essay of 2½–3 pages.

**In your response you are expected to:**

- Read the source material carefully.
- Take a definite stand on the statement.
- Plan your essay before you start writing. Your planning will be marked.
- Present a debated argument. Use relevant information from sources A–G as well as your own knowledge of Life Sciences to support your point of view.
- Arrange the information to best develop your argument.
- Write in a scientifically appropriate way.
- **In your essay, ensure that you have discussed at least nine different facts from the sources.**

<b>40 marks</b>
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**Total: 100 marks**