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TOTAL MARKS

NATIONAL SENIOR CERTIFICATE EXAMINATION
MAY 2024

LIFE SCIENCES: PAPER II

EXAMINATION NUMBER

Time: 2 hours 100 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 16 pages and a Source Material Booklet of 19 pages (i–xix). 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.

3. Read the sources provided in the Source Material Booklet and use this information and your own knowledge to answer all the questions. All the sources used in Question 1 and Question 2 are referenced in a Reference List on page xi.

4. **Answer ALL the questions on the question paper and hand it in at the end of the examination. Remember to write your examination number in the space provided.**

5. Read the questions carefully.

6. Use the total marks that can be awarded for each question and the space provided as an indication of the detail required.

7. It is in your own interest to write legibly and to present your work neatly.

8. ONE blank page (page 16) is included at the end of the paper. If you run out of space for a question, use this page. Clearly indicate the question number of your answer should you use this extra space.

FOR OFFICE USE ONLY: MARKER TO ENTER MARKS

QUESTION 1	QUESTION 2	QUESTION 3	TOTAL
30	**30**	**40**	**100**

SECTION A

QUESTION 1

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

1.1 Match the descriptions in Column 2 to the terms in Column 1. Write the letter of the description in the table below the question number.

Question number	Column 1	Column 2	
1.1.1	Evolution	A	Human choice leading to changes in a population.
1.1.2	Natural selection	B	Genetic change over time in generations of a population.
1.1.3	Hybrid	C	The offspring of two parents that are homozygous for a certain characteristic.
1.1.4	Divergent evolution	D	Different species arising from a common ancestor.
		E	Environmental change leading to the best-adapted individuals surviving.
		F	Organism that tends to be heterozygous for at least one characteristic.

Question	1.1.1	1.1.2	1.1.3	1.1.4
Answer				

(4)

1.2 The Grants have shown that the evolution of a new species can take place very quickly.

1.2.1 Describe ONE other example of rapid evolutionary change in microorganisms about which you have learned.

(3)

1.2.2 Explain why it is rare to observe evolution taking place in most organisms.

(2)

1.3 Why would inbreeding negatively affect survival? Use the term 'homozygosity' in your answer.

(3)

1.4 The 'Big Birds' are reproductively isolated from the rest of the bird populations of Daphne Major.

1.4.1 What is meant by being 'reproductively isolated'?

(2)

1.4.2 Provide TWO characteristics that led to the Big Birds becoming reproductively isolated from the rest of the Daphne Major population.

(2)

1.4.3 The Big Birds and the other Cactus Finches on Daphne Major have different beak sizes. Explain how this characteristic seems to contribute to them becoming a new species.

(4)

1.5 Answer the following questions on the assumption that the Big Birds have been classified as a new species.

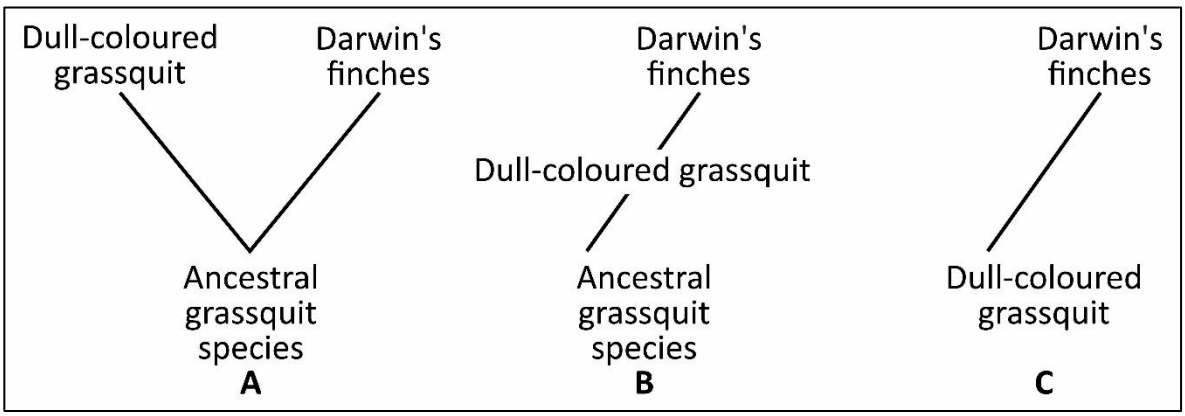
1.5.1 What type of speciation is represented by the original male Cactus Finch moving to the island of Daphne Major and giving rise to the Big Birds?

(1)

1.5.2 What would the Grants have to observe to be able to confirm that the Big Birds actually are a new species?

(2)

1.6 Study the following evolutionary trees/cladograms showing the suggested relationships between grassquits and Darwin's Finches. Write the letter that identifies the correct relationship between grassquits and Darwin's finches in the space below.



Answer:

(1)

1.7 Study Figure 1.5. The three birds are drawn to the same scale. Calculate how many *times* bigger 'Big Bird' is than the GCD. Use the scale lines A–B and C–D.
Show all working and round your answer off to the nearest whole number.

(3)

1.8 The Grants have spent a long time studying the evolution of species on the Galápagos Islands and received numerous awards for their work. Describe THREE important concepts in evolution that have been highlighted by their research.

.

(3)
[30]

QUESTION 2

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

2.1 The founder effect plays a role in the evolution of new species of *Drosophila* in isolated kīpukas.

2.1.1 What is meant by the founder effect?

(2)

2.1.2 Describe ONE example of the founder effect that you have studied.

(2)

2.1.3 Explain how the founder effect resulted in the evolution of fruit flies on the Hawaiian Islands.

(3)

2.2 Explain why speciation of fly populations that are isolated in kīpukas is considered to be allopatric rather than sympatric.

(3)

2.3 The different environments in the kīpukas will, through natural selection, result in fruit flies with specific characteristics surviving. Genetic variation is important to allow natural selection to occur.

2.3.1 Give TWO sources of genetic variation in a population.

(2)

2.3.2 Why can inherited variation only be influenced by genetic factors and not by environmental changes?

(1)

2.4 Study the cladogram in Figure 2.5. Use the information in the cladogram to provide evidence for the following statements:

2.4.1 Hawaii Big Island is at least 0,5 million years old.

(2)

2.4.2 *Drosophila heteroneura* has a closer genetic relationship to *D. silvestris* than to *D. planitibia*.

(3)

2.5 The following table contains a list of statements describing possible steps involved in the evolution of fruit flies that consume green algae.

Indicate which of the four statements below correspond to Darwin's and/or to Lamarck's explanation of evolution.
Make use of the following codes:

- Write D for Darwin's explanation
- Write L for Lamarck's explanation
- Write LD if BOTH Darwin's and Lamarck's explanation apply to the statement

Statement	L, D or LD
Those individuals who could consume and digest algae survived better than those that could not.	
Fruit flies that started eating algae produced digestive enzymes to digest algae.	
Individuals passed the ability to consume algae to their offspring.	
The environment affects the survival of the species.	

(4)

2.6 The presence of kīpukas helps to explain the extraordinary rate of speciation on the Hawaiian Islands.

2.6.1 Although the presence of the kīpukas can explain the allopatric speciation of many fruit fly species on the Hawaiian Islands, allopatric speciation of birds would not occur in kīpukas. Explain a reason for this.

(2)

2.6.2 How do kīpukas provide 'natural laboratories for evolution'?

(3)

2.7 Climate change is affecting the Hawaiian Islands, resulting in lower rainfall. Explain how this climate change will affect the number of species of *Drosophila* on the Hawaiian Islands.

(3)
[30]

60 marks

SECTION B

Refer to pages xi–xix of the Source Material Booklet.

QUESTION 3

Consider the following statement:

'Homo naledi used caves as a burial site for their dead.'

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–H 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.**

40 marks

Total: 100 marks

ADDITIONAL SPACE (ALL QUESTIONS)

REMEMBER TO CLEARLY INDICATE AT THE QUESTION THAT YOU USED THE ADDITIONAL SPACE TO ENSURE THAT ALL ANSWERS ARE MARKED.