

Biodiversity

Question Paper 1

Level	International A Level
Subject	Biology
Exam Board	Edexcel
Topic	Plant structure and function, Biodiversity and Conservation
Sub-Topic	Biodiversity
Booklet	Question paper 1

Time Allowed: 63 minutes

Score: /52

Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	77.5%	70%	62.5%	57.5%	45%	<45%

- 1 The wild nutmeg tree, *Virola surinamensis*, is found in tropical forests in Brazil. The leaves and fruits are used in local medicines.

The wild nutmeg tree, shown in the photograph below, is an endangered species due to habitat loss.



© Smithsonian Tropical Research Institute
Magnification $\times 0.1$

Habitat loss is reducing the biodiversity of tropical forests in Brazil.

- (a) Suggest how the effects of habitat loss on the biodiversity of a tropical forest could be measured.

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- (b) Seeds of the wild nutmeg tree have been collected for storage in seed banks. It is important to collect seeds that allow the conservation of genetic diversity.

Explain how seed banks can help to conserve the genetic diversity of plant species.

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(ii) In this investigation, the seeds were stored at 22 °C and 53% humidity.

These stored seeds were observed to have fungi (mould) growing on their surfaces.

Suggest how these storage conditions could be changed to increase the percentage germination of these seeds after storage. Give an explanation for your answer.

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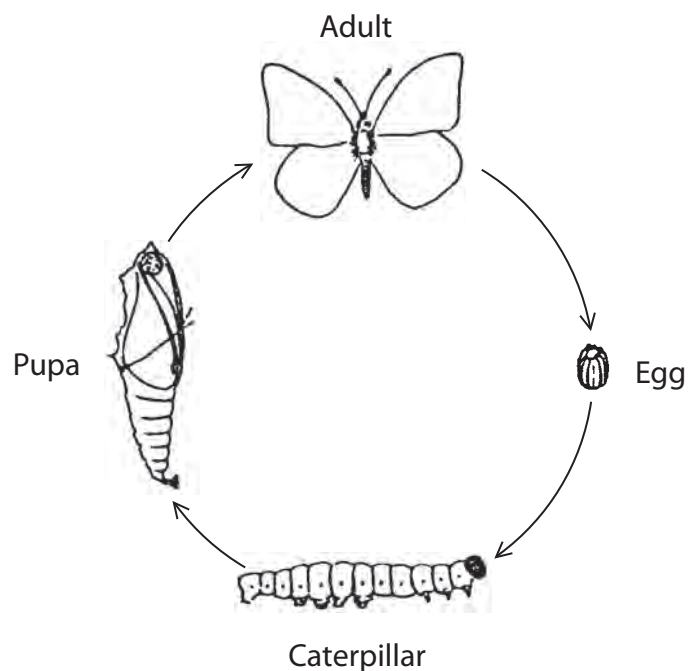
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(Total for Question 1 = 10 marks)

(b) The life cycle of a butterfly is shown in the diagram below.



Scientists carried out an experiment in which the caterpillars of the bush brown butterfly were kept in either cold or warm conditions. The types of butterfly that developed were recorded.

The results are shown in the table below.

Caterpillars kept in	Form of adult bush brown butterfly
Cold conditions	Wings with many, large eyespots
Warm conditions	Wings with few, small eyespots

Suggest why the scientists may have found it difficult to interpret the factors affecting the phenotype of these butterflies.

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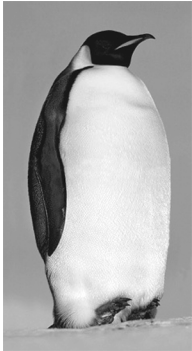

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(Total for Question 2 = 9 marks)

3 Information about two species of penguin and their habitats is shown in the table below.

Name of penguin species	Photograph of penguin	Mean adult body mass / kg	Mean adult height / cm	Endemic to	Temperature range of habitat / °C
Emperor penguin <i>(Aptenodytes forsteri)</i>		34.0	115.0	Antarctica	–60 to –28
Galapagos penguin <i>(Spheniscus mendiculus)</i>		2.2	50.0	Galapagos Islands	19 to 31

(a) Explain what is meant by the term **endemic**, with reference to these two species of penguin.

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(b) Place a cross ☒ in the box that completes the following statement.

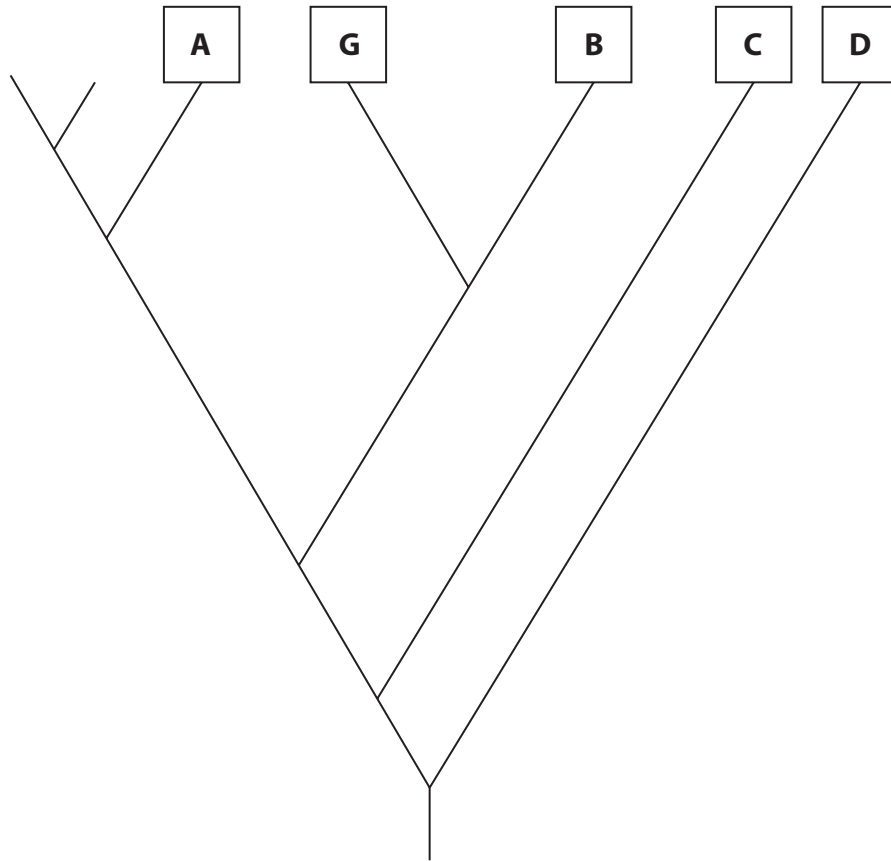
One anatomical adaptation that helps the emperor penguin to survive in its habitat is

(1)

- A** having a large surface area to volume ratio to reduce heat loss
- B** having a small surface area to volume ratio to reduce heat loss
- C** huddling together to maintain body temperature
- D** reduced resting metabolic rate while incubating eggs

(c) Molecular phylogeny suggests that the emperor penguin split off from a branch, which led to the evolution of **all** other living penguin species. This split happened 40 million years ago.

The diagram below indicates the evolutionary relationships between the main species of penguin. The letter G indicates the position of the Galapagos penguin.



- (c) There is a range of different phenotypes of *Biston betularia* with intermediates between the light-coloured and melanic forms of moth. This may be a result of polygenic inheritance.

Explain what is meant by the term **polygenic inheritance**.

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(Total for Question 4 = 9 marks)

5 The table below shows the numbers of species of lizard found living in different regions of the world. The table also shows the total land area of each region and the number of lizard species per 10 000 km² in each region.

Region of the world	Number of lizard species	Land area / km ²	Number of species per 10 000 km ²
Australia	623	7 741 000	0.80
California	67	424 000	1.58
New Zealand	80	268 700	2.98
Texas	61	696 200	0.88
United Kingdom		244 800	0.12

(a) (i) Using the data in the table, calculate the number of species of lizard in the United Kingdom. Show your working. (2)

Answer

(ii) Using information in the table, compare the biodiversity of lizard species in California with that in Texas. (2)

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(iii) Explain what is meant by the term **species richness**. (2)

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(b) Several types of lizards called geckos, live in New Zealand.

Naultinus are green geckos. They are active during the day and live in trees.

Hoplodactylus are brown forest geckos. They are active at night and live on the ground or in trees.

These geckos are shown in the photographs below.



Green gecko Magnification $\times 1$



Brown forest gecko Magnification $\times 1$

(i) These geckos are endemic to New Zealand.

Describe what is meant by the term **endemic**.

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(ii) Both types of gecko live in the same habitat. However, they occupy different niches.

Explain what is meant by the term **niche**.

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(iii) Suggest how these two types of gecko can survive in the same habitat.

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(Total for Question 5 = 12 marks)