LUI | | | | | | | | | | | School code | | | | |

School name

Given name/s

Family name

Attach your barcode ID label here

Book of books used

External assessment 2021

Question and response book

Biology

Paper 1

Time allowed

- Perusal time — 10 minutes
- Working time — 90 minutes

General instructions

- Answer all questions in this question and response book.
- QCAA-approved calculator permitted.
- Planning paper will not be marked.

Section 1 (20 marks)

- 20 multiple choice questions

Section 2 (30 marks)

- 8 short response questions

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DO NOT WRITE ON THIS PAGE

THIS PAGE WILL NOT BE MARKED

Section 1

Instructions

- Choose the best answer for Questions 1–20.
- This section has 20 questions and is worth 20 marks.
- Use a 2B pencil to fill in the A, B, C or D answer bubble completely.
- If you change your mind or make a mistake, use an eraser to remove your response and fill in the new answer bubble completely.

	A	B	C	D
Example:	●	○	○	○

	A	B	C	D
1.	○	○	○	○
2.	○	○	○	○
3.	○	○	○	○
4.	○	○	○	○
5.	○	○	○	○
6.	○	○	○	○
7.	○	○	○	○
8.	○	○	○	○
9.	○	○	○	○
10.	○	○	○	○
11.	○	○	○	○
12.	○	○	○	○
13.	○	○	○	○
14.	○	○	○	○
15.	○	○	○	○
16.	○	○	○	○
17.	○	○	○	○
18.	○	○	○	○
19.	○	○	○	○
20.	○	○	○	○

Do not write outside this box.

Section 2

Instructions

- Write using black or blue pen.
- If you need more space for a response, use the additional pages at the back of this book.
  - On the additional pages, write the question number you are responding to.
  - Cancel any incorrect response by ruling a single diagonal line through your work.
  - Write the page number of your alternative/additional response, i.e. See page …
  - If you do not do this, your original response will be marked.
- This section has eight questions and is worth 30 marks.

QUESTION 21 (4 marks)

In the Linnaean system of classification, the features used to classify living things change according to taxonomic levels. Describe, using relevant examples, how these features change.

Do not write outside this box.

QUESTION 22 (3 marks)

Describe two ways carbon is transformed and one way it is transferred as it cycles through the biotic components of an ecosystem.

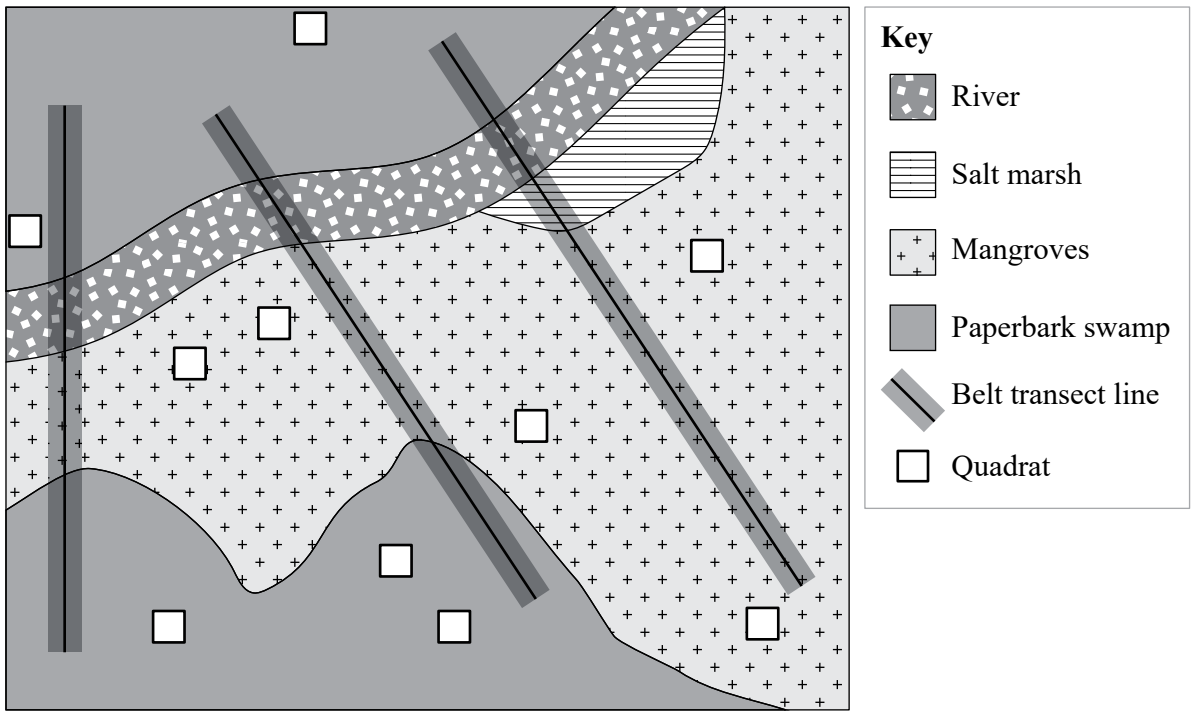
Do not write outside this box.

QUESTION 23 (5 marks)

To determine the species diversity and species richness of a wetland ecosystem, ecologists surveyed communities adjacent to a river, using two methods for each community:

1. random species sampling with predetermined grid numbers, with 10 quadrats of 4 m^2 each used for these grids
2. three belt transect lines (50 m × 2 m) across predetermined sampling locations based on strata variation.

The map shows the locations of quadrats and transect lines. The table shows survey results.



Not to scale

	Survey method	
	Quadrat	**Belt transect**
Species diversity (Simpson's diversity index)	0.6	0.8
Species richness (number of species)	16	22

Do not write outside this box.

a) Identify three differences between the survey methods used to determine species diversity and species richness in the ecosystem. *[3 marks]*

b) Draw a conclusion about the most suitable method for estimating species diversity and species richness of the communities in this wetland ecosystem. Give a reason to support your conclusion. *[2 marks]*

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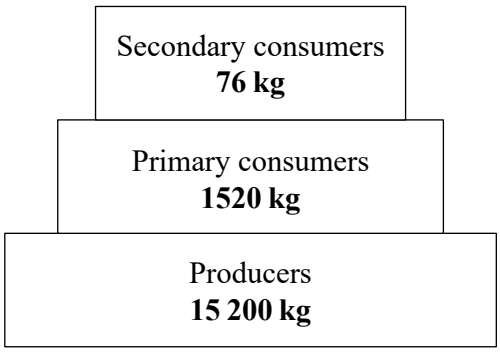
QUESTION 24 (5 marks)

The diagram is a hypothetical biomass pyramid for a community.



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a) Contrast the efficiency of the biomass transfers between each level of the pyramid. *[3 marks]*

b) Explain the difference in biomass transfer efficiency identified in Question 24a). *[2 marks]*

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QUESTION 25 (3 marks)

In blood group inheritance in humans, three alleles (i, I^A and I^B) determine blood type, which can be type O, A, B or AB.

It is known that:

- allele I^A produces type A and is co-dominant with allele I^B, which produces type B
- allele i produces type O
- alleles I^A and I^B are dominant over allele i.

A father who is heterozygous type A and a mother who is heterozygous type B have children. Predict the likely frequency of phenotypes for their offspring. Show your working.

Do not write outside this box.

QUESTION 26 (4 marks)

a) State the three components of a DNA nucleotide. *[1 mark]*

b) Describe the steps involved in DNA profiling. *[3 marks]*

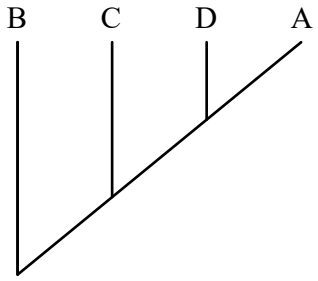
Do not write outside this box.

QUESTION 27 (3 marks)

The table shows the percentage sequence similarity for three different parts of a gene found in four different eukaryotic species. The data was obtained by comparing DNA from one member of each species to Species A.

From this data, a proposed phylogenetic tree was produced.

Species	Gene region 1	Gene region 2	Gene region 3
A	100%	100%	100%
B	98%	96%	82%
C	99%	92%	96%
D	99%	99%	92%



Determine whether the phylogenetic tree has been drawn correctly based on the DNA comparison. Explain your reasoning.

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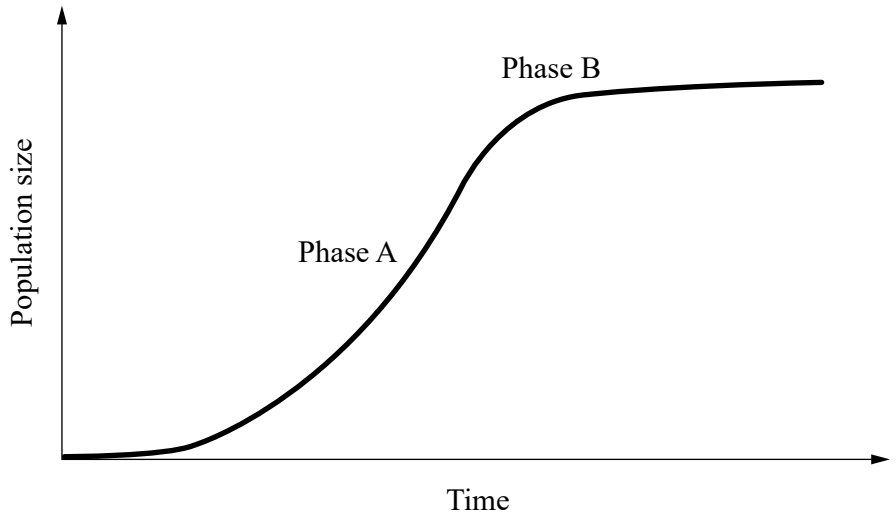
QUESTION 28 (3 marks)

The graph depicts the population change of a species after it is introduced into a previously disturbed environment.



Referring to Phase A and Phase B, determine the population growth model for the species.

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ADDITIONAL PAGE FOR STUDENT RESPONSES

Write the question number you are responding to.

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ADDITIONAL PAGE FOR STUDENT RESPONSES

Write the question number you are responding to.

Do not write outside this box.

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