

## QCE Biology Units 3&4

### Paper 1

Student's Name: \_\_\_\_\_

Teacher's Name: \_\_\_\_\_

#### Time allowed

- Perusal time – 10 minutes
- Working time – 90 minutes

#### General instructions

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

#### Section 1 (25 marks)

- 25 multiple choice questions

#### Section 2 (25 marks)

- 5 short response questions

Students are advised that this is a trial examination only and cannot in any way guarantee the content or the format of the 2020 QCE Biology Units 3&4 examination.

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**SECTION 1****Instructions**

- Choose the best answer for Questions 1–25.
- This section has 25 questions and is worth 25 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:	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	A	B	C	D
1.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
21.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
22.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



**QUESTION 27 (6 marks)**

Two groups of students studied the diversity of arthropod species found in Sherbrooke Forest in Victoria. Each group searched for two hours in two sites of equal area. The table below gives the number of individuals of four arthropod species counted during the time period.

Species	Site A	Site B
Springtails – <i>Collembola</i> sp.	11	21
Millipedes – <i>Diplopoda</i> sp.	6	11
Bull ants – <i>Myrmecia forficata</i>	14	7
Red spider mites – <i>Tetranychus urticae</i>	11	2

- a) Explain the usefulness of the two-word scientific name used for a species, such as *Tetranychus urticae*. [2 marks]

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- b) Calculate the Simpson diversity indices for the arthropod species at the two sites, using the formula  $SDI = 1 - D$ , where:
- $D = \frac{\sum n(n - 1)}{N(N - 1)}$
  - $n$  = number of organisms of one species
  - $N$  = total number of organisms of all species.
- [2 marks]

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- c) Suggest and explain a possible conclusion that could be reached regarding species diversity between the two sites by comparing the calculated SDI indices. [2 marks]

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**QUESTION 28 (4 marks)**

One of the major types of haemophilia is Haemophilia A or factor VIII deficiency. It is inherited as a sex-linked recessive condition and it appears more frequently in males than females.

- a) Allocate symbols for haemophiliac and non-haemophiliac alleles. Use these symbols to show the possible genotypes of males and females for the haemophilia gene and explain why the haemophilia condition appears more frequently in males than females. [2 marks]

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- b) Using the allele symbols assigned in part a) and a Punnet square diagram, predict the chance of a haemophilic boy being born if the mother was a carrier and the father was non-haemophiliac. [2 marks]

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**QUESTION 30 (5 marks)**

- a) Waterlogging of the soil due to flooding or poor water drainage can impact on the nitrogen cycle. With less oxygen in waterlogged soil, the denitrification process by *Pseudomonas* bacteria is favoured instead of nitrogen fixation by nitrogen-fixing bacteria.

Discuss the effect on the soil and the impact on the ecosystem of this change in the nitrogen cycle.

[2 marks]

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- b) In wetland ecosystems, such as swamps that are permanently waterlogged, some plant species have specific adaptations to be able to obtain nitrogen from extracellular digestion of insects and other small animals.

Explain how these adaptations have arisen in these species.

[2 marks]

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**END OF PAPER**





