

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 2021 QCE Biology Units 3&4 Written 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"/>

SECTION 2

Instructions

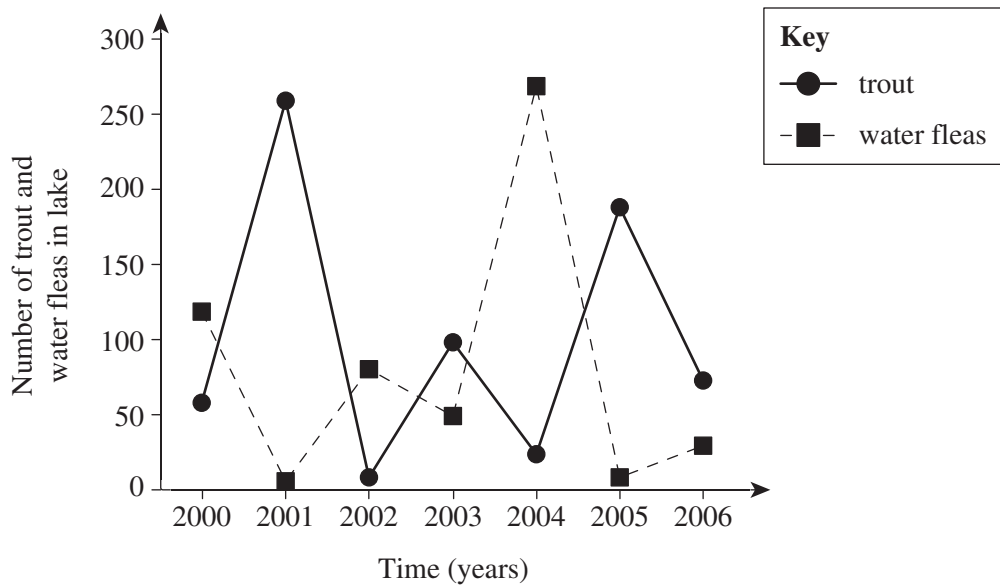
- Write using black or blue pen.
 - If you need more space for a response, use the additional pages at the back of this booklet.
 - On the additional pages, write the question number you are responding to.
 - Cancel any incorrect response by ruling a single diagonal line through your work.
 - Write the 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 five questions and is worth 25 marks.
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QUESTION 26 (5 marks)

Explain how antibiotic resistance in bacteria can arise in response to environmental change.

QUESTION 27 (5 marks)

Trout are freshwater fish. The water flea is a small crustacean (about 3 mm in length) that swims in surface waters and feeds on phytoplankton. The graph below shows data for changes in the population size of both species in a small lake over a six-year period.



a) Define the term *population*. [1 mark]

b) Outline how the data supports the hypothesis that trout eat water fleas. [1 mark]

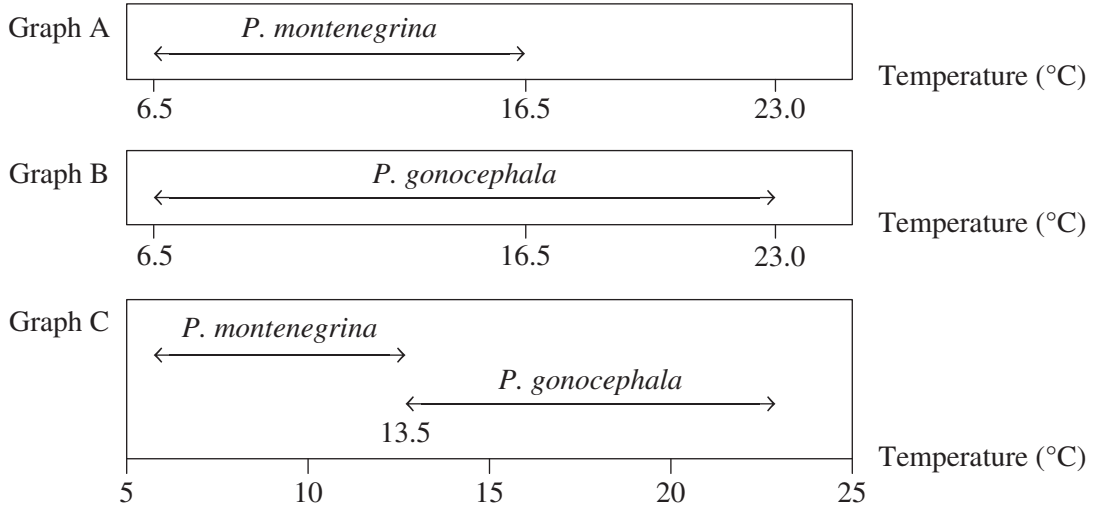
c) In 2001, the number of water fleas was very low.
Identify a reason why the population of trout did not die out. [1 mark]

d) From the given information, what trophic level are the water fleas in the small lake? [1 mark]

e) Identify a method for obtaining a reliable estimate of the number of water fleas per litre in the lake. [1 mark]

QUESTION 28 (6 marks)

The graphs below show the distribution of two species of freshwater flatworms, *Planaria gonocephala* and *Planaria montenegrina*, over a range of temperatures. Graph A and graph B below show the distributions when each species is separate from the other. Graph C below shows the distribution when they are found living together.



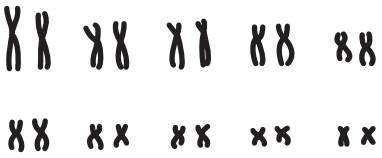
- a) Using graph A and graph B, compare and contrast the temperature ranges of the two species when they are found separately. [2 marks]

- b) Explain, using the example of *P. montenegrina*, what is meant by the term *realised niche*. [2 marks]

- c) Would it be reasonable to predict that several species living naturally in a natural community would have a high degree of niche overlap? Give a reason to support your answer. [2 marks]

QUESTION 29 (5 marks)

Polyploidy, where the genotype of a species has more than two complete sets of chromosomes, is well-tolerated by plants and is often sought after by agriculturalists, as polyploidy plants tend to be larger. Animals generally cannot tolerate polyploidy, as it is lethal in early stages of development; however, frogs are unusual in that polyploidy forms do exist. The table below refers to two species of frogs. Species A, *Neobatrachus fulvus*, has a diploid number of chromosomes, and species B, *Neobatrachus kunapalari*, has a tetraploid number of chromosomes. The karyotype is shown for species A and the number of chromosomes is shown for species B.

Species	Species A <i>(Neobatrachus fulvus)</i>	Species B <i>(Neobatrachus kunapalari)</i>
Karyotype		
Number of chromosomes		$4n = 48$

a) On the karyotype of species A above, circle a pair of homologous chromosomes. [1 mark]

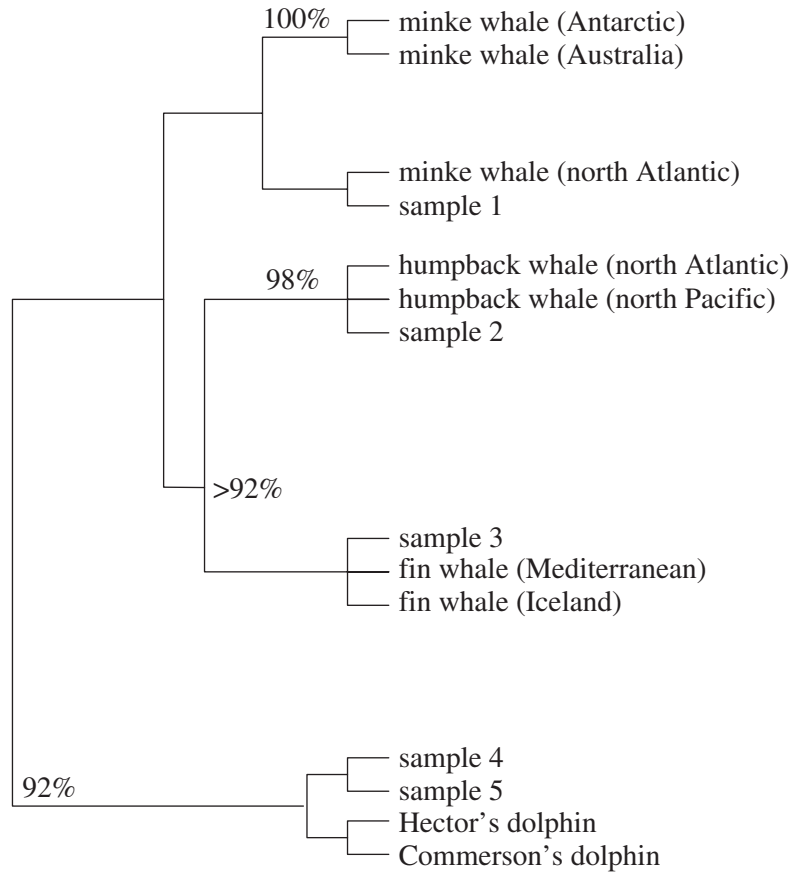
b) Outline what makes a pair of chromosomes homologous. [1 mark]

c) Complete the table above by sketching the karyotype for *Neobatrachus kunapalari* and giving the number of chromosomes for *Neobatrachus fulvus*. [2 marks]

d) Outline how the tetraploid chromosome number in cells of species B could have occurred. [1 mark]

QUESTION 30 (4 marks)

International agreement limits the hunting of whales. Only the meat of the minke, fin and humpback whales from Southern Hemisphere populations is permitted to be sold on the domestic market in Japan. Scientists obtained five samples of meat that were being sold as ‘whale meat’ in a Japanese marketplace. They identified the species and probable geographic origin of the meat using genetic analysis, including polymerase chain reaction (PCR). The results were used to construct the cladogram below.



a) Using the data in the cladogram, infer why the sale of sample 1 meat is illegal in Japan . [1 mark]

b) Outline the steps of the PCR used in this study. [3 marks]

END OF PAPER

