Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel International GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Wednesday 13 January 2021

Morning (Time: 1 hour 15 minutes) | Paper Reference **4BI1/2B**

Biology

Unit: 4BI1

Paper: 2B

You must have:
Calculator

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- Show all the steps in any calculations and state the units.
- Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Information

- The total mark for this paper is 70.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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Answer ALL questions.

1 Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

Plastic pollution

A mass of 12.7 million tonnes of plastic is dumped into our oceans every year. This is equivalent to the mass of 1.8 million adult elephants. This plastic pollution is a concern because of its harmful effect on living organisms.

Turtles eat plastic bags, mistaking them for jellyfish, and sea birds have been found with stomachs full of plastic. Researchers have reported 800 kg of plastic found in the carcass of a stranded whale in France. The stomach of another whale in Australia contained six square metres of plastic sheeting and 30 plastic carrier bags. Plastic items can block the tubes leading from the mouth to the stomach and to the lungs in some animals. This can cause death because it affects digestion and gas exchange.

Whale sharks are the largest fish in the world, yet feed on microscopic plankton that photosynthesise. The plankton is also eaten by crustaceans, which are then eaten by fish. These fish are eaten by humans. Many whales are filter feeders. They swallow hundreds of cubic metres of water a day to capture plankton and may take in microplastics during the process. The microplastics are produced from the breakdown of larger pieces of plastic. Microplastics are similar in size and mass to many types of plankton. These microplastics are not biodegradable and build up in the bodies of organisms that occupy higher trophic levels in food chains. This is called bioaccumulation.

Plastic pollution may be responsible for putting filter feeding whale sharks and other filter feeders at risk of extinction. The whale shark, for example, is listed as being endangered.

Studies have found toxic chemicals associated with plastics in the bodies of large filter feeders. Scientists think these chemicals might reduce the population sizes of the large filter feeders. This is because the toxins might affect many biological processes involving hormones that regulate the body's growth and development, metabolism, and reproduction.

Whale sharks feeding in the Sea of Cortez near Mexico, an important breeding ground, ingest 200 microplastic particles per day. Fin whales in the Mediterranean Sea ingest 2000 microplastic particles per day. Any reduction in the reproduction of these species will have consequences for biodiversity.

Attempts are being made to reduce the use of plastic. Coffee companies are being encouraged to use wooden spoons and straws rather than plastic ones. Also, shoppers are being given biodegradable plastic bags, or paper bags.

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1 (a) (i) Which organism named in the passage is a producer?

(1)

- ☒ **A** crustaceans
- ☒ **B** microscopic plankton
- ☒ **C** sea birds
- ☒ **D** turtles

(ii) Which organism named in the passage is a tertiary consumer?

(1)

- ☒ **A** crustaceans
- ☒ **B** fin whale
- ☒ **C** human
- ☒ **D** whale shark

(b) Explain how blocked tubes leading from the mouth can lead to death in some animals. (lines 8 to 10)

(5)

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(c) Suggest why bioaccumulation of microplastics is a problem for humans. (lines 17–20)

(2)

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(d) Calculate the difference between the number of plastic particles ingested in a year by a fin whale and a whale shark. (lines 29–31)

Give your answer in standard form.

(3)

difference = ...

(e) Explain the effects of reduced reproduction on biodiversity. (lines 31–32)

(2)

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(f) Suggest a benefit of using biodegradable plastic bags. (line 35)

(2)

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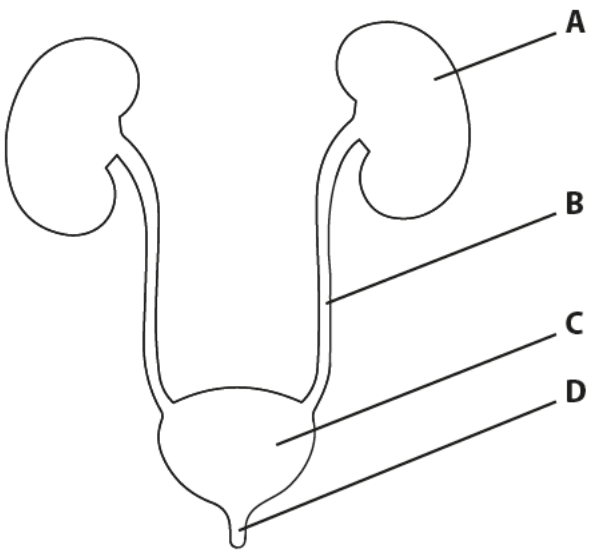
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(Total for Question 1 = 16 marks)

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2 The urinary system is used in excretion.

The diagram shows the urinary system with parts labelled A, B, C and D.



(a) Which part of the urinary system contains nephrons?

(1)

- ☒ **A**
- ☒ **B**
- ☒ **C**
- ☒ **D**

(b) The urinary system produces urine.

Name a substance found in urine.

(1)

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(c) A scientist uses this method to investigate the effect of drinking different liquids on urine production.

- drink 600 cm^3 of water in the morning
- measure the volume of urine produced during the next two hours
- drink 600 cm^3 of 0.8 % salt (NaCl) solution at the same time the following morning
- measure the volume of urine produced during the next two hours

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The table shows the scientist's results.

Liquid	Volume of urine produced during two hours in cm^3
water	560
salt solution	254

(i) Explain the scientist's results.

(5)

(ii) Give **two** other factors that affect the volume of urine produced.

(2)

1 .....

2 .....

(Total for Question 2 = 9 marks)

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3 Micropropagation is used to produce plant clones.

The process involves growing explants *in vitro*.

(a) State what is meant by the term ***in vitro***.

(1)

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(b) The explants grow new roots and shoots.

A student investigates the effect of pH on the growth of new shoots.

The table shows the student's results.

pH	Mean number of shoots per explant
4.5	3.0
5.0	4.8
5.5	5.4
6.0	6.4
6.5	4.3

(i) Explain the relationship between pH and the mean number of shoots per explant.

(2)

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(ii) Describe a procedure the student could use to obtain explants and produce these results.

(6)

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(c) Give two benefits of using micropropagation to produce new plants rather than using seeds.

(2)

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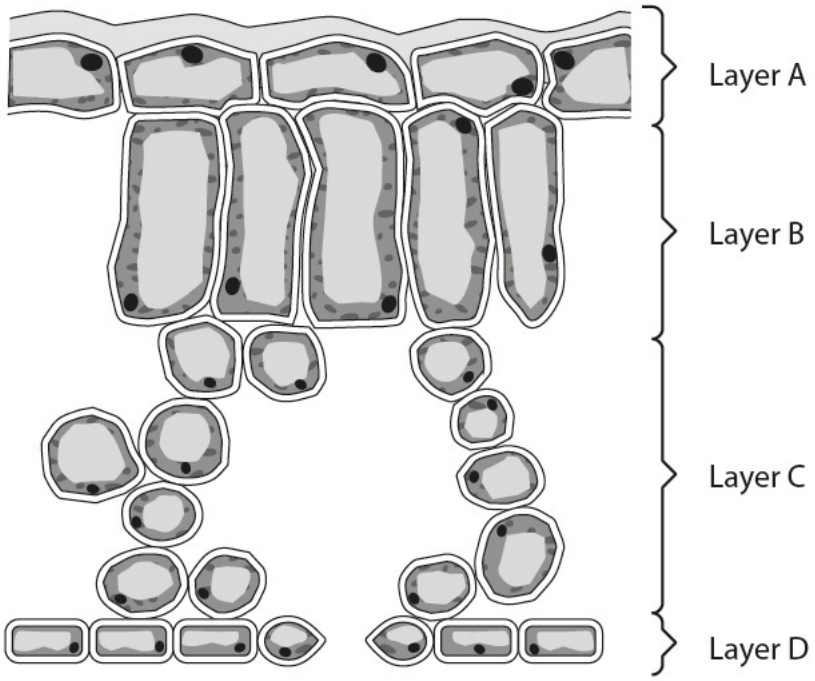
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(Total for Question 3 = 11 marks)

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4 The diagram shows a transverse section through a leaf.



(a) Explain how layer A is adapted for its role.

(2)

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(b) Explain how layers B and C are adapted for photosynthesis and gas exchange.

(4)

(c) Explain how layer D is able to regulate gas exchange.

(2)

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(d) Gardeners sometimes apply a spray called an anti-transpirant to plant leaves.



The spray is impermeable to water vapour but allows other gases to pass through.

Discuss whether an anti-transpirant spray will promote plant growth.

(4)

(Total for Question 4 = 12 marks)

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5 (a) A DNA strand has this sequence of bases.

C A T T C A A T T C A T T T C

(i) How many amino acids does this sequence of bases code for?

(1)

☒ **A** 1

☒ **B** 3

☒ **C** 5

☒ **D** 15

(ii) Write down the complementary mRNA code for this sequence of bases.

(2)

(iii) A student reads that DNA codons are non-overlapping.

Suggest what is meant by the term non-overlapping.

You should refer to the sequence of bases in your answer.

(2)

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(b) Describe what happens in the translation stage of protein synthesis.

(4)

(c) State what is meant by the genome of an organism.

(1)

(Total for Question 5 = 10 marks)

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6 Catalase is an enzyme found in many cells.

It speeds up the breakdown of hydrogen peroxide into water and oxygen.

The equation for the reaction is

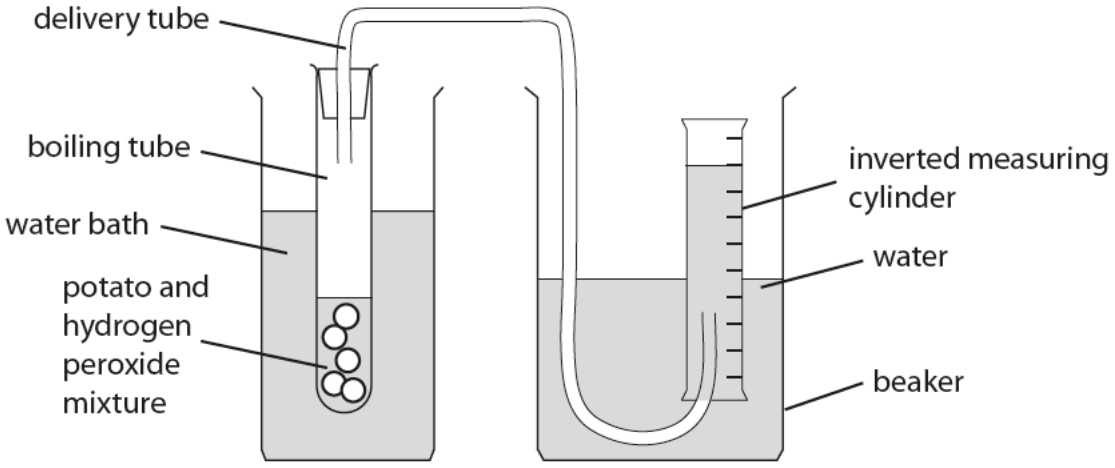
$$2H_2O_2 \rightarrow 2H_2O + O_2$$

A teacher demonstrates the effect of increasing catalase concentration on the initial rate of the reaction.

This is the teacher's method.

- cut five equal size discs from a potato, each 0.2 mm thick
- place the discs in a boiling tube with 5 cm^3 of buffer solution
- add 5 cm^3 of hydrogen peroxide solution to the boiling tube
- place a bung and delivery tube firmly into the boiling tube
- position the other end of the delivery tube under an inverted measuring cylinder
- start a timer as soon as the first bubble of oxygen enters the measuring cylinder
- measure the volume of oxygen produced in one minute

Repeat this method three times.



The teacher uses this method with different numbers of potato discs, making sure that other conditions are unchanged.

(a) Give the expected relationship between the named independent variable and the named dependent variable in this demonstration.

(2)

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(b) Give **two** variables that the teacher controls in this demonstration.

(2)

1 .....

2 .....

(c) The table shows the teacher's results.

Enzyme concentration in number of discs	Volume of oxygen produced in one minute in cm^3				
	Reading 1	Reading 2	Reading 3	Reading 4	Mean reading
5	1.2	1.5	0.0	1.5	
10	3.5	4.5	6.0	5.5	4.9
15	6.5	7.0	7.5	8.0	7.3
20	9.0	8.5	8.0	7.5	8.3
25	15.0	11.0	11.5	12.0	12.4

(i) Calculate the mean volume of oxygen produced in one minute using 5 potato discs.

(2)

mean reading = ... cm^3

(ii) Calculate the percentage increase in mean volume of oxygen produced in one minute as the concentration of enzyme changes from 15 to 20 discs.

(2)

percentage increase = ... %

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(iii) Explain the relationship between the concentration of enzyme and mean volume of oxygen produced in one minute.

(2)

(d) Suggest why the teacher measures the volume of oxygen after the first minute of the reaction rather than after 10 minutes.

(2)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 70 MARKS

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