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Surname	Other names

Pearson Edexcel International GCSE

Centre Number	Candidate Number

Biology

Unit: 4BI0

Paper: 2B

Monday 15 January 2018 – Afternoon

Time: 1 hour

Paper Reference

4BI0/2B

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.

Information

- The total mark for this paper is 60.
- 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.
- Write your answers neatly and in good English.
- 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.

Poisonous ragwort



Ragwort is a plant with yellow insect-pollinated flowers.

Many insect species eat ragwort leaves. The larvae of some insects damage the leaves when they eat into leaf mesophyll tissue to feed on the cells. This feeding behaviour reduces the growth of the ragwort plant. The larvae of the cinnabar moth, found in the UK, are very efficient at eating ragwort leaves. For this reason, the moth has been introduced into other countries as a biological control.

Ragwort plants contain a poison that kills many insects. However, the cinnabar moth is not killed by this poison and it builds up in its body. This makes the moth taste unpleasant to its predators.

Unfortunately, if a horse eats ragwort, the poison damages its liver. The poison also causes blindness by making the cornea cloudy. A horse that eats 11% of its own body mass of ragwort will be poisoned and die. It is estimated that 6500 horses in the UK die every year from ragwort poisoning.

Honey bees that visit ragwort flowers may collect nectar that can also contain the poison. This nectar is used to make honey. If a human consumes this honey it may harm their liver.

It is hard to control the size of the ragwort population because the flowers of a single plant can produce about 200 000 seeds in one season. These seeds remain dormant in the soil until they are stimulated to germinate by light.

Apart from using biological control, farmers can use other methods to reduce the size of the ragwort population in their fields. One method is to use weed killer. Another method involves keeping farm animals out of their fields to allow the grass to grow.

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(a) What is meant by the term **insect-pollinated** (line 1)?

(1)

(b) Give one feature of ragwort flowers, mentioned in the passage, that indicates they are pollinated by insects.

(1)

(c) Explain how the feeding behaviour of many insect larvae affects the growth of a ragwort plant (lines 3 and 4).

(3)

(d) Suggest why it might be a risk to introduce cinnabar moths into other countries (line 6).

(2)

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(e) Explain how natural selection could have resulted in cinnabar moths that are not killed by the poison (lines 7 and 8).

(3)

(f) Explain why a cloudy cornea can cause blindness (line 11).

(2)

(g) Calculate the mass of ragwort that a 520 kg horse would have to eat to become poisoned and die (lines 11 and 12).

(2)

mass of ragwort = ... kg

(h) Name the blood vessel that transports the poison from a horse's intestine to its liver.

(1)

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(i) Ragwort seeds need to be stimulated by light in order to germinate (line 19).

Give one other factor that seeds need in order to germinate.

(1)

.....

(j) Suggest why the size of the ragwort population can be reduced if farm animals are kept out of fields where ragwort grows (lines 22 and 23).

(2)

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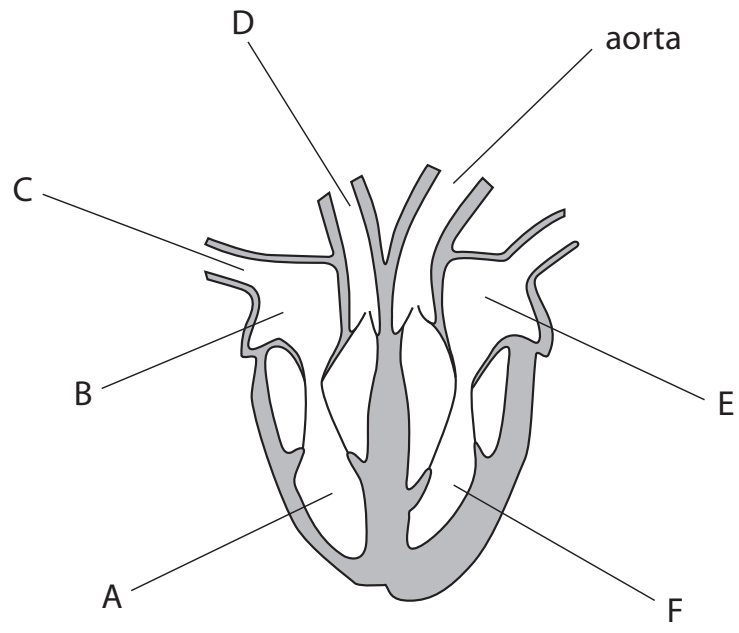
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(Total for Question 1 = 18 marks)

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2 The diagram shows a section through the human heart.



(a) (i) Give the letter of the part known as the vena cava.

(1)

.....

(ii) Give the letters of the chambers where oxygenated blood is found.

(1)

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(b) Describe how the structure of the aorta is adapted for its role.

(2)

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(c) The table shows the speed of blood flow in three blood vessels.

Blood vessel	Speed of blood flow in cm per second
aorta	40.00
lung capillary	0.03
vena cava	15.00

(i) Blood has to travel 20 cm from a person's heart to their renal artery.

Calculate the time taken for blood to flow from this person's heart to their renal artery.

Show your working.

(2)

time = ... s

(ii) Explain how the speed of blood flow in the lung capillary affects gas exchange.

(2)

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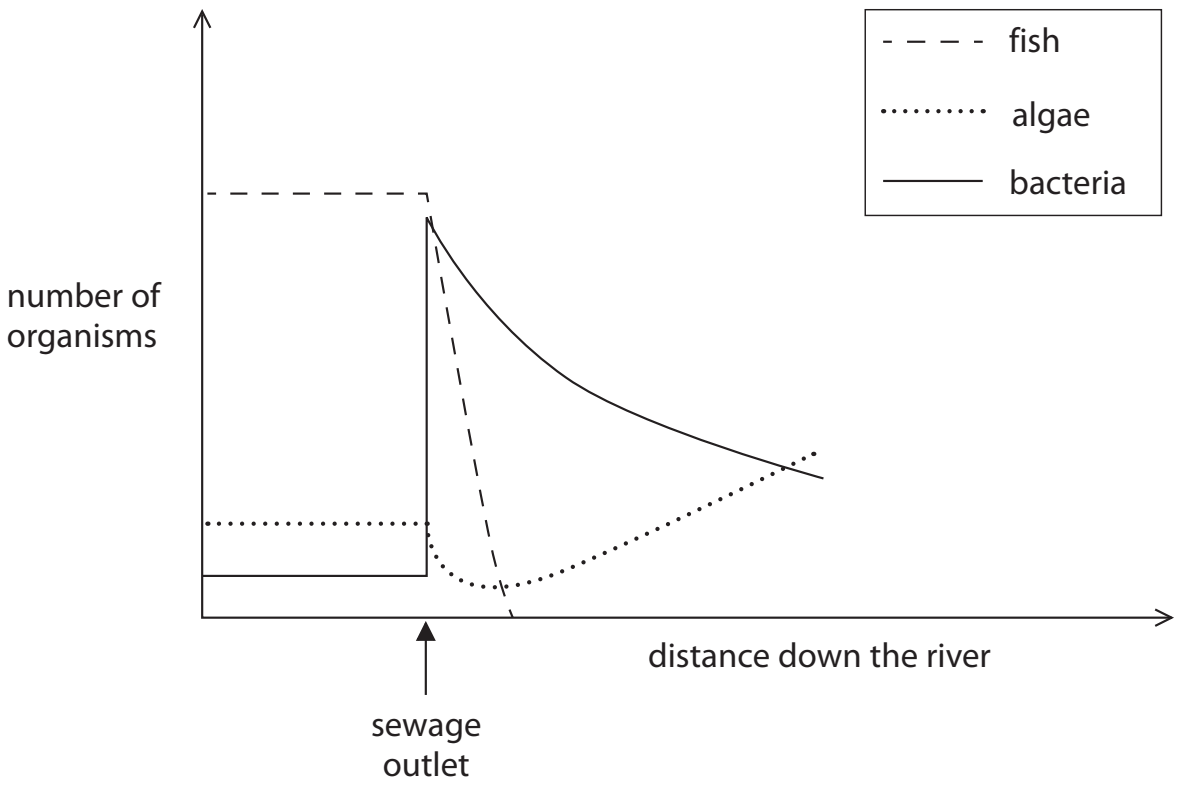
(Total for Question 2 = 8 marks)

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3 Untreated sewage entering a river affects the numbers of organisms living in the river.

The graph shows the changes in the numbers of fish, algae and bacteria in a river before the sewage outlet and after the sewage outlet.

Algae are protoctists that can carry out photosynthesis.



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Explain the changes in the numbers of fish and algae from the point at which sewage enters the river.

(6)

(Total for Question 3 = 6 marks)

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4 Translocation is the transport of the products of photosynthesis in a plant.

A scientist investigates the effect of sulfur dioxide gas, a common air pollutant, on the rate of translocation in young bean plants.

She uses this method.

- select young bean plants that each have one mature leaf and one young leaf that is still growing
- expose some of the plants to sulfur dioxide gas, a common air pollutant
- measure the rate of translocation in the plants exposed to sulfur dioxide gas
- measure the rate of translocation in the plants not exposed to sulfur dioxide gas

(a) (i) Identify the independent variable in this investigation.

(1)

.....

(ii) Identify the dependent variable in this investigation.

(1)

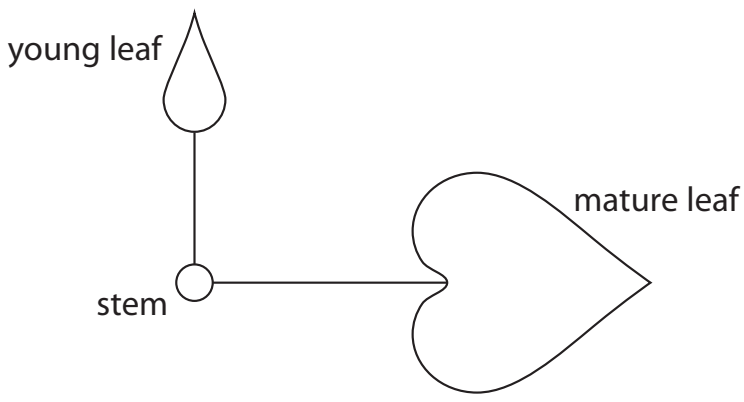
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(iii) Suggest a control variable for this investigation.

(1)

.....

(b) The diagram shows one of the young bean plants viewed from above.



(i) Draw an arrow on the diagram to show the main direction of translocation.

(1)

(ii) Name the tissue that is the main site of translocation.

(1)

.....

(iii) Name one substance that is moved by translocation.

(1)

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(c) The scientist compares the results for the two groups of plants.

She realises that sulfur dioxide might directly affect the rate of translocation or affect the rate of photosynthesis.

Explain why changing the rate of photosynthesis would change the rate of translocation.

(3)

(d) Explain how sulfur dioxide pollution can affect ecosystems.

(4)

(Total for Question 4 = 13 marks)

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5 Yoghurt is a healthy food that is high in protein, calcium and vitamins.

(a) (i) Describe the process of making yoghurt from milk.

(4)

(ii) Give a benefit of having calcium in the diet.

(1)

(iii) Fat-free yoghurt, which has had the fat removed from the milk, is also available.

Give a benefit of eating fat-free yoghurt rather than full-fat yoghurt.

(1)

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(b) Some people are lactose-intolerant.

Eating foods that contain lactose, such as milk, can make them ill.

Explain why people who are lactose-intolerant are able to eat yoghurt without becoming ill.

(2)

(c) Suggest the health benefits of adding fruit to sweeten yoghurt.

(2)

(Total for Question 5 = 10 marks)

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6 Modern genetics enables scientists to produce organisms with new phenotypes.

(a) (i) What is meant by the term **genetically modified transgenic organism**?

(1)

(ii) Explain the benefits of cloning transgenic organisms.

(2)

(b) Scientists have discovered a great deal of information about genetics from studying the growth of simple organisms such as bacteria.

Suggest two precautions that scientists should take to make sure that they can grow bacteria safely in a laboratory.

(2)

1 .....

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2 .....

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(Total for Question 6 = 5 marks)

TOTAL FOR PAPER = 60 MARKS

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