

Specimen Paper

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
TOTAL	



AQA Level 1/2 Certificate in Science: Double Award
Specimen Paper

Double Award

Biology Paper 2H

For this paper you must have:

- a ruler.

You may use a calculator.

Time allowed

- 60 minutes

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

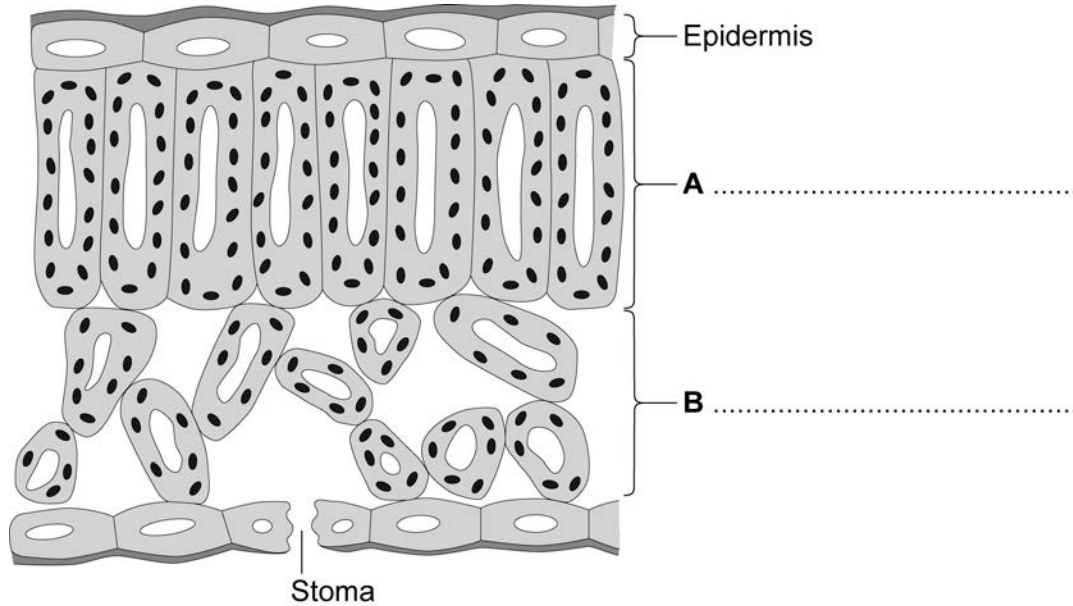
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 5(a) should be answered in continuous prose.
In this question you will be marked on your ability to:
 - use good English
 - organise information clearly
 - use specialist vocabulary where appropriate.

Advice

- In all calculations, show clearly how you work out your answer.

Answer **all** questions in the spaces provided.

- 1 (a) The diagram shows a section through a leaf.



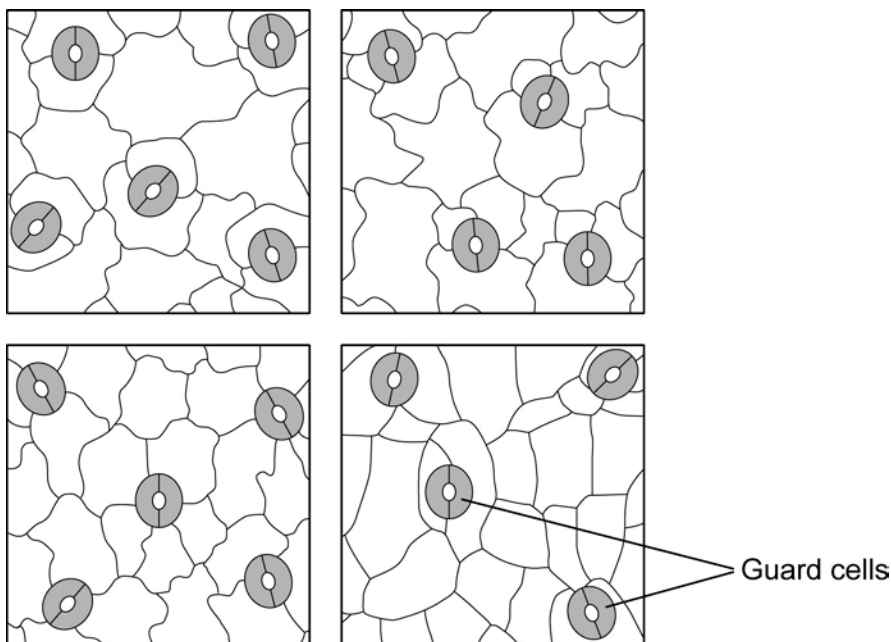
On the diagram, name the parts labelled **A** and **B**.

(2 marks)

- 1 (b) A student used a grid on a microscope to estimate the number of stomata in some leaf epidermis.

The drawings show four of the grid squares the student observed.

Each grid has an area of 0.01 mm^2 .



1 (b) (i) Calculate the mean number of stomata per grid square.

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Mean number of stomata per grid square
(2 marks)

1 (b) (ii) Calculate the mean number of stomata per 1 mm² of leaf epidermis.

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Mean number of stomata per 1 mm²
(2 marks)

1 (b) (iii) Each side of a grid square has a length of approximately 0.1 mm.

Use this information to estimate the length of a guard cell.

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Estimated length of guard cell mm
(2 marks)

Question 1 continues on the next page

Turn over ►

1 (c) A group of students looked at stomata on four different species of plant, **W**, **X**, **Y** and **Z**. The students estimated the number of stomata per mm² on the upper and lower surfaces of the leaves of the four species.

The results are shown in the table.

Plant species	Estimated number of stomata per mm ² of leaf surface	
	Upper surface of leaf	Lower surface of leaf
W	40	280
X	0	8
Y	85	150
Z	80	260

1 (c) (i) Which plant species, **W**, **X**, **Y** or **Z**, probably lives in a dry region?

Explain why you have chosen this species.

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(3 marks)

1 (c) (ii) All four species have more stomata on the lower surface of their leaves than on the upper surface.

Suggest how this feature could improve the chances of survival for the plants.

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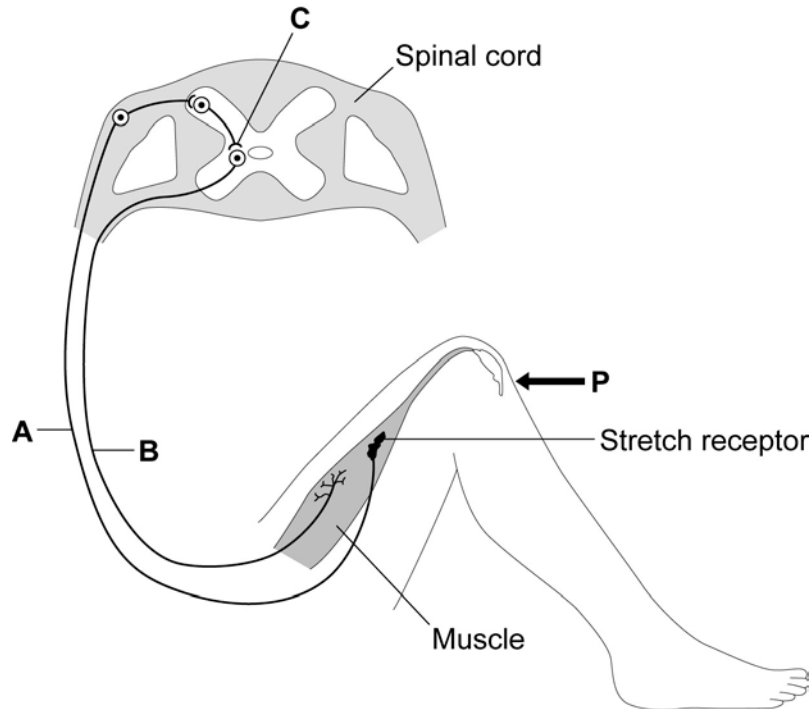
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(2 marks)

2 The diagram shows the nervous pathway that is used to coordinate the knee-jerk reflex. When the tendon below the knee is tapped with a hammer, the lower leg jerks upwards in a reflex action.



2 (a) On the diagram, draw arrows next to the neurones labelled **A** and **B** to show the direction in which an impulse moves in each neurone.

(1 mark)

2 (b) How is information passed across the synapse at **C**?

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(1 mark)

2 (c) On the diagram, label the effector with the letter **X**.

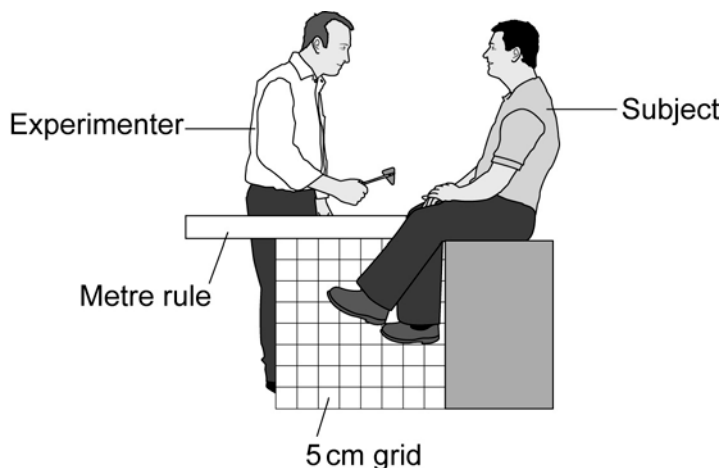
(1 mark)

Question 2 continues on the next page

Turn over ►

- 2 (d)** A group of students wanted to find out how the speed of the hammer affected the distance the lower leg moved.

The diagram shows how the experiment was set up.



Each trial was recorded on a video. A frame was taken every 33 milliseconds. The video was then played using single-frame advance. The number of frames for the hammer to move to the knee was found. The faster the speed, the smaller was the number of frames. The video was also used to find the distance moved by the toe.

In each trial, the experimenter held the hammer 20 cm from the subject's knee and then hit the subject's tendon. For each trial the experimenter used the hammer at a different speed.

The table shows some of the results.

Trial number	1	2	3	4	5	6	7	8	9	10
Distance hammer moved to knee in cm	20	20	20	20	20	20	20	20	20	20
Number of frames it took the hammer to move to the knee	15	14	12	10	9	8	7	6	2	2
Distance moved by toe in cm	0	0	5	5	4	10	10	10	10	10

- 2 (d) (i)** What variable did the experimenter control in this experiment?

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(1 mark)

2 (d) (ii) Give **two** advantages of using a video to measure the time it took for the hammer to move to hit the tendon.

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(2 marks)

2 (d) (iii) One of the results seems to be anomalous.

Draw a ring around the anomalous result in the table.

Suggest **one** reason why the anomalous result may have happened.

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(2 marks)

2 (d) (iv) Give a conclusion from the results of the experiment.

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(2 marks)

10

Turn over for the next question

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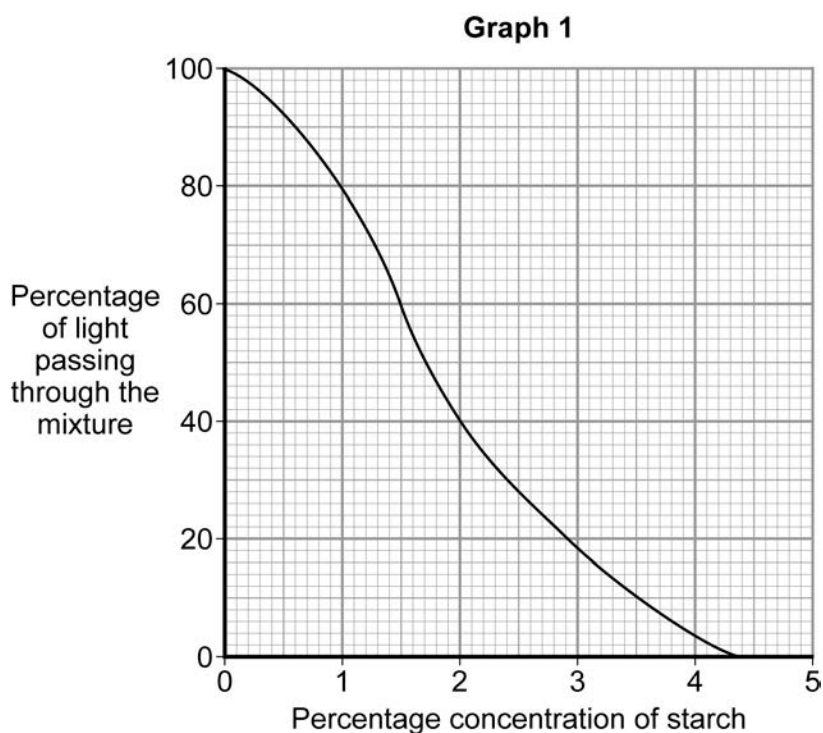
**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

- 3** A manufacturer of slimming foods is investigating the effectiveness of carbohydrases from different microorganisms.

Iodine solution is a pale golden brown, transparent solution. Starch reacts with iodine to form a dark blue mixture.

Known concentrations of starch are added to iodine solution. The mixture is placed in a colorimeter, which measures the percentage of light passing through the mixture.

Graph 1 shows the results.



- 3 (a) (i)** Explain why less light passes through the mixture when the starch is more concentrated.

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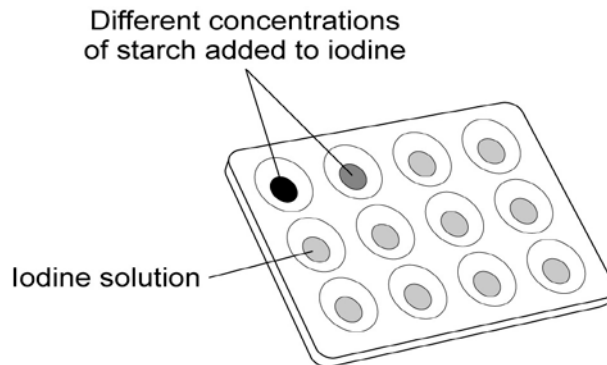
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(1 mark)

Question 3 continues on the next page

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- 3 (a) (ii)** The manufacturer could have used a white spotting tile, as shown below, instead of a colorimeter. Suggest **two** advantages of using a colorimeter in this investigation rather than a spotting tile.



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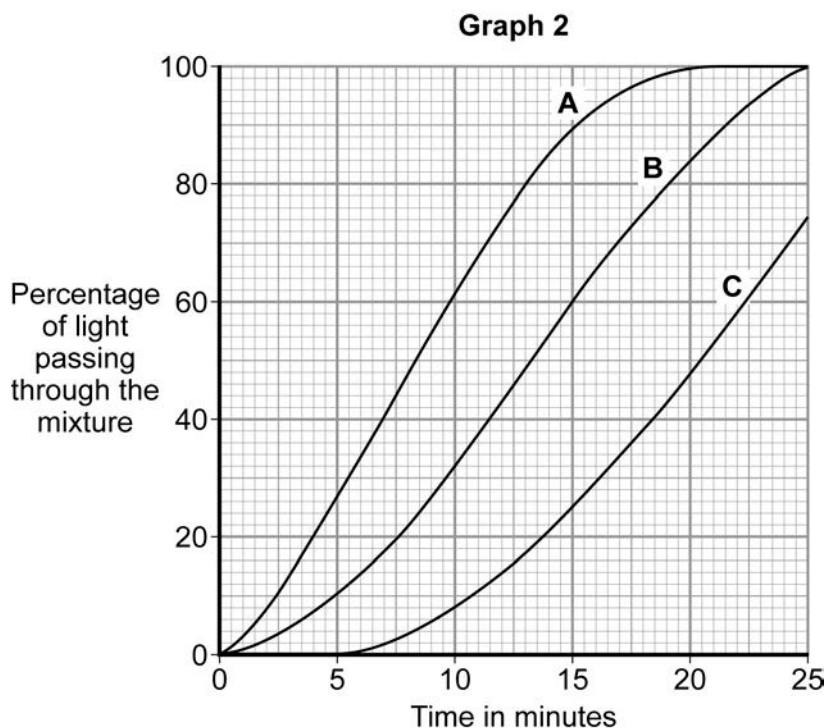
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(2 marks)

- 3 (b)** The manufacturer adds carbohydrase from each of three different microorganisms, **A**, **B** and **C**, to starch in flasks at 40 °C. Every minute a sample of the mixture is added to iodine solution and placed in the colorimeter. **Graph 2** shows these results.



3 (b) (i) When the concentration of starch reaches 2%, digestion is considered to be sufficient for the next stage in the manufacture of the slimming food.

Use information from graphs 1 and 2 to find how long this takes for the most effective carbohydrase.

.....
..... minutes
(2 marks)

3 (b) (ii) Suggest why the amount of light passing through the mixture containing carbohydrase A did not change after 20 minutes.

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(1 mark)

3 (c) Explain why the manufacturer carried out the investigation at 40 °C.

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(2 marks)

3 (d) Carbohydrases convert starch into glucose. To complete the manufacture of the slimming food the glucose should be converted into fructose.

Explain why fructose, rather than glucose, is used in slimming foods.

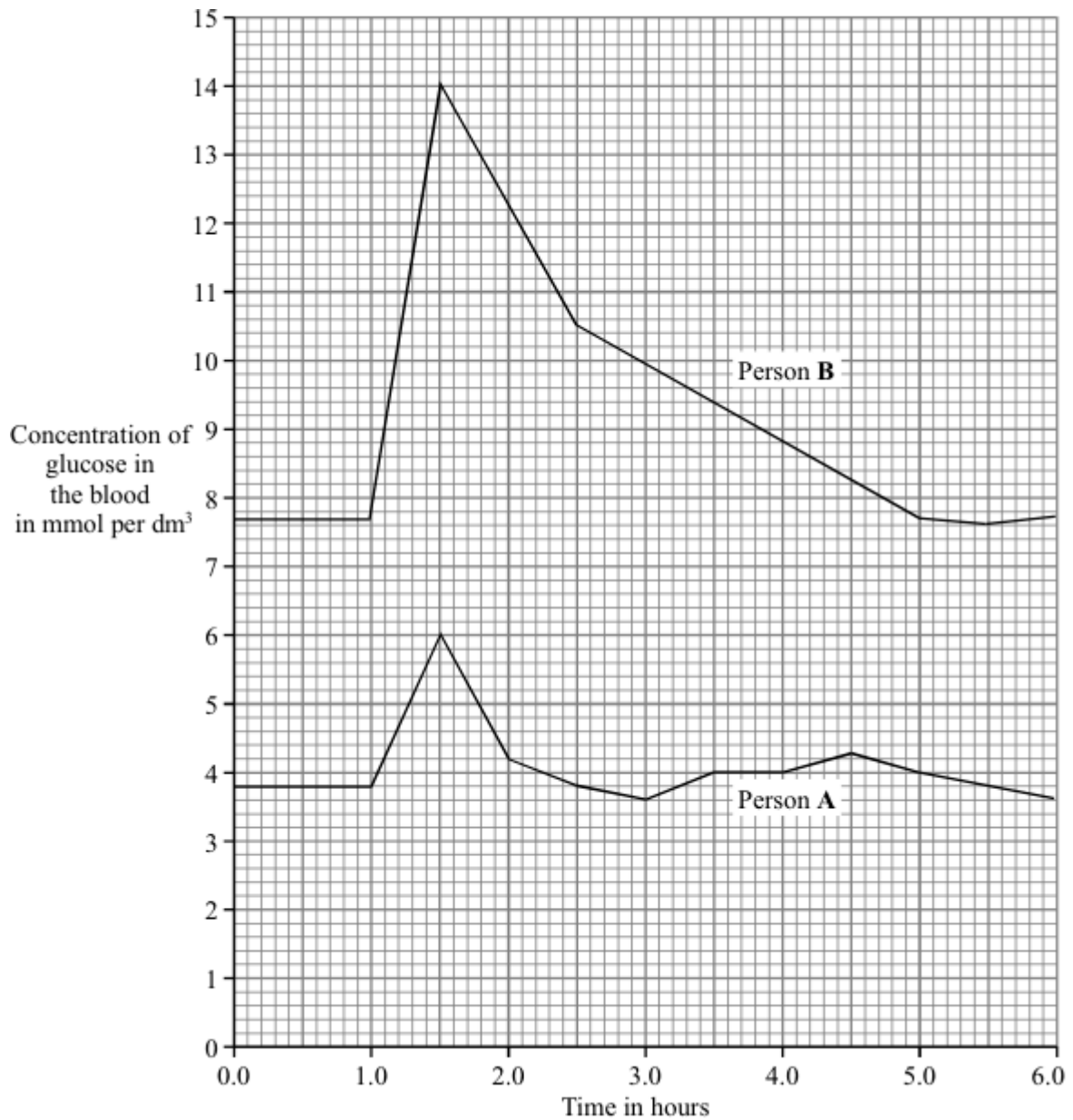
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(2 marks)

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- 4** The graph shows the concentration of glucose in the blood of two people. Person **A** is a non-diabetic. Person **B** has diabetes. Each person has 75 grams of glucose at 1.0 hours.



- 4 (a) (i)** What was the maximum concentration of glucose in the blood of Person **A**?
- mmol per dm³
(1 mark)
- 4 (a) (ii)** After eating the glucose, how long did it take for the concentration of glucose in the blood of Person **B** to return to the level before eating glucose?
- hours
(1 mark)

4 (b) A diabetic person does not produce enough insulin.

Write the letter **X** on the graph to show one time when the blood of Person **A** would contain large amounts of insulin.

(1 mark)

3

Turn over for the next question

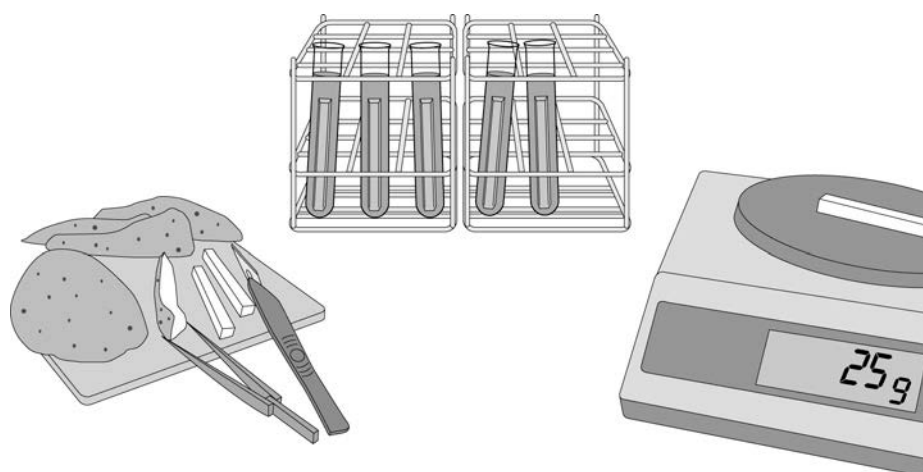
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5 In fish and chip shops, potatoes are cut into chips several hours before they are cooked.

The mass of water in the chips must be kept constant during this time.

To keep the water in the chips constant, the chips are kept in sodium chloride solution.

5 (a) The drawing shows some apparatus and materials.



In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

Describe how you would use the apparatus and materials shown in the drawing to find the concentration of sodium chloride in which to keep the chips so that the mass of water in the chips remains constant.

You should include:

- the measurements you would make
- how you would make the investigation a fair test.

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(6 marks)

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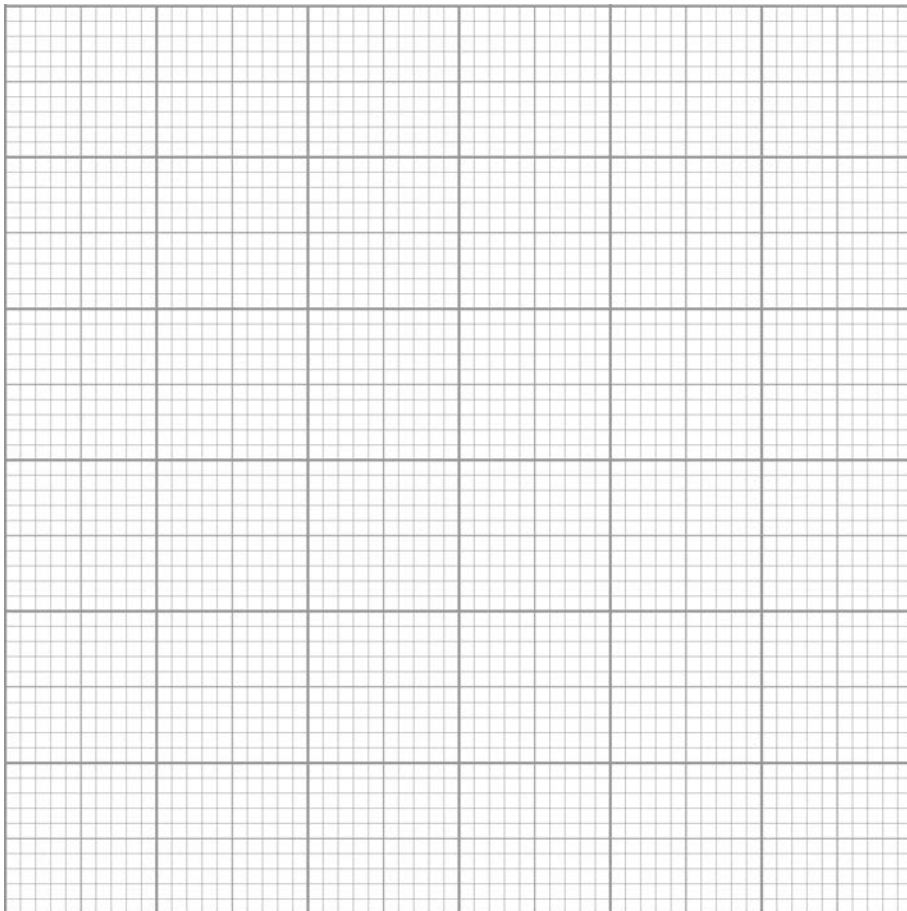
- 5 (b)** In a similar investigation a student investigated the effect of the concentration of sodium chloride solution on standard-sized cylinders cut from a potato.

The table shows the student's results.

		Concentration of sodium chloride solution in mol dm ⁻³					
		0	0.2	0.4	0.6	0.8	1.0
Change in length of cylinders in mm		+4.1	+1.5	-1.4	-3.6	-4.6	-5.2

- 5 (b) (i)** On the graph paper below draw a graph to display the student's results.

- Decide on suitable scales and labels for your axes.
- Plot the student's results.
- Draw a line of best fit.



(4 marks)

5 (b) (ii) In which concentration of sodium chloride solution would the chips **not** change mass?

Concentration mol dm⁻³
(1 mark)

5 (b) (iii) Explain the changes in length of potato cylinders that were placed in the 1 mol dm⁻³ sodium chloride solution.

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(3 marks)

14

Turn over for the next question

Turn over ►

6 Environmental change can be measured by using invertebrate animals or by using non-living indicators.

The photograph shows scientists collecting a sample of invertebrates from a stream.



This is the method that they use.

- A 1 m² area of the bed of the stream is marked out.
- A net 1 m wide is held by one person on the downstream side of the marked-out area.
- The other person uses their boots to gently move stones in this area of the stream bed. They do this for three minutes. This dislodges invertebrates, which are then caught in the net.
- The invertebrates are then identified and counted.

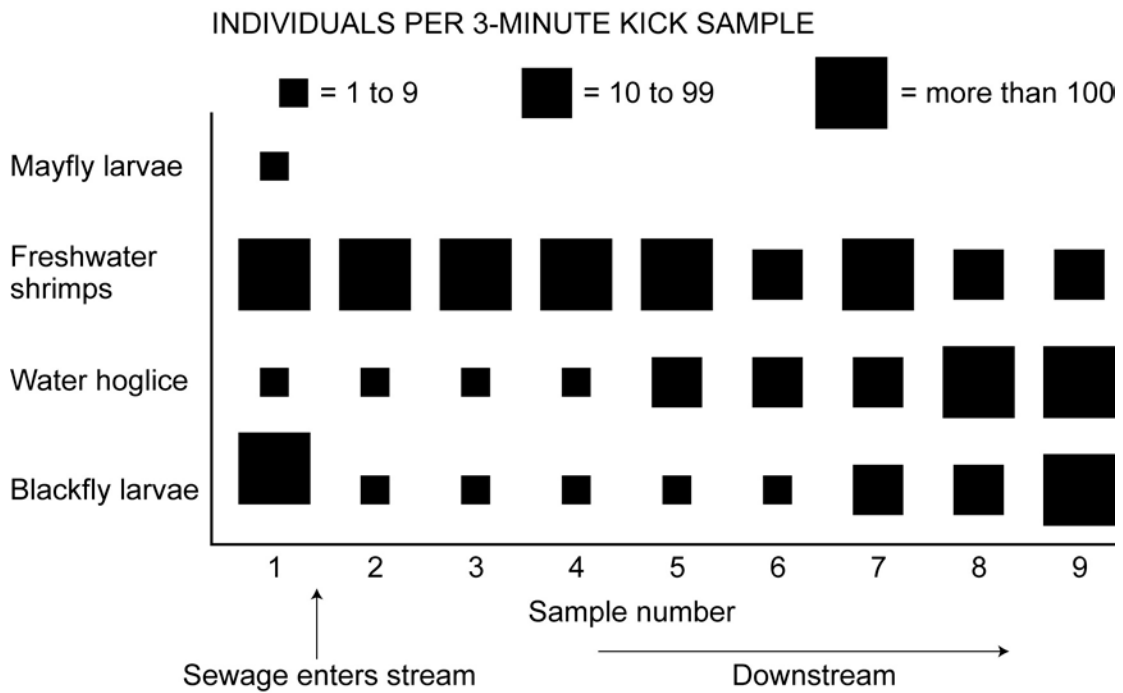
6 (a) Suggest **one** reason why the results from a sample might not be accurate.

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(1 mark)

- 6 (b)** The technique described opposite was used to investigate the effect of sewage on stream invertebrates. Nine samples were taken.
- Sample 1 was taken upstream of the point where the sewage entered the stream.
 - Samples 2–9 were taken at regular intervals downstream of the sewage inflow.

The chart shows the results.



Evaluate the use of the invertebrates shown in the chart as indicators of sewage pollution.

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(4 marks)

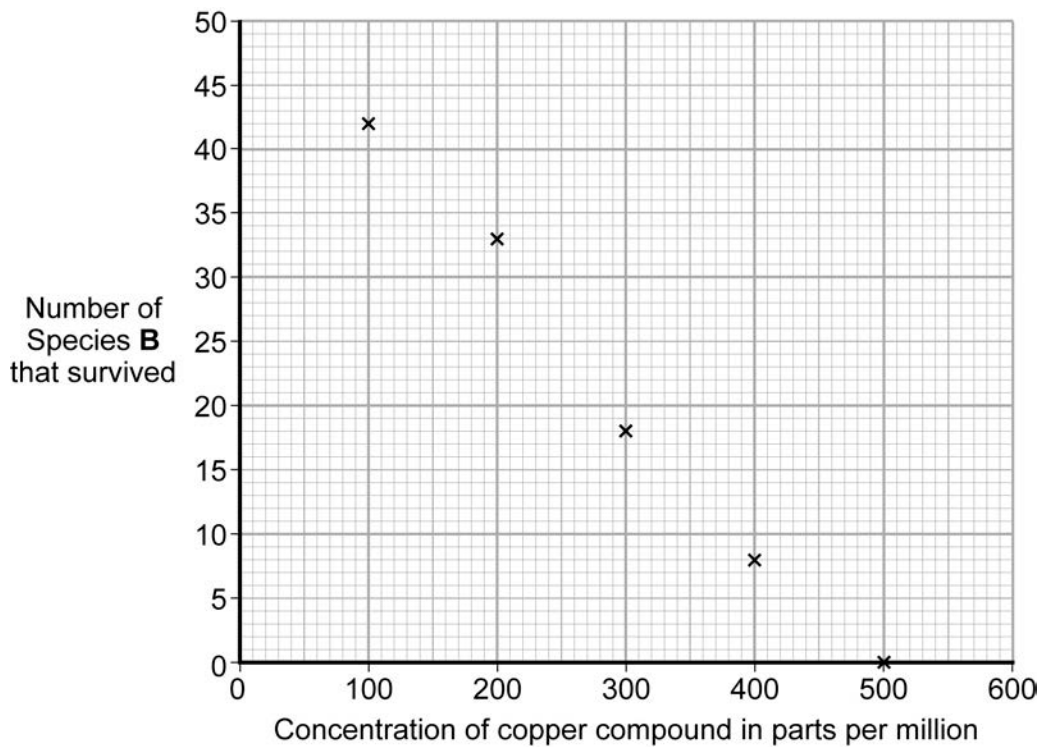
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- 6 (c)** Invertebrate animals are used to monitor the concentration of copper compounds in water. First, scientists must find out which invertebrate animals can survive in a range of concentrations of copper compounds.

This is how the procedure is carried out.

- Solutions of different concentrations of a copper compound are prepared.
- Batches of fifty of each of five different invertebrate species, **A**, **B**, **C**, **D** and **E**, are placed in separate containers of each solution.
- After a while, the number of each type of invertebrate that survive at each concentration is counted.

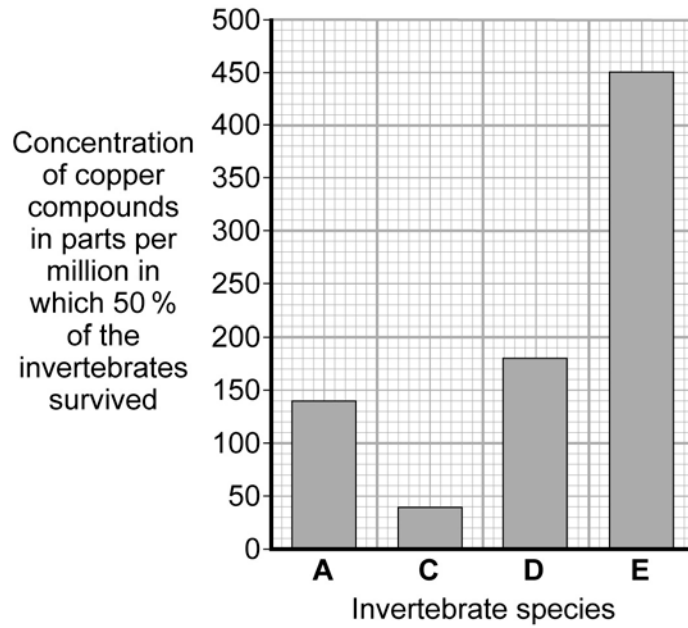
The graph below shows the results for species **B**.



Use the graph to find the concentration of copper compounds in which 50% of Species **B** survived.

Concentration parts per million
(1 mark)

6 (d) The graph below shows the results of the tests on the other four invertebrate species.



6 (d) (i) Which species, **A**, **C**, **D** or **E**, is most sensitive to the concentration of copper in the water?

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Give the reason for your answer.

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(1 mark)

Question 6 continues on the next page

Turn over ►

6 (d) (ii) Chemical tests can also be used to measure the effects of copper pollution.

Evaluate the use of invertebrates rather than chemical tests to measure copper pollution.

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(3 marks)

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END OF QUESTIONS

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