Specimen Paper

AQA

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

Double Award

Biology Paper 2F

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 6(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 photograph shows a student transferring bacteria to a culture medium.

List A gives four actions that are sometimes used when growing microorganisms.

List B gives five possible effects of these actions.

Draw a straight line from each action in **List A** to its effect in **List B**.

| List A Actions	List B Effects
	Increases the risk of contamination with bacteria
Heating loop in flame	Decreases the risk of bacteria entering
Placing loop on bench to cool	Kills bacteria
Only lifting lid of Petri dish a little	Prevents air entering
Placing Petri dish in incubator at 25°C rather than 35°C	Decreases the risk of growth of pathogens

(4 marks)

1 (b) UHT milk is milk that has been heated to 135 °C, then cooled.

In an investigation, three sterile Petri dishes containing sterile agar jelly were set up as follows.
- UHT milk was added to dish **1**.
- Untreated milk was added to dish **2**.
- Dish **3** was left unopened as a control.
- The dishes were kept at 25 °C for two days.

The results are shown in the diagram below.
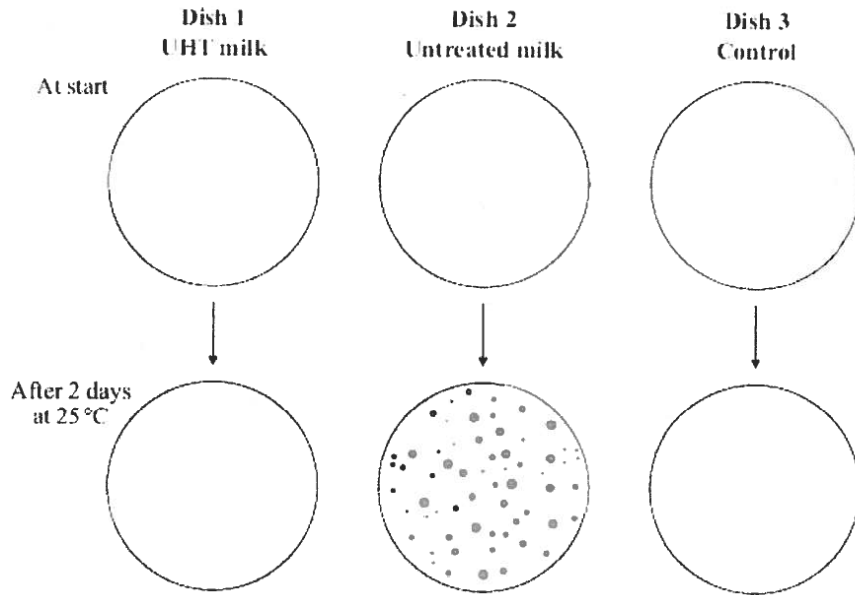
1 (b) (i) Describe the difference in appearance between dishes **1** and **2** after two days.

....

....

(1 mark)

1 (b) (ii) Give **one** reason for this difference.

....

....

(1 mark)

1 (b) (iii) There was no change in the appearance of dish **3** after two days.

Give **one** reason why.

....

....

(1 mark)

Question 1 continues on the next page

Turn over ▶

1 (c) The table gives information about the growth of different types of organism.
The figures were obtained during the period of fastest growth for each organism.

Organism	Time taken to double in mass
Bacteria	40 minutes
Yeasts	2 hours
Fusarium	4 hours
Algae	5 hours
Soybeans	1 week
Cattle	8 weeks

1 (c) (i) Which type of organism grows the fastest?

....

(1 mark)

1 (c) (ii) *Fusarium* grows at its fastest rate in a fermenter.
Some scientists put **one tonne** of *Fusarium* into a fermenter.

Use data from the table to calculate how much *Fusarium* there would be in the fermenter after 8 hours.

....

.... tonnes

(1 mark)

1 (d) *Fusarium* is an organism used to make mycoprotein.
Vegetarians use mycoprotein as a meat-free source of protein.

Read the information about substances found in mycoprotein.

- Protein – can be used for making cells, enzymes and antibodies.
- Fats – are rich in energy but large amounts in the diet can cause circulatory problems.
- Dietary fibre – helps to reduce the risk of colon cancer.

The table compares the composition of mycoprotein and beef.

Substance	Percentage of dry mass	
	Mycoprotein	**Beef**
Protein	47.2	68.3
Fat	13.5	30.1
Dietary fibre	19.2	0.0

Use the information above to answer the questions.

Give **two** reasons why it would be better to eat mycoprotein instead of beef.

....

....

....

....

(2 marks)

11

Turn over ▶

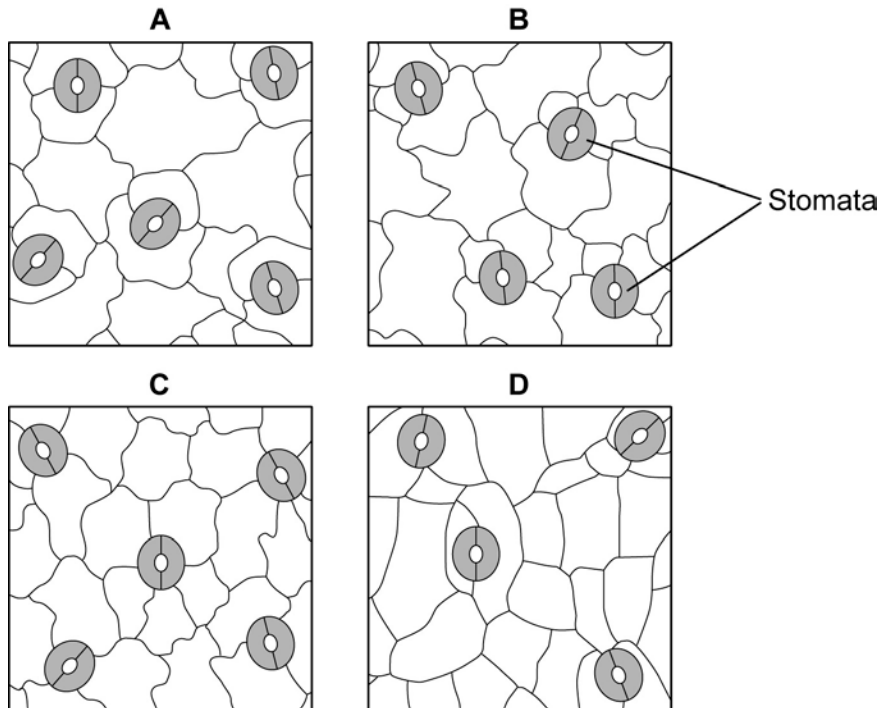**2 (a)** A student used a grid on a microscope to estimate the number of stomata in some leaf epidermis.

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

2 (a) (i) Count the number of stomata in each of the grid squares, **A**, **B**, **C** and **D**.

Draw a suitable table and complete the table with your results.

(2 marks)

2 (a) (ii) Calculate the mean number of stomata per grid square.

....

Mean number of stomata per grid square ....
(1 mark)

2 (a) (iii) Each grid square has an area of 1/100 mm^2.

Use your answer to part **(a)(ii)** to calculate the mean number of stomata per 1 mm^2 of leaf epidermis.

....

Mean number of stomata per 1 mm^2 ....
(2 marks)

2 (b) 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 mm^2 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

Which plant species, **W**, **X**, **Y** or **Z**, would lose least water via stomata?

Complete the sentence below.

This species is adapted for survival in .... conditions.
(2 marks)

7

Turn over for the next question

Turn over ▶

3 A class of students was set the task of estimating the number of dandelions on the school field.

To do this, they decided to use sampling squares called quadrats.

Each quadrat had an area of $1\,m^2$.

The diagram shows the dimensions of the school field.

90 m

60 m | Area of field 60 × 90 = 5400 m²
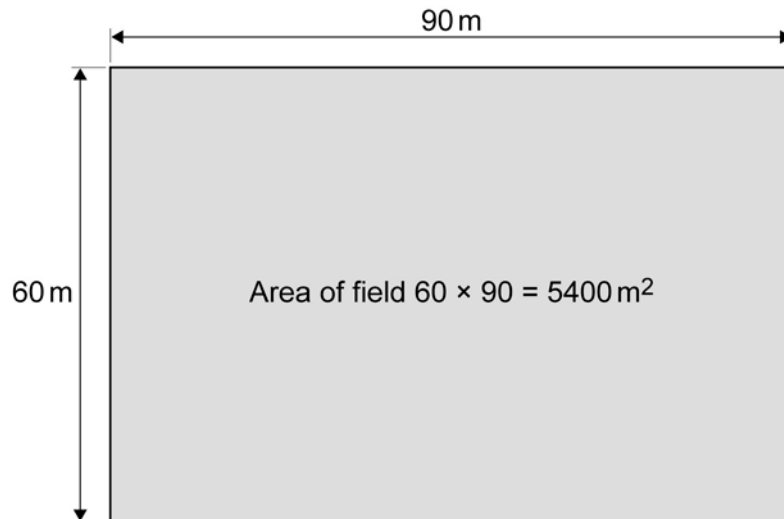
3 (a) Which is the best way of using quadrats in this investigation?

Tick (✓) **one** box.

Statement	Tick (✓)
Place all the quadrats where there are lots of plants.	
Place all the quadrats randomly in the field.	
Place all the quadrats where only dandelions are growing.	

(1 mark)

3 (b) Each student collected data by using 10 quadrats.

These are the results for one student, Mary.

Quadrat number	Number of dandelions
1	3
2	3
3	6
4	2
5	1
6	2
7	0
8	3
9	2
10	0

Calculate the mean number of dandelions per quadrat counted by Mary.
Show clearly how you work out your answer.

....

....

Mean number of dandelions............................

(2 marks)

3 (c) Another student calculated a mean of 2.8 dandelions per quadrat from her results.

Estimate the number of dandelions in the whole field by using:

- a mean of 2.8 dandelions per quadrat

- information from the diagram on the opposite page

- the equation below.

Show clearly how you work out your answer.

estimated number of dandelions on field $=$ mean number of dandelions per quadrat $\times$ number of quadrats that would fit into the field

....

....

Estimated number of dandelions on field ....

(2 marks)

5

Turn over ▶

4 The diagram shows how cells from human embryos can be used to grow 'replacement body parts' for humans.
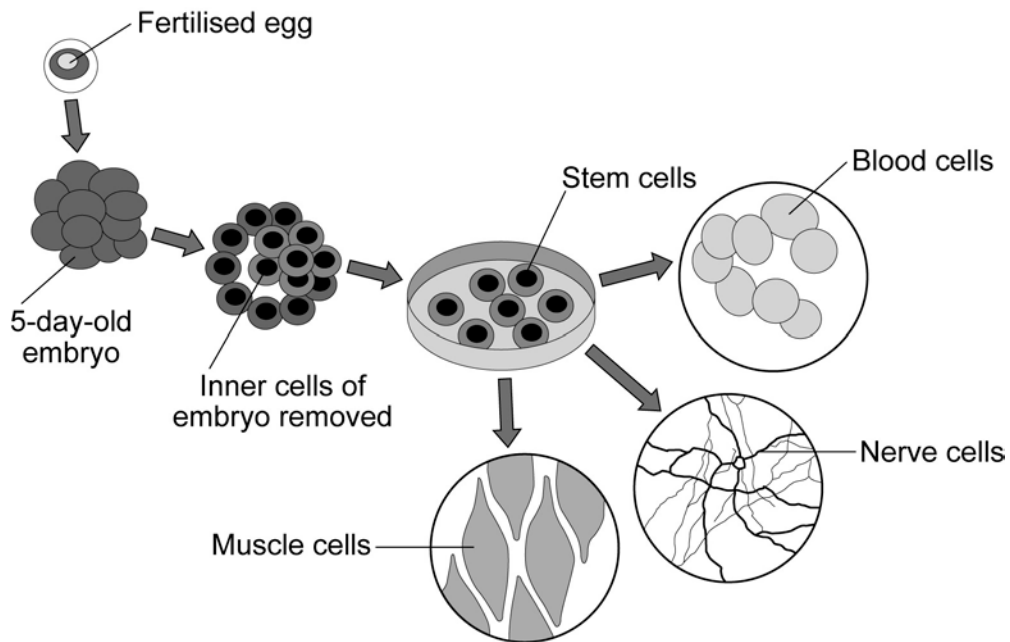
4 (a) Complete the following sentences.

4 (a) (i) The fertilised egg has .... sets of genetic information.

(1 mark)

4 (a) (ii) The fertilised egg divides to form the 5-day-old embryo by a process

called ....

(1 mark)

4 (b)   Some statements about stem cells are given below.

Tick (✓) **two** advantages and **two** disadvantages of using stem cells to grow 'replacement body parts' for humans.

	Advantage Tick (✓)	Disadvantage Tick (✓)
Stem cells can grow into many different kinds of body cells.		
Stem cells may grow out of control.		
Large numbers of stem cells can be grown in the laboratory.		
Stem cells may be used to treat some human diseases.		
Collecting and growing stem cells is expensive.		
Patients treated with stem cells may need to take drugs for the rest of their life to prevent rejection.		

(4 marks)

6
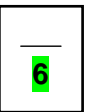
Turn over for the next question

Turn over ▶

5 The bar chart shows the amount of water lost from the body of a student on two different days.

The student ate the same amount of food and drank the same amount of liquid on the two days.

The temperature of the surroundings was similar on the two days.
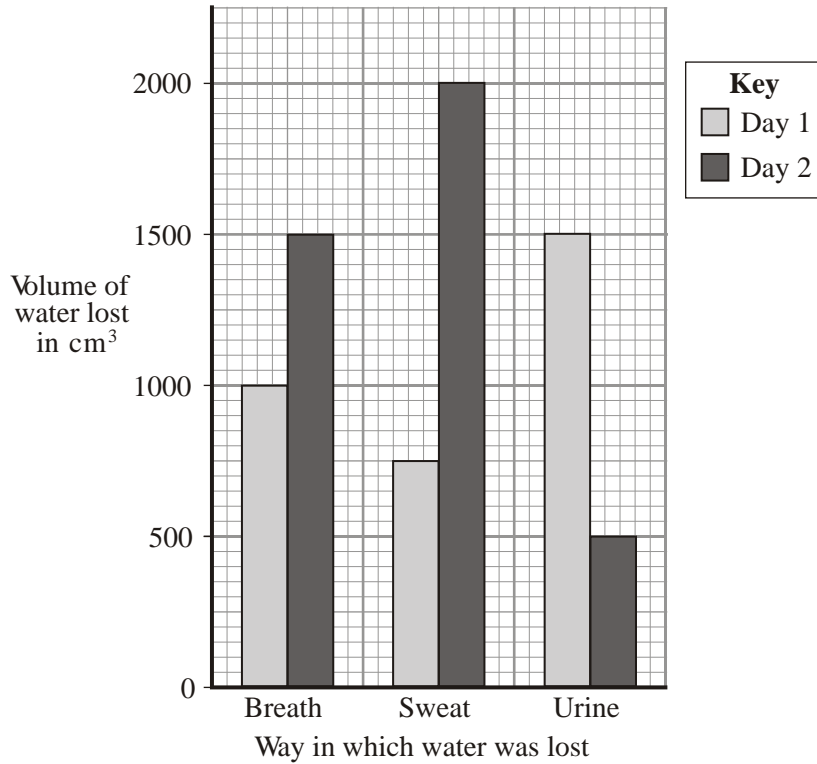
5 (a) The total volume of water lost on day 1 was 3250 cm^3.

How much water was lost on day 2?

Show clearly how you work out your answer.

....

.... cm^3
(2 marks)

5 (b) The student did much more exercise on one of the days than on the other.

On which day did he do more exercise? Day ....

Give **two** reasons for your answer.

....

....

....

....

(2 marks)

5 (c) How does sweating help the body?

....

....

(1 mark)

5
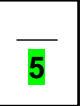
Turn over for the next question

6 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.

6 (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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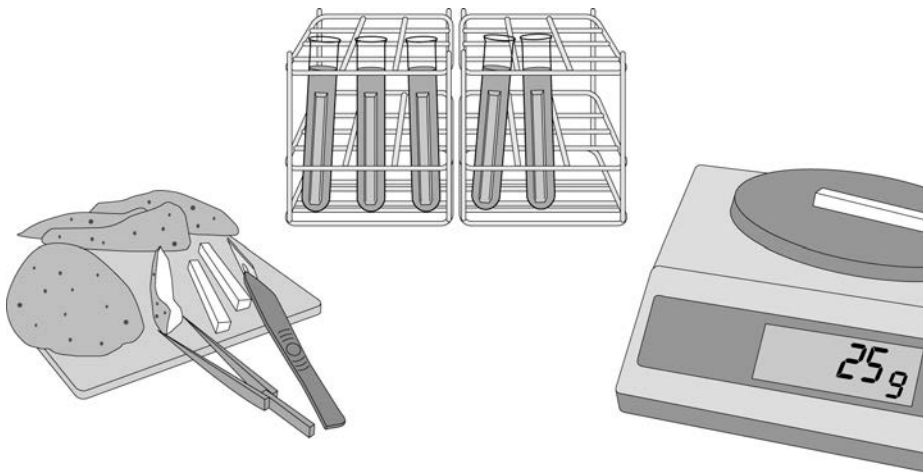
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(6 marks)

Question 6 continues on the next page

Turn over ▶

6 (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

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

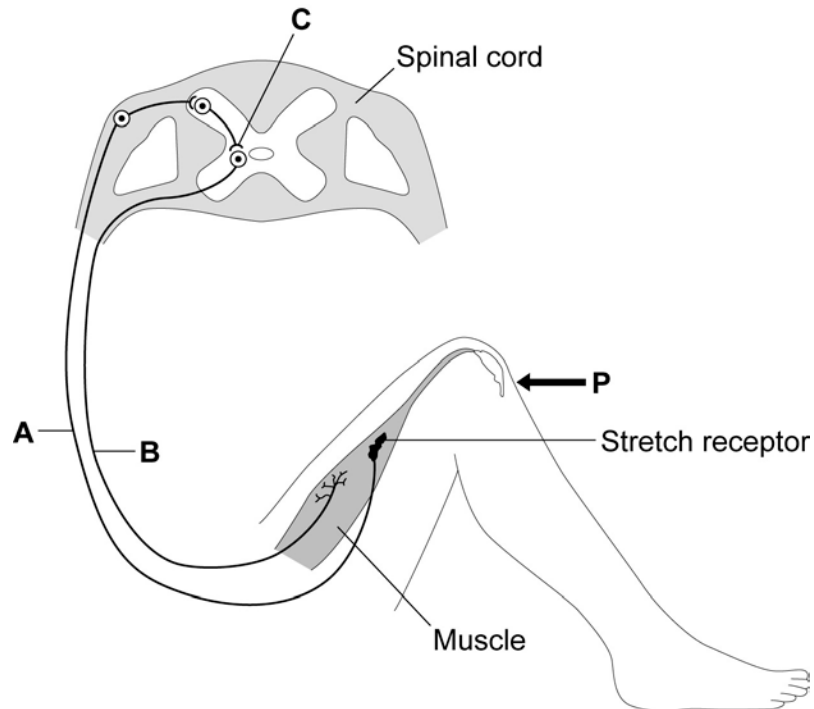- Plot the student's results.

- Draw a line of best fit.
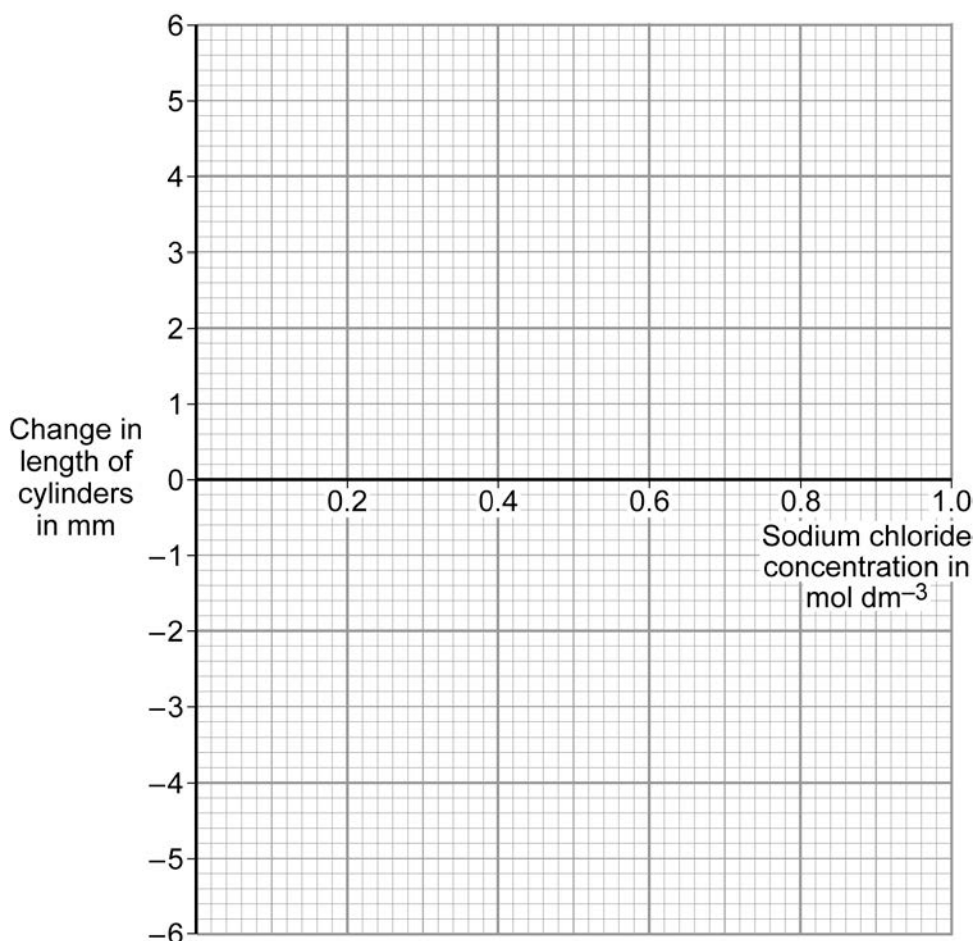
(3 marks)

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

Concentration .... mol dm^{-3}

(1 mark)

10

7 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.

7 (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)

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

....

(1 mark)

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

(1 mark)

Question 7 continues on the next page

Turn over ▶

7 (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.
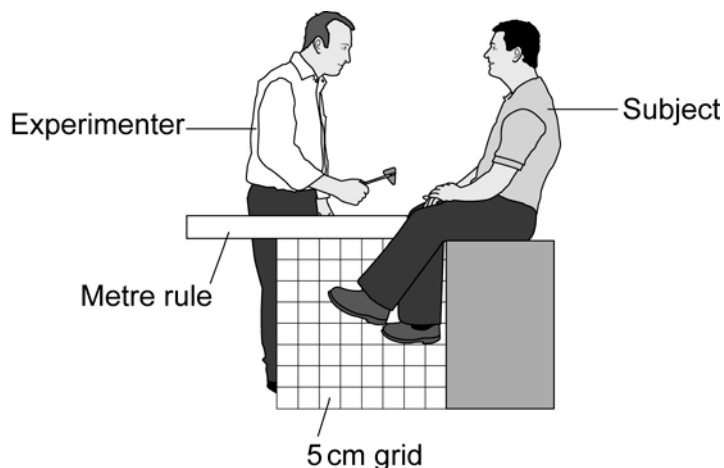
Each trial was recorded on a video. A frame was taken every 33 milliseconds. The video was then played using single-frame advance. The number of frames for the hammer to move to the knee was found. The faster the speed, the smaller was the number of frames. The video was also used to find the distance 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

7 (d) (i) What variable did the experimenter control in this experiment?

....
(1 mark)

7 (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)

7 (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.

....

....

(2 marks)

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

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(2 marks)

7 (d) (v) Suggest **one** way in which the precision of the experiment could have been improved.

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....
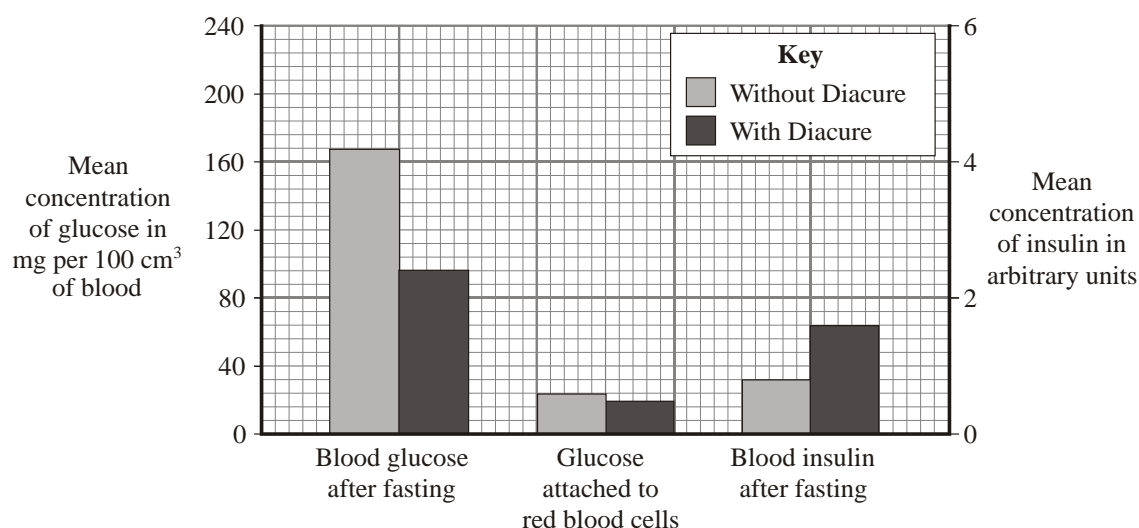
(1 mark)

11

8 A person with diabetes can be monitored in three ways:

- measuring the blood glucose concentration after fasting (going without food for 12 hours)
- measuring the amount of glucose attached to red blood cells: this is a measure of the average blood glucose concentration over the previous three months
- measuring the concentration of insulin in the blood after fasting.

The manufacturer of a new treatment for diabetes, called Diacure, publishes the following two claims.

> **1. 98.6 % of all people who used Diacure reported an improvement in their condition.**
>
> **2. An independent study of 30 diabetic patients showed a significant reduction in blood glucose concentrations and a significant increase in insulin production, as shown by the graph.**

Mean concentration of glucose in mg per 100 cm^3 of blood

Mean concentration of insulin in arbitrary units

Key
Without Diacure
With Diacure

Blood glucose after fasting

Glucose attached to red blood cells

Blood insulin after fasting

8 (a) Which of the manufacturer's claims is **not** based on scientific evidence?
Give the reason for your answer.

....

....
(1 mark)

8 (b) Why might the data in this study be unreliable?

....

....
(1 mark)

8 (c) The manufacturer did **not** draw attention to the data for the amount of glucose attached to red blood cells.

Suggest an explanation for this.

....

....

....

....

(2 marks)

8 (d) The study of diabetic patients was carried out by an independent company.
Why is it important that the study should be independent?

....

....

(1 mark)

5

END OF QUESTIONS

There are no questions printed on this page

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ANSWER IN THE SPACES PROVIDED**