Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

GCSE
COMBINED SCIENCE: TRILOGY

H

Higher Tier

Biology Paper 1H

Specimen 2018 (set 2)

Time allowed: 1 hour 15 minutes

Materials

For this paper you must have:
- a ruler
- a scientific calculator.

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

Information
- The maximum mark for this paper is 70.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

0 1 Plants make glucose by photosynthesis.

0 1 . 1 Complete the word equation for photosynthesis.

[1 mark]

_____ + _____ → glucose + _____

0 1 . 2 What is the name of the chemical that makes a leaf look green?

[1 mark]

Tick **one** box.

Cellulose ☐

Chlorophyll ☐

Chloroplast ☐

Chromosome ☐

0 1 . 3 A test for starch is used to show that a plant has photosynthesised.

How does the presence of starch show that photosynthesis has taken place?

[1 mark]

_____

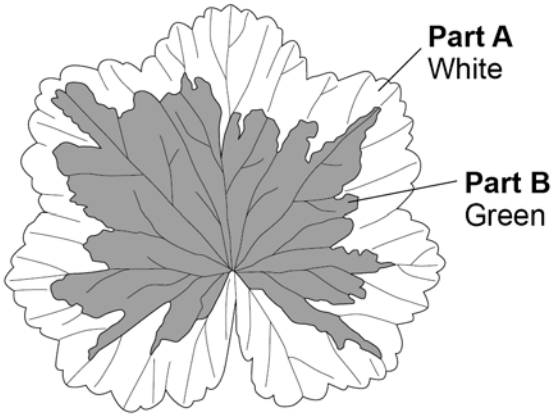
_____

Question 1 continues on the next page

A student investigated where starch was made in a leaf.

She used a leaf that was part green and part white as shown in **Figure 1**.

Figure 1



This is the method used.

1. Put the leaf in boiling water for 1 minute.
   Reason: stops all chemical reactions in the leaf.

2. Transfer the leaf to boiling ethanol for 5 minutes.
   Reason: removes the green colour.

3. Dip the leaf in hot water.
   Reason: softens the leaf.

4. Spread the leaf on a white tile and test with iodine solution.
   Reason: stains any starch.

0 1 . 4 If the chemical reactions in the leaf were not stopped, the amount of starch in the leaf could decrease.

Give the reason why.

[1 mark]

0 1 . 5 Suggest why it is important to remove the green colour from the leaf before adding iodine solution.

[1 mark]

0 1 . 6 Ethanol is flammable.

The student wore safety goggles when testing the leaf for starch.

Give **one** other safety precaution the student should have taken.

[1 mark]

0 1 . 7 Look at the leaf in **Figure 1**.

What colour would part **A** and part **B** stain with iodine solution after the starch test?

[2 marks]

A _____

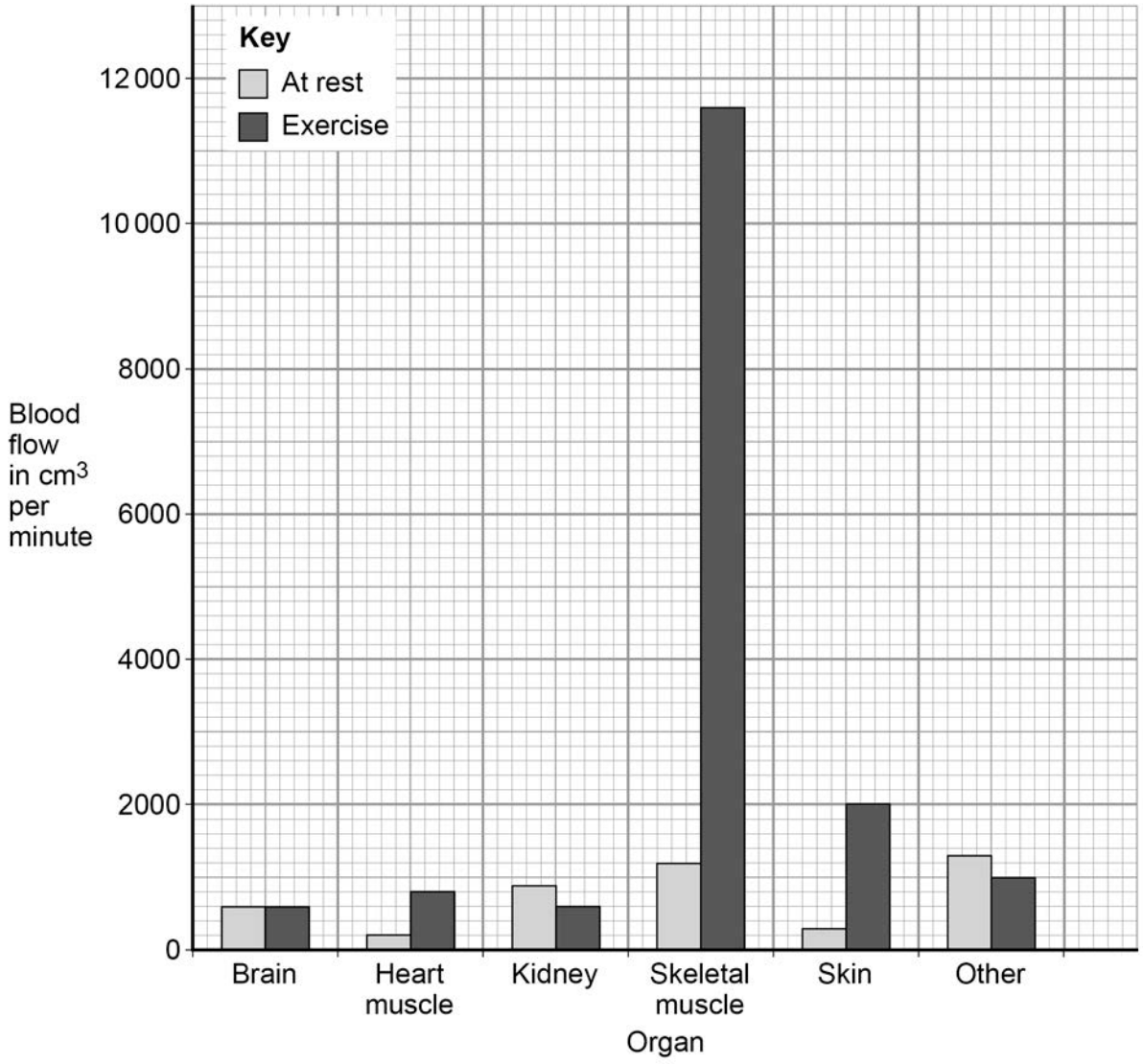
B _____

Turn over for the next question

8

0 2 **Figure 2** shows the rate of blood flow through different organs at rest and during exercise.

Figure 2



0 2 . 1 Determine the total volume of blood that flows through the brain in 1 hour.

[1 mark]

Volume = _____ cm^3

0 2 . 2 Look at the blood flow through the skeletal muscle.

Calculate how many times the blood flow increases by during exercise compared to at rest.

[2 marks]

Answer = _____

0 2 . 3 Explain why the blood flow to the skeletal muscles increases during exercise.

[3 marks]

Question 2 continues on the next page

0 2 . 4 Arteries and veins have different structures and different functions.

Explain how the different structure of arteries and veins relates to their different functions.

[6 marks]

12

0 3 Proteins are broken down by protease enzymes.

0 3 . 1 Which organs in the digestive system produce protease enzymes?

[1 mark]

Tick **one** box.

- Mouth and liver ☐
- Mouth and stomach ☐
- Pancreas and liver ☐
- Stomach and pancreas ☐

Question 3 continues on the next page

A student used a colorimeter to investigate the rate of protein digestion of an insoluble protein.

A colorimeter measures the percentage of light that passes through a liquid.

The student measured the percentage of light passing through different concentrations of protein suspension.

The student used the results to produce a concentration curve.

Table 1 shows the results.

Table 1

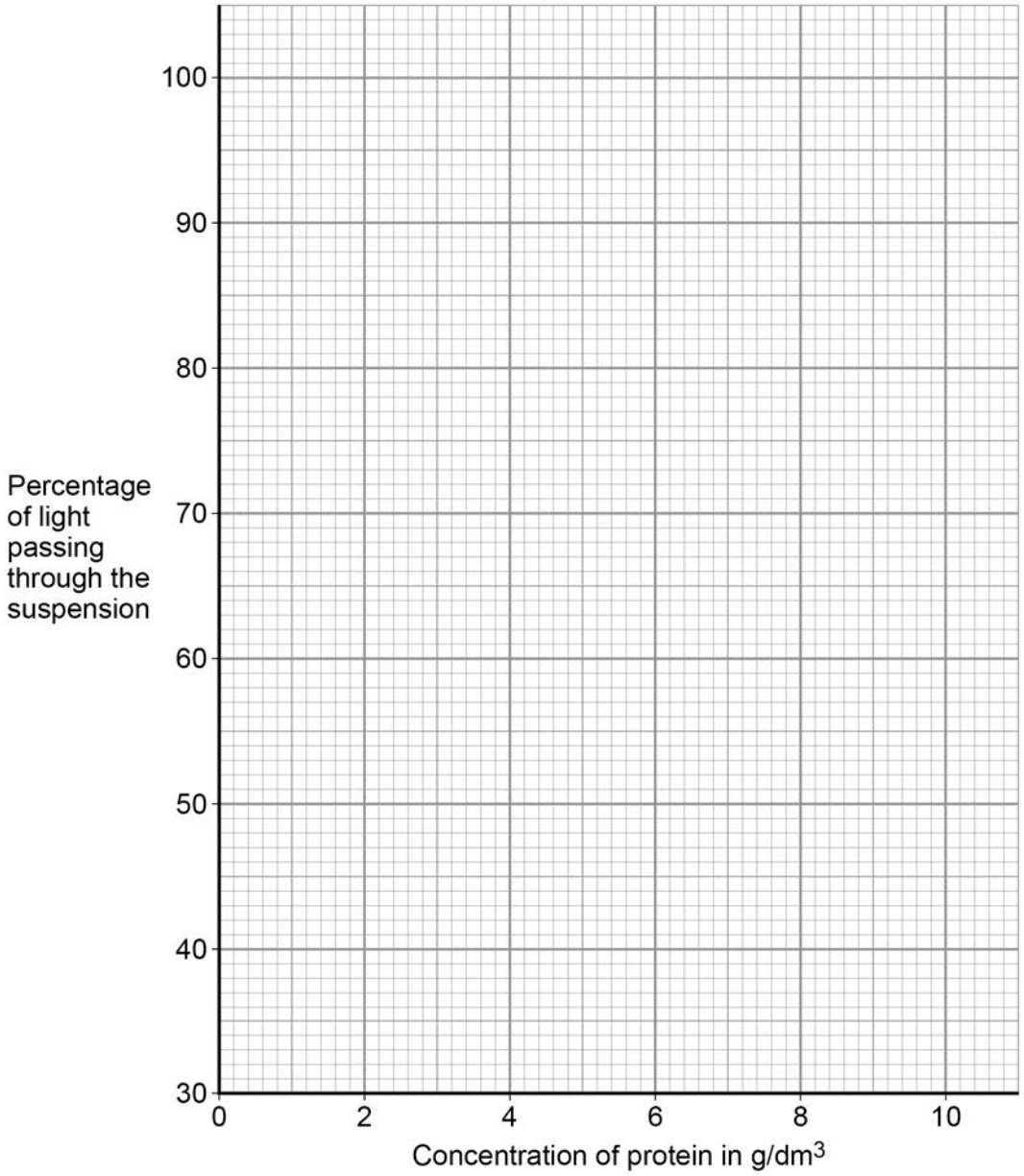
Concentration of protein in g/dm^3	**Percentage of light passing through the suspension**
0.0	100
0.5	93
2.0	75
10.0	38

0 3 . 2 Plot the data from **Table 1** on **Figure 3**.

Draw a line of best fit.

[3 marks]

Figure 3



0 3 . 3 Explain the change in the percentage of light passing through the suspension.

[2 marks]

Question 3 continues on the next page

0 3 . 4 Suggest how the student could improve their investigation to draw a more accurate concentration curve.

[1 mark]

The student then investigated the rate of protein digestion with protease obtained from two different organs.

This is the method used.

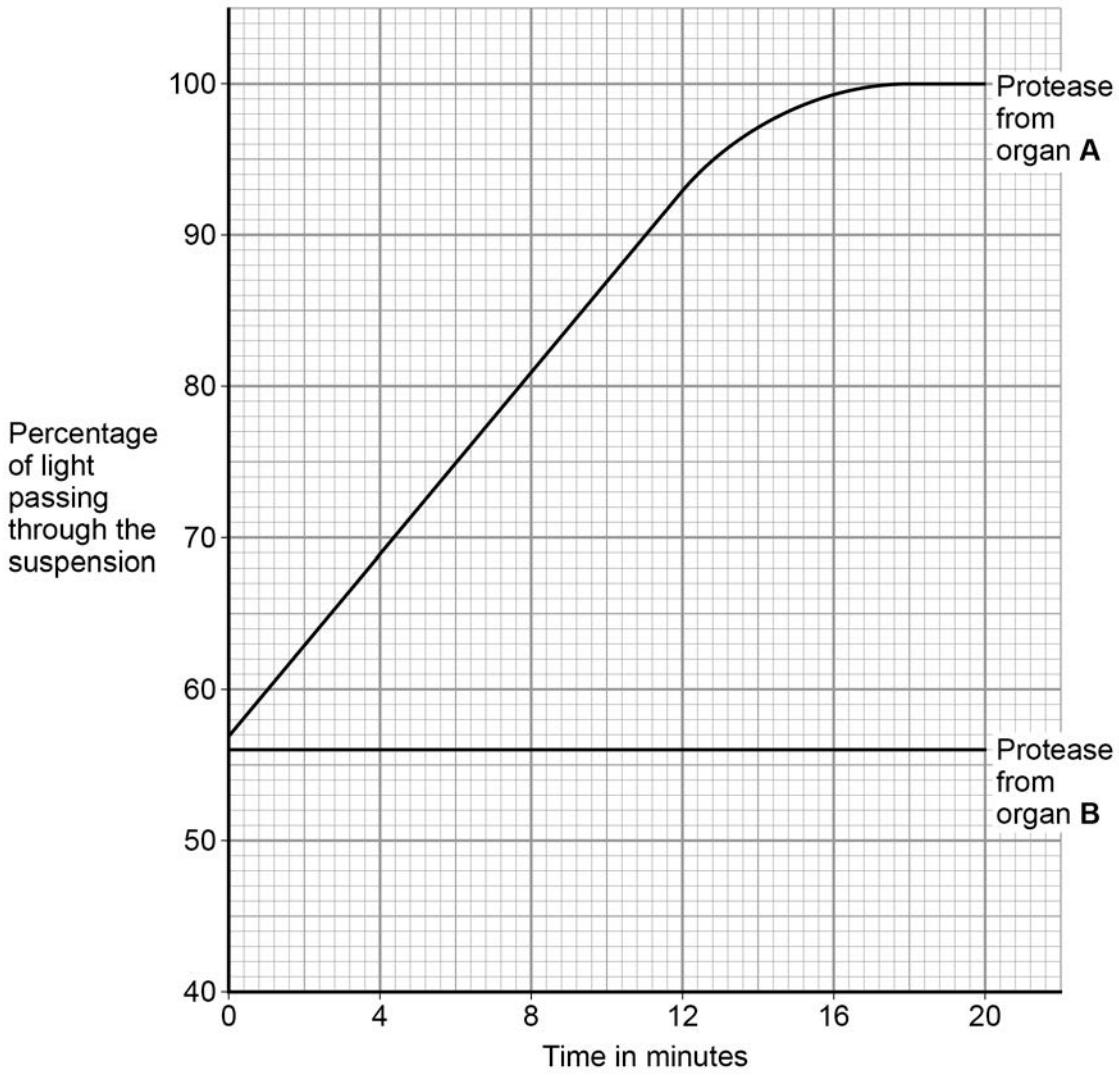
1. Put 5 cm^3 of protease from each organ into separate test tubes.
2. Put 10 cm^3 of protein suspension into two other test tubes.
3. Put all four tubes into a water bath at 37 °C for 10 minutes.
4. Mix each 5 cm^3 of protease into a tube of protein suspension.
5. Take a sample of each mixture every 2 minutes.
6. Measure the percentage of light passing through each sample using a colorimeter.

0 3 . 5 Suggest why the protease and the protein suspension were put into a water bath before being mixed.

[1 mark]

Figure 4 shows the student's results.

Figure 4



0 3 . 6 Determine the concentration of protein at the start of the reaction with protease from organ **A**.

Use **Figure 4** and your graph in **Figure 3**.

[1 mark]

Concentration = _____ g/dm^3

Question 3 continues on the next page

Turn over ►

0 3 . 7 Calculate the rate of protein digestion with protease from organ **A** over the first 12 minutes.

Use **Figure 4** and your graph in **Figure 3**.

[2 marks]

Rate = _____ g/dm^3 per minute

0 3 . 8 Describe how the activity of protease from organ **B** is different from the activity of protease from organ **A**.

Suggest **one** reason for the difference.

[2 marks]

0 4 Eukaryotic cells respire continuously to transfer energy.

0 4 . 1 Give **two** uses of energy transferred by respiration in eukaryotes.

[2 marks]

1 _____

2 _____

0 4 . 2 Name the cell structure in a eukaryotic cell where aerobic respiration occurs.

[1 mark]

_____

0 4 . 3 Muscle cells and plant cells can respire anaerobically.

Compare the processes of anaerobic respiration in muscle and plant cells.

[4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

0 4 . 4 Anaerobic respiration in muscle cells creates an oxygen debt.

What does oxygen debt mean?

[1 mark]

_____

_____

8

Turn over ►

0 5 Plants have tissues that are specialised for the transport of food and water molecules.

0 5 . 1 Which is a description of the role of the xylem?

[1 mark]

Tick **one** box.

Transports dissolved sugars using translocation ☐

Transports starch in the transpiration stream ☐

Transports water in the transpiration stream ☐

Transports water using translocation ☐

0 5 . 2 Which is a description of the role of the pholem?

[1 mark]

Tick **one** box.

Transports dissolved sugars in the transpiration stream ☐

Transports dissolved sugars using translocation ☐

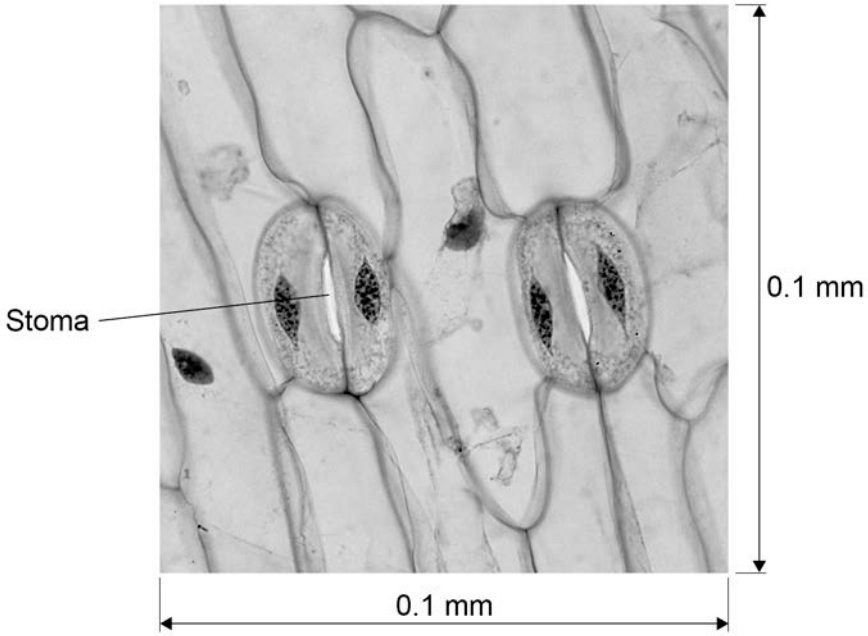
Transports starch using translocation ☐

Transports water in the transpiration stream ☐

In plants water is lost through stomata.

Figure 5 shows stomata on the lower surface of a leaf.

Figure 5



0 5 . 3 Calculate the number of stomata per mm^2 for the leaf shown in **Figure 5**.

[2 marks]

Number of stomata = _____

Question 5 continues on the next page

0 5 . 4 Most plants have more stomata on the lower surface of a leaf than on the upper surface.

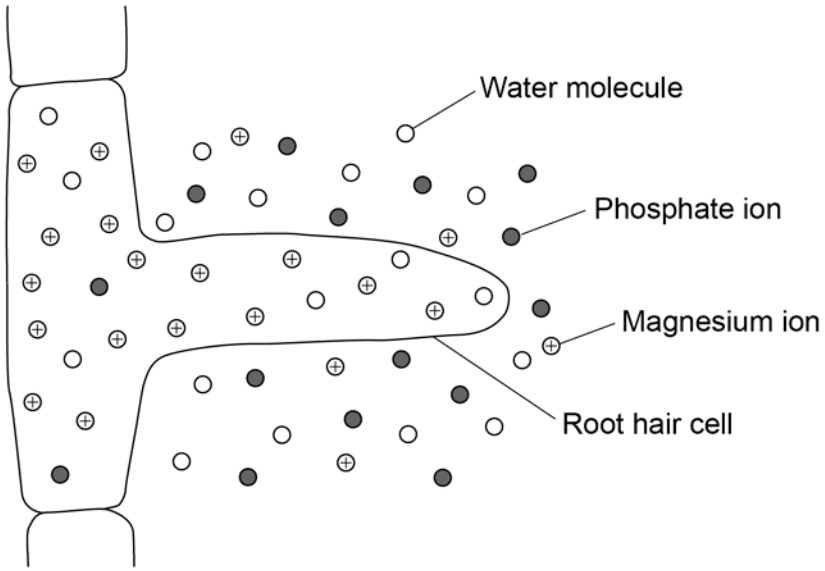
Explain why there are more stomata on the lower surface of a leaf.

[3 marks]

0 5 . 5 Particles can move into and out of cells by different processes.

Figure 6 shows different particles inside and outside a root hair cell.

Figure 6



Explain the processes by which the different particles would enter the root hair cell.

[6 marks]

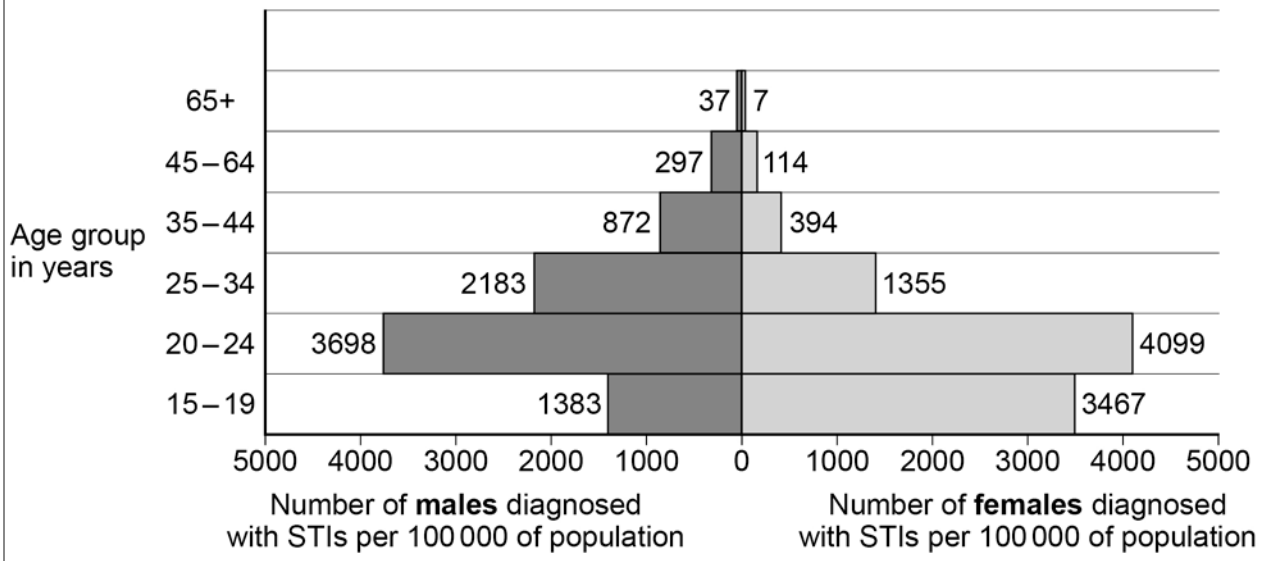
13

Turn over for the next question

0 6 This question is about sexually transmitted infections (STIs).

Figure 7 shows the number of STIs diagnosed in England in 2015.

Figure 7



0 6 . 1 The total population of females aged 15–19 was 1 572 189

Calculate the number of females aged 15–19 who were diagnosed with an STI.

[3 marks]

Number of females = _____

0 6 . 2 Suggest why the data is given per 100 000 of the population and **not** as the number of people.

[1 mark]

0 6 . 3 Gonorrhoea is an STI.

Describe the symptoms of gonorrhoea.

[1 mark]

and

Question 6 continues on the next page

Gonorrhoea was treated using penicillin until resistant strains of *Gonorrhoea* bacteria appeared.

A new antibiotic is tested to treat gonorrhoea.

Scientists need to know the concentration of antibiotic that will be most effective and safe.

This is the method used.

1. Soak paper discs in different concentrations of antibiotic solution.
2. Place one disc in the centre of an agar plate where *Gonorrhoea* bacteria are growing.
3. Incubate the agar plate at 37 °C for 24 hours.
4. Measure the diameter of the clear area where the bacteria are killed.
5. Repeat steps 2–4 for each concentration of the antibiotic solution.

Figure 8 shows the results for one concentration of the antibiotic solution.

Figure 8

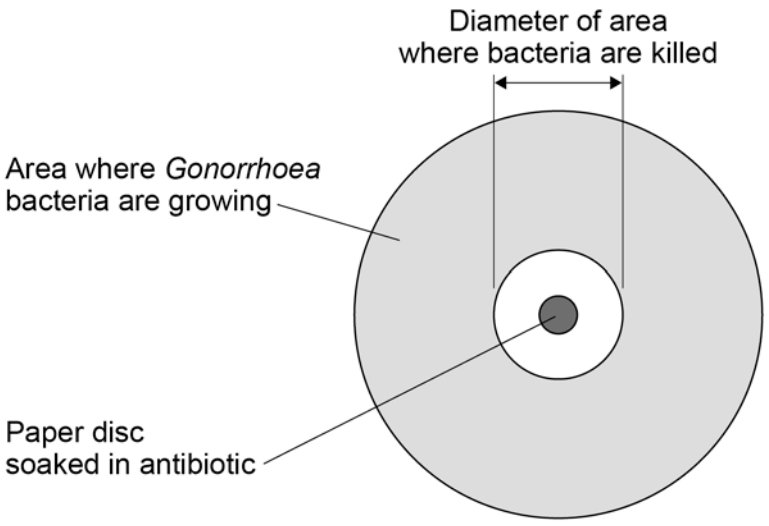


Table 2 shows the results.

Table 2

Concentration of antibiotic in mg/dm^3	**Diameter of clear area in mm**
0	0
1	0
3	8
5	15
10	16
20	17

0 6 . 4 What was the dependent variable in this investigation?

[1 mark]

0 6 . 5 Calculate the area where bacteria were killed when the antibiotic concentration was 20 mg/dm^3

Use the equation: area = πr^2

Use 3.14 as the value for π

r is the radius of the circle.

Give your answer to 3 significant figures.

[2 marks]

Area = _____ mm^2

Question 6 continues on the next page

Turn over ►

0 6 . 6 The scientists recommended that the antibiotic should be used at a concentration of 5 mg/dm^3

Suggest **two** reasons why the scientists recommended this concentration.

[2 marks]

1 _____

_____

_____

2 _____

_____

_____

0 6 . 7 The antibiotic needs further testing before it can be licensed for human use.

The first stage is pre-clinical tests using live cells, tissues and animals.

Describe the other stages of drug testing.

Give reasons for each stage.

[6 marks]

END OF QUESTIONS

16

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED