

Paper Reference(s) 1BI0/1H
Pearson Edexcel Level 1/Level 2 GCSE (9–1)
Biology
Paper: 1
Higher Tier

Tuesday 15 May 2018 – Afternoon

**Time: 1 hour 45 minutes plus your
additional time allowance**

INSTRUCTIONS TO CANDIDATES
**Write your centre number, candidate
number, surname, other names and your
signature in the boxes below. Check that
you have the correct question paper.**

Centre No.					
Candidate No.					
Surname					
Other names					
Signature					
Paper Reference	1	B	I	0	/ 1 H

- **Use BLACK ink or ball-point pen.**
- **Answer ALL questions.**
- **Answer the questions in the spaces provided – there may be more space than you need.**
- **Calculators may be used.**
- **Any diagrams may NOT be accurately drawn, unless otherwise indicated.**
- **You must show all your working out with your answer clearly identified at the end of your solution.**

MATERIALS REQUIRED FOR EXAMINATION
Calculator, ruler

ITEMS INCLUDED WITH QUESTION PAPERS
Nil

(Instructions continue on next page)

(Turn over)

INFORMATION FOR CANDIDATES

- **The total mark for this paper is 100.**
- **The marks for EACH question are shown in brackets – use this as a guide as to how much time to spend on each question.**
- **In questions marked with an asterisk (*), marks will be awarded for your ability to structure your answer logically showing how the points that you make are related or follow on from each other where appropriate.**

ADVICE TO CANDIDATES

- **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)

Answer ALL questions. Write your answers in the spaces provided.

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 ☐.

(Questions begin on next page)

(Turn over)

1 Figure 1 shows an eye.

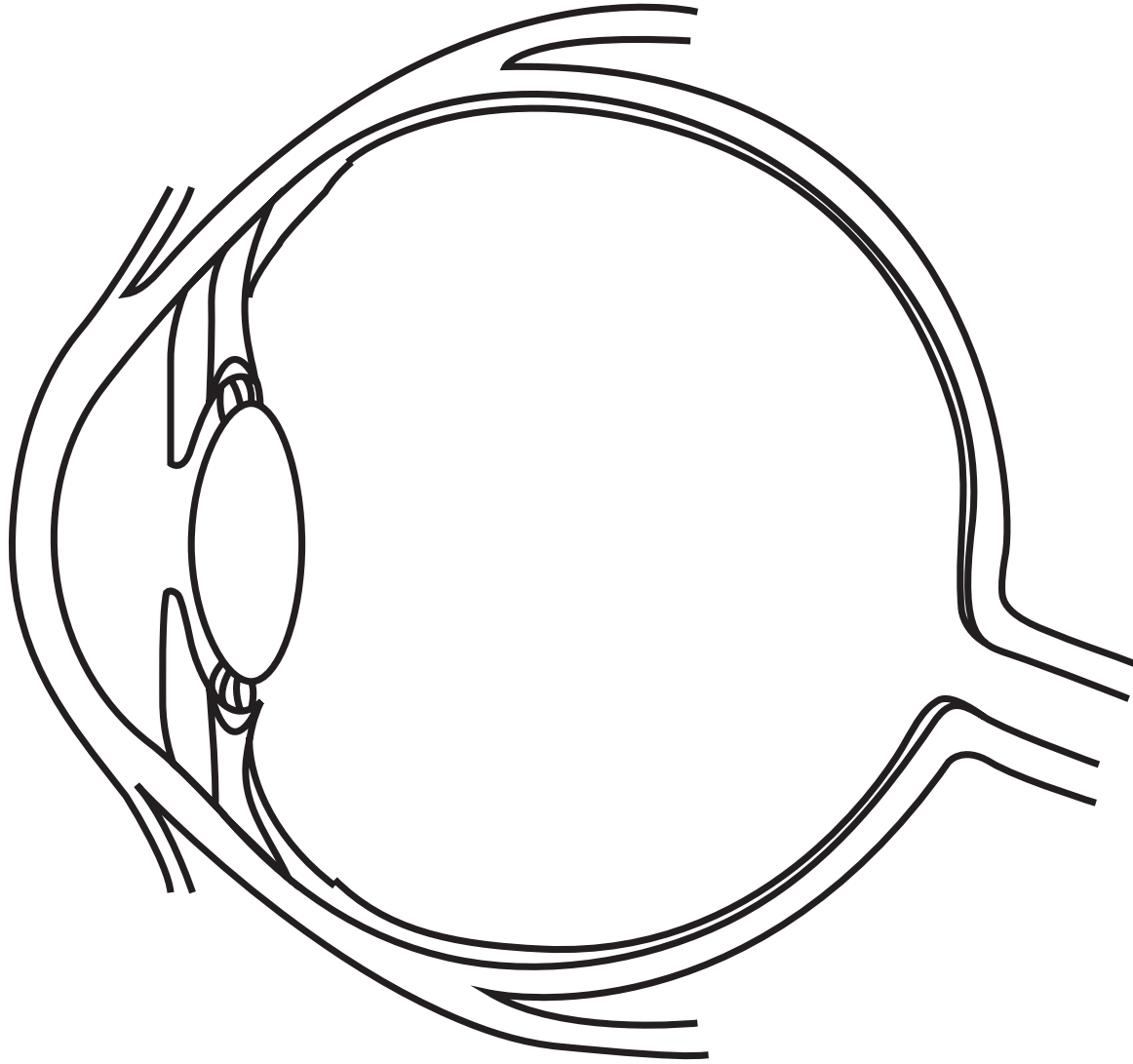


Figure 1

(Question continues on next page)

(Turn over)

(a) (i) When the eye changes from focusing on a distant object to focusing on a near object (1 mark)

- ☐ **A the lens gets thinner to bend the light rays more**
- ☐ **B the lens gets thicker to bend the light rays more**
- ☐ **C the lens gets thinner to bend the light rays less**
- ☐ **D the lens gets thicker to bend the light rays less**

(Question continues on next page)

(Turn over)

- (ii) Give a reason why people who are short-sighted cannot see distant objects clearly. (1 mark)**

- (iii) State the type of lens that can be used to correct short-sightedness. (1 mark)**

(Question continues on next page)

(Turn over)

**(b) A student was given the hypothesis
‘People with brown eyes are more
likely to be short-sighted than people
with blue eyes.’**

**Devise a plan to test this hypothesis.
(3 marks)**

**(Continue your answer on next page)
(Turn over)**

(Total for Question 1 = 6 marks)

(Questions continue on next page)

(Turn over)

- 2 (a) Obesity increases the risk of a person developing cardiovascular disease.

Losing weight can reduce the risk of this disease occurring.

Explain why exercise can cause weight loss. (2 marks)

(Question continues on next page)

(Turn over)

(b) Figure 2 shows a gastric band fitted to a stomach.

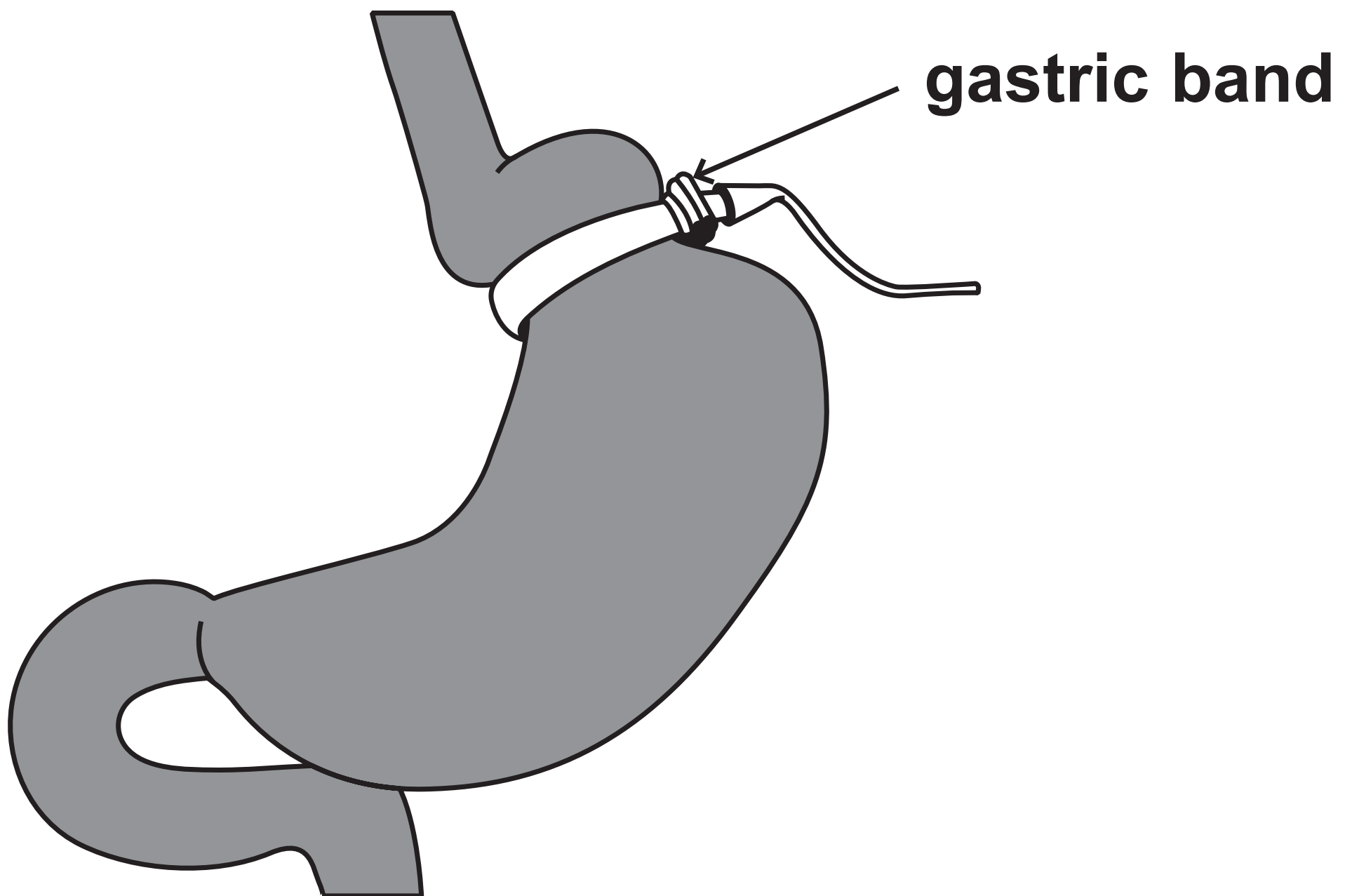


Figure 2

(Question continues on next page)

(Turn over)

12

**Explain how a gastric band helps a person to lose weight.
(2 marks)**

(Question continues on next page)

(Turn over)

- (c) BMI and waist:hip ratio can be used to find out if a person is obese.

Figure 3 shows some data for two males.

male	BMI	waist:hip ratio
A	27.3	0.85
B	?	0.81

Figure 3

(Question continues on next page)

(Turn over)

BMI is calculated using the equation:

$$\text{BMI} = \frac{\text{mass in kilograms}}{(\text{height in metres})^2}$$

- (i) Male B has a mass of 72 kg and a height of 1.81 m.**

Calculate the BMI of male B.

Give the answer to 3 significant figures. (3 marks)

BMI = _____

(Question continues on next page)

(Turn over)

- (ii) Figure 4 shows the interpretation of BMI values.

BMI range	interpretation
below 18·5	underweight
18·5–24·9	normal
25·0–29·9	overweight
30·0 and above	obese

Figure 4

(Question continues on next page)

(Turn over)

Males with a waist:hip ratio above 0.90 are defined as abdominally obese.

Explain what the BMI and waist:hip ratio for male A shows about his weight distribution. (2 marks)

(Total for Question 2 = 9 marks)

(Questions continue on next page)
(Turn over)

3 (a) Figure 5 shows two potato chips.

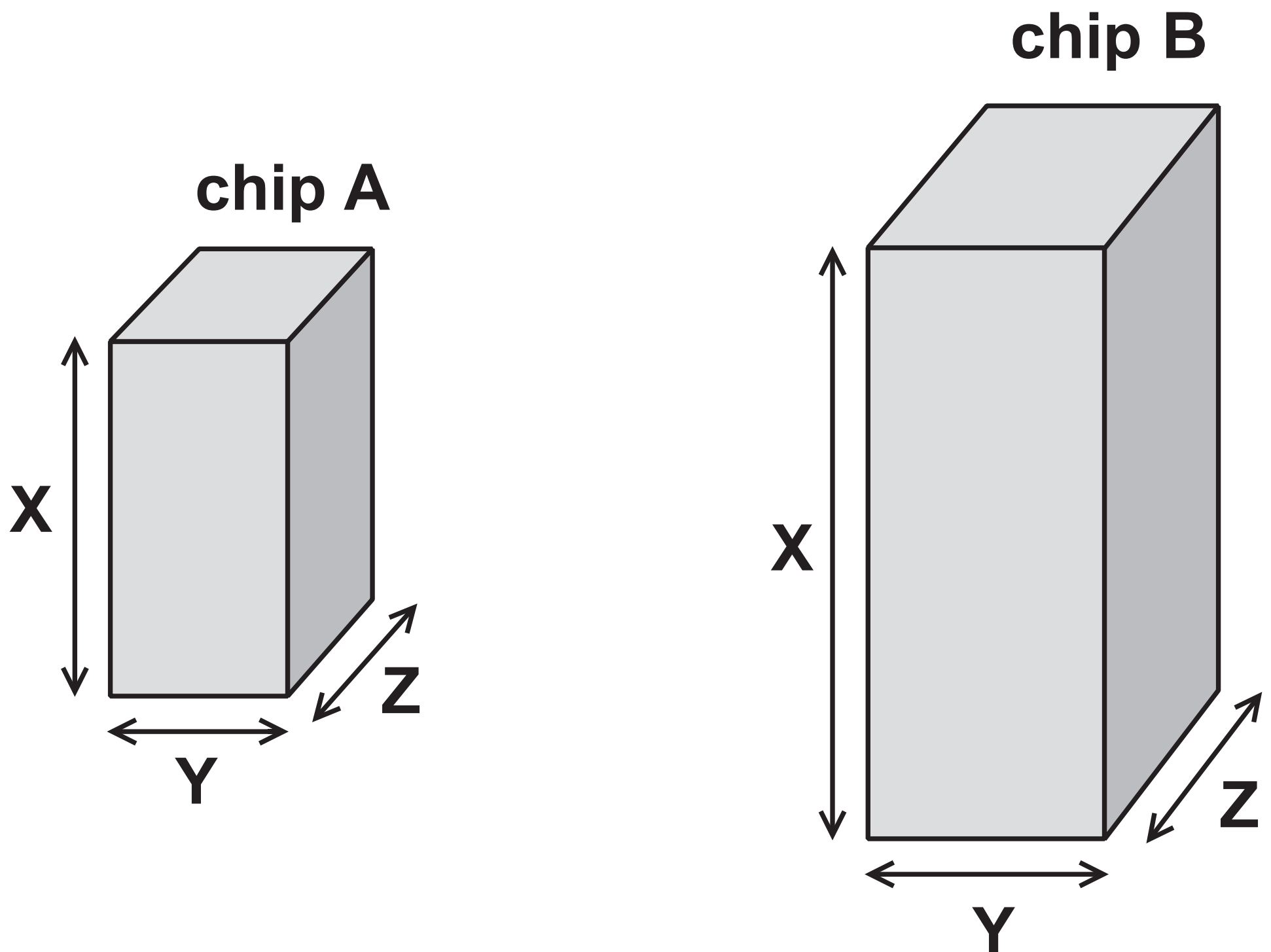


Figure 5

(Question continues on next page)

(Turn over)

Figure 6 shows some information about each potato chip.

potato chip	length of X in cm	length of Y in cm	length of Z in cm	total surface area of four sides in cm ²	total surface area of top and bottom in cm ²	total surface area of chip in cm ²
A	3·0	1·5	1·5	18·0	4·5	22·5
B	5·0	2·0	2·0	?	?	?

Figure 6

(Question continues on next page)

(Turn over)

- (i) Calculate the total surface area of potato chip B using the formula,

$$\text{Total surface area} = 2XY + 2XZ + 2YZ$$

(2 marks)

total surface area = _____ cm^2

(Question continues on next page)

(Turn over)

- (ii) The potato chips were placed in distilled water for 20 minutes.

Figure 7 shows the increase in mass of each potato chip.

potato chip	increase in mass in grams
A	0.1
B	0.3

Figure 7

(Question continues on next page)

(Turn over)

Explain why potato chip B has a greater increase in mass than potato chip A. (2 marks)

(Question continues on next page)

(iii) Potato chip A is transferred from the distilled water into a concentrated salt solution.

Explain what will happen to the cells in potato chip A. (3 marks)

(Question continues on next page)

(Turn over)

- (b) The potatoes of a potato plant develop underground.

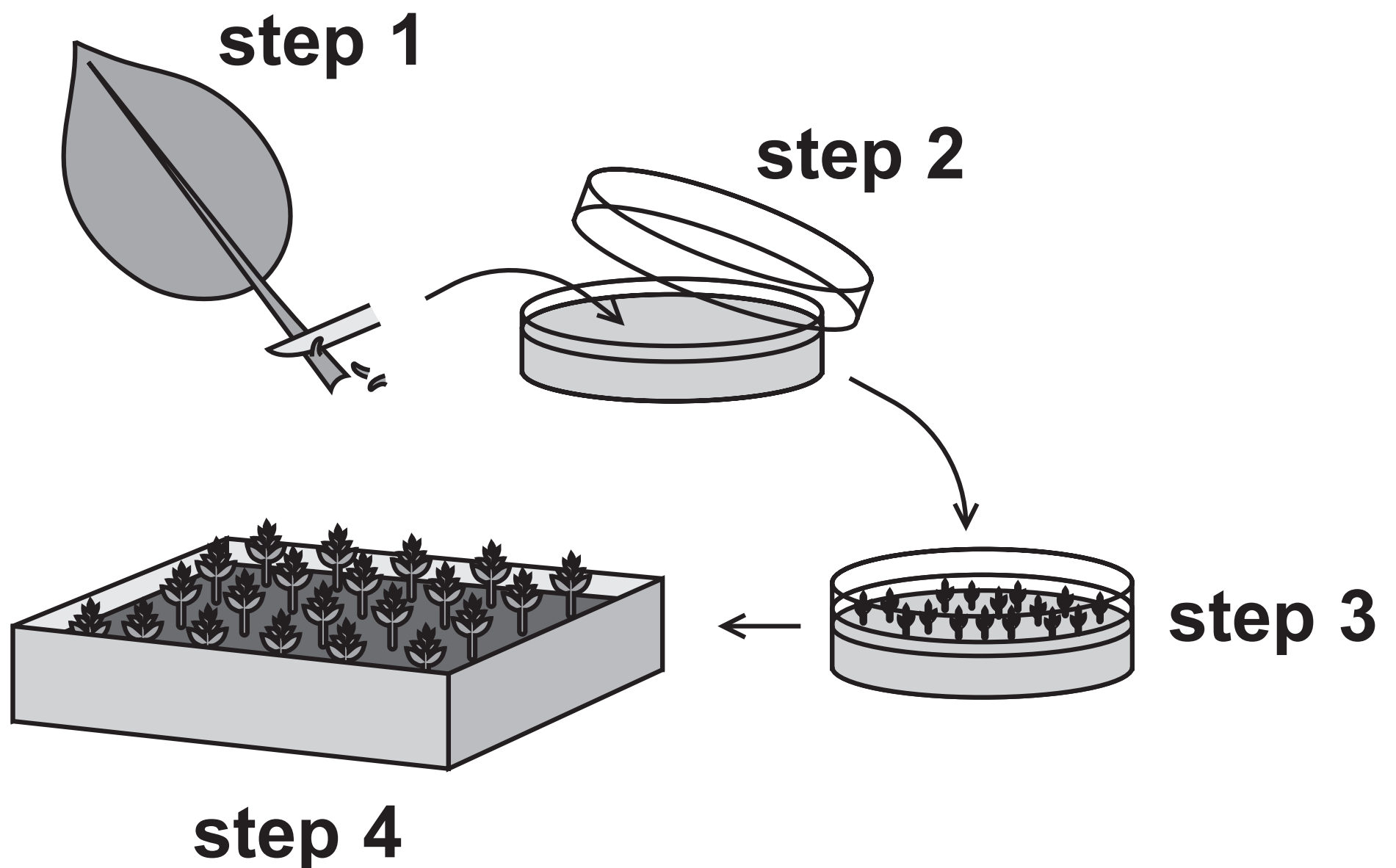
Explain ONE difference in the sub-cellular structures in a cell in the potato and those in a cell in the leaf of the potato plant.
(2 marks)

(Total for Question 3 = 9 marks)

(Questions continue on next page)

(Turn over)

4 (a) Figure 8 shows a method of producing plants.



Step 1. Cells taken from parent plant.

Step 2. Cells placed on agar growth medium.

Step 3. Cells develop into tiny plantlets.

Step 4. Plantlets grown in compost.

Figure 8

(Question continues on next page)

(Turn over)

- (i) Some cells in each plantlet develop into root cells.

Name the process occurring as these cells develop into root cells. (1 mark)

- (ii) Describe the advantages of producing plants by the method shown in Figure 8. (2 marks)

(Question continues on next page)

(Turn over)

- (iii) An autoclave is used to prepare the agar growth medium used in Step 2.

**Explain why the agar growth medium is autoclaved.
(2 marks)**

(Question continues on next page)

(Turn over)

- (iv) One of the plantlets had different coloured leaves.**

Give one reason why this plantlet had different coloured leaves. (1 mark)

(Question continues on next page)

(b) Crop plants provide a source of energy in the form of carbohydrates such as starch and sugars.

(i) Describe the test to identify starch. (2 marks)

(Question continues on next page)

(Turn over)

- (ii) The amount of energy in the sugars extracted from crop plants can be measured using the calorimeter shown in Figure 9.

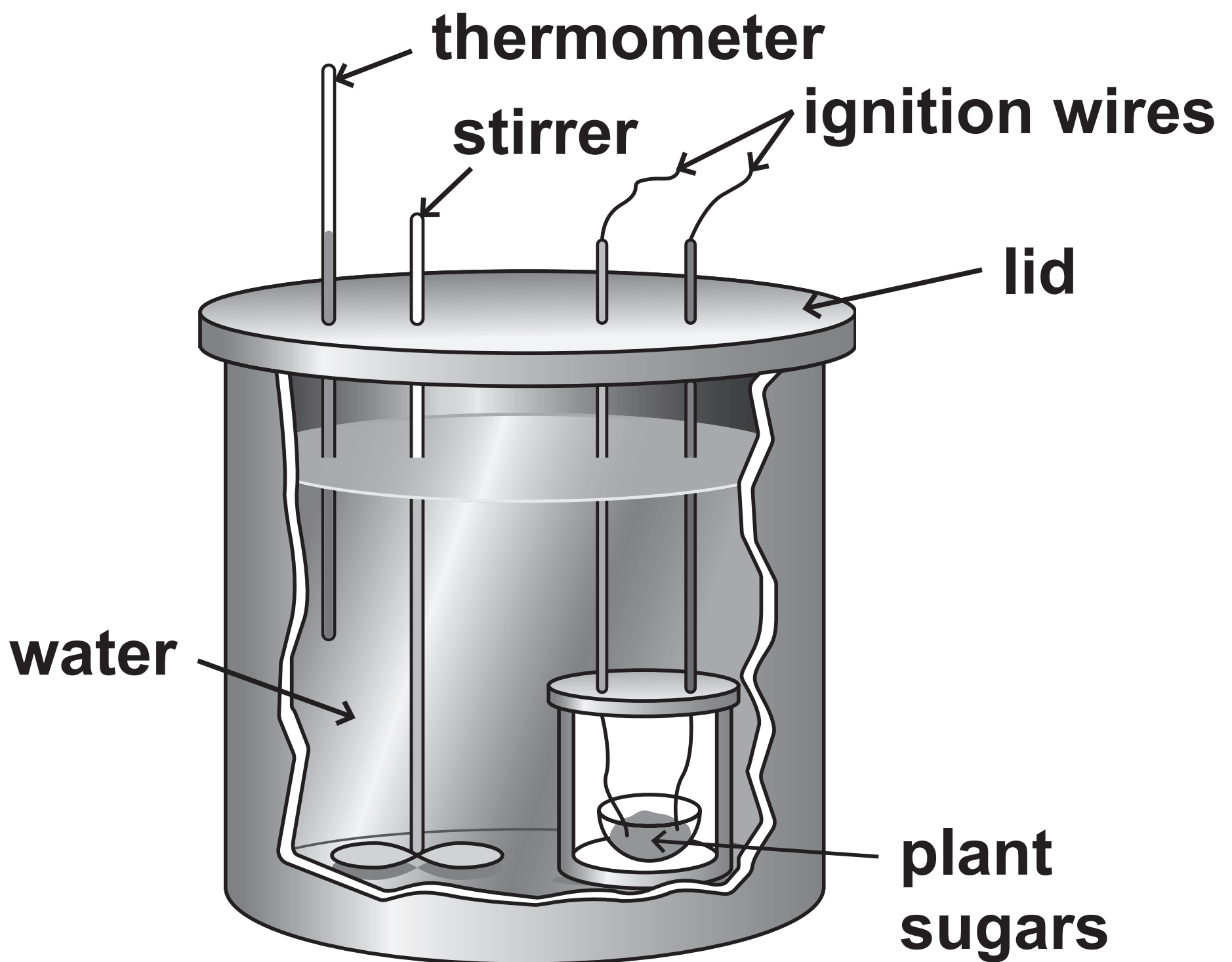


Figure 9

(Question continues on next page)

(Turn over)

30

**Explain why the calorimeter
has a lid. (2 marks)**

(Question continues on next page)

(Turn over)

(iii) State why it is important to stir the water in the calorimeter. (1 mark)

(Total for Question 4 = 11 marks)

(Questions continue on next page)

(Turn over)

5 Streptococcus bacteria can cause a sore throat or skin infection.

An illness called scarlet fever can also develop during an infection with this bacterium.

(a) (i) Give TWO precautions a doctor should take when treating a patient who is infected with Streptococcus. (2 marks)

(Question continues on next page)
(Turn over)

- (ii) From September 2013 to March 2014 there were 2 830 cases of scarlet fever in the UK.**

From September 2014 to March 2015 there were 5 943 cases of scarlet fever.

Calculate the percentage increase of the number of cases of scarlet fever between the periods September 2014 to March 2015 and September 2013 to March 2014. (2 marks)

_____ %

(Question continues on next page)

(Turn over)

(iii) Figure 10 shows some Streptococcus bacteria.

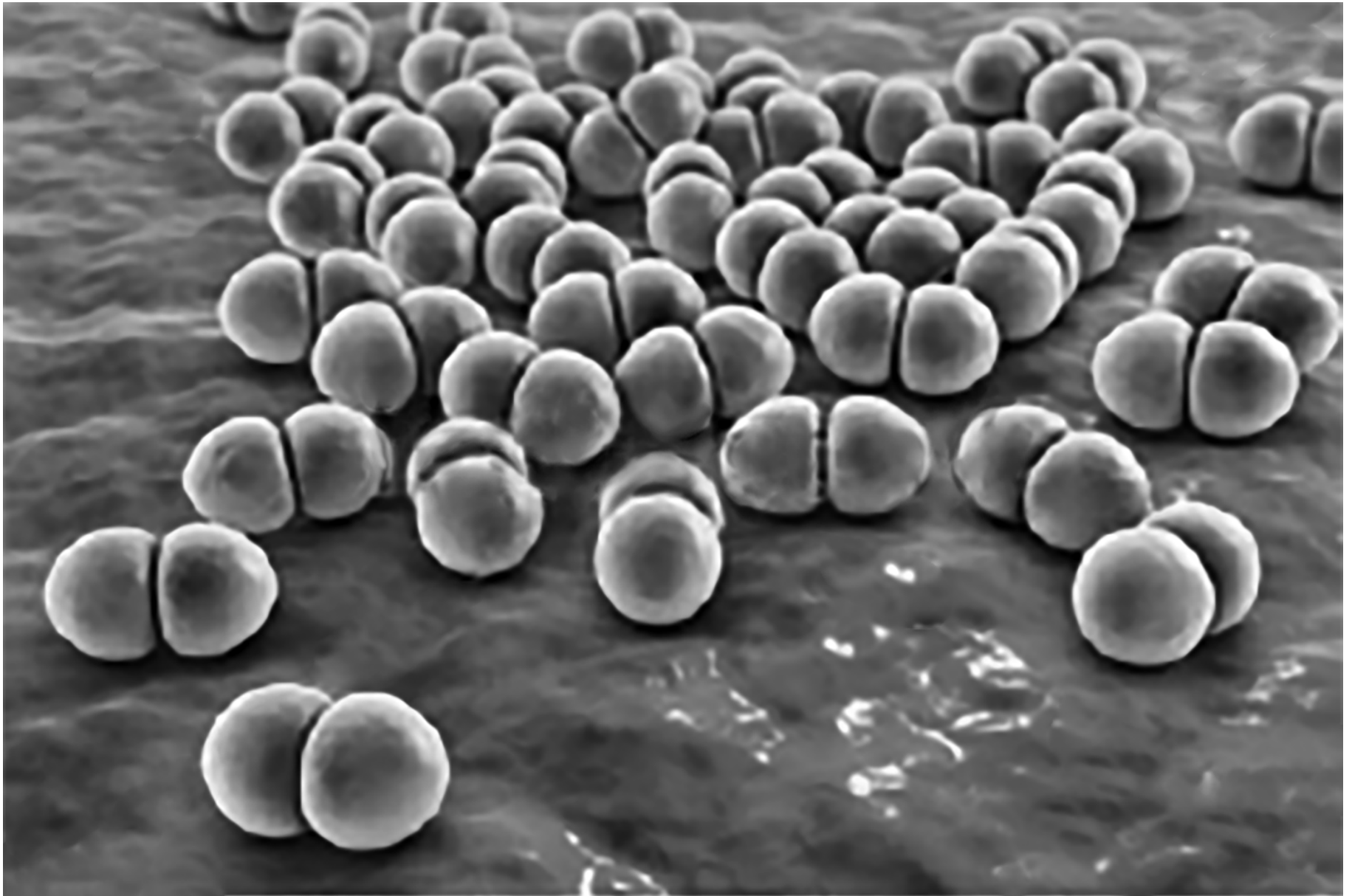


Figure 10

(Question continues on next page)

(Turn over)

Some bacteria are motile, meaning they can move themselves.

Why is a Streptococcus bacterium not motile? (1 mark)

- ☐ **A it does not have flagella**
- ☐ **B it does not have plasmids**
- ☐ **C it does not have ribosomes**
- ☐ **D it does not have acrosomes**

(b) Patients with scarlet fever can be treated with antibiotics.

New antibiotics need to be tested before they can be used in patients.

(Question continues on next page)

(Turn over)

Which is the correct sequence for the development of a new medicine? (1 mark)

- ☐ **A testing in healthy volunteers → testing using cultured cells → double blind trials on patients**
- ☐ **B testing using cultured cells → double blind trials on patients → testing in healthy volunteers³⁶**
- ☐ **C testing in healthy volunteers → double blind trials on patients → testing using cultured cells**
- ☐ **D testing using cultured cells → testing in healthy volunteers → double blind trials on patients**

(Question continues on next page)

(Turn over)

(c) Most cases of scarlet fever occur in children.

Adults have usually developed immunity to a toxin that the Streptococcus bacteria produce during infection.

Explain how an adult develops immunity to the toxin. (3 marks)

(Continue your answer on next page)

(Turn over)

(Turn over)

- 6 (a) In 2012, two scientists were awarded the Nobel prize for their research on stem cells.

They showed that adult cells could be reprogrammed to become cells with the properties of embryonic stem cells.

Describe the possible benefits of this research. (3 marks)

(Continue your answer on next page)

(Turn over)

(Question continues on next page)

(b) Figure 11 shows four stages of mitosis, labelled P, Q, R and S.

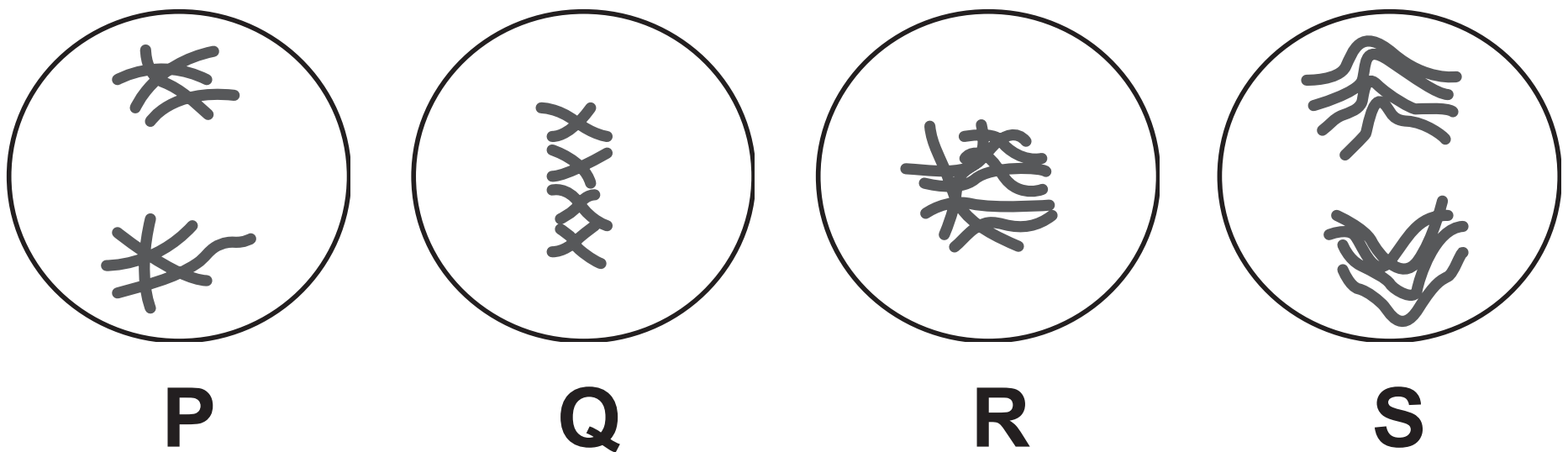


Figure 11

(i) Which is the correct order for these stages? (1 mark)

☐ **A $Q \rightarrow R \rightarrow S \rightarrow P$**

☐ **B $R \rightarrow Q \rightarrow S \rightarrow P$**

☐ **C $R \rightarrow S \rightarrow Q \rightarrow P$**

☐ **D $Q \rightarrow S \rightarrow R \rightarrow P$**

(Question continues on next page)

(Turn over)

(ii) The stage of mitosis labelled S in figure 11 is

(1 mark)

- ☐ **A anaphase**
- ☐ **B prophase**
- ☐ **C telophase**
- ☐ **D metaphase**

(Question continues on next page)

(Turn over)

(iii) Interphase is part of the cell cycle.

Describe what happens during interphase. (2 marks)

(Question continues on next page)

(Turn over)

(c) Figure 12 shows a root tip with cells in different stages of mitosis.

The image was magnified 400 ×.

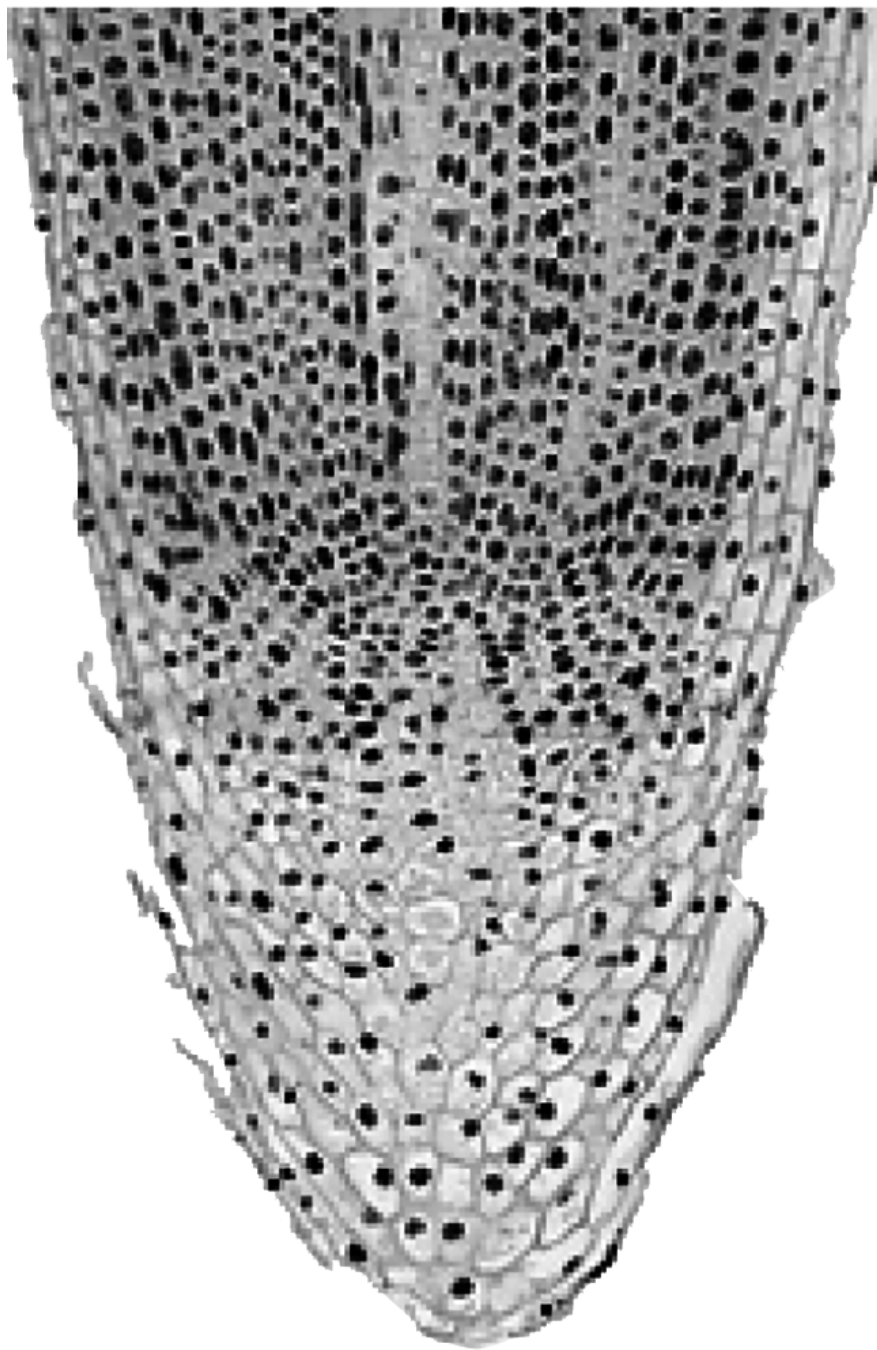


Figure 12

(Question continues on next page)

(Turn over)

45

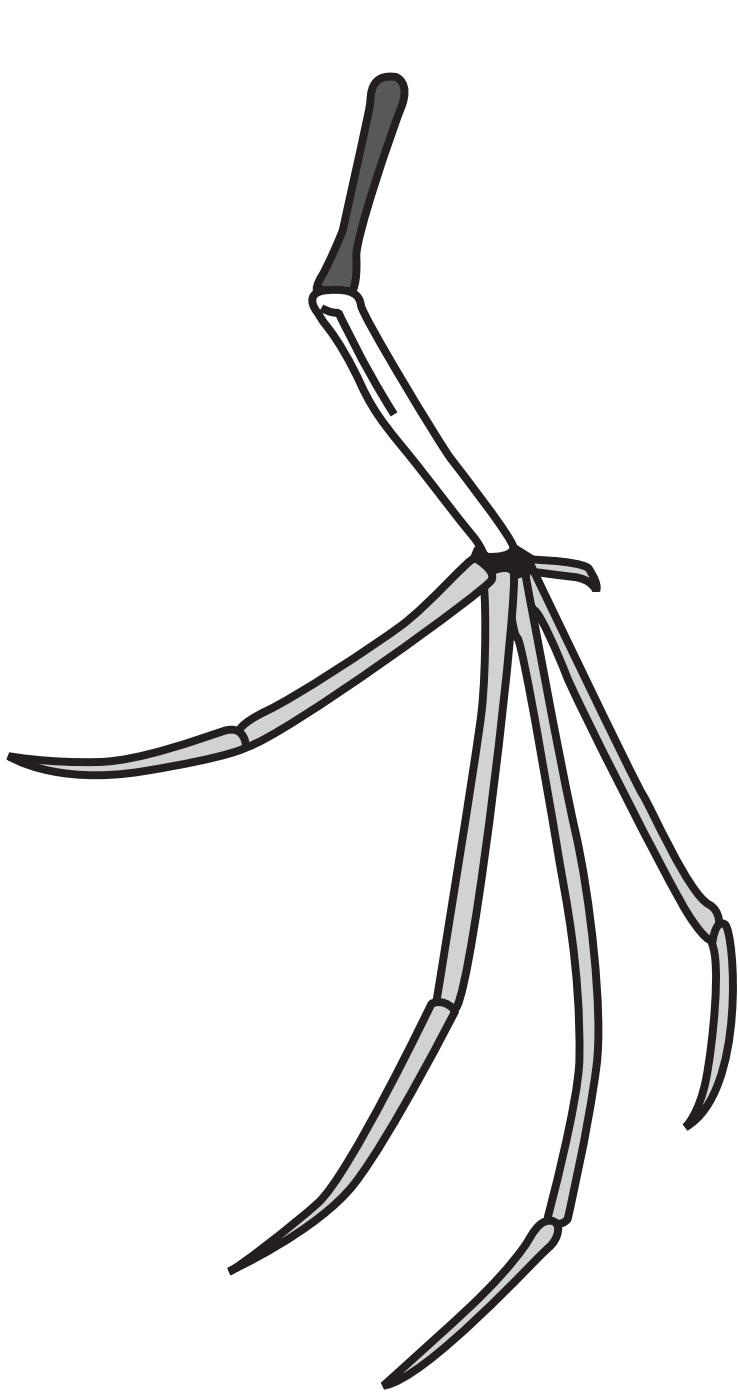
Explain how a magnification of $400\times$ can be obtained using the lenses on a light microscope. (2 marks)

(Total for Question 6 = 9 marks)

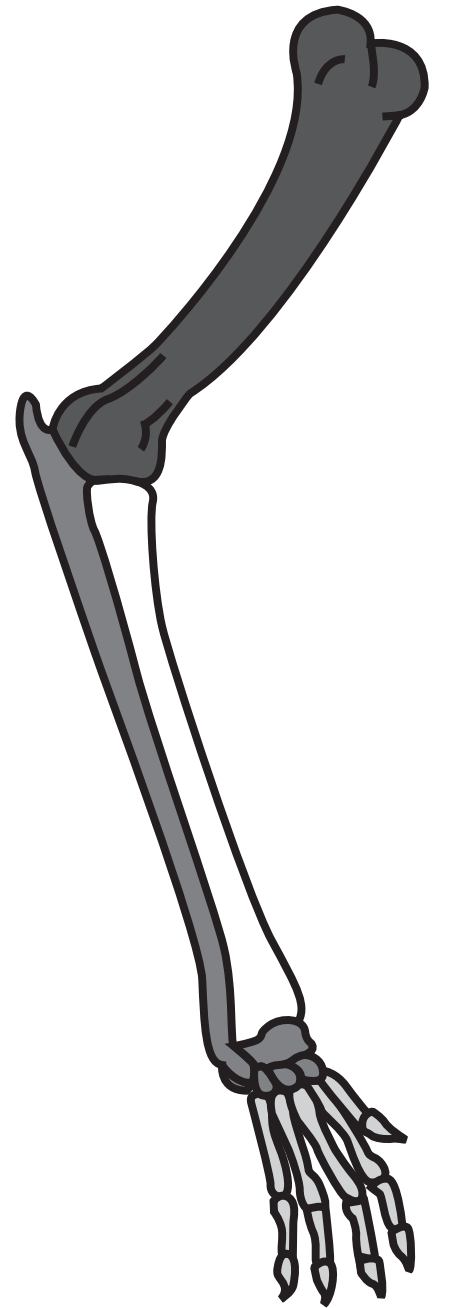
(Questions continue on next page)

(Turn over)

- 7 (a) Figure 13 shows the pentadactyl limb of a bat and a cat.



bat



cat

Figure 13

(Question continues on next page)

(Turn over)

- (i) Describe the reasons why the anatomy of the pentadactyl limb suggests that bats and cats evolved from a common ancestor. (2 marks)

(Question continues on next page)

(Turn over)

- (ii) Genetic analysis also provides evidence for evolution.

Scientists can sequence genes from different organisms.

Describe how this type of genetic analysis provides evidence for evolution. (2 marks)

(Question continues on next page)

(Turn over)

(b) Mendel's research on pea plants showed that genetic traits are inherited.

**(i) Which term is used to describe the expression of traits in an organism?
(1 mark)**

☐ **A genotype**

☐ **B phenotype**

☐ **C allele**

☐ **D gamete**

(Question continues on next page)

(Turn over)

- (ii) Mendel crossed pea plants that produced round seeds with pea plants that produced wrinkled seeds.**

All the offspring produced round seeds.

He then crossed these offspring with each other.

Some pea plants in the next generation produced round seeds and the others produced wrinkled seeds.

(Question continues on next page)

(Turn over)

Explain how this showed that some inherited traits are not expressed in an organism. (3 marks)

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

(Question continues on next page)
(Turn over)

- (c) **Duchenne muscular dystrophy is a recessive sex-linked genetic disorder.**

This disorder causes muscle weakness.

Figure 14 shows the inheritance of Duchenne muscular dystrophy in a family.

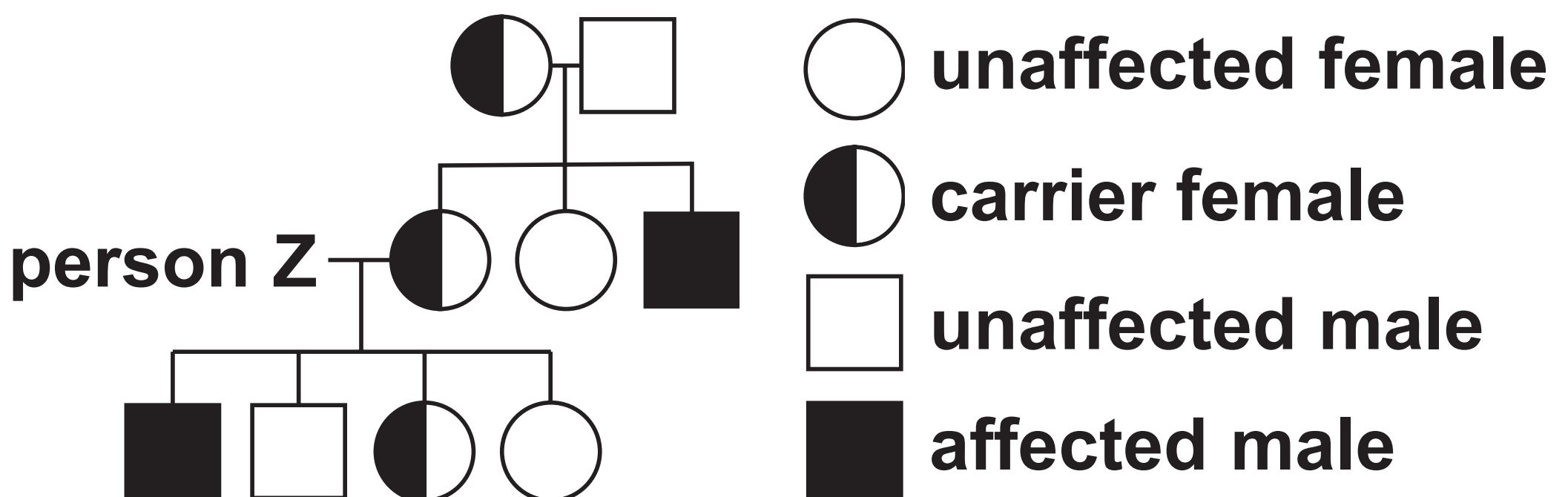


Figure 14

(Question continues on next page)

(Turn over)

53

State and explain the phenotype of person Z. (3 marks)

[illegible]

(Total for Question 7 = 11 marks)

(Questions continue on next page)

(Turn over)

8 Potato cells contain the enzyme catalase.

This enzyme catalyses the breakdown of hydrogen peroxide into oxygen and water.

Figure 15 shows what happened when a student placed a potato disc in a 5% hydrogen peroxide solution.

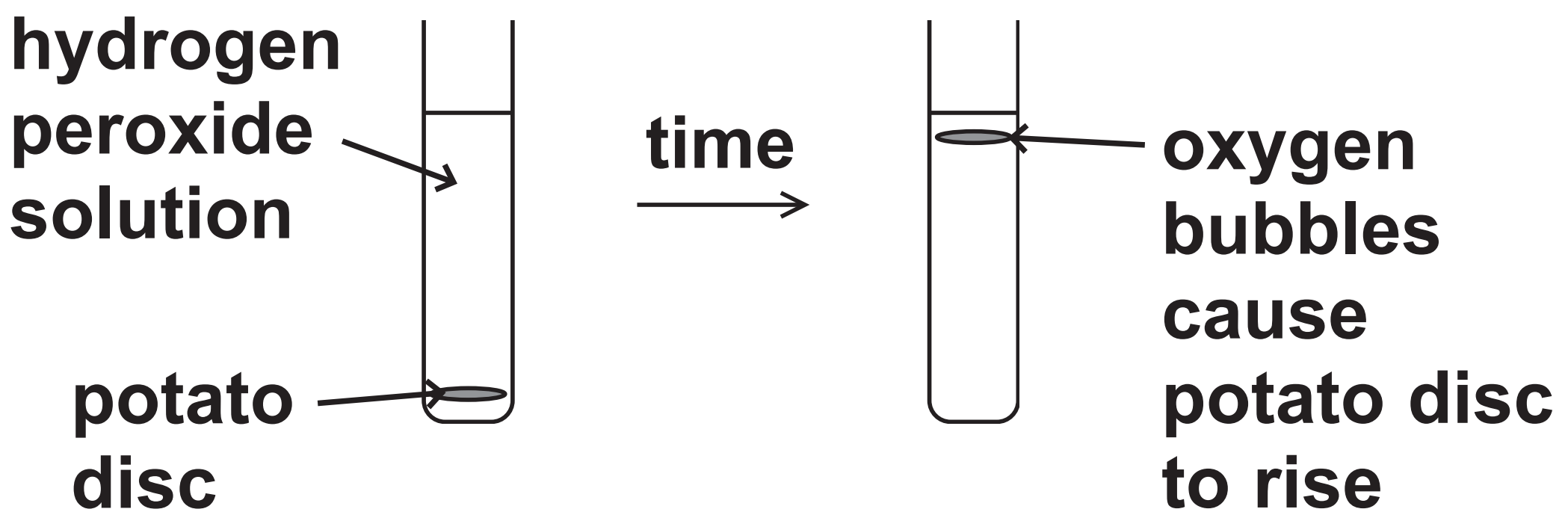


Figure 15

(Question continues on next page)

(Turn over)

The student measured the time taken for the potato disc to rise.

The student repeated the investigation using 10%, 15% and 20% concentrations of hydrogen peroxide solution.

(Question continues on next page)

(a) (i) Which term describes the hydrogen peroxide in this reaction? (1 mark)

- ☐ **A product**
- ☐ **B substrate**
- ☐ **C active site**
- ☐ **D control**

(Question continues on next page)

(Turn over)

- (ii) The potato discs all had the same mass.**

Explain why the student used potato discs with the same mass. (2 marks)

(Question continues on next page)

(Turn over)

(iii) State TWO other factors that need to be kept the same to improve this investigation. (2 marks)

(Question continues on next page)

(Turn over)

(b) Figure 16 shows the results of this investigation.

The student calculated the rate of reaction using

$$\frac{1}{\text{time in seconds}}$$

concentration of hydrogen peroxide solution (%)	time taken for disc to rise (s)	rate (s^{-1})
5	325	0.003
10	245	0.004
15	132	0.008
20	72	0.014

Figure 16

(Question continues on next page)

(Turn over)

- (i) State and explain a conclusion based on these results. (4 marks)**

(Question continues on next page)

(Turn over)

- (ii) The student repeated the investigation with a 25% hydrogen peroxide solution and recorded a time of 75 seconds.

Calculate the rate of reaction for the 25% hydrogen peroxide solution. (2 marks)

_____ s⁻¹

(Question continues on next page)

(Turn over)

(iii) The student decided that the rate for the 25% hydrogen peroxide solution was not anomalous.

**Give the reason why the result was not anomalous.
(1 mark)**

(Total for Question 8 = 12 marks)

(Questions continue on next page)

(Turn over)

- 9 (a) Yeast cells can be genetically modified to produce a painkiller.

This painkiller is usually obtained from opium poppies.

One method for genetically modifying a yeast cell uses a plasmid containing the desired gene.

- (i) Explain how a gene can be inserted into a plasmid.
(2 marks)

(Continue your answer on next page)

(Turn over)

(Question continues on next page)

- (ii) Discuss the possible benefits and risks of producing painkillers from genetically modified yeast cells rather than extracting the painkillers from poppies. (3 marks)**

(Continue your answer on next page)

(Turn over)

(Question continues on next page)

(Turn over)

(b) Figure 17 shows the structure of a DNA nucleotide.

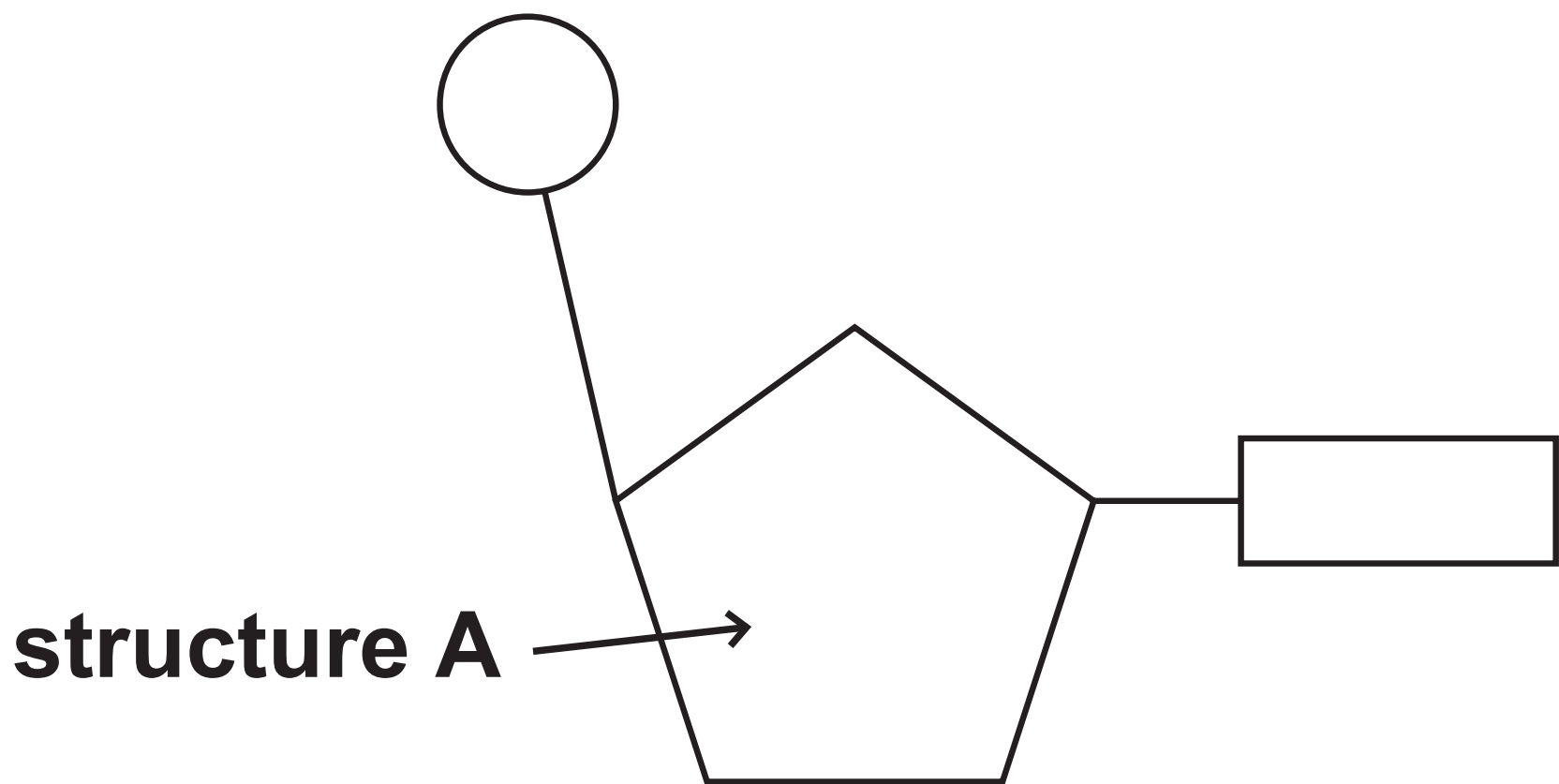


Figure 17

**(i) Structure A is a
(1 mark)**

- ☐ **A base**
- ☐ **B phosphate**
- ☐ **C sugar**
- ☐ **D polymer**

**(Question continues on next page)
(Turn over)**

***(ii) In 2003, the first complete human genome was sequenced.**

The genomes of different people have small changes in the sequence of the DNA bases.

Describe how these changes in DNA sequence can affect the individuals and how sequencing a person's genome could influence their medical treatments. (6 marks)

(Continue your answer on next page)

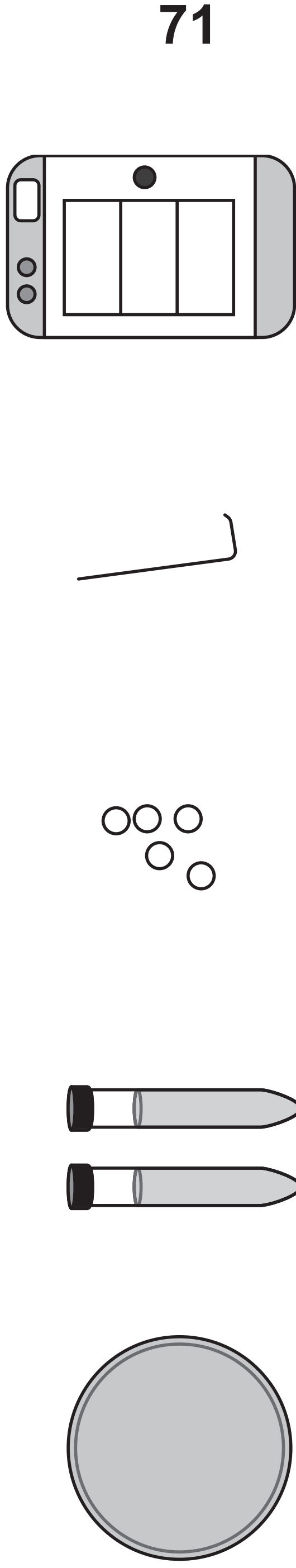
(Turn over)

(Continue your answer on next page)
(Turn over)

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

10 A scientist was planning to compare the effectiveness of the antibiotic myxopyronin on two different species of bacteria.

Figure 18 shows the equipment the scientist can use.



71

agar plates two species of bacteria filter discs of myxopyronin incubator

Figure 18

(Question continues on next page)

(Turn over)

- (a) (i) Describe how the scientist could determine the effectiveness of myxopyronin on the two species of bacteria. (2 marks)**

(Question continues on next page)

(Turn over)

- (ii) **Myxopyronin inhibits bacterial RNA polymerase.**

Explain why the antibiotic myxopyronin can be used to treat bacterial infections in humans. (4 marks)

(Continue your answer on next page)
(Turn over)

(Question continues on next page)

***(b) Infections can also be caused by viruses.**

Describe the lytic pathway of a virus and how this causes the spread of infection through a population. (6 marks)

(Continue your answer on next page)

(Turn over)

(Turn over)

(Turn over)

78

(Total for Question 10 = 12 marks)

TOTAL FOR PAPER = 100 MARKS

END