

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.**

<b>Centre No.</b>					
<b>Candidate No.</b>					
<b>Surname</b>					
<b>Other names</b>					
<b>Signature</b>					
<b>Paper Reference</b>	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**

## **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.

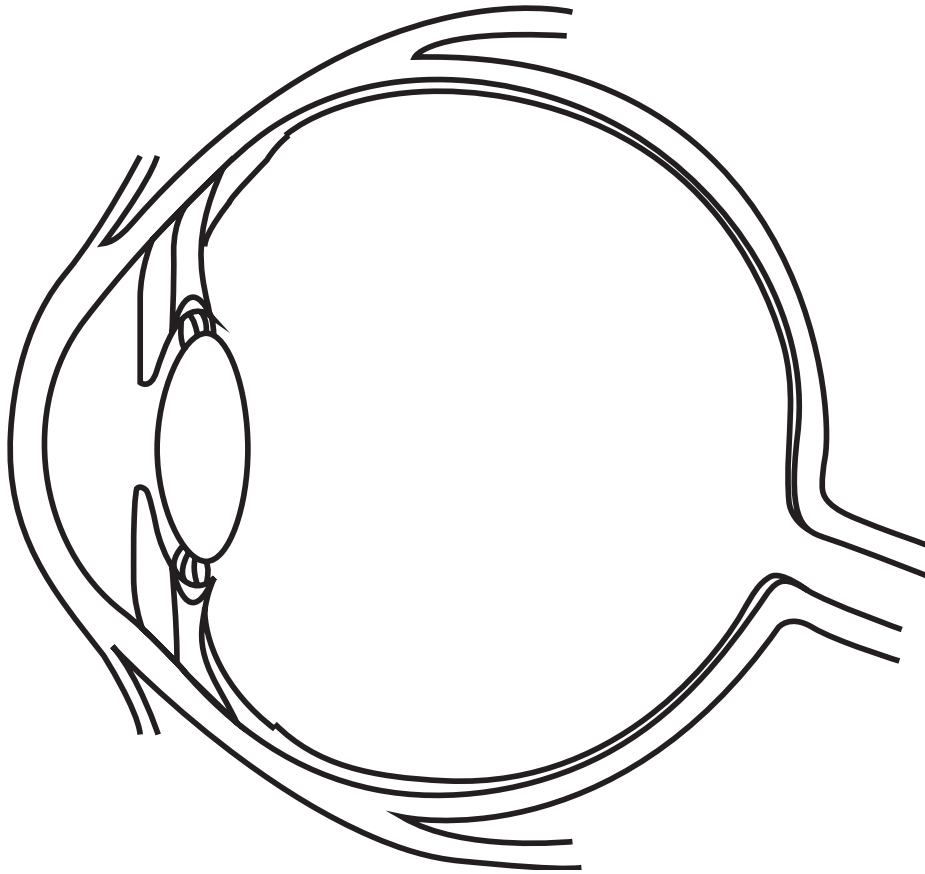
**(Turn over)**

**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)**

**1 Figure 1 shows an eye.**



**Figure 1**

**(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)

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

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**(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)**

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**(TOTAL FOR QUESTION 1 = 6 MARKS)**

- 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)**

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

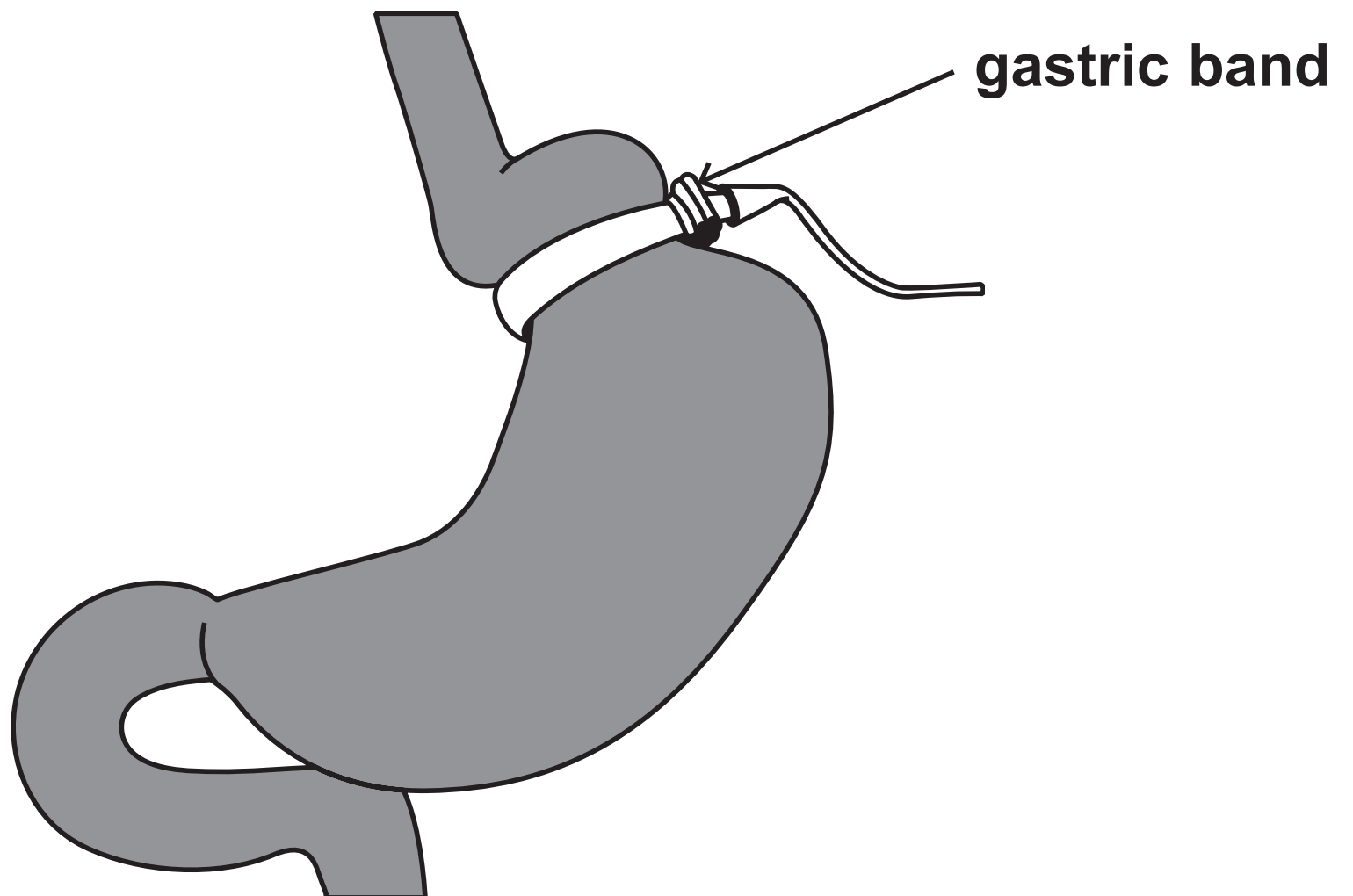


Figure 2

(Question continues on next page)

(Turn over)



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

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**(Question continues on next page)**

- (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

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 = \_\_\_\_\_

- (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)

**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)**

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**(TOTAL FOR QUESTION 2 = 9 MARKS)**

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**(Questions continue on next page)**

- 3 (a) Figure 5 shows two potato chips.

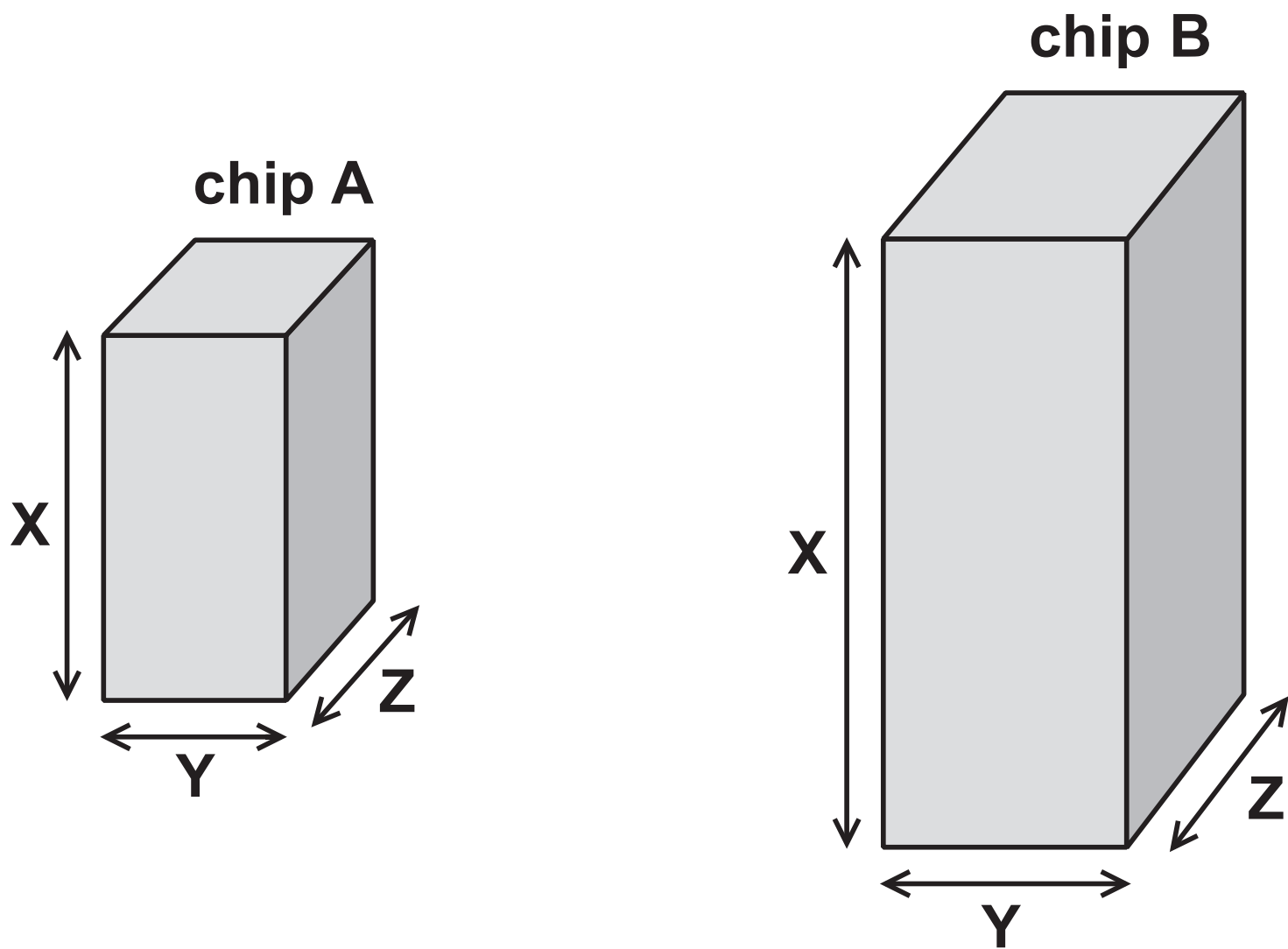


Figure 5

(Question continues on next page)

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 $\text{cm}^2$	total surface area of top and bottom in $\text{cm}^2$	total surface area of chip in $\text{cm}^2$
A	3.0	1.5	1.5	18.0	4.5	22.5
B	5.0	2.0	2.0	?	?	?

Figure 6

- (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 = \_\_\_\_\_  $\text{cm}^2$

(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

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

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**(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)**

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**(Question continues on next page)**



- (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)**

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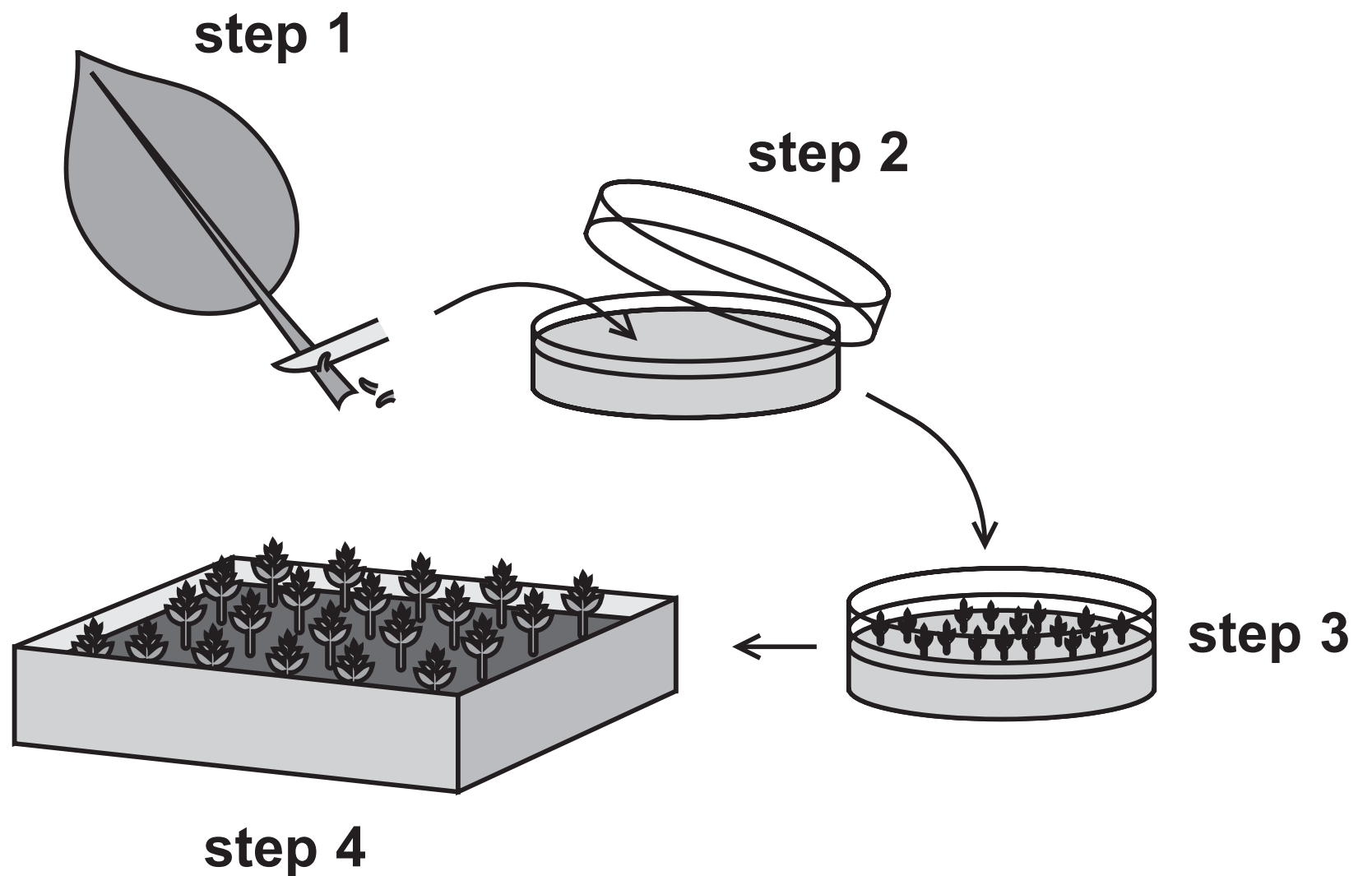
**(TOTAL FOR QUESTION 3 = 9 MARKS)**

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**(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)

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

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- (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)

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

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

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**(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)**

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

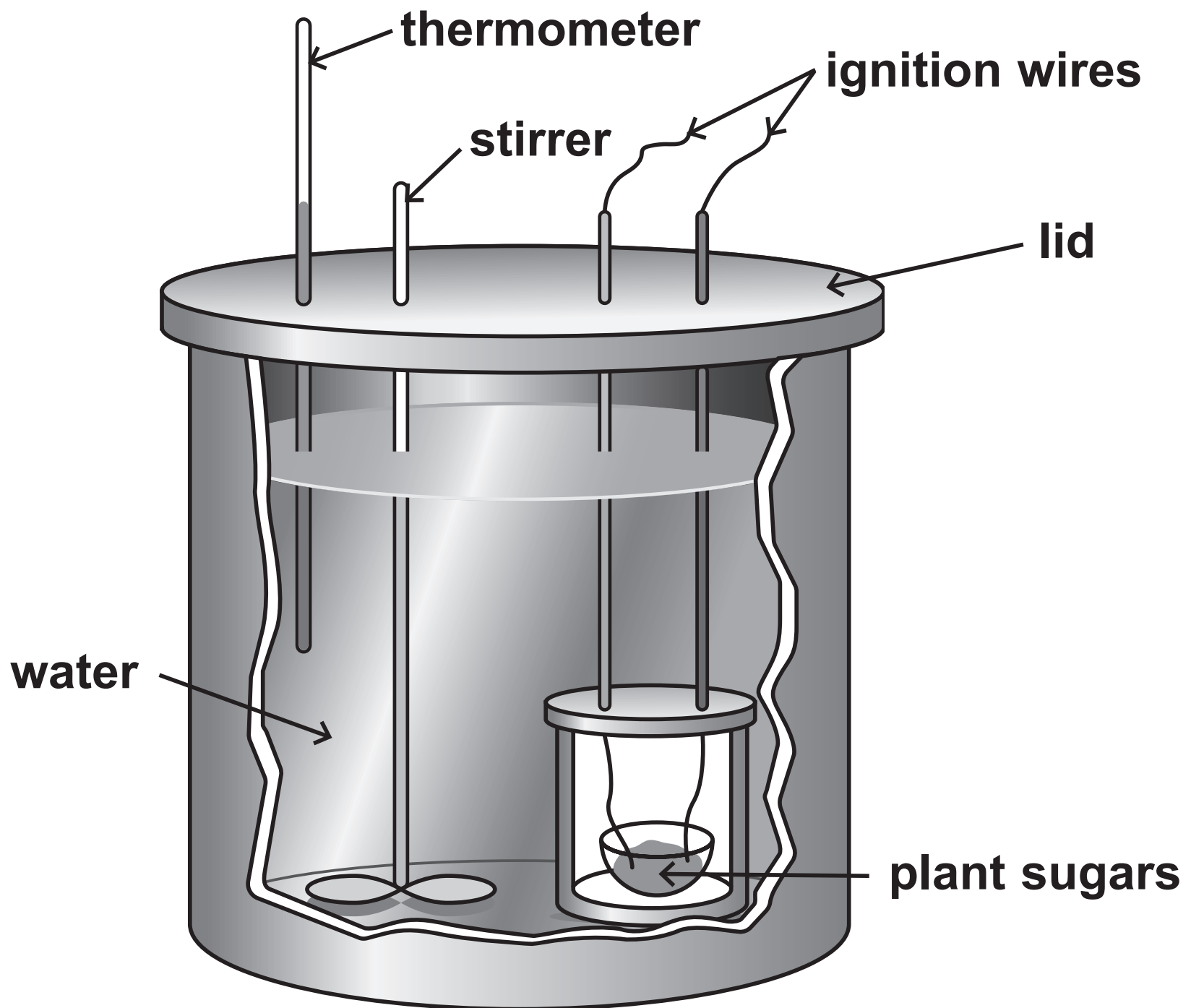


Figure 9

(Question continues on next page)

(Turn over)

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

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

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**(TOTAL FOR QUESTION 4 = 11 MARKS)**

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**(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)**

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**(Turn over)**



- (ii) From September 2013 to March 2014 there were 2830 cases of scarlet fever in the UK.

From September 2014 to March 2015 there were 5943 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.

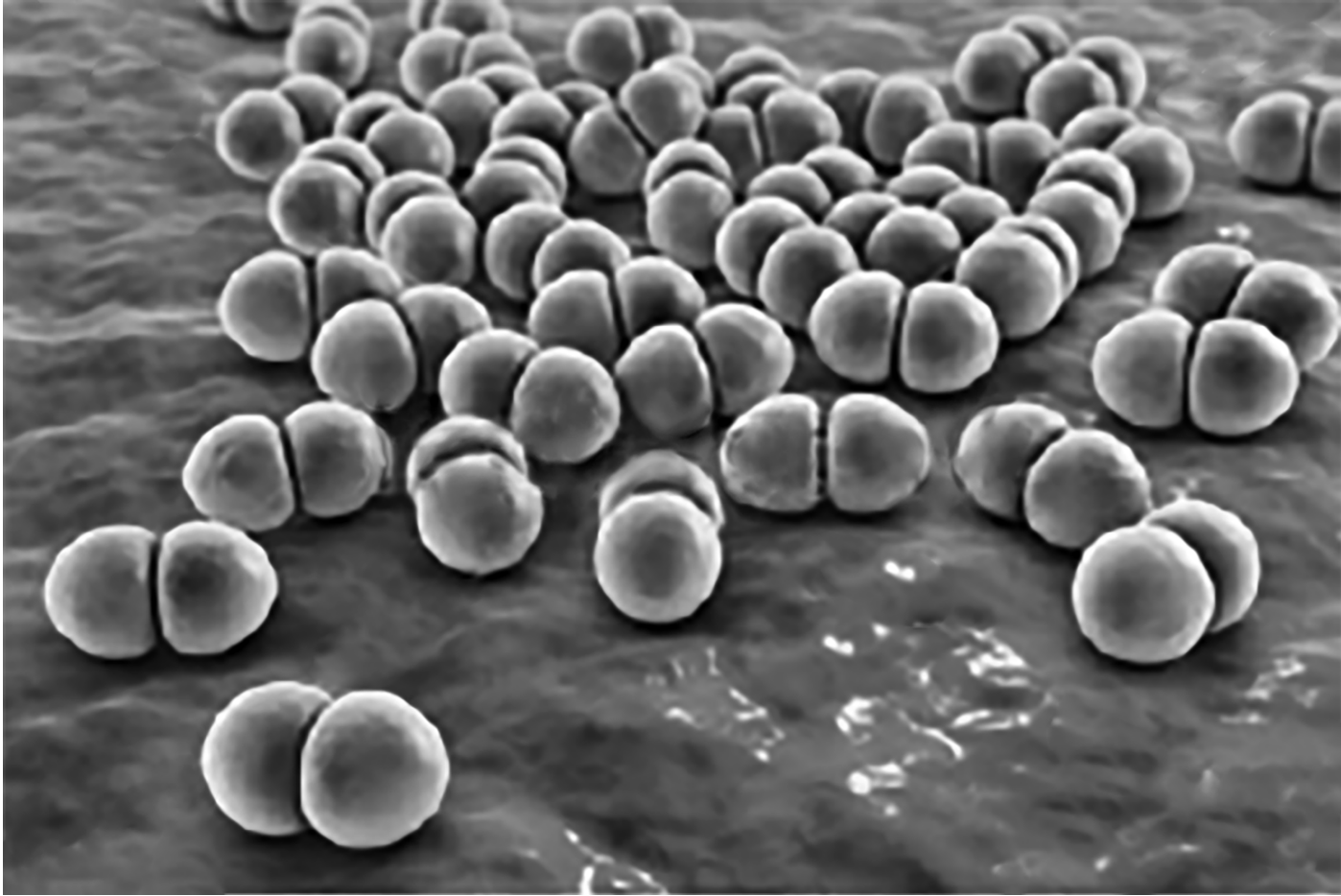


Figure 10

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.**

**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 volunteers
- ☐ **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

**(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)**

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**(TOTAL FOR QUESTION 5 = 9 MARKS)**

**(Questions continue on next page)**

**(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)

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

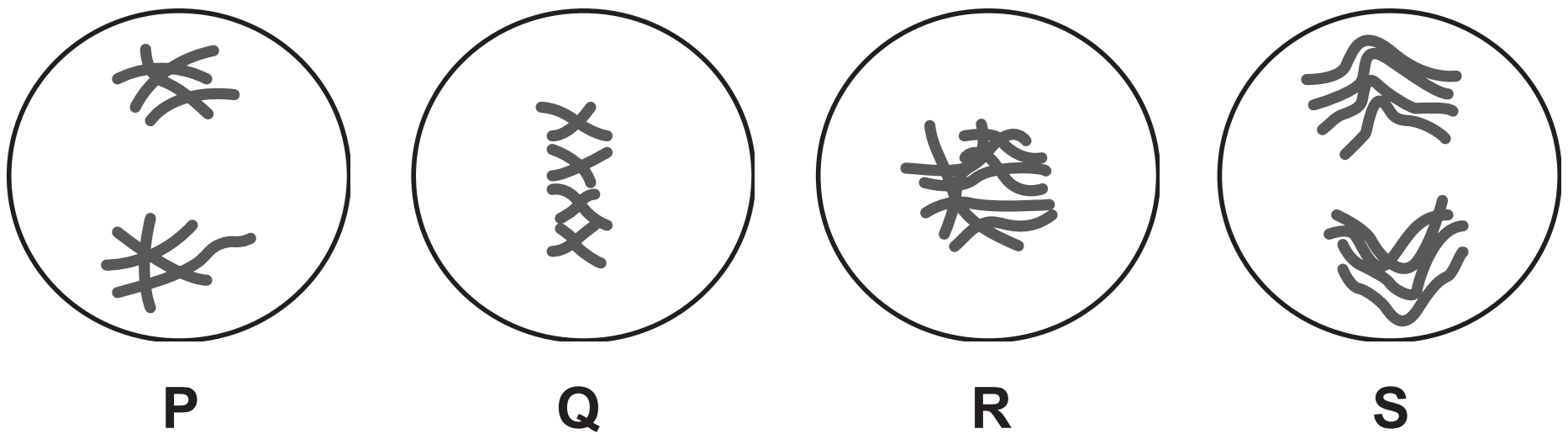


Figure 11

(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)

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

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

**(iii) Interphase is part of the cell cycle.**

**Describe what happens during interphase.  
(2 marks)**

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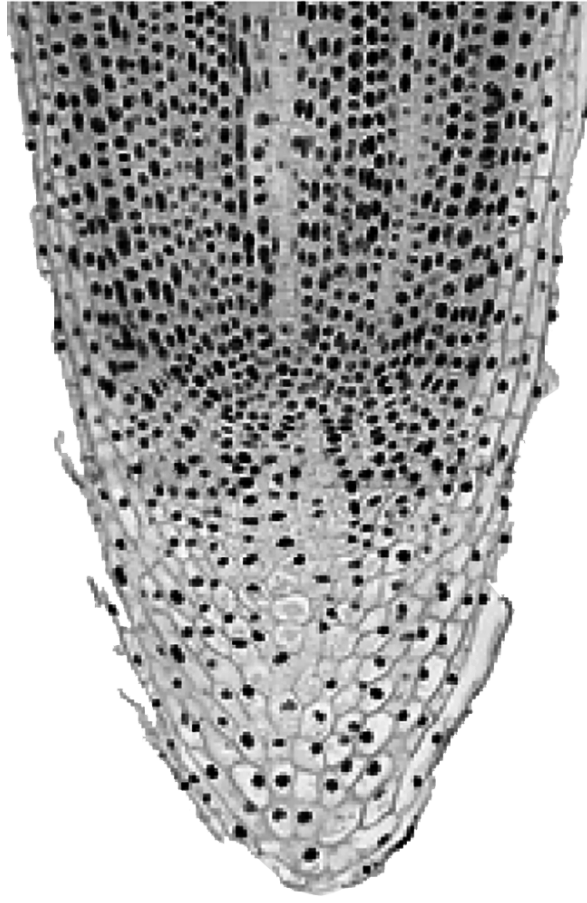
**(Question continues on next page)**

**(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)**

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

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**(TOTAL FOR QUESTION 6 = 9 MARKS)**

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

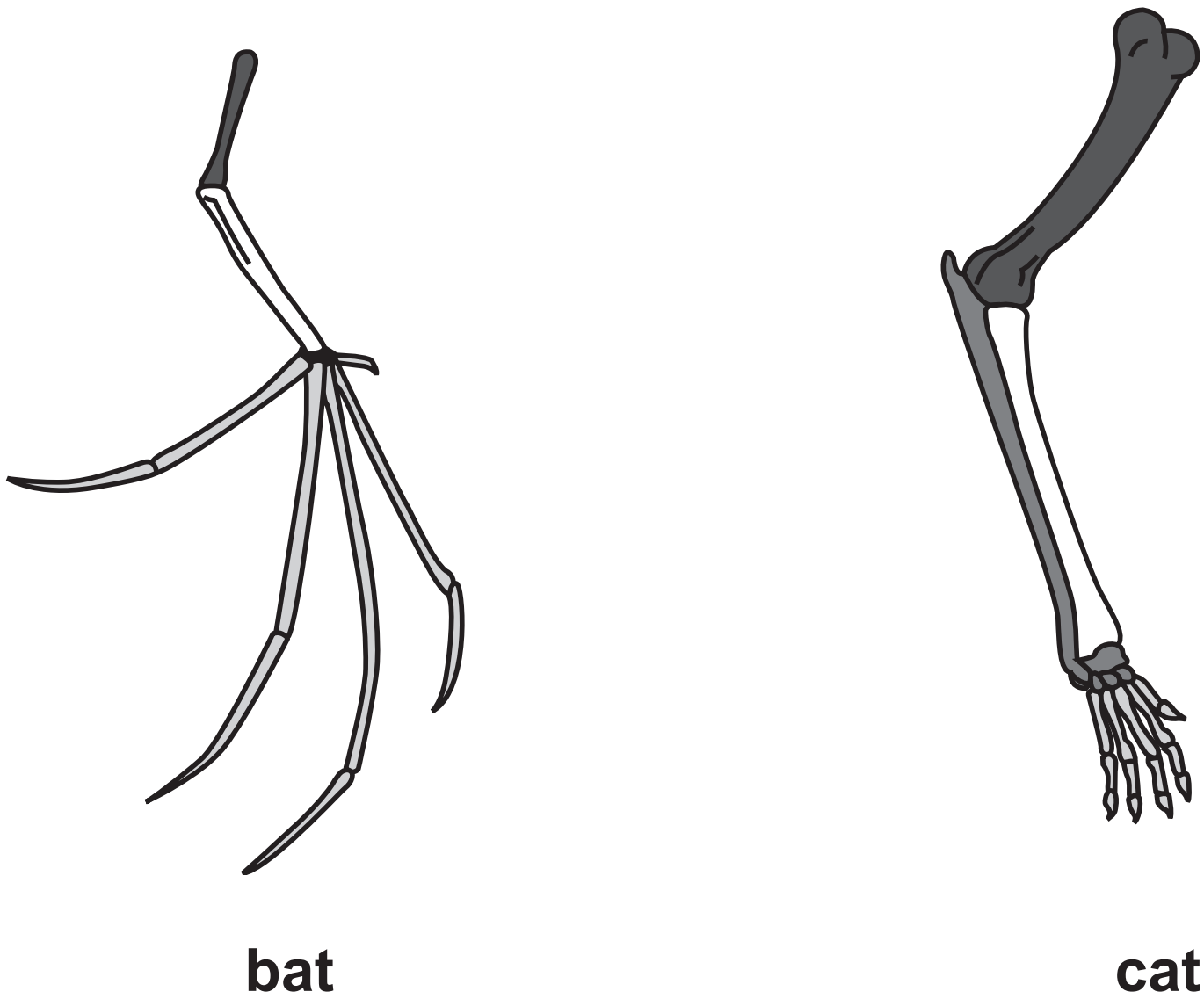


Figure 13

(Question continues on next page)

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

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- (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)

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**(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**

**(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)**

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(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.

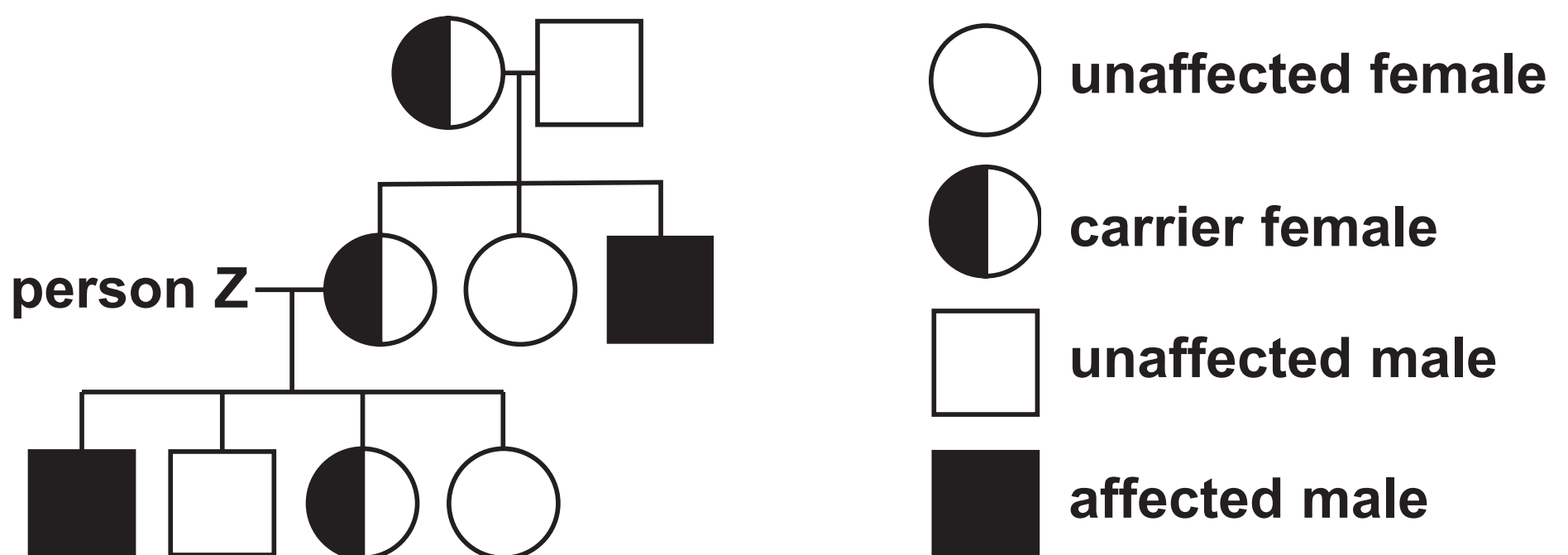


Figure 14

(Question continues on next page)



**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.

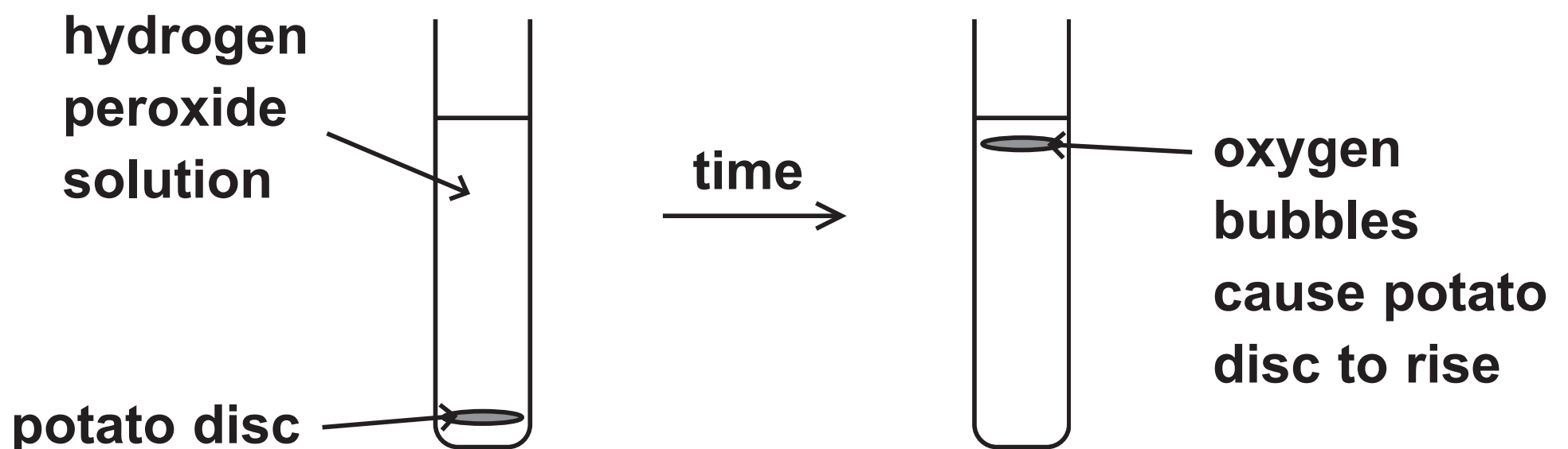


Figure 15

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**

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

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

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**(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)

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(Question continues on next page)

(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 ( $\text{s}^{-1}$ )
5	325	0.003
10	245	0.004
15	132	0.008
20	72	0.014

Figure 16

(Question continues on next page)

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

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**(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<sup>-1</sup>

- (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)

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**(TOTAL FOR QUESTION 8 = 12 MARKS)**

- 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)

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

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**(Turn over)**

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

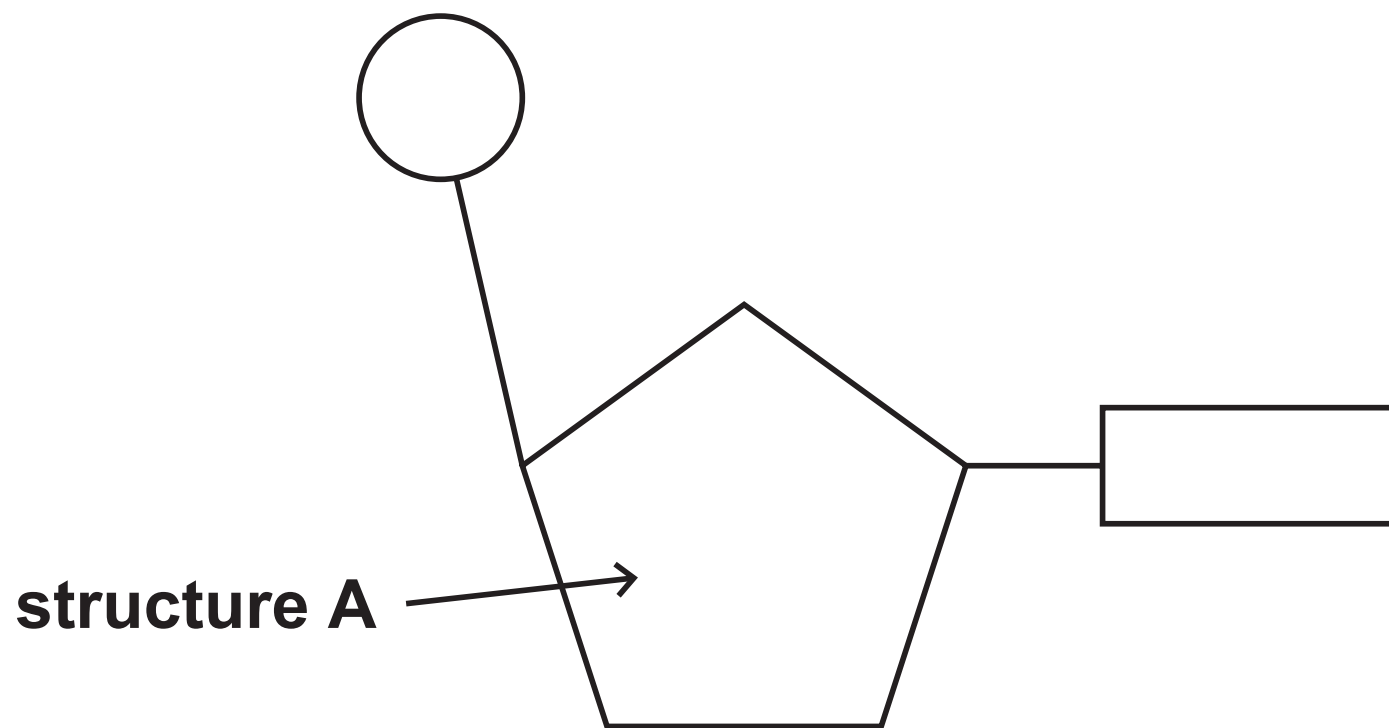


Figure 17

(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)**

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**(TOTAL FOR QUESTION 9 = 12 MARKS)**

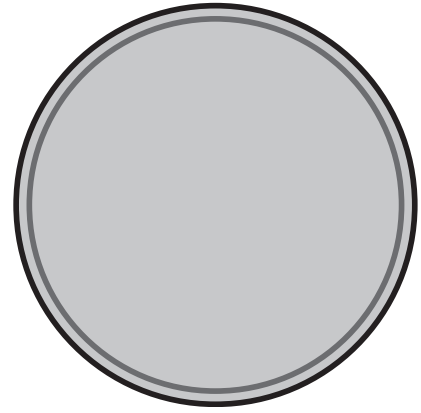
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**(Turn over)**

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

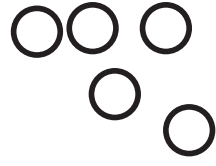
**Figure 18 shows the equipment the scientist can use.**



**agar plates**



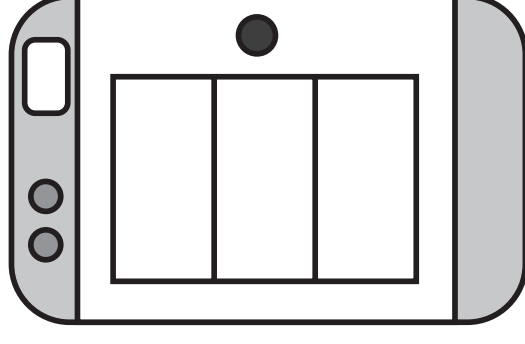
**two species  
of bacteria**



**filter discs of  
myxopyronin**



**spreader**



**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)

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

**Explain why the antibiotic myxopyronin can be used to treat bacterial infections in humans.**

**(4 marks)**

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**\*(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)**

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**(TOTAL FOR QUESTION 10 = 12 MARKS)**

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**TOTAL FOR PAPER = 100 MARKS**

**END**