OXFORD

INTERNATIONAL
AQA EXAMINATIONS

Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

INTERNATIONAL GCSE

BIOLOGY

Paper 2

Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:
- a ruler with millimetre measurements
- 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.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- There are 90 marks available on this paper.
- 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.

Advice

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

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	

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ANSWER IN THE SPACES PROVIDED

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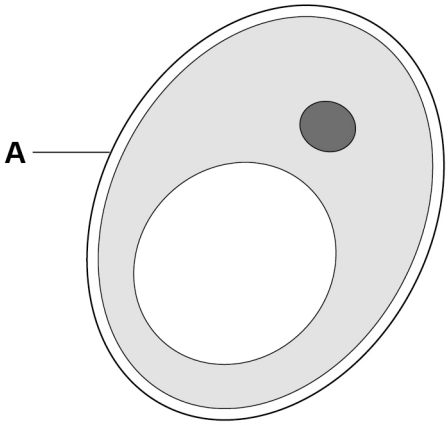
Answer **all** questions in the spaces provided.

0 1 Yeast is an example of a eukaryotic organism.

Figure 1 shows a yeast cell.

Figure 1



0 1 . 1 What is cell part **A**?

Tick (✓) **one** box.

[1 mark]

- Cell wall ☐
- Cytoplasm ☐
- Nucleus ☐
- Vacuole ☐

Question 1 continues on the next page

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0 1 . 2 Which parts of the cell release energy during respiration?

Tick (✓) **one** box.

[1 mark]

Chloroplasts ☐

Mitochondria ☐

Ribosomes ☐

Yeast cells can respire **anaerobically**.

0 1 . 3 Complete the word equation for anaerobic respiration in yeast.

Choose the answer from the box.

[1 mark]

ethanol	**glycerol**	**starch**	**urea**

glucose ⟶ _____ + carbon dioxide

0 1 . 4 What does anaerobic mean?

[1 mark]

_____

_____

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Yeast is used in some types of bread making because it produces carbon dioxide. The more carbon dioxide the yeast produces the more the bread increases in volume.

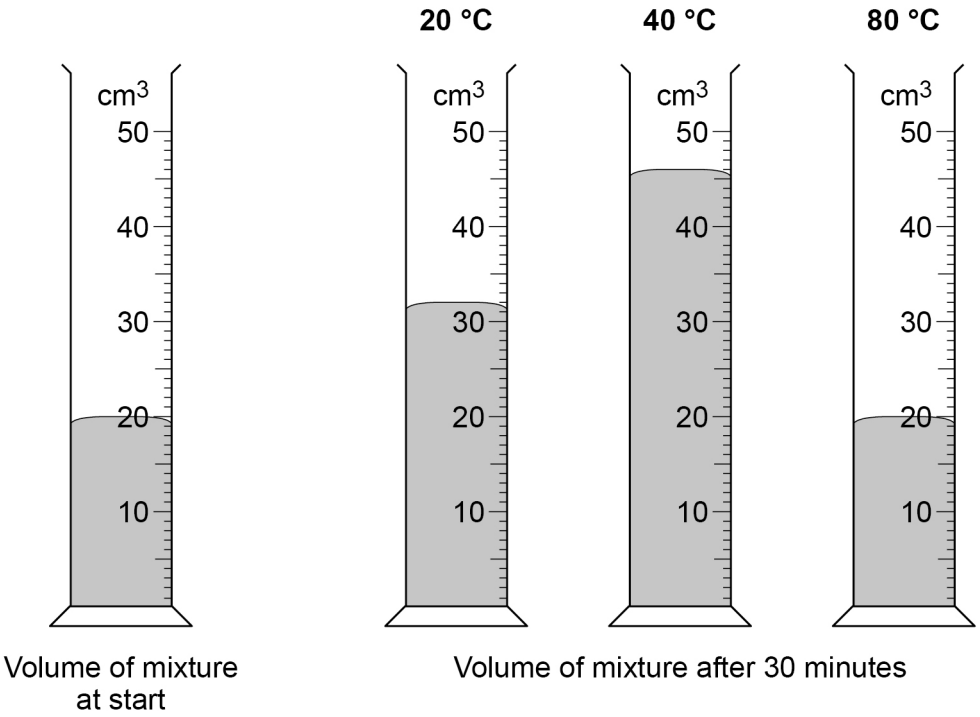
A student investigated the effect of temperature on the production of carbon dioxide by yeast.

This is the method used.

1. Make a bread mixture from flour, water, yeast and sugar.
2. Put 20 cm^3 of the mixture into each of three measuring cylinders.
3. Leave each measuring cylinder at a different temperature for 30 minutes.
4. Record the volume of the mixture in each measuring cylinder after 30 minutes.

Figure 2 shows the results.

Figure 2



0 1 . 5 Calculate the increase in the volume of mixture at 40 °C.

[2 marks]

Question 1 continues on the next page

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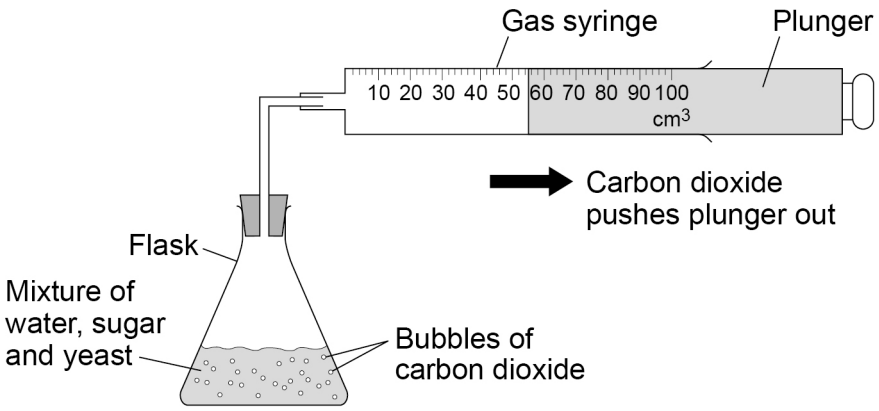
0 1 . 6 Give the reason why the volume of the mixture did **not** increase at 80 °C.

[1 mark]

Another student used a different method to investigate the effect of temperature on the production of carbon dioxide by yeast.

Figure 3 shows the apparatus used.

Figure 3



0 1 . 7 How could the student control the temperature of the mixture in the flask?

[1 mark]

Do not write outside the box

0 1 . 8 Give the measurements the student will need to make to calculate the rate of carbon dioxide production.

[3 marks]

0 1 . 9 Yeast can also respire **aerobically**.

Complete the sentence to give **one** way in which aerobic respiration is different from anaerobic respiration.

Choose the answer from the box.

[1 mark]

carbon	**energy**	**oxygen**	**glucose**

Aerobic respiration releases more _____ than anaerobic respiration.

12

Turn over for the next question

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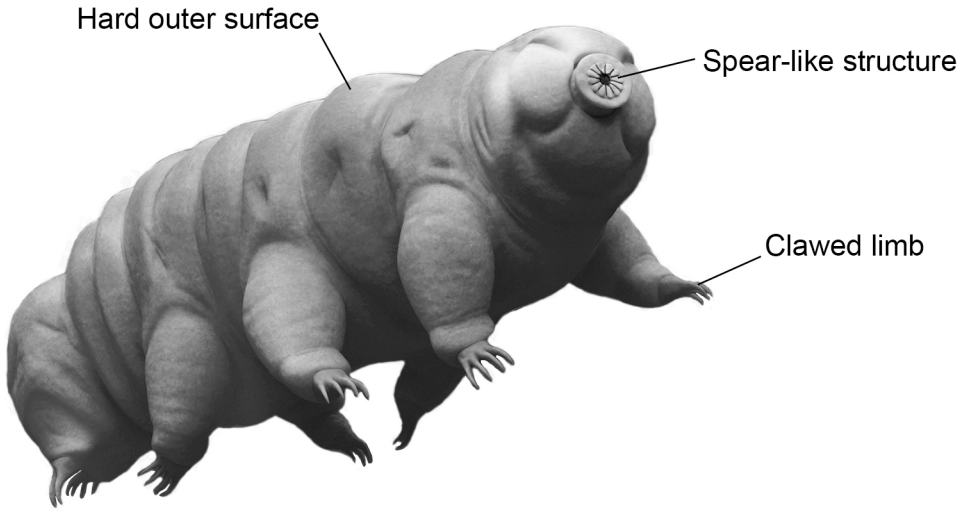
0 2 A tardigrade is a very small animal. Some tardigrades feed on the cell contents of plants.

Figure 4 shows a tardigrade and some features which help it survive.

Figure 4



0 2 . 1 Draw **one** line from each feature to the description of how the feature helps the tardigrade survive.

[2 marks]

Feature	**How the feature helps the tardigrade survive**
Hard outer surface	To grip onto plants
Spear-like structure	To pierce cell walls to feed
Clawed limb	To protect from physical damage

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0 2 . 2 Tardigrades can survive in extremely cold and dry conditions.

In extreme conditions, tardigrades have the following adaptations:

1. Produce a waxy layer to cover their body surface.
2. Curl up into a tiny ball.
3. Are light enough to be carried by the wind.

Describe how each adaptation helps the tardigrade to survive.

You should give a different reason for each adaptation.

[3 marks]

Adaptation 1 _____

_____

Adaptation 2 _____

_____

Adaptation 3 _____

_____

0 2 . 3 Tardigrades can reproduce both sexually and asexually.

During asexual reproduction, the female produces offspring from eggs which have not been fertilised.

Give **one** advantage to the female if she does **not** need to find a mate.

[1 mark]

_____

_____

Question 2 continues on the next page

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Drought is a long period of time without rainfall.

0 2 . 4 Scientists have identified a gene in the tardigrade which gives it drought-resistance.

Describe how the gene could be removed from a tardigrade and used to genetically engineer a drought-resistant plant.

[4 marks]

0 2 . 5 Name a technique which could be used to quickly produce large numbers of the genetically engineered plants.

[1 mark]

0 2 . 6 Drought is a worldwide problem affecting crop production.

Give **two** advantages of producing drought-resistant plants.

[2 marks]

Advantage 1

Advantage 2

13

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0 3 Most cells are too small to see without a microscope.

Figure 5 shows the viewing power of the eye, the light microscope and the electron microscope.

Figure 5

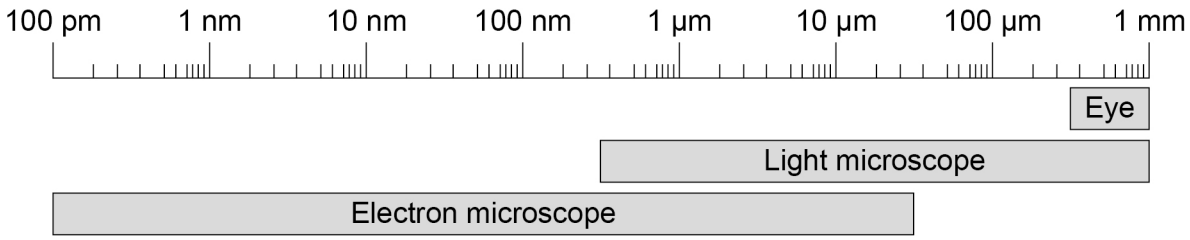


Table 1 shows the approximate size of five specimens that a scientist observed.

Table 1

Specimen	Approximate size
Bacterial cell	3 µm
Chloroplast	8 µm
Frog egg	1 mm
Virus	100 nm
White blood cell	12 µm

0 3 . 1 Which specimen in **Table 1** would be visible **without** a microscope?

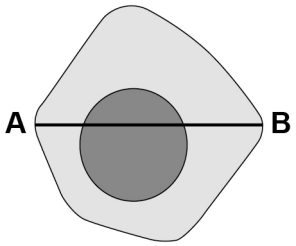
[1 mark]

0 3 . 2 Which specimen in **Table 1** would **only** be visible with an electron microscope?

[1 mark]

Figure 6 shows a skin cell magnified 800 times using a light microscope.

Figure 6



0 3 . 3 The width of a skin cell is shown by the line **A** to **B** on the image in **Figure 6**.

Calculate the real width of the skin cell.
Use the formula:

$$\text{Magnification} = \frac{\text{size of image}}{\text{size of real object}}$$

Give your answer in micrometres (μm).
1000 μm = 1 millimetre (mm).

[5 marks]

Real width of skin cell = _____ μm

0 3 . 4 Skin cells contain many ribosomes.

Suggest why ribosomes are **not** visible in **Figure 6**.

[1 mark]

Question 3 continues on the next page

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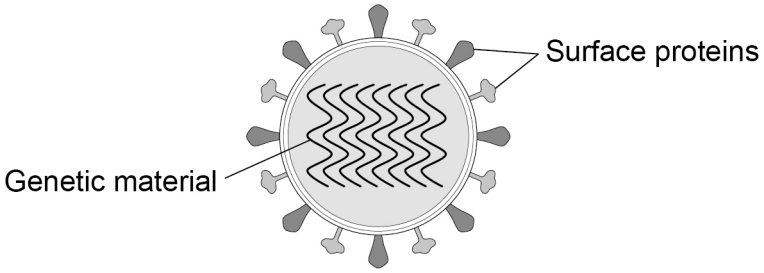
Figure 7 shows the structure of a virus which causes influenza in humans.

Figure 7



Vaccination is the best way to prevent infection from the influenza virus.

0 3 . 5 Vaccination of a large proportion of the population will help to protect those who are not vaccinated.

Give a reason why.

[1 mark]

0 3 . 6 People must be vaccinated with a new vaccine each year to prevent infection from influenza.

Explain why a new vaccine is used each year.

[3 marks]

12

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0 4 . 1 Digestive enzymes break down insoluble molecules into smaller, soluble molecules.

Name **two insoluble** molecules digested by enzymes.

Choose the answers from the box.

[2 marks]

amino acid	**fat**	**fatty acid**	**glucose**	**protein**

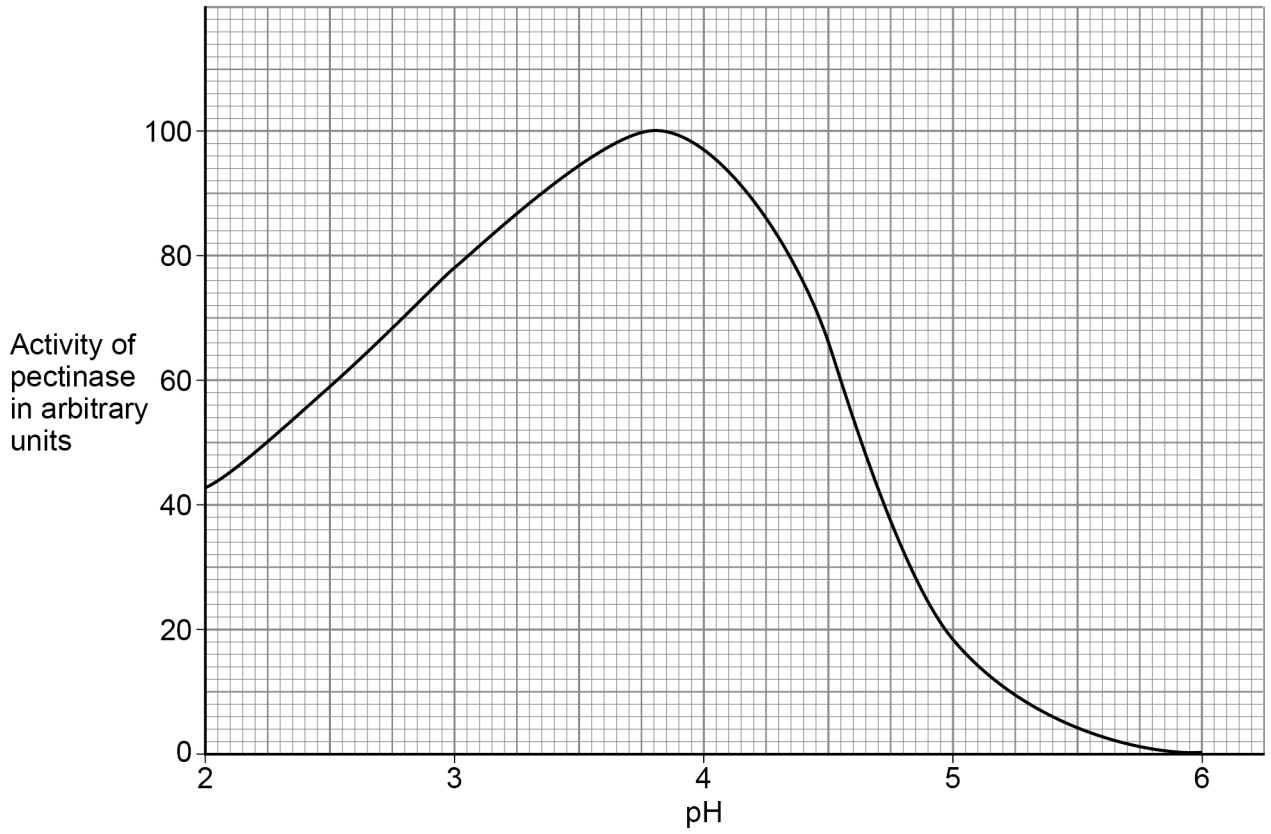
1 _____

2 _____

Pectinase is an enzyme which breaks down pectin. Pectin is found in the cell walls of plants.

Figure 8 shows the effect of pH on the activity of pectinase.

Figure 8



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0 4 . 2 What is the optimum pH for pectinase?

[1 mark]

0 4 . 3 Explain why pectinase does **not** work at pH 6.

[3 marks]

Tomatoes become softer as they ripen. Softening is partly due to the action of pectinase.

Scientists have produced a genetically modified (GM) tomato plant which produces tomatoes that take longer to ripen.

Scientists compared the rate at which non-GM tomatoes and GM tomatoes ripened. This is the method used.

1. Select 10 non-GM tomatoes and 10 GM tomatoes.
2. Measure the height of each tomato.
3. Place a 500 g mass on top of each tomato.
4. Measure the distance each tomato flattens by.
5. Repeat step 4 at regular time intervals for 20 days.

0 4 . 4 Explain why it was important to control the temperature of the investigation.

[2 marks]

Question 4 continues on the next page

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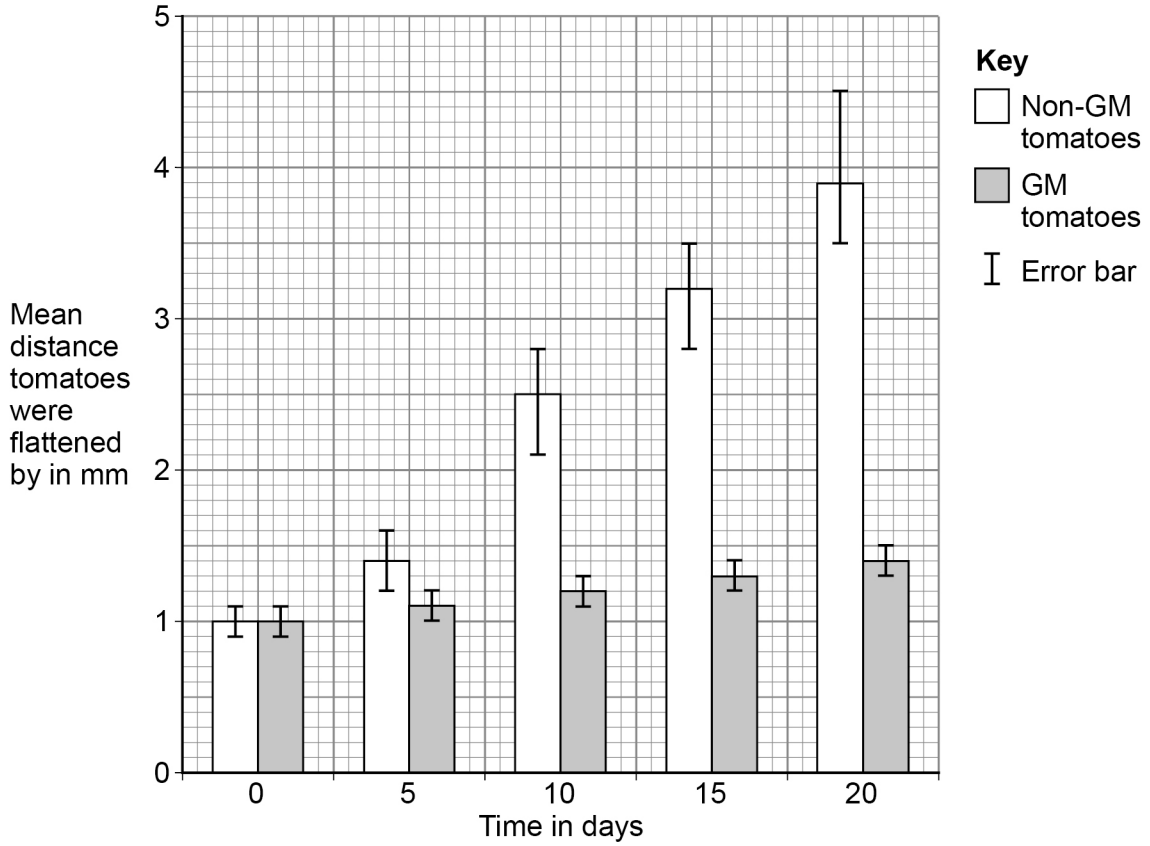
Figure 9 shows the results.

Figure 9



0 4 . 5 What time interval did the scientists use to measure the tomatoes?

[1 mark]

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0 4 . 6 The scientists concluded that GM tomatoes ripen more slowly than non-GM tomatoes.

Describe how the results support this conclusion.

Use data from **Figure 9**.

[2 marks]

0 4 . 7 The error bars on **Figure 9** show the spread of results about the mean.

Explain what the error bars show about the precision of the results.

[2 marks]

13

Turn over for the next question

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0 5 Gregor Mendel carried out breeding experiments with pea plants from 1856 to 1863.

0 5 . 1 Mendel thought that characteristics were controlled by 'inherited factors'.

What are these 'inherited factors' now called?

[1 mark]

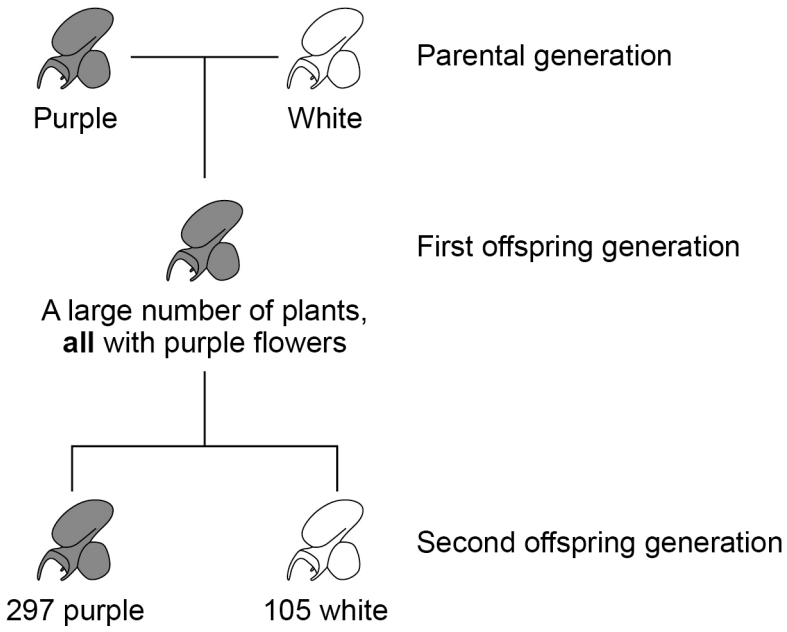
0 5 . 2 Mendel published his results in 1866, but his ideas were ignored until the early 1900s.

Suggest **one** reason why people did not accept Mendel's ideas in 1866.

[1 mark]

Figure 10 shows results from a breeding experiment by Mendel.

Figure 10



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0 5 . 3 The allele for white flower colour is recessive.

Describe how **Figure 10** shows that a recessive allele causes white flower colour.

[2 marks]

0 5 . 4 Mendel predicted the ratio of purple flowers to white flowers in the second generation in **Figure 10**.

Draw a genetic diagram for a cross between two pea plants from the first generation.

Use the following symbols:
A = dominant allele for purple flower
a = recessive allele for white flower

Give the phenotypes of all the offspring in your diagram.

[3 marks]

0 5 . 5 Give the predicted ratio for purple flowers to white flowers in the second generation.

Use information from your answer to Question **5.4**.

[1 mark]

Ratio = _____ : 1

Question 5 continues on the next page

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0 5 . 6 In Mendel's breeding experiment there were 297 purple flowers and 105 white flowers in the second generation.

Calculate the actual ratio Mendel achieved.
Give your answer to 3 significant figures.

[3 marks]

Ratio of purple flowers : white flowers = _____ : 1

0 5 . 7 Actual ratios rarely match predicted ratios in breeding experiments.

Suggest why.

[1 mark]

Plants with purple flowers can be heterozygous or homozygous.

0 5 . 8 What does heterozygous mean?

[1 mark]

0 5 . 9 Describe a cross between two pea plants that would determine whether a purple-flowered plant was homozygous or heterozygous for flower colour.

[2 marks]

15

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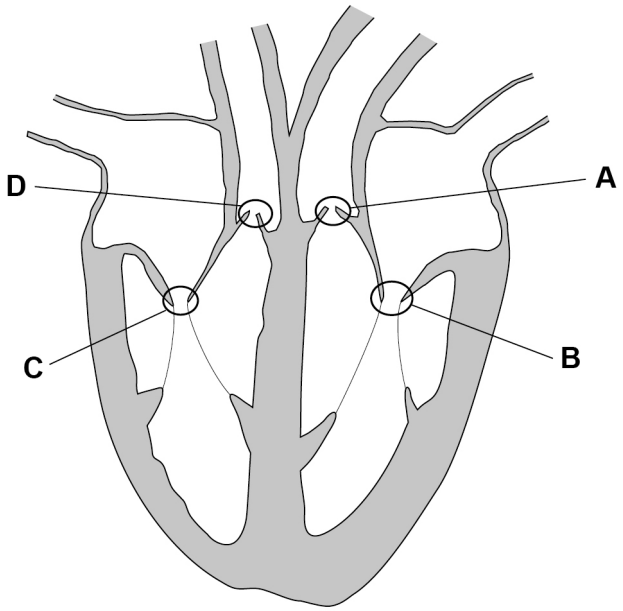
0 6 **Figure 11** shows the human heart.

Figure 11



0 6 . 1 What is the main type of tissue found in the wall of the heart?

[1 mark]

0 6 . 2 Draw arrows on **Figure 11** to show the direction that oxygenated blood from the lungs takes through the heart.

[2 mark]

0 6 . 3 Structures **A**, **B**, **C** and **D** are valves.

Which valve opens when the blood pressure in the right ventricle is greater than the blood pressure in the pulmonary artery?

Write the correct letter in the box. ☐

[1 mark]

Question 6 continues on the next page

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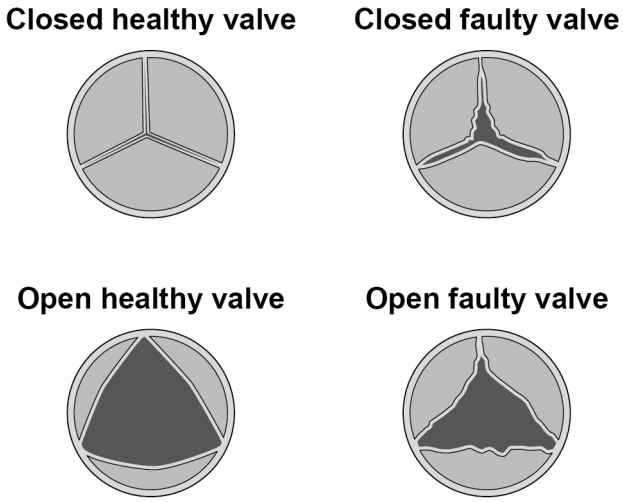
Figure 12 shows a healthy valve and a faulty valve.

Figure 12



0 6 . 4 Describe **two** possible effects that a faulty valve can have on the functioning of the heart.

[2 marks]

1 _____

_____

2 _____

_____

0 6 . 5 Explain why a person with a faulty heart valve can feel very tired.

[4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

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0 6 . 6 Doctors can replace a faulty heart valve with either a mechanical or biological valve.

Mechanical valves
Mechanical valves are made from artificial material and can last 20 to 30 years. All patients must take medication to prevent blood clots forming.

Biological valves
Biological valves are made from animal tissue and may wear out after 10 to 15 years. A third of patients may require medication to prevent blood clots forming.

An operation is needed to replace the valve. During the operation the patient's chest is opened and the patient's blood goes through a bypass machine.

In a new procedure a biological valve is inserted inside the existing faulty valve. The valve is attached to a stent. The stent is inserted into a blood vessel in the leg and is pushed through the blood vessel to the heart.

A 60-year-old patient has a faulty heart valve.
The doctor recommends the new procedure.

Evaluate the doctor's recommendation.

[6 marks]

16

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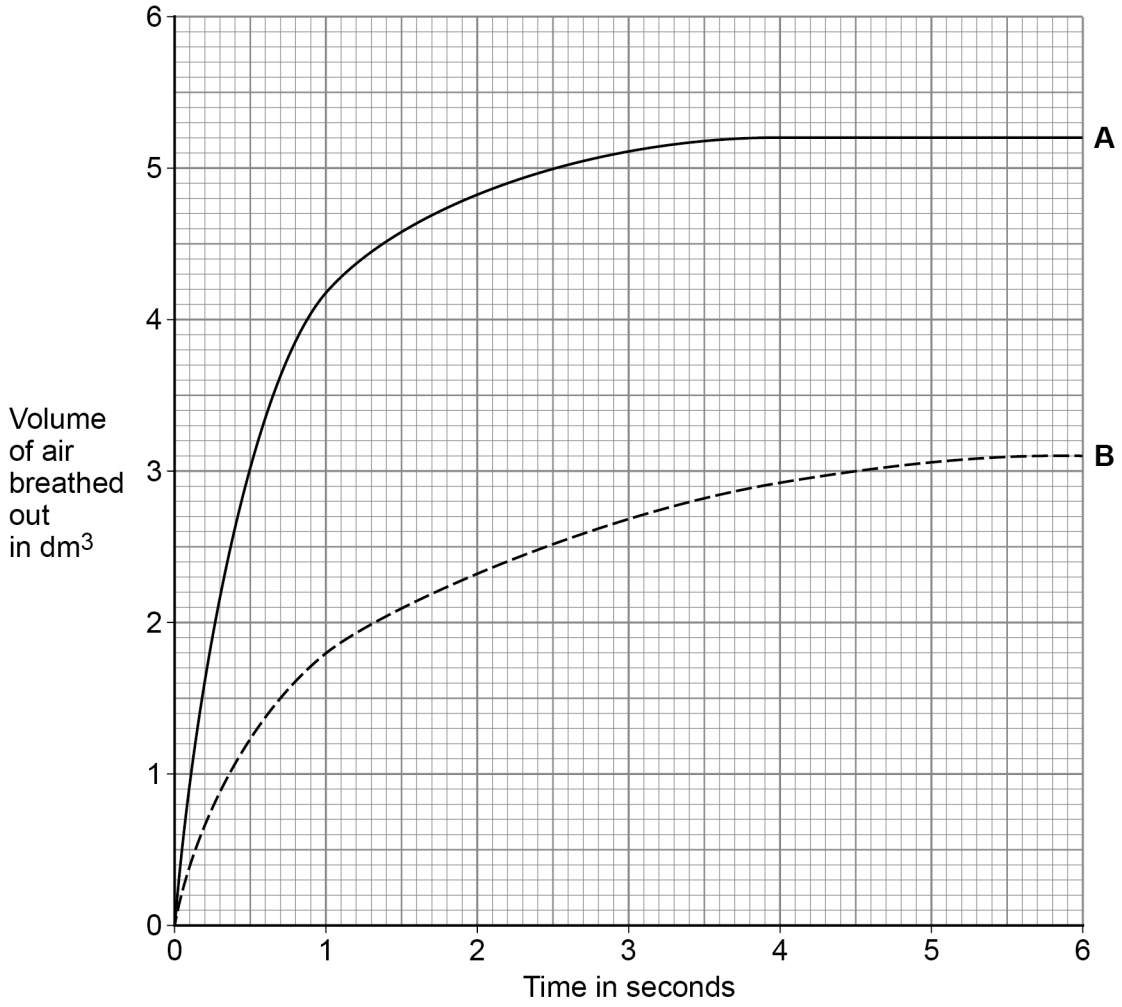
0 7 Doctors can use a device called a spirometer to measure the volume of air breathed out by a patient.

Figure 13 shows the results from two patients, **A** and **B**.

Figure 13



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0 7 . 1 Lung function is assessed using two volumes, **X** and **Y**, from the spirometer readings.

X is the volume of air breathed out in the first second.
Y is the total volume of air breathed out.

Complete **Table 2** for patient **B**.

[3 marks]

Table 2

Patient	X in dm^3	Y in dm^3	X ÷ Y
A	4.19	5.20	0.81
B			

0 7 . 2 Patient **B** has asthma.

Patient **B** was given a drug which widens the bronchioles.

Draw a line on **Figure 13**, on the opposite page, to show the predicted results for patient **B after** using the drug.

[1 mark]

Question 7 continues on the next page

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0 7 . 3 Asthma causes breathing difficulties, known as asthma attacks.

A swimming instructor thinks that swimming can reduce the number of asthma attacks and improve lung function in young people.

Design an investigation to test the instructor's idea.

[5 marks]

9

END OF QUESTIONS

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