OCR
Oxford Cambridge and RSA

Tuesday 16 May 2023 – Morning

GCSE (9–1) Combined Science (Biology) A (Gateway Science)

J250/01 Paper 1 (Foundation Tier)

Time allowed: 1 hour 10 minutes

F

You must have:
- a ruler (cm/mm)

You can use:
- a scientific or graphical calculator
- an HB pencil

Please write clearly in black ink. **Do not write in the barcodes.**

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

First name(s) _____

Last name _____

INSTRUCTIONS
- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. If you need extra space use the lined pages at the end of this booklet. The question numbers must be clearly shown.
- Answer **all** the questions.
- Where appropriate, your answer should be supported with working. Marks might be given for using a correct method, even if your answer is wrong.

INFORMATION
- The total mark for this paper is **60**.
- The marks for each question are shown in brackets **[ ]**.
- Quality of extended response will be assessed in questions marked with an asterisk (*).
- This document has **24** pages.

ADVICE
- Read each question carefully before you start your answer.

Section A

You should spend a **maximum** of **20 minutes** on this section.

Write your answer to each question in the box provided.

1 Which of these substances is transported **out** of the human body as waste?

A Blood

B Food molecules

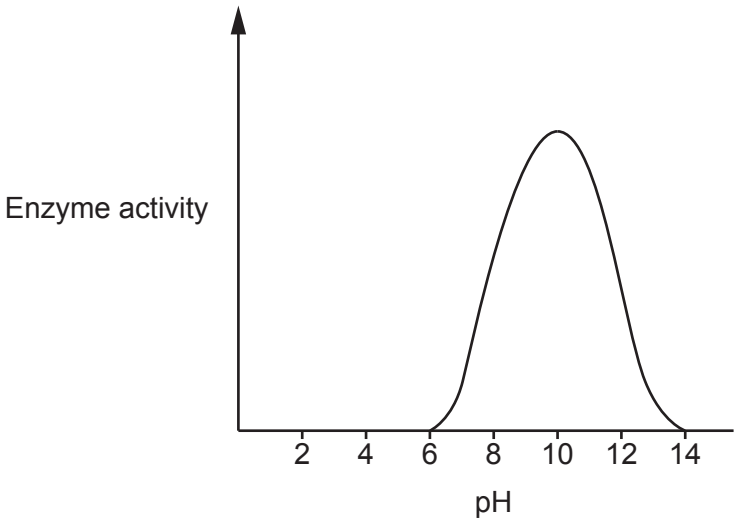
C Oxygen

D Urea

Your answer ☐ **[1]**

2 The graph shows the effect of pH on enzyme activity.

What is the pH when enzyme activity is **highest**?



A pH 2

B pH 6

C pH 10

D pH 14

Your answer ☐ **[1]**

3 Which term describes cells that have the ability to differentiate into **all** types of body cells?

A Adult stem cells

B Bone marrow stem cells

C Embryonic stem cells

D Skin stem cells

Your answer ☐ **[1]**

4 Which cell size in the table is the **mode**?

Cell	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Size (mm)	0.4	0.3	0.4	0.5	0.3	0.3	0.6	0.5	0.3

A 0.3 mm

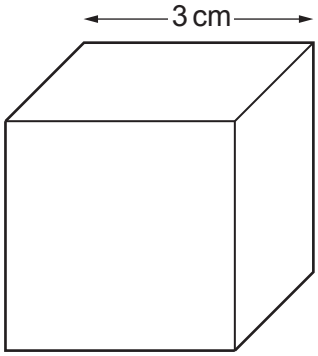
B 0.4 mm

C 0.5 mm

D 0.6 mm

Your answer ☐ **[1]**

5 A student uses a cube to model the size of an organism.



not to scale

Which row shows the correct calculation of the surface area to volume ratio?

	Surface area (cm^2)	**Volume (cm^3)**	**SA:V ratio**
A	6	27	2:9
B	9	27	1:3
C	54	27	2:1
D	162	27	6:1

Your answer ☐ **[1]**

6 Which sentence describes **one** correct adaptation of phloem?

A They are made of dead cells.

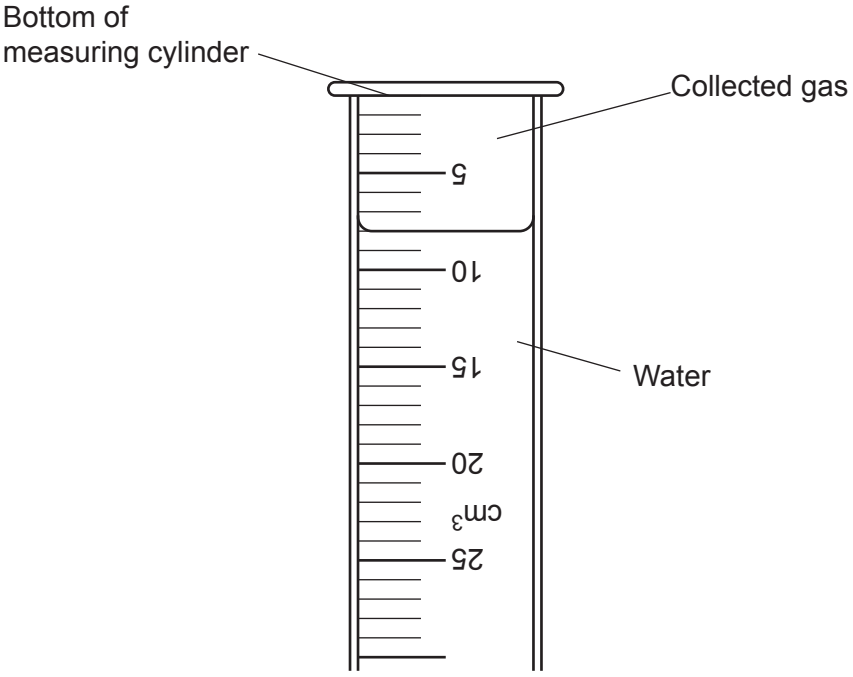
B They contain large amounts of cytoplasm.

C They have a thick cell wall.

D They have sieve plates with holes in.

Your answer ☐ **[1]**

7 The diagram shows the volume of gas collected during an enzyme reaction in an upside down measuring cylinder.



What is the volume of collected gas in the measuring cylinder?

A 6 cm^3

B 8 cm^3

C 12 cm^3

D 14 cm^3

Your answer ☐ **[1]**

8 What is the function of FSH in the female body?

A It causes the eggs to mature.

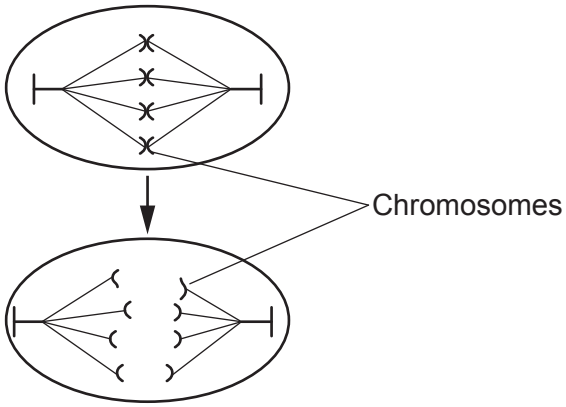
B It inhibits the release of progesterone.

C It maintains the uterus lining.

D It prevents pregnancy.

Your answer ☐ **[1]**

9 Which stage of the cell cycle is represented by the diagram?



A Differentiation of cell

B DNA replication

C Growth of cell

D Movement of chromosomes

Your answer ☐ **[1]**

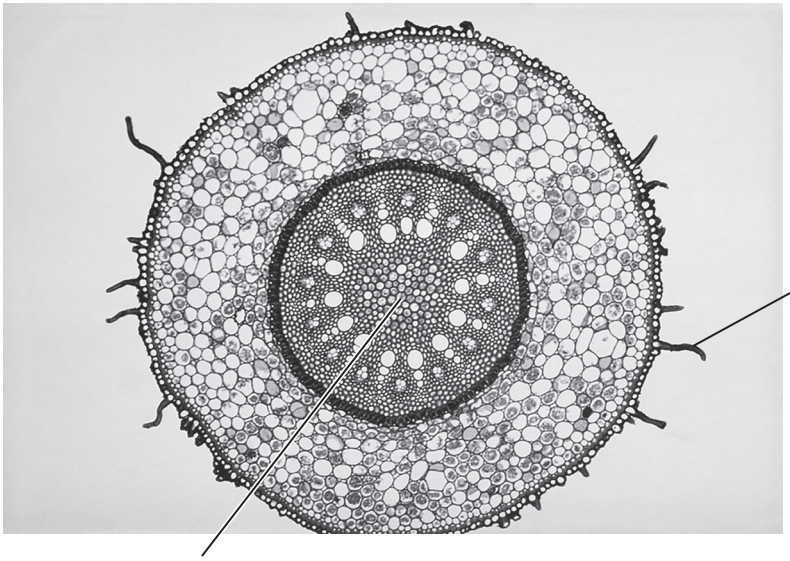
10 Which method of contraception is the **most** effective?

Method of contraception	Females who became pregnant while using the method of contraception (%)
A	1
B	8
C	9
D	18

Your answer ☐ **[1]**

Section B

11 (a) The photograph shows a cross section of a root seen under a light microscope.



(i) Complete each sentence about root hair cells. Use words from the list.

active transport	**glucose**	**mineral ions**
osmosis	**surface area**	**volume**

Root hair cells take in water and ..... from the soil.

Water is taken in by the process of ..... .

For more efficient uptake, the root hair cell has a large ..... .

[3]

(ii) Water moves from the root hair cells into the transport cells of the roots.

Describe how water travels to the leaves of the plant from the roots.

.....

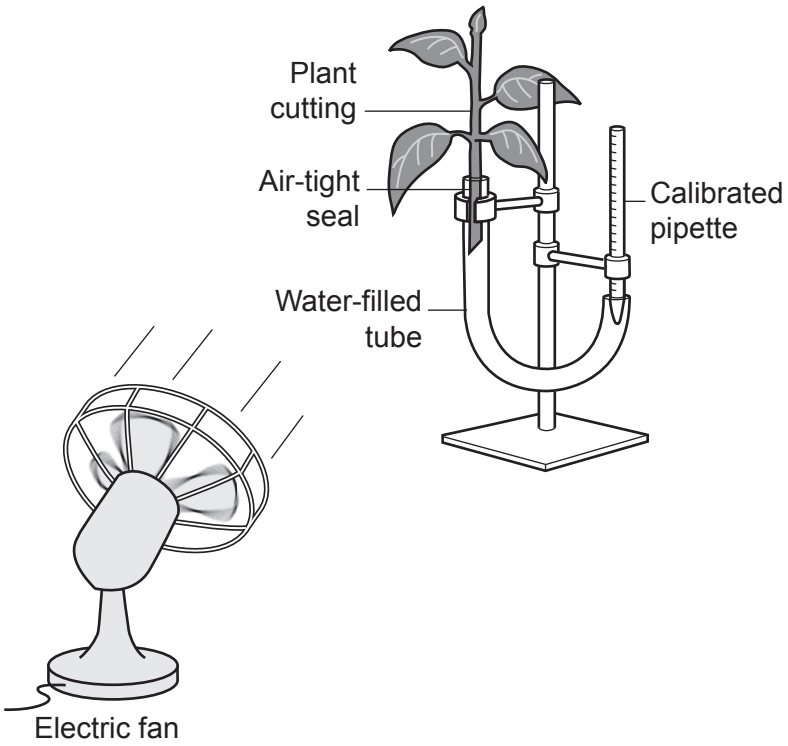
.....

.....

..... **[2]**

(b) A student investigates the effect of air movement on the rate of water uptake using a plant cutting.

The diagram shows the apparatus they use.



This is the method they follow:

- Measure the level of water in the calibrated pipette.
- Switch on the fan and record the level of water again after 25 minutes.
- Repeat investigation with the fan switched off.

The table shows their results.

	Level of water in calibrated pipette (cm^3)		
	At the start	**After 25 minutes**	**Change in level**
Electric fan switched on	20	8	12
Electric fan switched off	22	16	

(i) Describe the effect of air movement on water uptake.

.....

..... **[1]**

(ii) Calculate the rate of water uptake when the fan is **switched off**.

Give your answer to **1** significant figure.

Rate of water uptake = ... cm^3 / min **[3]**

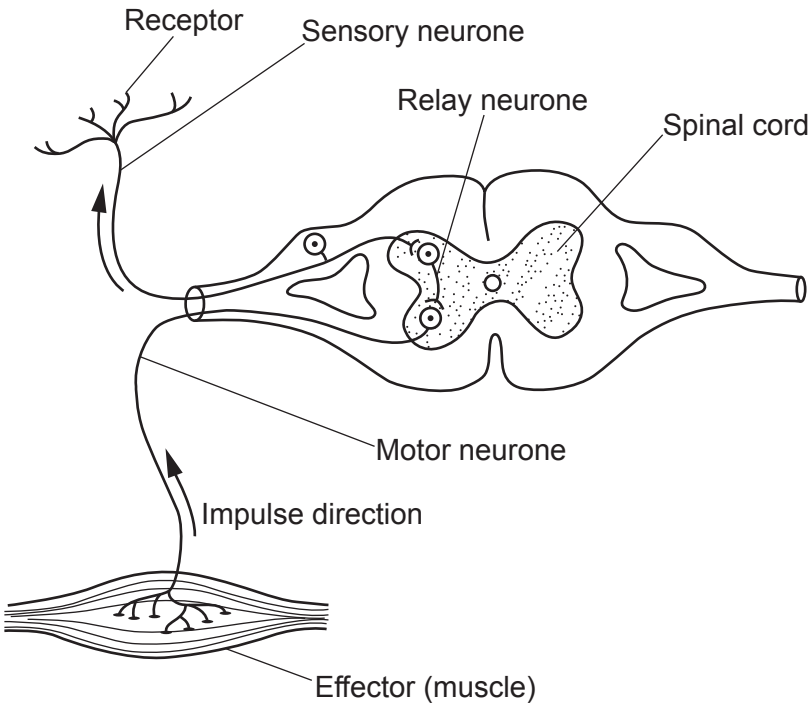
(iii) Suggest **one** way the student could now investigate the effect of light intensity on water uptake.

.....

..... **[1]**

12 (a) A student draws and labels a diagram of a reflex arc.

The diagram shows their labelled drawing.



(i) What mistake has the student made in their drawing?

Tick (✓) **one** box.

Labelling the effector as muscle instead of the receptor. ☐

The arrows showing impulse direction should point downwards. ☐

The relay neurone should connect the spinal cord to the effector. ☐

The sensory neurone and motor neurone labels have been swapped. ☐

[1]

(ii) The spinal cord coordinates nervous responses.

Which **other** part of the central nervous system coordinates responses?

..... **[1]**

(b) The body is also controlled by the endocrine system.

Complete the table to show **two** differences between the nervous system and the endocrine system.

	Nervous system	**Endocrine system**
How message is sent	electrical impulses	..... messengers called hormones
How message travels around body	along neurones	in the .....

[2]

(c) Oestrogen and testosterone are both hormones.

Write down **one** role of oestrogen and **one** role of testosterone in the body.

Oestrogen .....

.....

Testosterone .....

.....

[2]

(d) A person with type 1 diabetes tests their blood sugar level before they eat any food.

The diagram shows their results. The units for blood sugar level are mmol / l.

The person then compares their results with the information in this table.

	Blood sugar level (mmol / l)
too low	<4
healthy target	4–7
too high	>7

Explain why the person will need to take insulin.

.....

.....

.....

..... **[2]**

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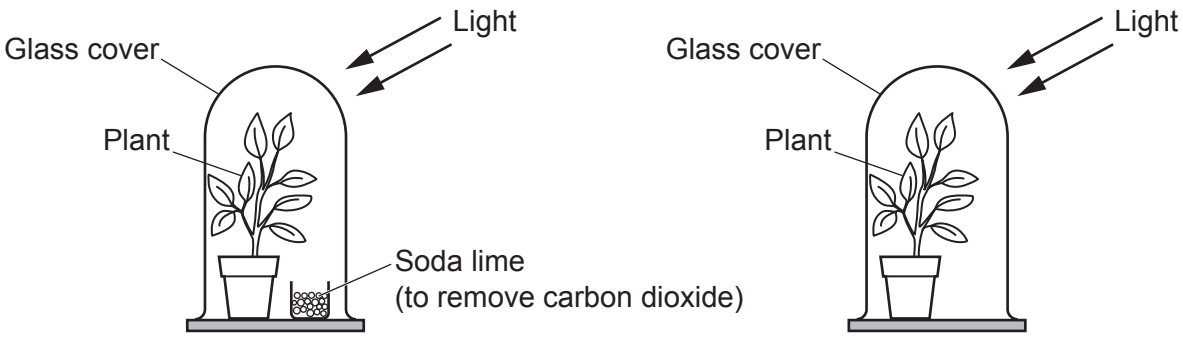
13 (a) **Fig. 13.1** shows the apparatus used to prove that carbon dioxide is needed for photosynthesis.

Fig. 13.1



(i) Describe how this apparatus and iodine solution are used to prove that carbon dioxide is needed for photosynthesis.

.....

.....

.....

..... **[2]**

(ii) What is the expected result for this experiment?

Result for **Plant A** .....

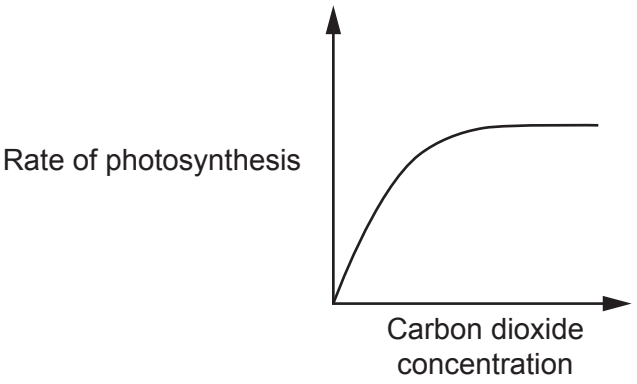
Result for **Plant B** .....

[1]

(b) (i) A student then investigates the effect of changing the carbon dioxide concentration on the rate of photosynthesis.

Fig. 13.2 is a sketch of the expected results.

Fig. 13.2



Describe the pattern in the graph.

.....

..... **[1]**

(ii) What is the dependent variable for this investigation?

..... **[1]**

(c) Oxygen is one product of photosynthesis. The other product of photosynthesis is a monomer.

This monomer is then used to make a polymer. The polymer is then used as an energy store by the plant.

Name the monomer and polymer.

Monomer .....

Polymer .....

[2]

14 (a) **Fig. 14.1** is a diagram of a healthy heart. **Fig. 14.2** shows a heart with a defect.

Fig. 14.1

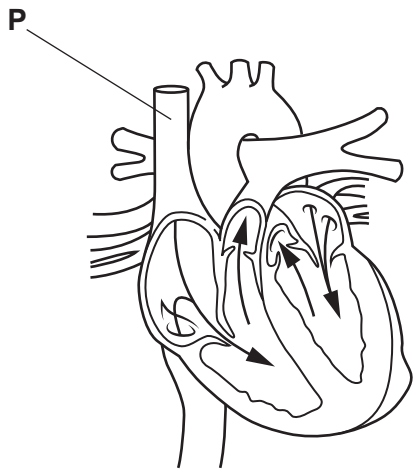
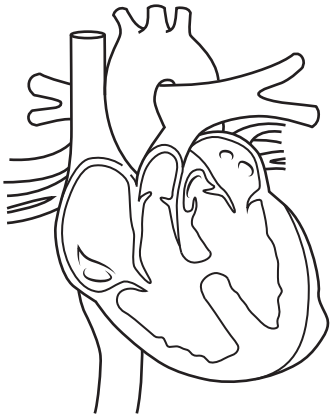


Fig. 14.2



(i) Identify the blood vessel labelled **P** in **Fig. 14.1**.

Put a (ring) around the correct answer.

aorta **pulmonary artery** **pulmonary vein** **vena cava**

[1]

(ii)* Describe the heart defect shown in **Fig. 14.2**.
Explain how this defect would affect oxygen transportation around the body.

Include the names of the chambers affected by the defect.

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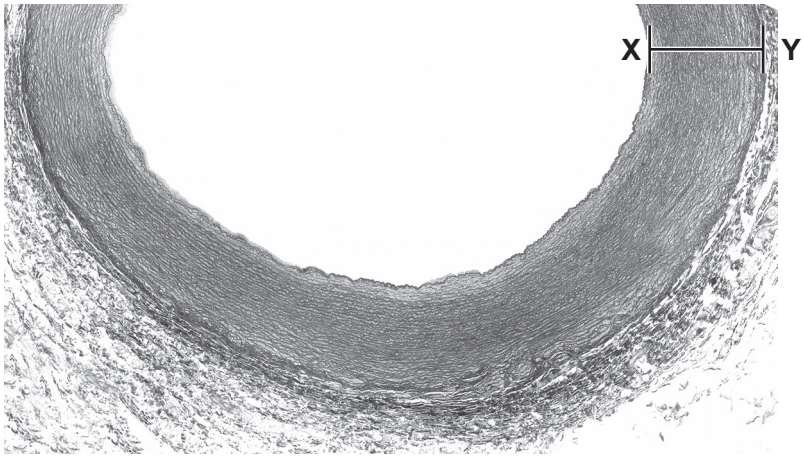
..... **[6]**

(b) The photograph shows part of an artery seen using a light microscope.

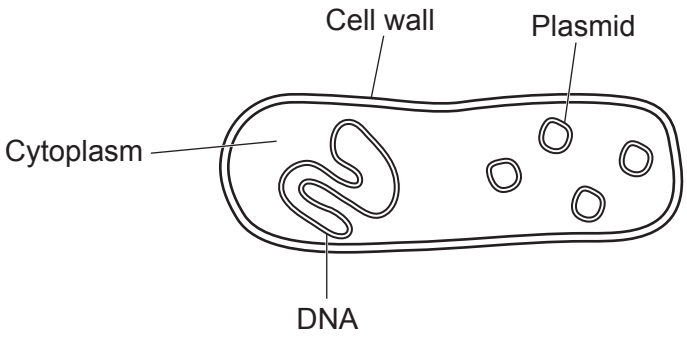


The actual thickness of the wall at **X–Y** is 2 mm.

Calculate the magnification of the image.

Magnification = × ..... **[2]**

15 The diagram shows a prokaryotic cell.



(a) Which structure labelled in the diagram would **not** be found in a eukaryotic plant cell?

Tick (✓) **one** box.

Cell wall ☐

Cytoplasm ☐

DNA ☐

Plasmid ☐

[1]

(b) Prokaryotic cells are much smaller than most eukaryotic plant cells.

Explain why an electron microscope is used to view smaller prokaryotic cells instead of a light microscope.

.....

.....

..... **[2]**

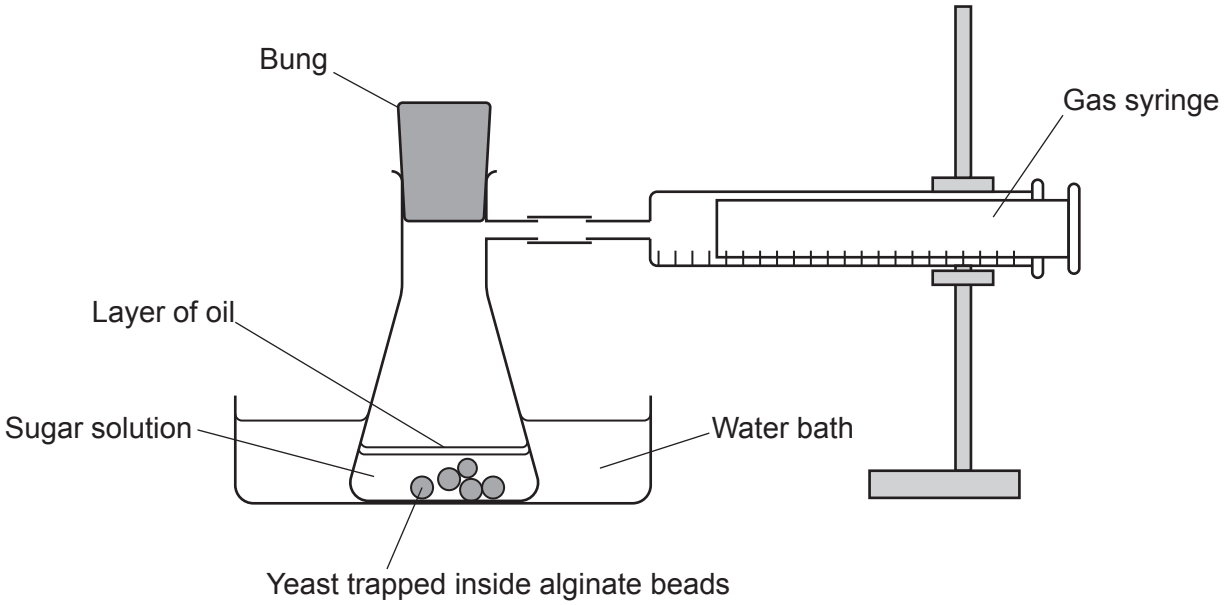
(c) Some prokaryotic cells contain chlorophyll in their cytoplasm.

Where is chlorophyll found inside eukaryotic plant cells?

..... **[1]**

16 A scientist investigates the effect of temperature on anaerobic respiration in yeast.

The diagram shows the apparatus they use.



This is the method they follow:

- Collect the gas produced by the yeast for five minutes.
- Increase the temperature of the water bath.
- Repeat the investigation with fresh sugar solution.
- Do each temperature three times.

(a) (i) Suggest why the scientist used fresh **sugar** solution each time.

.....

..... **[1]**

(ii) Identify **one** variable the scientist should keep constant throughout the experiment.

Tick (✓) **one** box.

Number of alginate beads ☐

Position of the gas syringe at the start ☐

Temperature of the water bath ☐

Volume of gas collected ☐

[1]

(iii) Which gas is collected by the scientist in the gas syringe?

..... **[1]**

(b) The table shows the scientist's results.

Temperature of water bath (°C)	Volume of gas collected (cm^3)			
	Trial 1	**Trial 2**	**Trial 3**	**Mean**
15	5	6	6	6
25	14	16	16	15
35	23	26	24	24
45	1	3	2	2
55	6	1	1	1

(i) When calculating the mean for 55 °C, they did **not** include Trial 1.

Give the reason why.

..... **[1]**

(ii) Plot the mean values from the table on the graph. **[3]**

(iii) Draw a curve of best fit. **[1]**

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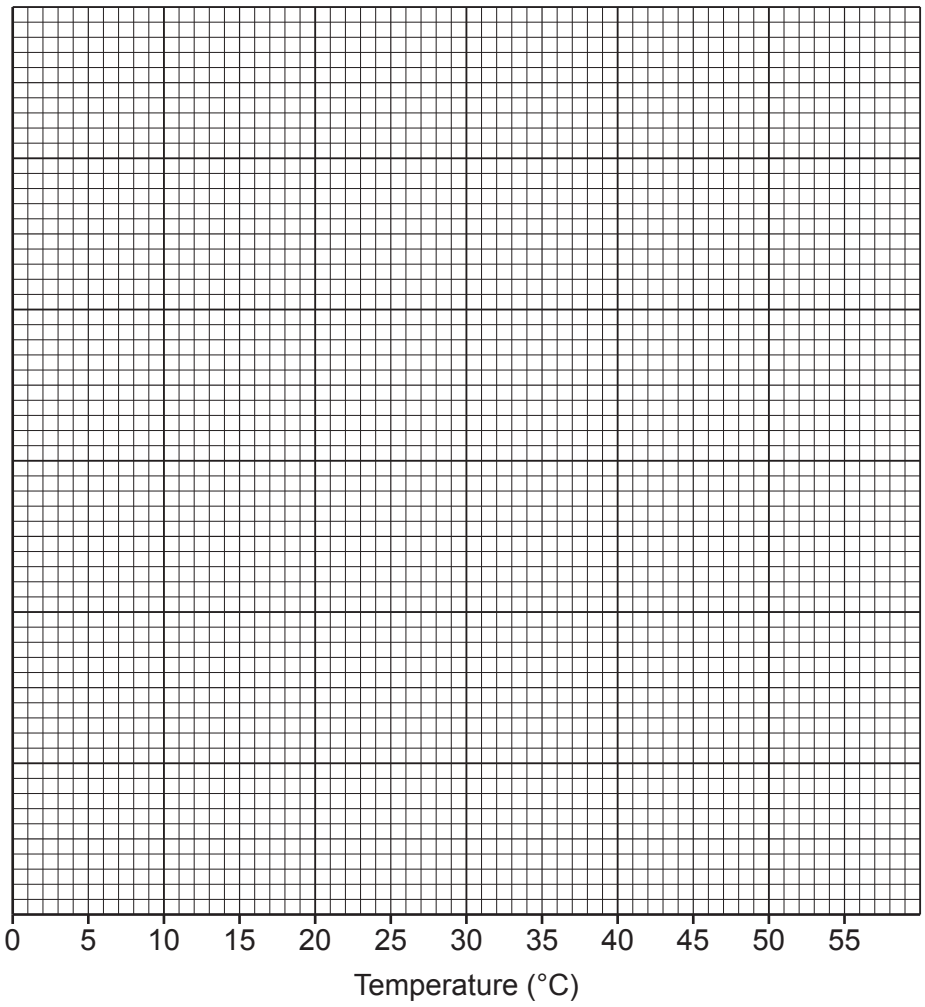

(iv) Anaerobic respiration is an enzyme-controlled reaction.

Explain the results between **15 °C and 35 °C**.
Include ideas about enzyme particles.

.....

.....

.....

..... **[2]**

(v) The scientist concludes that the best temperature for anaerobic respiration is approximately 40 °C.

How could they alter their investigation to identify a more **accurate** temperature?

.....

.....

..... **[2]**

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).