OCR
Oxford Cambridge and RSA

Friday 10 May 2024 – Morning

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

J250/07 Biology (Higher Tier)

Time allowed: 1 hour 10 minutes

H

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 The table shows some information about insulin in the body.

Which row shows the correct information about insulin?

	Organ that produces insulin	Type of signal	Target organ
A	liver	chemical	pancreas
B	liver	electrical	pancreas
C	pancreas	chemical	liver
D	pancreas	electrical	liver

Your answer ☐ **[1]**

2 The length of a bacteria cell is 5.3 μm.

What is the length of this cell in **mm**?

(1 mm = 1000 μm)

A 5.3×10^{-6}

B 5.3×10^{-3}

C 5.3×10^{3}

D 5.3×10^{6}

Your answer ☐ **[1]**

3 What are two characteristics of a cell membrane?

A Non-selective barrier and contains plasmids

B Non-selective barrier and contains receptors

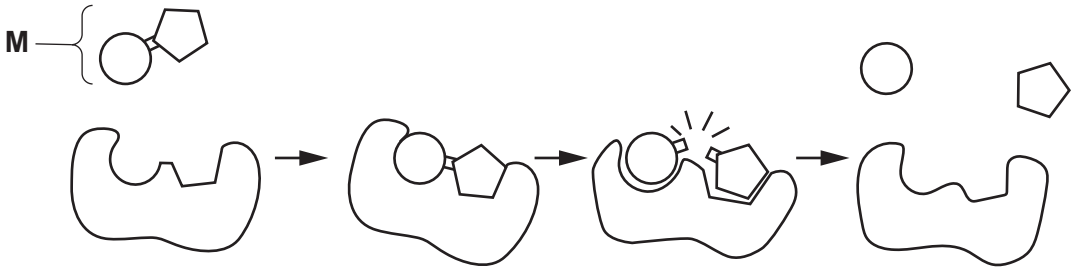
C Selective barrier and contains plasmids

D Selective barrier and contains receptors

Your answer ☐ **[1]**

4 The diagrams show stages in the hypothesis used to explain the mechanism of enzyme action.

Which term describes the molecule labelled **M**?



A Active site

B Enzyme

C Lock and key

D Substrate

Your answer ☐ **[1]**

5 What is a difference between embryonic stem cells and adult stem cells?

A Adult stem cells are less likely to be rejected when used in transplants.

B Only embryonic stem cells can differentiate.

C Only embryonic stem cells produce a full range of different cell types.

D There are more ethical issues in the use of adult stem cells.

Your answer ☐ **[1]**

6 The resolution of a microscope is limited to **half** the wavelength of light used to see the image.

Our eyes only detect light with a wavelength greater than 400 nm.

What is the approximate resolution of a light microscope?

(1000 nm = 1 μm)

A <0.2 μm

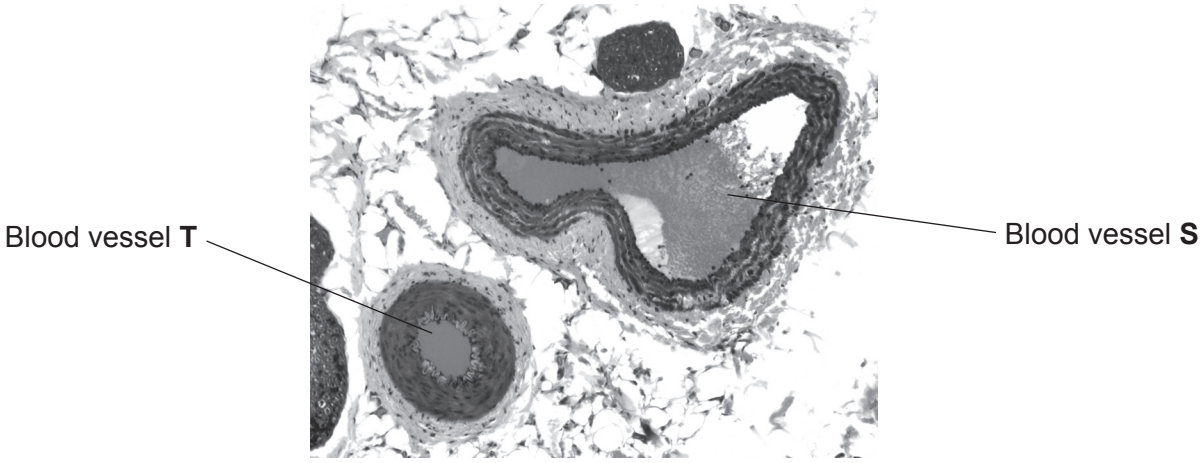
B ~0.2 μm

C ~0.4 μm

D >0.4 μm

Your answer ☐ **[1]**

7 The photograph shows two different blood vessels.



Which statement about these blood vessels is correct?

A Blood flows through blood vessel **T** at a slower rate.

B Blood vessel **S** has a thinner muscular wall.

C Blood vessel **T** has a larger lumen diameter.

D Both blood vessels transport blood to the heart.

Your answer ☐ **[1]**

8 The table shows some information about respiration.

Which row is correct about anaerobic respiration in fungi?

	Products	**Site of reaction**	**Endothermic or Exothermic**
A	carbon dioxide and ethanol	mitochondria	endothermic
B	lactic acid and water	cytoplasm	exothermic
C	carbon dioxide and ethanol	cytoplasm	exothermic
D	lactic acid and water	mitochondria	endothermic

Your answer ☐ **[1]**

9 Which statement correctly compares mitosis and DNA replication in eukaryotic cells?

A Only DNA replication is part of the cell cycle.

B Only DNA replication occurs inside sub-cellular structures.

C Only mitosis is needed to produce new cells.

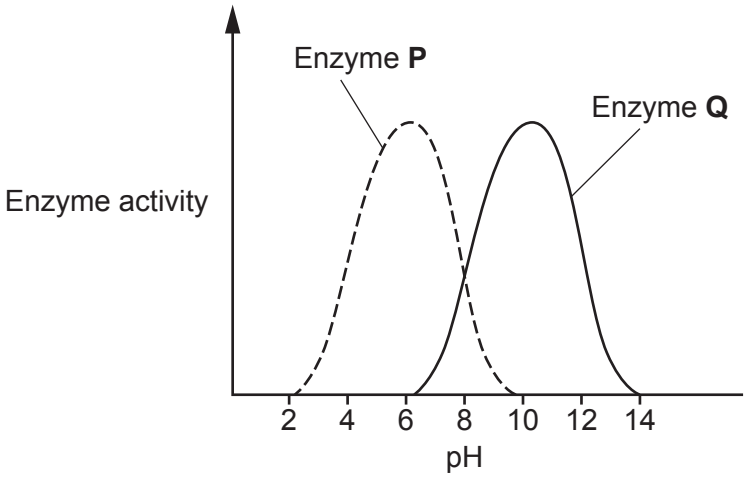
D Only mitosis is part of the cell cycle.

Your answer ☐ **[1]**

10 The pH inside the small intestine of the human digestive system is between pH 7 and pH 8.

The pH inside the stomach of the human digestive system is between pH 1 and pH 2.

The graph shows the effect of pH on the activity of two enzymes.



Which statement about the enzymes is correct?

A Both enzymes would be denatured inside the small intestine.

B Enzyme **Q** would be more efficient inside the small intestine compared to enzyme **P**.

C Neither enzyme would work at its highest activity inside the stomach or small intestine.

D Only enzyme **P** would be active in the stomach.

Your answer ☐ **[1]**

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Section B

11 **Fig. 11.1 and Fig. 11.2** show two different transport vessels in plants.

Fig. 11.1

Xylem vessels

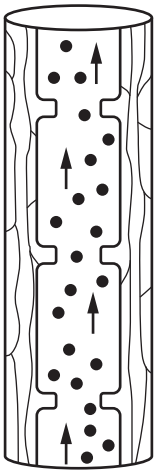

Fig. 11.2

Phloem vessels

(a) The arrows show direction of movement inside the vessels.

Give **two** reasons why **Fig. 11.2** shows phloem vessels.

1 .....

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2 .....

.....

[2]

(b) Compare the type of substances transported in xylem and phloem vessels.

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

(c) Explain how the transport of substances through **xylem** changes on a warm day compared with a cold day.

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

12 A teacher investigates the effect of different enzymes on starch. They want to find out if the enzyme breaks down the starch into sugar.

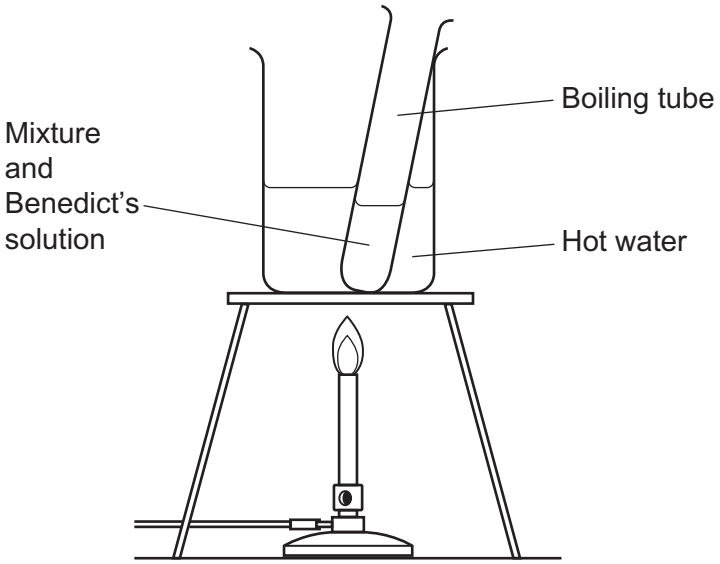
This is the method they use:

- Add 1 cm^3 of an enzyme to 5 cm^3 of starch solution in a boiling tube.
- Leave the mixture for 5 minutes.
- Add Benedict's solution to the mixture.
- Place the boiling tube in a hot water bath.
- Record the colour of the Benedict's solution after heating.

Benedict's solution is a blue solution that, when heated, forms a coloured precipitate if sugar is present.

Fig. 12.1 shows how the teacher tested for the presence of sugar in the mixture.

Fig. 12.1



(a) The teacher repeats the method with different enzymes.

(i) Identify the dependent variable in this investigation.

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

(ii) Suggest **one** hazard in this investigation and the precaution the teacher should take.

Hazard .....

Precaution .....

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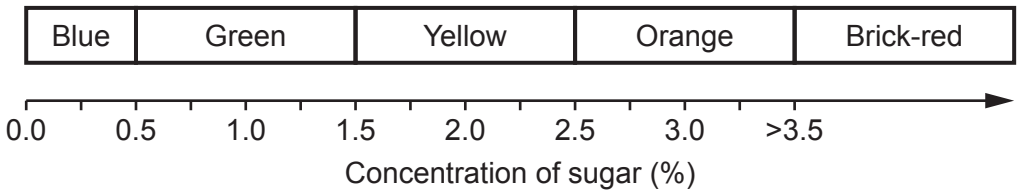
[1]

(b) **Fig. 12.2** is a chart that shows the colour of Benedict's solution after heating in different concentrations of sugar solution.

Fig. 12.2



The table shows the results recorded by the student.

Mixture of enzyme and starch	Colour of the Benedict's solution after heating	Sugar concentration in mixture (%)
A	brick-red	.....
B	blue	.....
C	orange	2.5 – 3.5
D	yellow	.....

(i) Complete the table. **[1]**

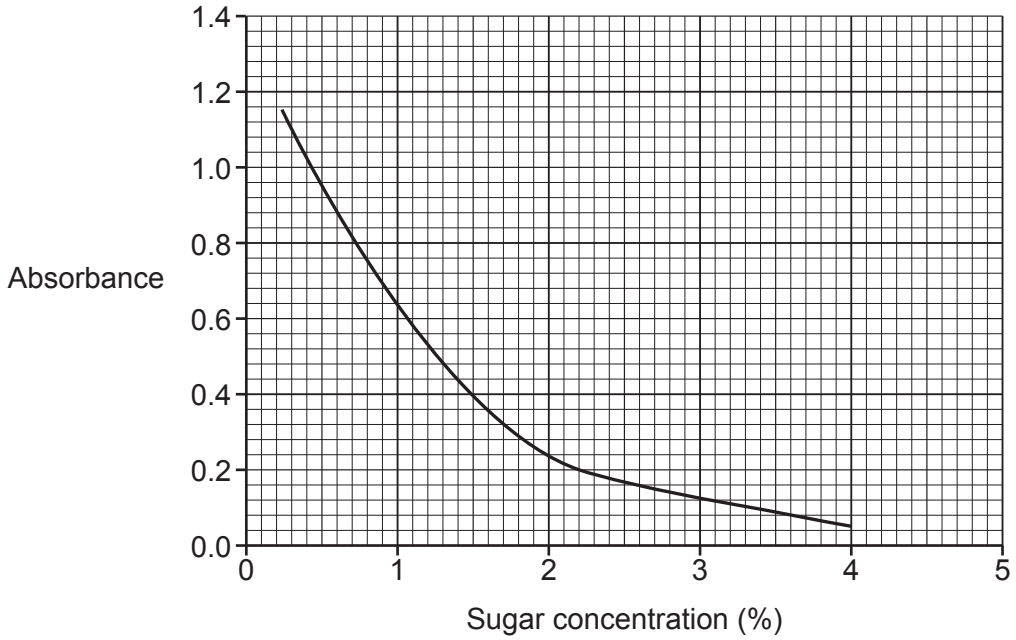
(ii) The concentration of sugar in mixture **C** stated in the table is **not** an accurate value.

How can the student tell that it is **not** an accurate value?

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

(c) The amount of light absorbed by different colours can be measured.

The graph compares absorbance with the percentage of sugar concentration.



(i) The teacher investigates the light absorbed by the different coloured mixtures.

They record an absorbance of 0.2 for mixture **C**.

Use the graph to find the sugar concentration of mixture **C**.

Sugar concentration = ... % **[1]**

(ii) The answer to **(i)** is outside the range stated in the results table.

Suggest how the student could improve their method to find out how **precise** their measurement is for mixture **C**.

.....

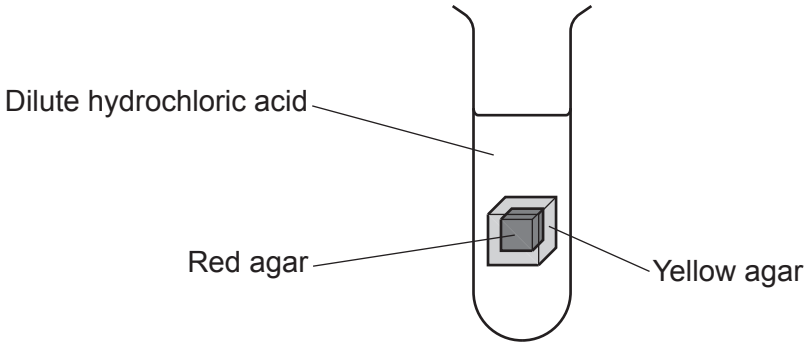
..... **[1]**

13 A student investigates diffusion. They use agar jelly stained red with a pH indicator.

This is the method they use:

- Cut the agar into cubes of different sizes.
- Place each agar cube into a different boiling tube.
- Add dilute hydrochloric acid to each boiling tube.
- Record the time taken for each agar cube to turn yellow.

The diagram shows one of their boiling tubes when the agar cube has started to turn yellow.



The table shows their results.

Agar cube	Length of one side (cm)	Surface area (cm^2)	Volume (cm^3)	Surface area to volume ratio	Time taken to turn yellow (seconds)
A	1	6	1	6 : 1	320
B	2	24	8	3 : 1	552
C	3			.....	833
D	4	96	64	1.5 : 1	523
E	5	150	125	1.2 : 1	1145
F	6	216	216	1 : 1	1408

(a) Calculate the surface area to volume ratio of agar cube **C**.

Write your answer in the table.

[3]

(b) One of the times recorded is an anomaly.

(i) Identify this anomalous result.

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

(ii) The anomaly was due to random error.

Suggest **one** random error that could have caused the anomaly.

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

(c) Describe and explain the pattern in the results.

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..... **[3]**

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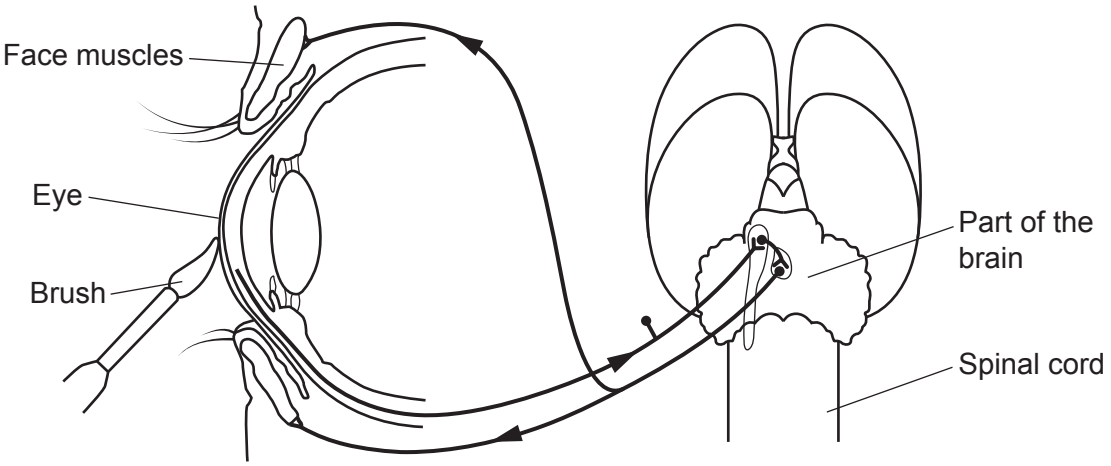
14

(a) Doctors can test your eye reflexes by touching the eye to make you blink.
Fig. 14.1 shows the reflex arc involved in blinking.

Fig. 14.1



Explain how the components of the nervous system produce the response of blinking.
Use **Fig. 14.1**.

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..... **[4]**

(b) The endocrine system also controls the body.

(i) Which endocrine gland releases thyroxine into the blood?

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

(ii) Describe **two** effects of adrenaline on the human body.

1 .....

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2 .....

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[2]

(c) Hormones are used in the contraceptive pill.

Explain how the **progesterone** contraceptive pill prevents pregnancy.

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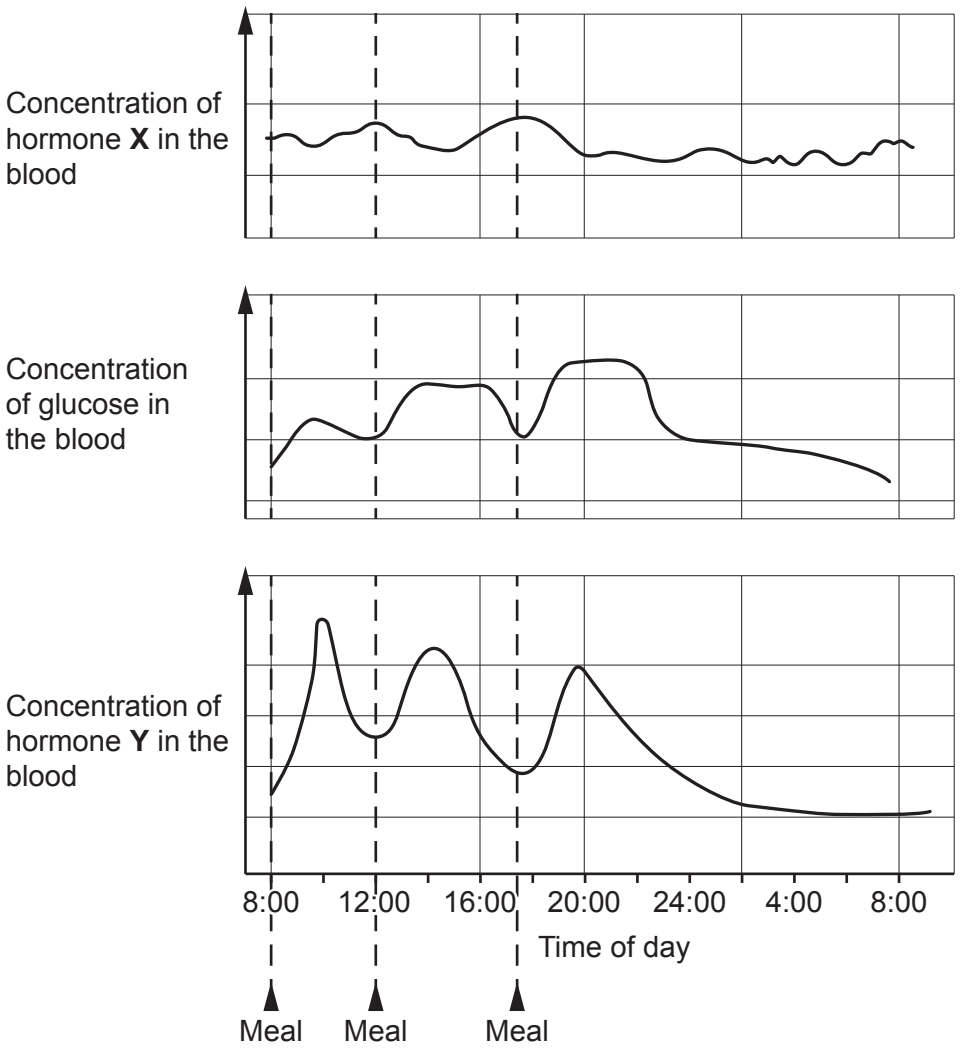
..... **[3]**

(d) Scientists used a computer model to predict the changes in concentration of glucose and two hormones in the blood before and after eating a meal.

Fig. 14.2 shows the results when three meals were included in the computer model.

Fig. 14.2



(i) Identify hormone **Y**.

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

(ii) Explain why hormone **X** is glucagon.

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

(iii) Compare the functions of glucagon and hormone **Y**.

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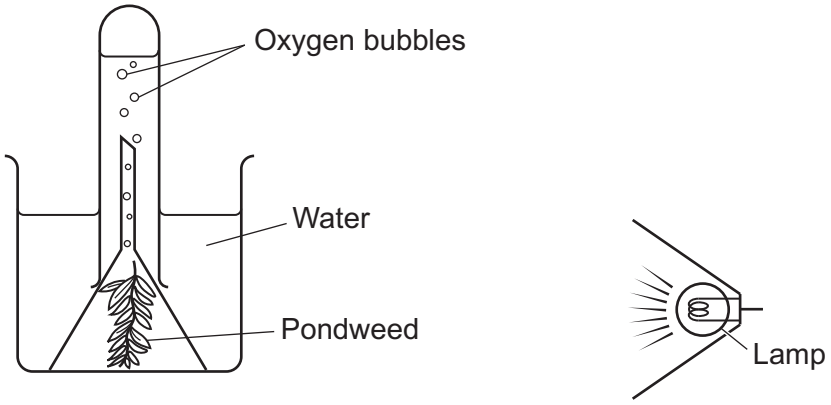
..... **[3]**

15 The diagram shows apparatus used to investigate photosynthesis.



The number of oxygen bubbles released each second indicates the rate of photosynthesis.

(a) A student counts the number of oxygen bubbles released from the pondweed in 2 minutes.

They use their result to correctly calculate a rate of 0.525 bubbles per second.

How many bubbles did the student count in the 2 minutes?

Number of bubbles = ... **[2]**

(b)* The student develops their investigation to find the effect of light intensity on the rate of photosynthesis.

Describe how they should develop their investigation.
Explain how a change in light intensity will affect the rate of photosynthesis.

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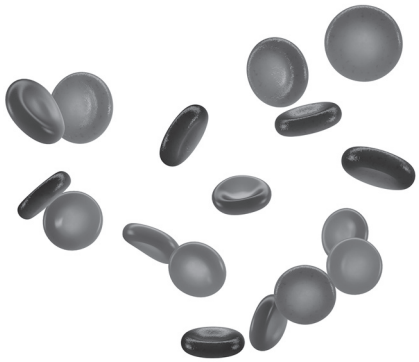
..... **[6]**

16

(a) The diagram shows drawings of red blood cells.



Explain **two** ways red blood cells are adapted to their function.

1 .....

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2 .....

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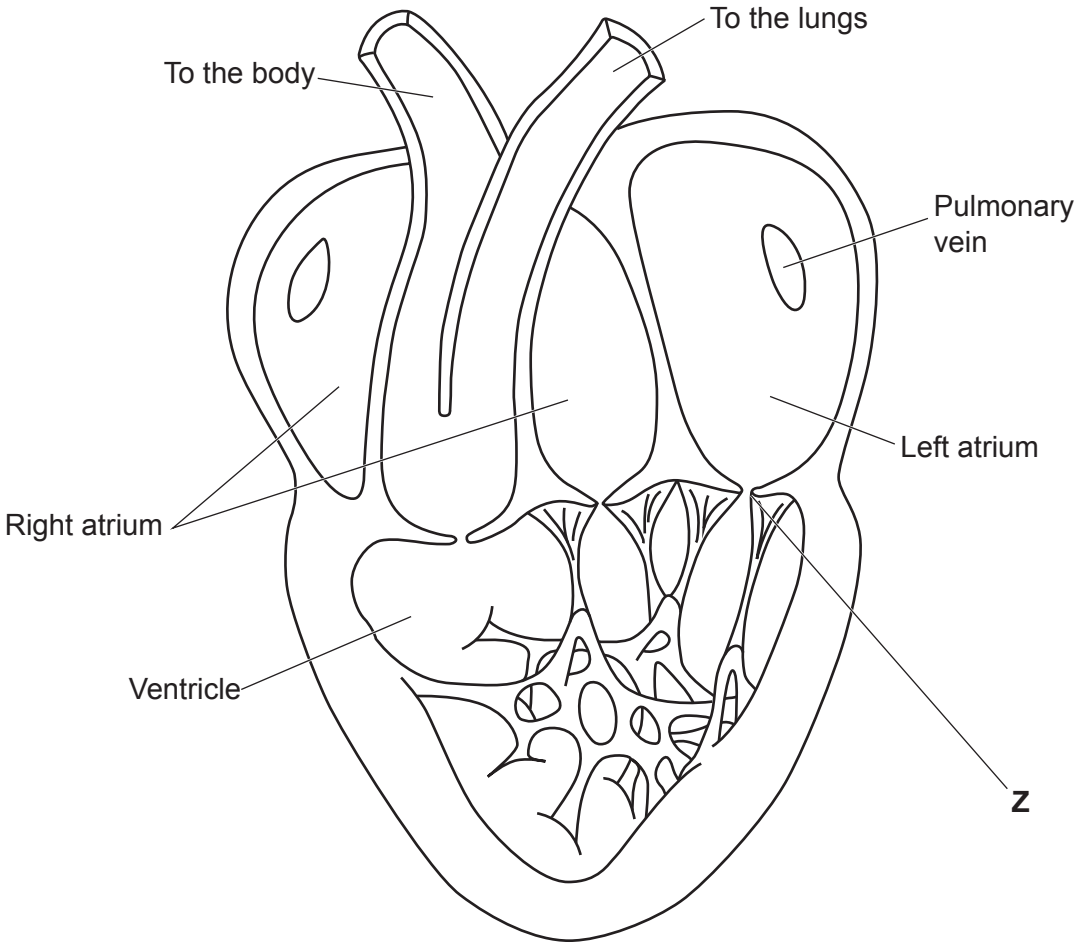
[2]

(b) This diagram shows a frog heart.



(i) Describe the function of the structure labelled **Z**.

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

(ii) Explain why the structure of the frog heart makes it **less** efficient than a human heart.

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..... **[3]**

END OF QUESTION PAPER

EXTRA ANSWER SPACE

If you need extra space use these lined pages. You must write the question numbers clearly in the margin.