

GCSE (9–1) Combined Science (Biology)
A (Gateway Science)
J250/07 Paper 7 (Higher Tier)
Sample Question Paper

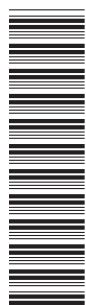
H

Date – Morning/Afternoon

Time allowed: 1 hour 10 minutes

You may use:

- a scientific or graphical calculator
- a ruler



First name															
Last name															
Centre number											Candidate number				

INSTRUCTIONS

- Use black ink. You may use an HB pencil for graphs and diagrams.
- Complete the boxes above with your name, centre number and candidate number.
- Answer **all** the questions.
- Write your answer to each question in the space provided.
- Additional paper may be used if required but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

INFORMATION

- The total mark for this paper is **60**.
- The marks for each question are shown in brackets [].
- Quality of extended responses will be assessed in questions marked with an asterisk (*).
- This document consists of **28** pages.

SECTION A

Answer **all** the questions.

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

1 What happens to a plant cell when it is placed in a more dilute solution? It will:

- A** Absorb water until it bursts
- B** Absorb water until it is turgid
- C** Lose water and shrink
- D** Lose water and become flaccid

Your answer

[1]

2 Which of the following is a similarity between xylem and phloem?
They both have:

- A** Cell walls containing lignin
- B** Companion cells
- C** No nucleus
- D** Sieve plates

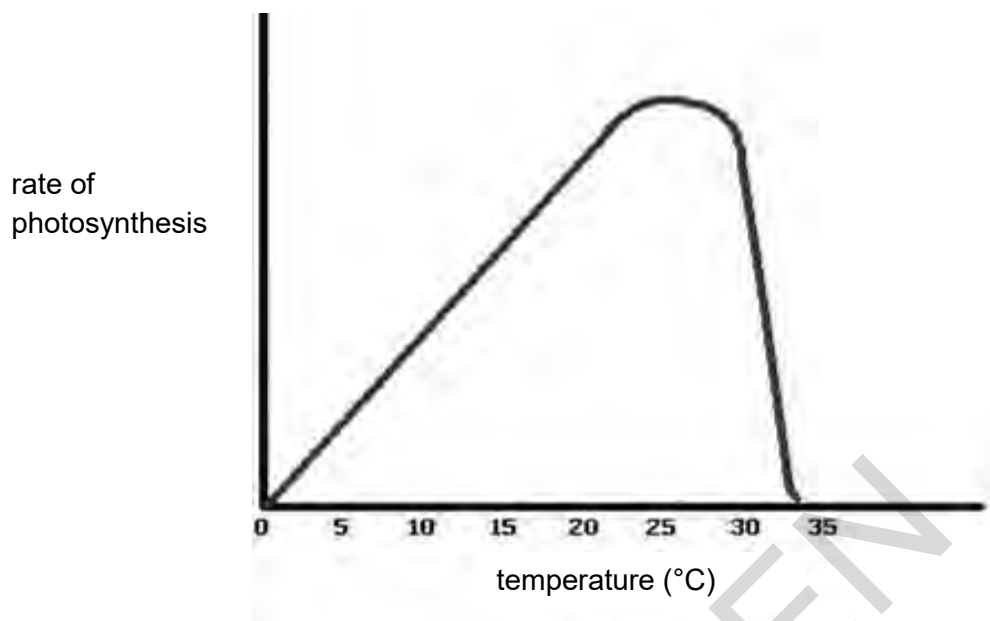
Your answer

[1]

3

3 Look at the graph.

It shows the effect of temperature on the rate of photosynthesis for a plant.



What is the optimum temperature for photosynthesis for this plant?

- A 0°C
- B 20°C
- C 25°C
- D 34°C

Your answer

[1]

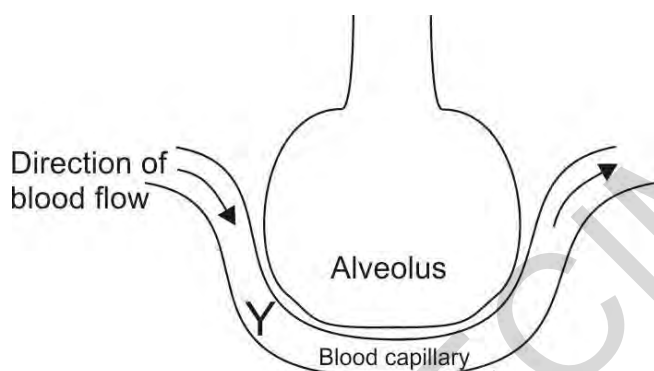
6 What structures do prokaryotic and eukaryotic cells have in common?

- A Cell membrane and cytoplasm
- B Cell membrane and nucleus
- C Cytoplasm and mitochondria
- D Mitochondria and nucleus

Your answer

[1]

7 Gas exchange in a mammal occurs between an alveolus and the blood in a capillary.



Which of the following statements is correct?

At point Y the:

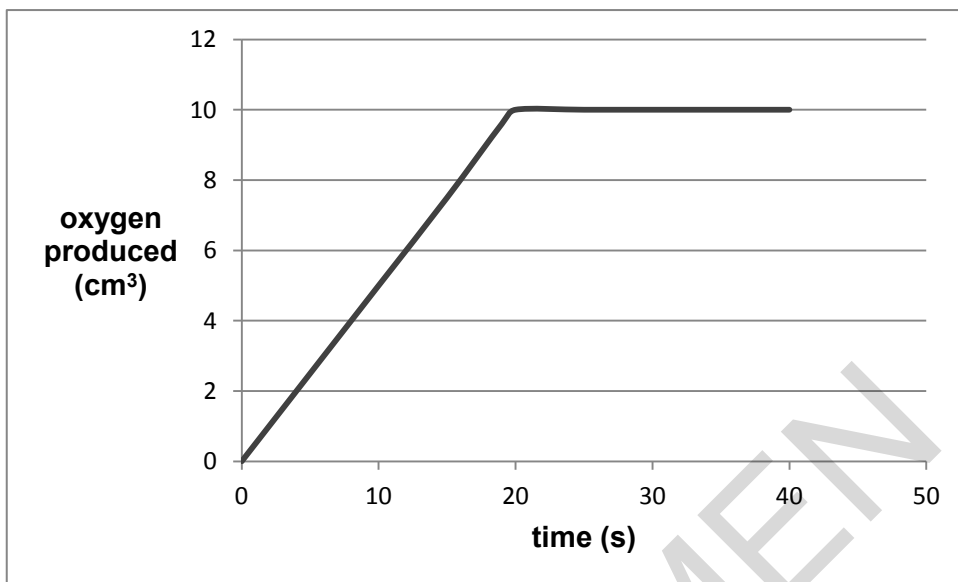
- A Carbon dioxide concentration is higher in the blood than in the alveolus.
- B Carbon dioxide concentration is lower in the blood than in the alveolus.
- C Oxygen concentration is higher in the blood than in the alveolus.
- D Oxygen concentration is the same in the blood as in the alveolus.

Your answer

[1]

- 8 When the enzyme catalase is added to hydrogen peroxide, oxygen and water are produced. The oxygen produced can be collected and used to show the progress of the reaction.

The graph below shows this reaction.



After 20 seconds no more oxygen is produced because the:

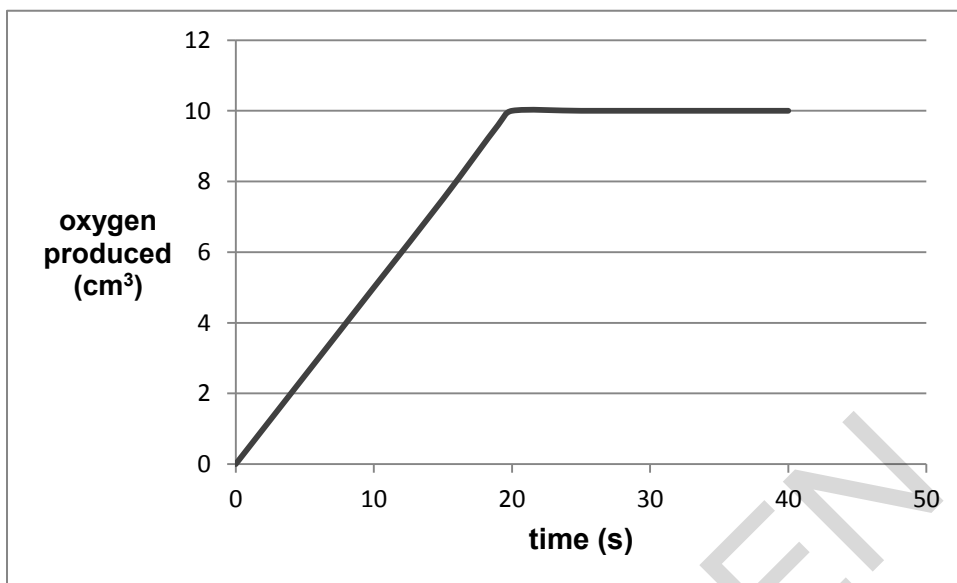
- A Active sites are all full
- B Enzyme has been used up
- C Enzyme has denatured
- D Substrate has been used up

Your answer

[1]

- 9 When the enzyme catalase is added to hydrogen peroxide, oxygen and water are produced. The oxygen produced can be collected and used to show the progress of the reaction.

The graph below shows this reaction.



What is the rate of reaction between 10 and 20 seconds?

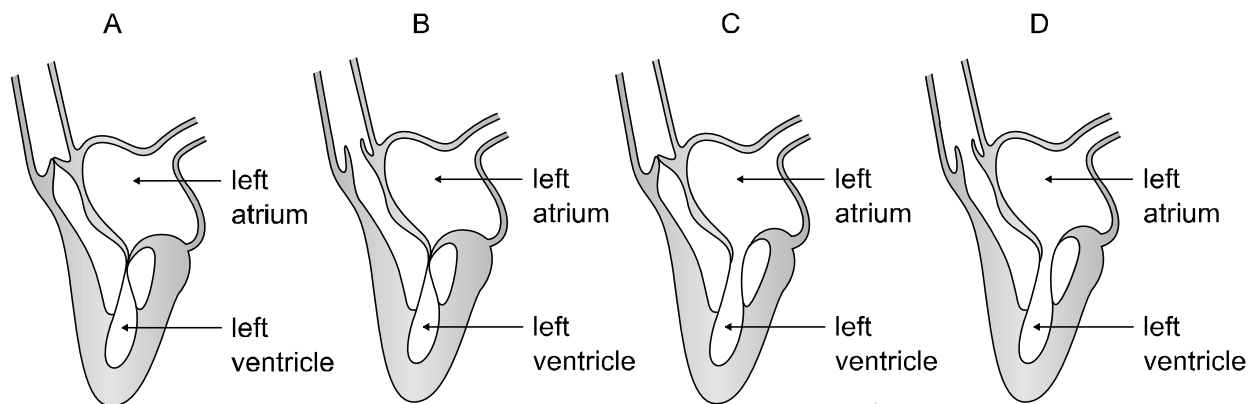
- A 0.5 cm³/s
- B 2.0 cm³/s
- C 5.0 cm³/s
- D 10.0 cm³/s

Your answer

[1]

10 The diagrams show sections through part of the heart.

Which diagram **A**, **B**, **C** or **D** shows the heart pumping blood to the rest of the body?



Your answer

[1]

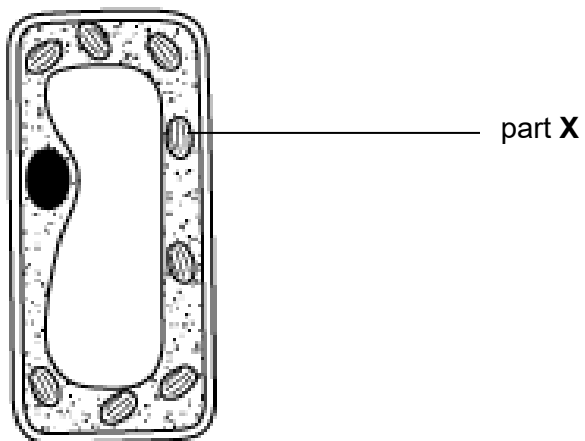
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SECTION B

Answer **all** the questions.

- 11** Look at the palisade cell from a leaf.

It is important for photosynthesis.



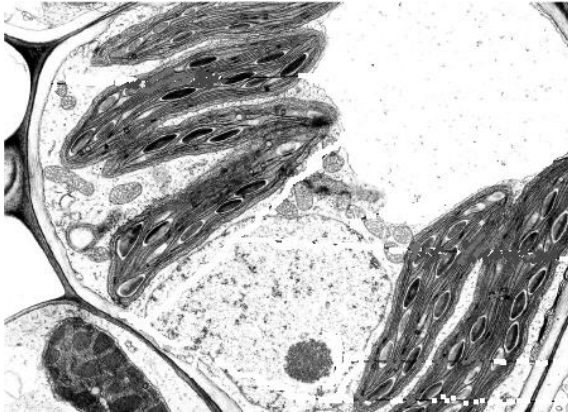
- (a) Part **X** is where the chemical reactions of photosynthesis take place.

Write down the name of the part **X**.

..... [1]

(b) Look at the picture.

It is an electron micrograph of another cell found in the leaf.



Explain how using electron microscopy has improved the understanding of structures inside cells.

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[2]

(c) Complete the chemical equation for photosynthesis.



[2]

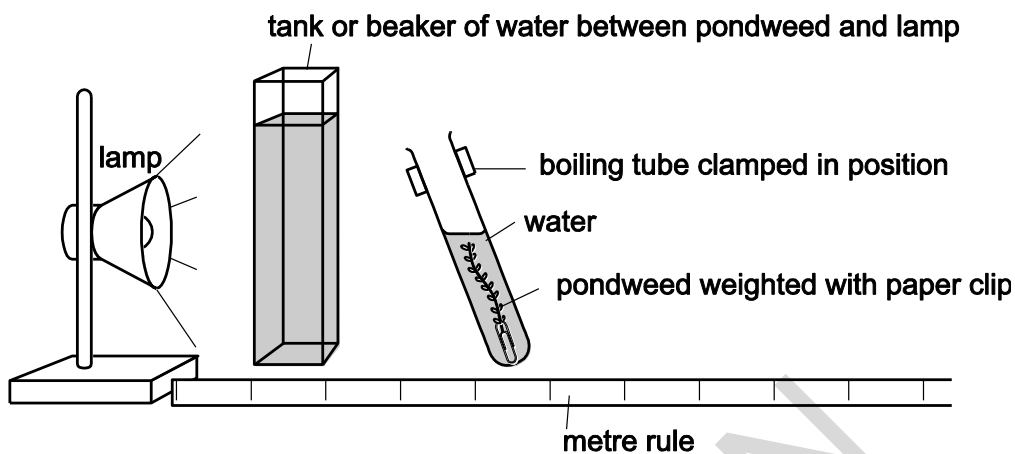
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SPECIMEN

(d) Look at the diagram.

It shows a set of apparatus that can be used to investigate the rate of photosynthesis.



Method

- a Set up the apparatus and look for a stream of bubbles coming from the cut end of the pond weed.
- b Count the number of bubbles produced in 1 minute. Repeat for a second minute. Repeat for a third minute.
- c Change the distance that the lamp is from the pondweed to investigate the effect on the rate of photosynthesis.
- d Leave for 2 minutes, then count the number of bubbles produced in one minute. Repeat for a second minute. Repeat for a third minute.
- e Change the distance again, and repeat instruction d.

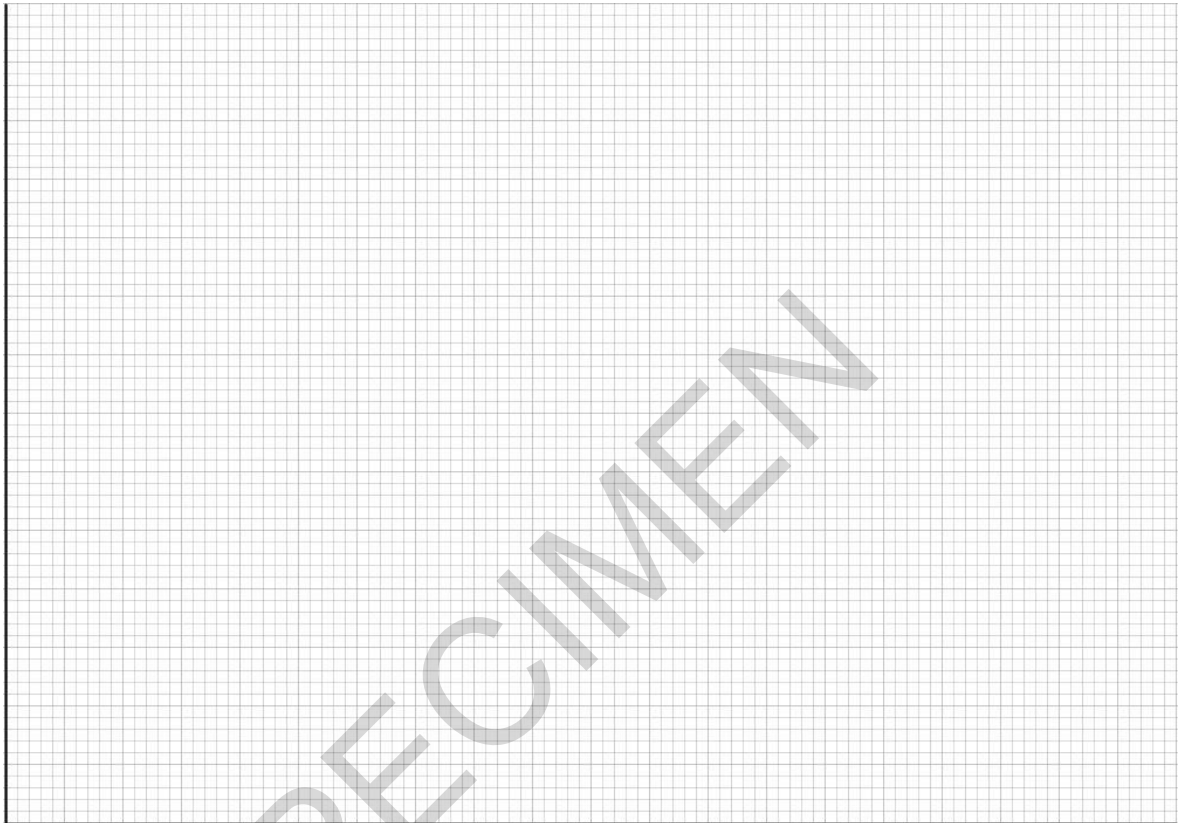
Students followed this method to investigate the effect of light intensity on photosynthesis.

The table shows results from their experiment.

Distance between light and pondweed in metres	Number of bubbles counted in 1 minute			Mean
	Trial 1	Trial 2	Trial 3	
1.0	8	6	7	7
0.5	28	32	30	30
0.25	105	106	104	105
0.125	105	104	109

(i) Calculate the mean for the distance 0.125 metres and write it in the table. [1]

(ii) Plot a graph to show the effect of the distance of light from the pondweed on the mean number of bubbles produced.



[3]

(iii) Describe the effect of light intensity on photosynthesis.

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

(iv) Suggest **one** source of error in the method for measuring the amount of gas given off.
Explain how this method could be improved.

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..... [2]

12 Look at the table.

It shows the contents of test tubes used in an investigation into the effect of adding the enzyme pepsin to egg-white.

The test tubes need to be kept at 40°C for 5 minutes.

Tube 1	Tube 2	Tube 3	Tube 4
5.0 cm ³ egg-white	5.0 cm ³ egg-white	5.0 cm ³ egg-white	5.0 cm ³ egg-white
3 drops distilled water	3 drops hydrochloric acid	3 drops hydrochloric acid	3 drops hydrochloric acid
1.0 cm ³ pepsin distilled water	1.0 cm ³ pepsin	1.0 cm ³ of boiled pepsin

(a) What quantity of distilled water must be added to **Tube 2**?

..... [1]

(b) Why is it important to set up **Tube 2**?

..... [1]

(c) Describe how you would make sure the temperature stayed at 40°C for 5 minutes.

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..... [2]

(d) Suggest **one** possible source of error in how the tubes were set up, shown in the table.

..... [1]

- (e) Two techniques were used to collect the results.

Technique 1.

A visual comparison was made to see how cloudy the tubes were at the start and after 5 minutes.

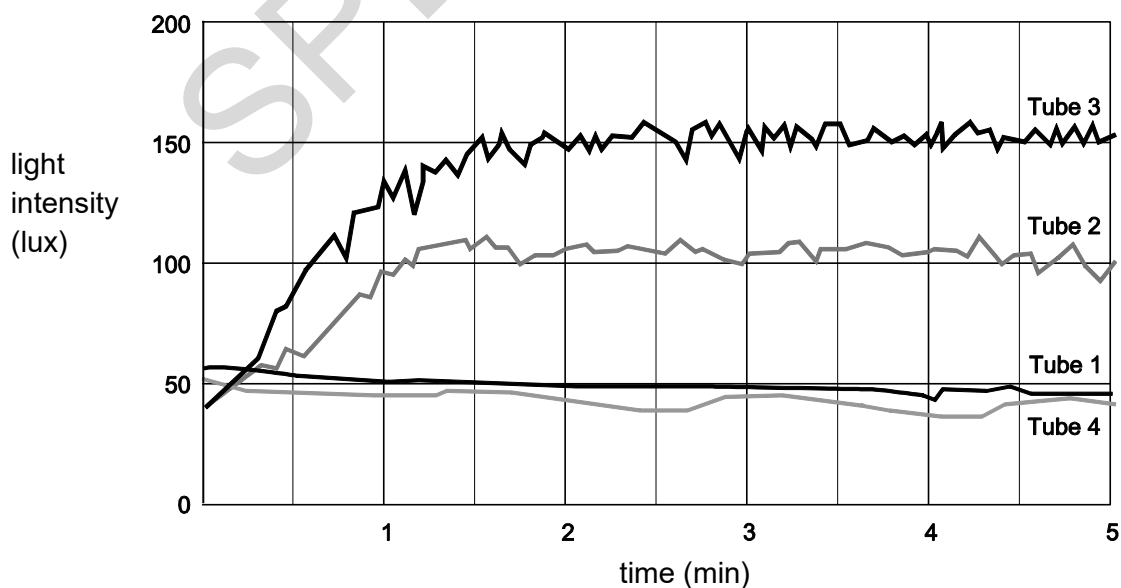
Look at the table of results.

Tube	Contents	Observations of tube contents	
		At start	At end
1	egg-white, water and pepsin	cloudy	almost clear
2	egg-white, hydrochloric acid and water	cloudy	cloudy
3	egg-white, hydrochloric acid and pepsin	cloudy	clear
4	egg-white, hydrochloric acid and boiled pepsin	cloudy	cloudy

Technique 2

A colorimeter was used to measure how much light passed through each tube during the 5 minutes.

Look at the graph taken from the colorimeter. It shows how much light passes through each tube.



(i) Compare the two techniques used to collect the results to decide which is best.

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..... [3]

(ii) **Tube 3** has the fastest rate of reaction during the first minute.

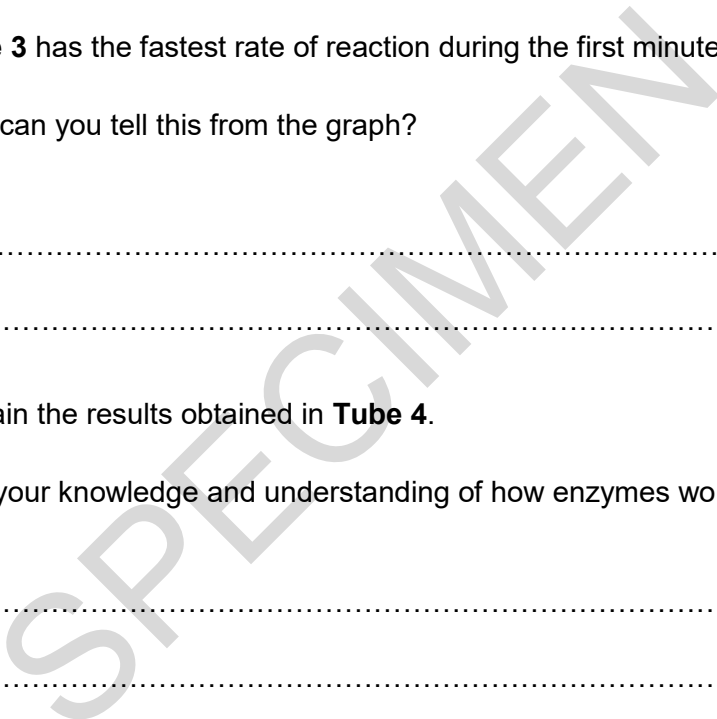
How can you tell this from the graph?

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..... [1]

(f) Explain the results obtained in **Tube 4**.

Use your knowledge and understanding of how enzymes work in your answer.

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..... [5]



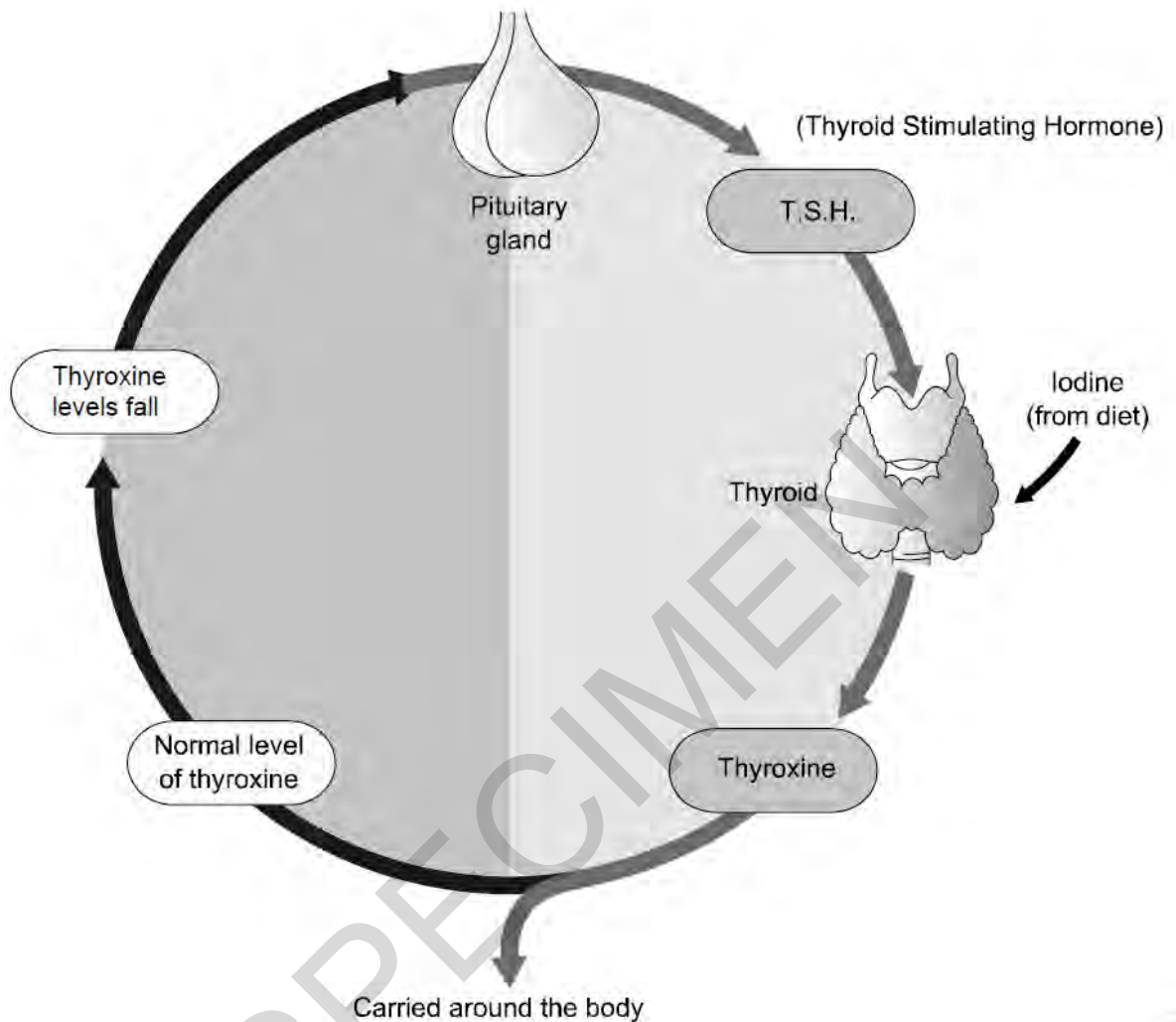
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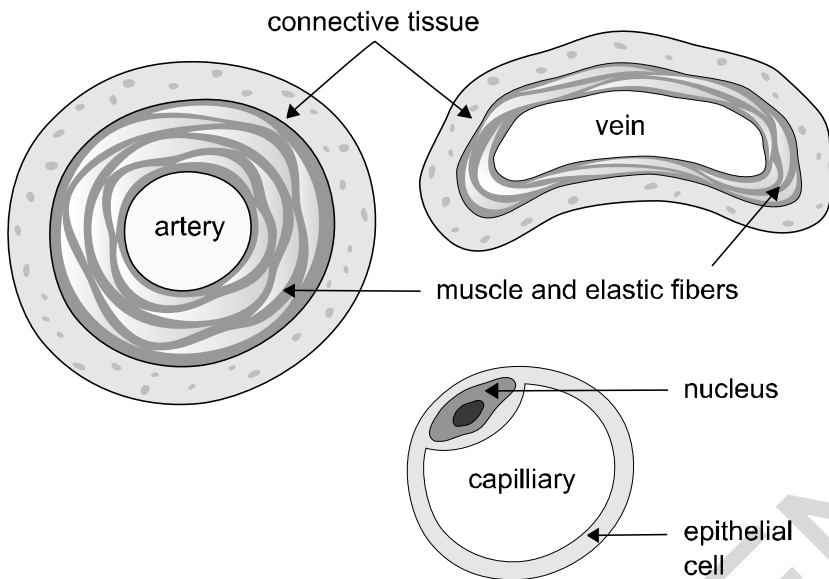
13 Thyroxine is a hormone made by the thyroid gland in the neck.

Look at the diagram. It shows how thyroxine is controlled in the body.



14 Look at the picture.

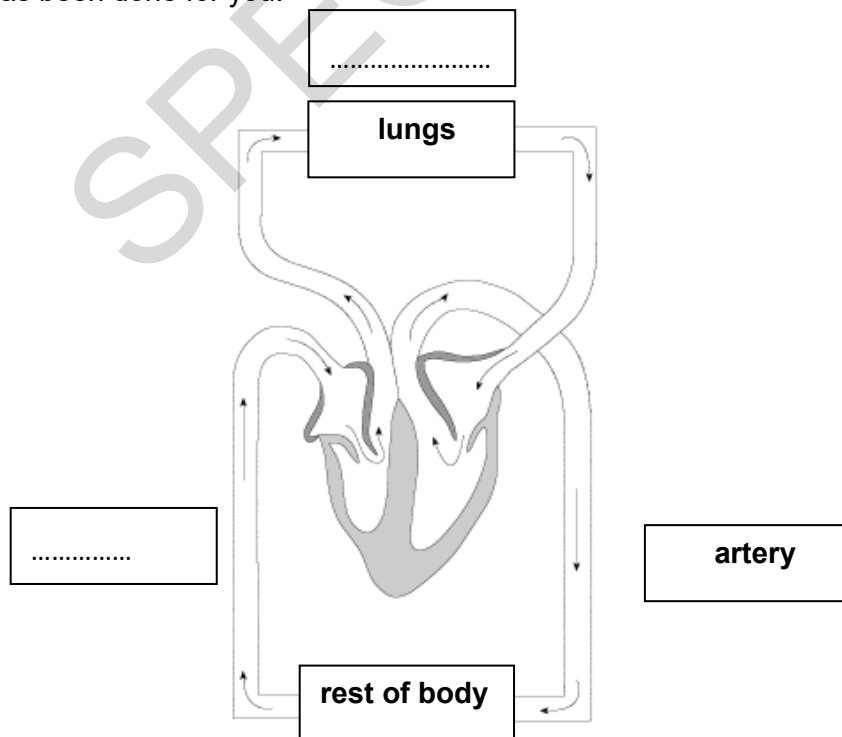
It shows three of the blood vessels found in humans (not drawn to the same scale).



(a) The blood vessels are part of a circulatory system.

Write down the name of each vessel to show its position in the circulatory system.

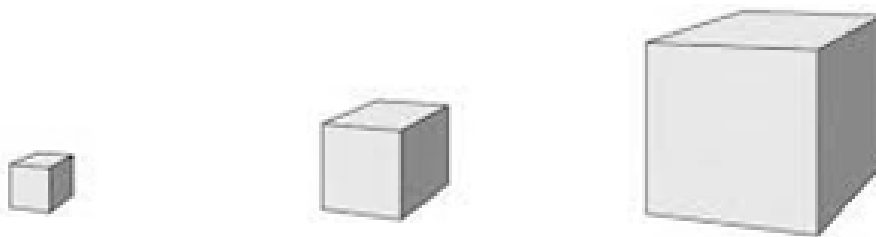
One has been done for you.



[2]

- (b) Surface area and volume are important for the transport of substances in the circulatory system.

Look at the diagram.



1 mm cube

2 mm cube

4 mm cube

Surface area	6 sides x 1 mm ² = 6 mm ²	6 sides x 2 mm ² = 24 mm ²	6 sides x 4 mm ² = 96mm ²
Volume	(1 mm) ³ = 1 mm ³	(2 mm) ³ = 8 mm ³	(4 mm) ³ = mm ³
Surface area: volume ratio	6/1	3/1

- (i) Complete the table to calculate the surface area:volume ratio for the 4 mm cube.

[2]

- (ii) Explain which blood vessel you would expect to have the largest surface area:volume ratio.

Use ideas from your answer to part (i) and your knowledge of blood vessels in your answer.

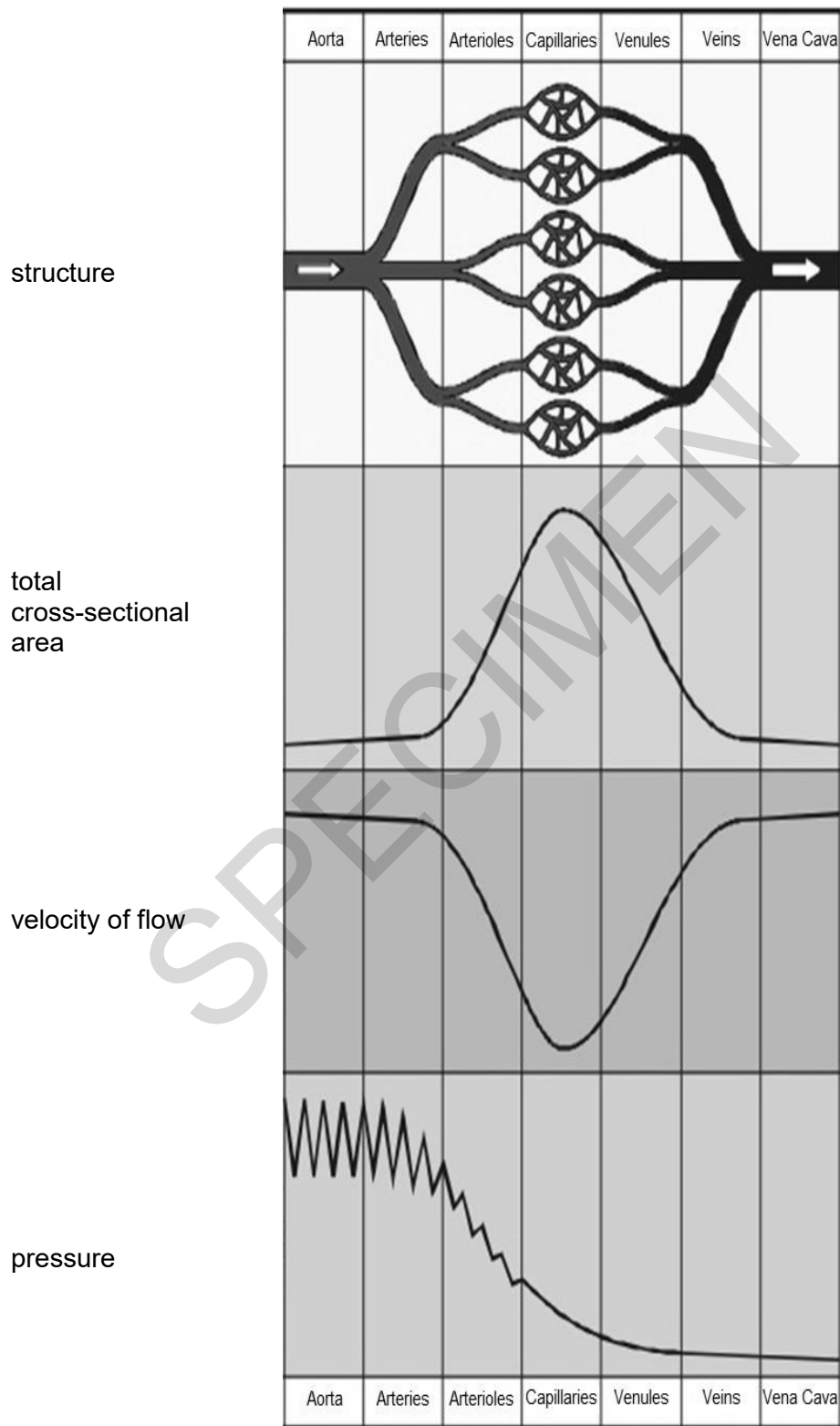
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..... [2]

Look at the diagram.

It shows the changes that take place as blood flows around the body.



- (c) Explain how the changes in velocity of flow and pressure are linked to total cross-sectional area.

Use the information and your understanding of blood vessels in your answer.

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[3]

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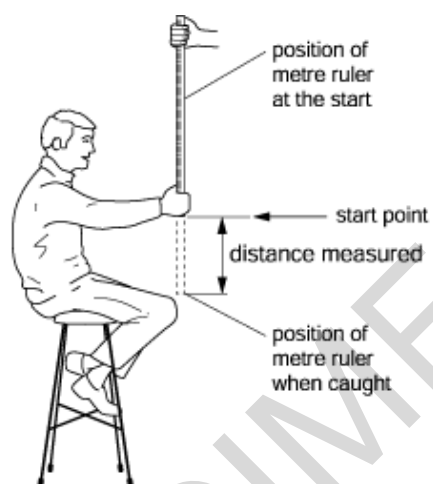
- 15 (a) Complete the sequence of a reflex arc.

stimulus →	receptor →	→	CNS →	motor neurone →	→	response
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[2]

Look at the diagram.

It shows the method a class of students used to investigate reaction time.



The table shows the results from their investigation.

	Distance the ruler falls before it is caught (mm)										Mean (mm)
	1	2	3	4	5	6	7	8	9	10	
Boys	55	54	56	60	58	54	50	48	52	53
Girls	197	194	198	196	195	199	193	198	196	194

The mean distance can be converted to a reaction time using this conversion table.

Catch Distance (mm)	Reaction time (milliseconds)
10	45
20	64
30	78
40	90
50	101
60	111
70	120
80	128
90	136
100	143
110	150
120	156
130	163
140	169
150	175
160	180
170	186
180	192
190	197
200	202

- (b) (i) Calculate the mean distances and then work out the reaction time for the boys and the girls.

Boys milliseconds

Girls milliseconds

[2]

- (ii) The students want to investigate if the reaction times for boys or girls would be different if the ruler was dropped by a person of the opposite sex.

How would you develop the experiment to test this?

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[3]

END OF QUESTION PAPER

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