

Friday 15 October 2021 – Morning

AS Level Biology A

H020/02 Depth in biology

Time allowed: 1 hour 30 minutes



You can use:

- a ruler (cm/mm)
- a scientific or graphical calculator



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 **70**.
- 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.

Answer **all** the questions.

1 The information below is about carbohydrates.

- Glucose is a monomer of polysaccharides such as glycogen and starch.
- Glucose is an important source of energy in animals and is transported in the circulatory system.
- Glycogen is an energy storage molecule found in many animals.
- Starch is an energy storage molecule found in many plants.
- Amylopectin is one of the two polysaccharides that constitute the molecular structure of starch.

(a) (i) State **one** property of glucose that allows it to be easily transported in animals.

..... [1]

(ii) Explain how the structure of glycogen differs from that of amylopectin to make it better suited as an energy store in animals.

.....

 [3]

(iii) Fig. 1.1 shows the molecular structure of beta glucose.

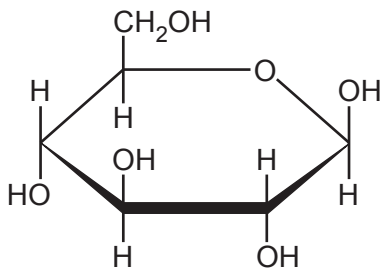


Fig. 1.1

Describe how the structure of alpha glucose would be different from the molecule shown in Fig. 1.1.

.....
 [1]

(b) Fig. 1.2 shows the start of the ring structure of ribose.

Complete the diagram to show the position of the carbon atoms. There is no need to include the $-H$ and $-OH$ groups. [1]

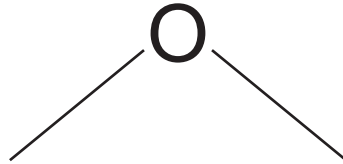


Fig. 1.2

(ii) Fig. 2.1 shows the circulatory system of the sea bass.

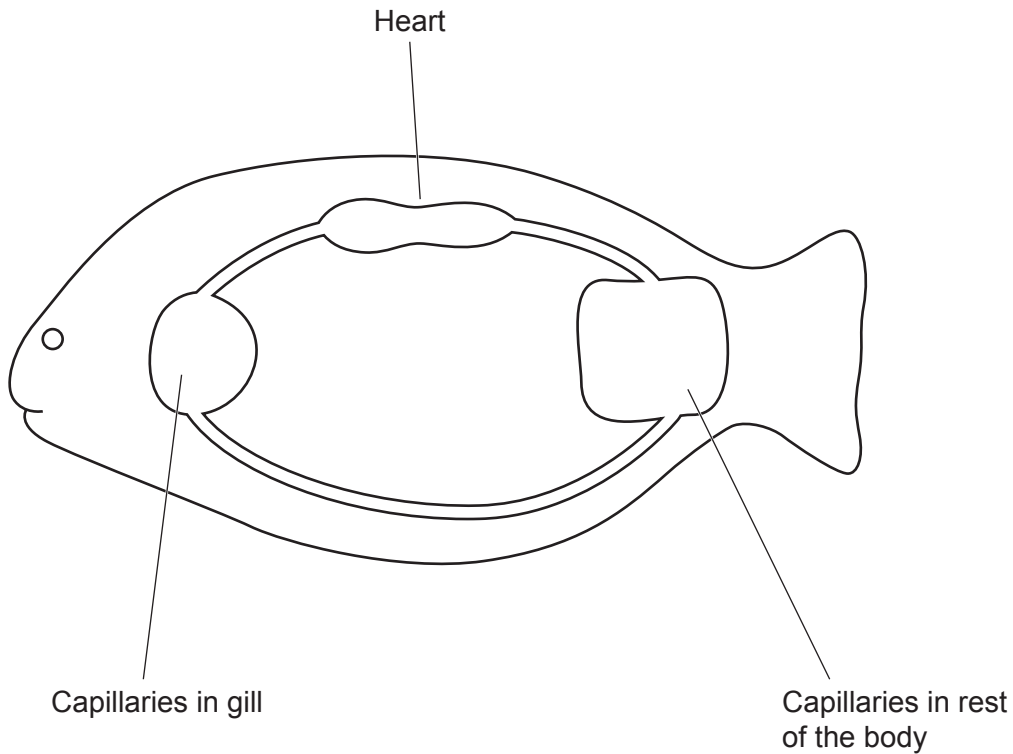


Fig. 2.1

Name the type of circulatory system shown in Fig. 2.1.

..... [1]

(iii) The circulatory systems of the sea bass and mammals are described as closed circulatory systems.

Define the term **closed circulatory system**.

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

(iv) State **two** differences between the closed circulatory system of the sea bass and the closed circulatory system of a mammal.

1
.....
2
.....

[2]

(b) A group of students were examining a mammalian heart prior to dissection. The atria and ventricles were clearly visible.

(i) Name **two** arteries that could be seen by the students.

1

2

[2]

(ii) The students then carried out a dissection of the heart. **Fig. 2.2** is an example of a drawing from one of the students.

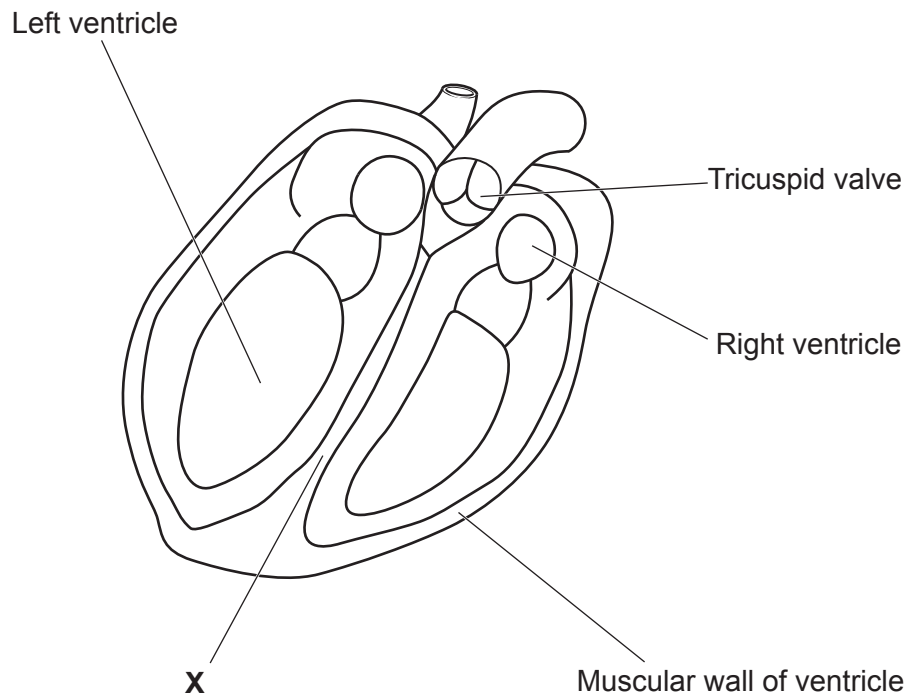


Fig. 2.2

Name the structure labelled **X** on **Fig. 2.2**.

..... [1]

- (iii) Another student pointed out that there were structural and labelling errors in the drawing in **Fig. 2.2**.

In the space below, list **three** of these errors **and** the correction you would make.

Biological drawing errors are not required.

Error and correction 1

.....
.....
.....

Error and correction 2

.....
.....
.....

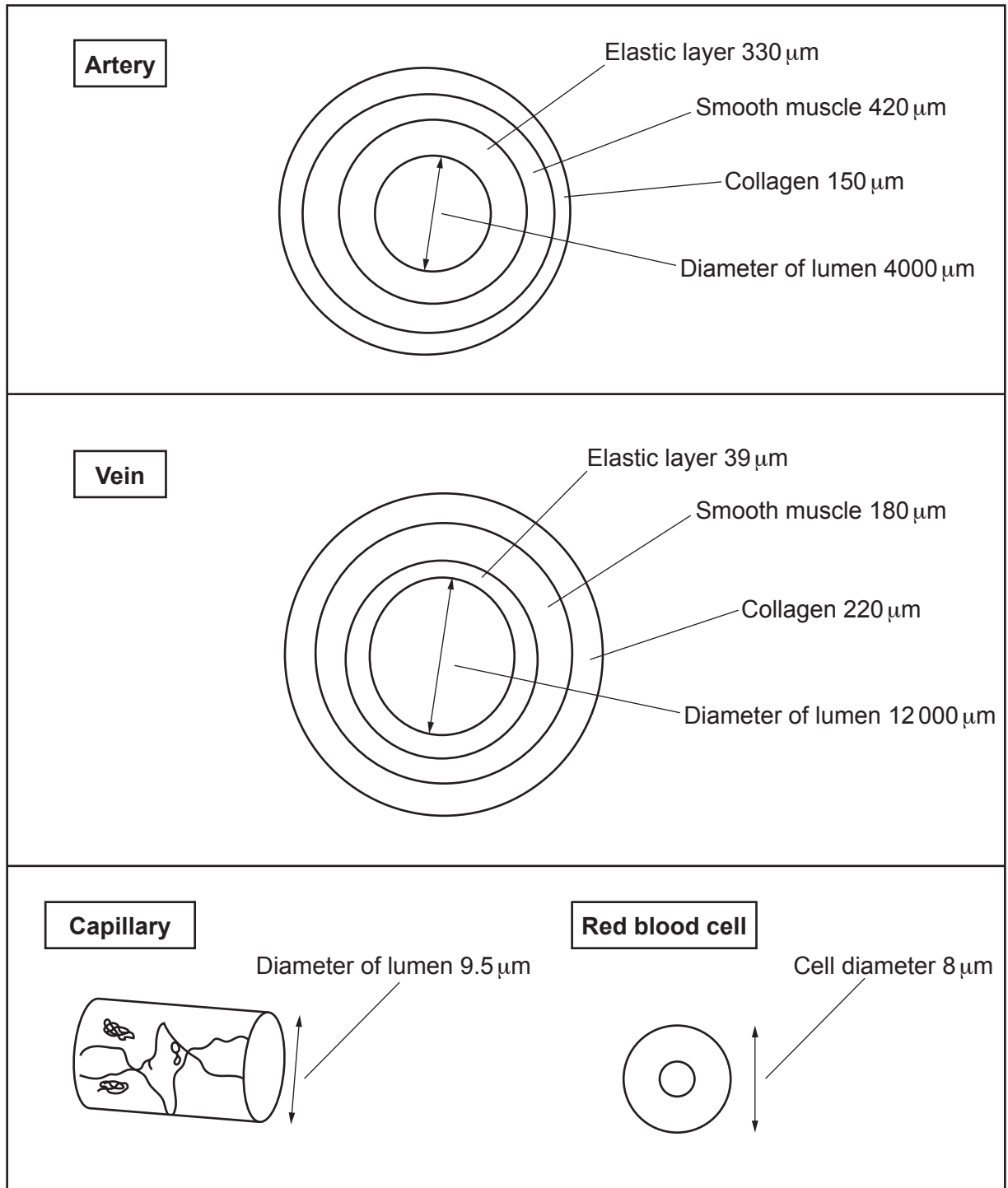
Error and correction 3

.....
.....
.....

[3]

(c)* Three types of blood vessels found in mammals are arteries, veins and capillaries.

Fig. 2.3 shows data on these blood vessels.



Not to scale

Fig. 2.3

3 Students carried out a practical investigation into the effect of enzyme concentration on the rate of reaction.

They were provided with:

- a 1% solution of the enzyme trypsin
- a supply of distilled water
- test tubes labelled 1–4
- 10 cm³ syringes.

(a) (i) Describe how they would create **four** different enzyme concentrations using **tenfold serial dilutions**. They started by using a syringe to transfer 1 cm³ of the 1% trypsin solution into tube 1. With a clean syringe, they then added 9 cm³ of distilled water to tube 1.

.....

.....

.....

..... [2]

(ii) State the concentration of trypsin in tube 4 once the **tenfold serial dilutions** had been completed.

Concentration = % [1]

(b) Trypsin is an example of a protease enzyme found in the small intestine of mammals. Explain why trypsin is described as an extracellular enzyme.

.....

..... [1]

(c) Fig. 3.1 shows how the rate of reaction of trypsin changes with pH.

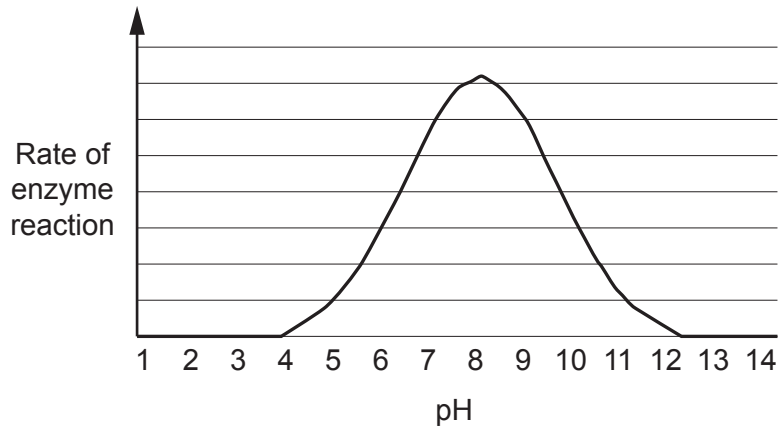


Fig. 3.1

With reference to Fig. 3.1, explain the change in the rate of reaction between pH8 and pH11.

.....

.....

.....

.....

..... [2]

- (d) Catalase is an enzyme found in a wide range of tissues. It catalyses the breakdown of hydrogen peroxide into water and oxygen. A group of students used liver tissue to investigate the effect of temperature on the rate of reaction of catalase.

A diagram of the apparatus is shown in **Fig. 3.2**.

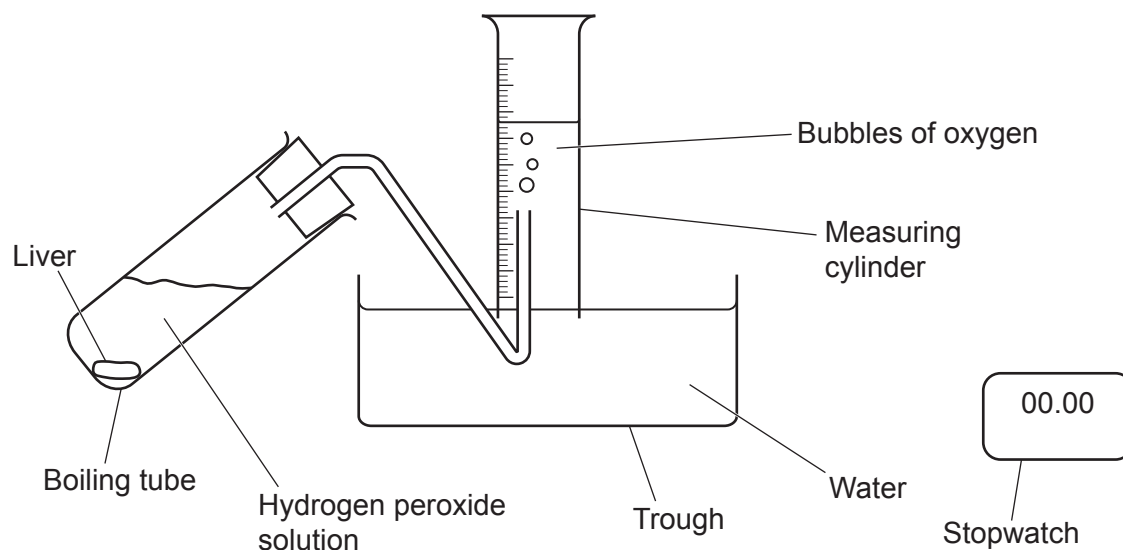


Fig. 3.2

Table 3 shows the results from the experiment carried out at 20 °C.

Time (s)	Volume of oxygen collected (cm ³)
30	6.0
60	12.0
90	15.0
120	18.0
150	21.0
180	22.0
210	23.5
240	24.0
270	24.5
300	25.0

Table 3

- (i) Other factors may affect the rate of the reaction.

Name **one** other factor they would need to control **and** describe how they would control this.

Factor

.....

How they would control this

.....

[2]

- (ii) Describe how you would use the apparatus shown in **Fig. 3.2** to obtain the results shown in **Table 3**.

.....

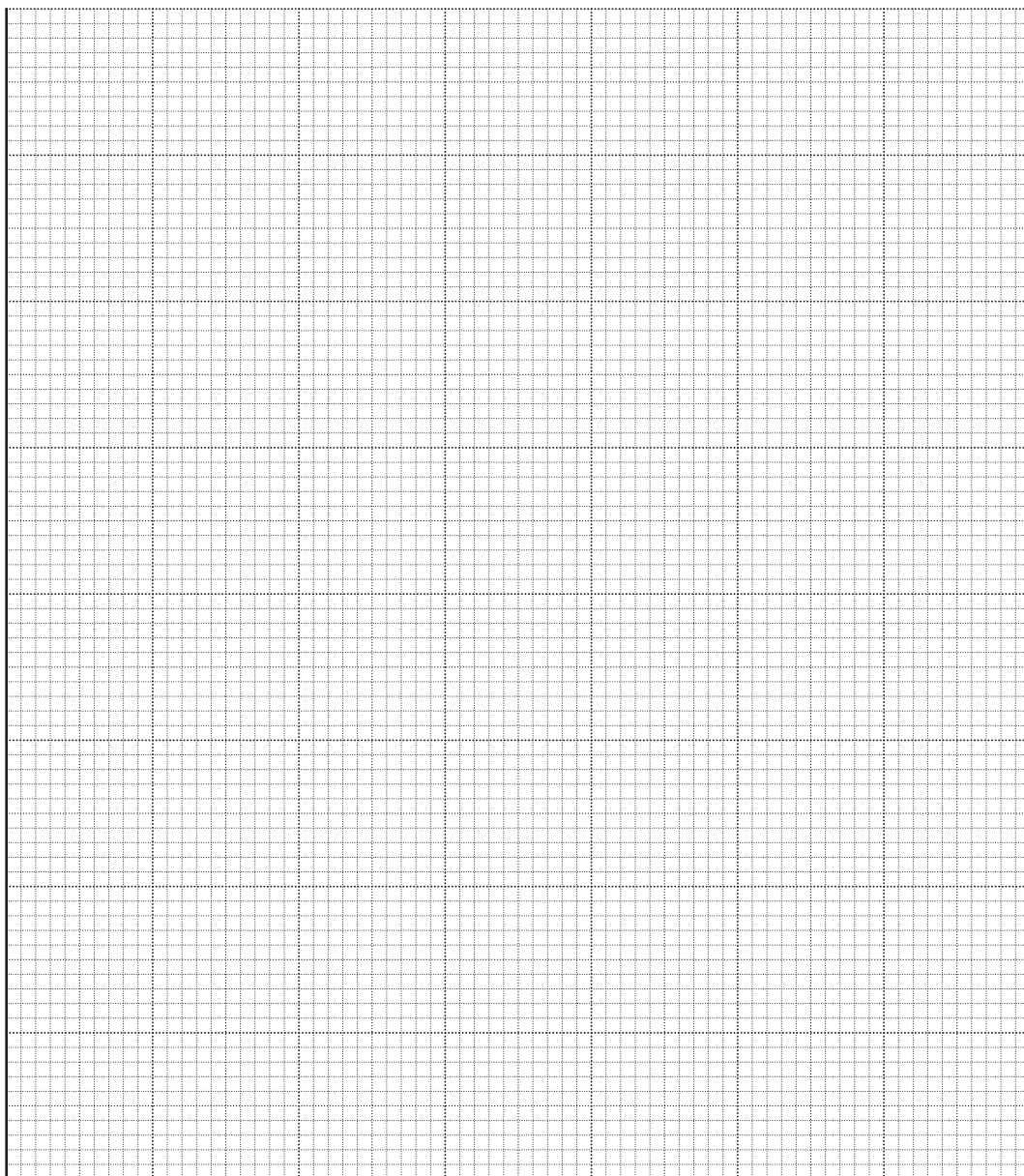
.....

.....

.....

..... [2]

(iii) Plot a graph of the results shown in **Table 3** on the grid below.



[3]

(iv) Use your graph to calculate the **initial** rate of reaction.

Give your answer to **2** significant figures.

Rate of reaction = cm^3s^{-1} [3]

15

- (v) The students investigating 30 °C calculated the initial rate of reaction to be $0.48 \text{ cm}^3 \text{ s}^{-1}$.
Calculate the temperature coefficient (Q_{10}) for this reaction.
Give your answer to **2** significant figures.

$Q_{10} = \dots\dots\dots$ [1]

(ii) The results for **Area A** are shown in the table below.

Species	n = Number of organisms	$\frac{n}{N}$	$\left(\frac{n}{N}\right)^2$
Common woodlouse	9		
Black sexton beetle	6		
Spotted wolf spider	2		
Woodlouse spider	4	0.190	0.036
	$N =$		$\sum \left(\frac{n}{N}\right)^2 =$
			$1 - \sum \left(\frac{n}{N}\right)^2 =$

Complete the above table **and** calculate the Simpson's Index of Diversity (D) for **Area A**.

Use the formula: $D = 1 - \left(\sum \left(\frac{n}{N} \right)^2 \right)$

Where: n = number of organisms of this species

N = total number of organisms

Give your answer to **2** significant figures.

$D = \dots\dots\dots$ [3]

(iii) The students found the Simpson's Index of Diversity for **Area B** to be 0.84.

Compare the stability of the community living in **Area B** with that of the community living in **Area A** based on their Simpson's Index of Diversity.

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

(b) A study was carried out on moorland vegetation in the North of England. A number of 10-metre interrupted belt transects were carried out in this area.

Here are some instructions for carrying out an interrupted belt transect:

1. Mark a line with a string.
2. Make an observation at varying points along the string.
3. Count how many different species of plants are found at each point.
4. Note down what you think the names of each of these species are.
5. Record your results as a table.

(i) Suggest **two** improvements you could make to these instructions.

Improvement 1

.....
.....
.....

Improvement 2

.....
.....
.....

[2]

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).

A large area of lined paper for writing answers. It features a vertical margin line on the left side and horizontal dotted lines for writing. The lines are evenly spaced and extend across the width of the page.

A large area of the page is reserved for writing, featuring a vertical solid line on the left side and horizontal dotted lines extending across the page.



Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series. If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact The OCR Copyright Team, The Triangle Building, Shaftesbury Road, Cambridge CB2 8EA.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.