Surname	Centre Number	Candidate Number
First name(s)		0

GCSE

3400U10-1

Z22-3400U10-1

WEDNESDAY, 15 JUNE 2022 – MORNING

BIOLOGY – Unit 1:
Cells, Organ Systems and Ecosystems

FOUNDATION TIER

1 hour 45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**5**	
2.	**6**	
3.	**7**	
4.	**10**	
5.	**12**	
6.	**9**	
7.	**11**	
8.	**9**	
9.	**11**	
Total	**80**	

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ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

You may use pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional page at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

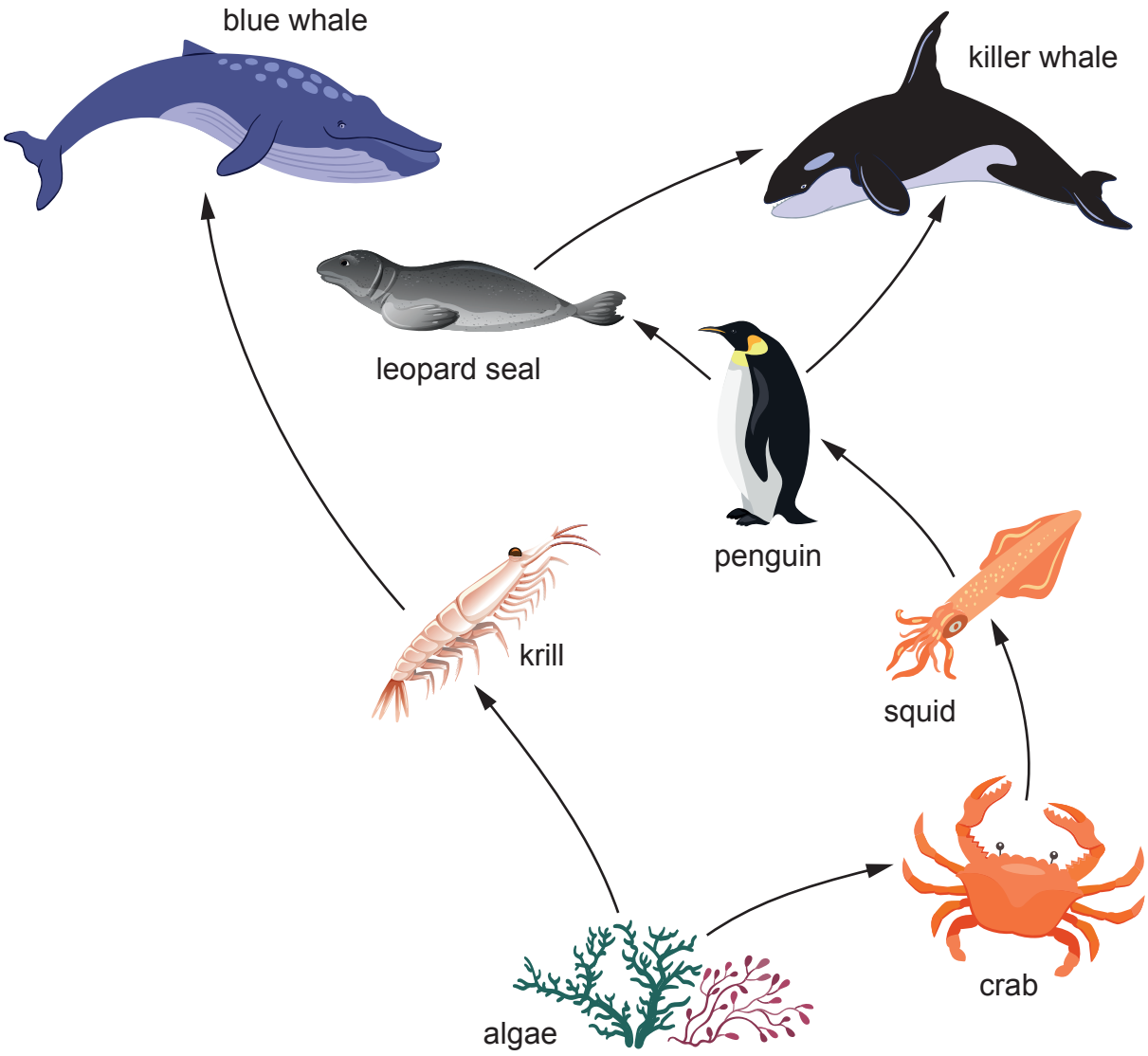
The number of marks is given in brackets at the end of each question or part-question.

Question **7**(a) is a quality of extended response (QER) question where your writing skills will be assessed.

Answer **all** questions.

1. **Image 1.1** shows a marine food web.

Image 1.1



Images are not to scale.

Examiner only

(a) From the food web in **Image 1.1**, state the name of:

(i) the producer; [1]

.....

(ii) the tertiary (third-stage) consumer. [1]

.....

(b) State what the arrows in the food web in **Image 1.1** represent. [1]

.....

(c) A disease caused the number of squid to decrease. Suggest what would happen to the numbers of penguins and crabs by underlining the correct word in each of the following sentences.

(i) The number of penguins would **(increase / decrease)**. [1]

(ii) The number of crabs would **(increase / decrease)**. [1]

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2. **Images 2.1A, 2.1B** and **2.1C** show a root hair cell, xylem and phloem, and a leaf.

Image 2.1A

root hair cell

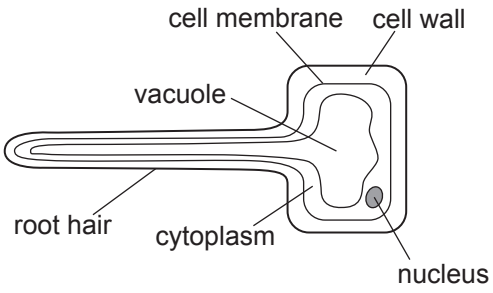

Image 2.1B

xylem and phloem

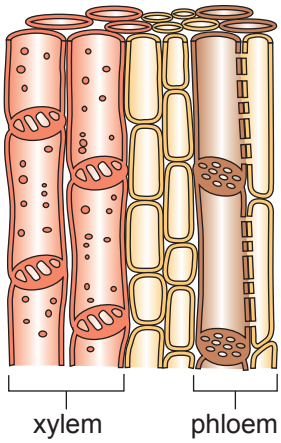

Image 2.1C

leaf

Images are not to scale.

(a) **Complete Table 2.2** by matching the parts of the plant to their functions, **A–D** shown below. [3]

A – transports sucrose around the plant

B – absorbs water from the soil

C – transports water in the plant

D – absorbs light for photosynthesis

Table 2.2

Part of plant	Function **(A–D)**
root hair cell	.....
xylem	.....
phloem	.....
leaf	.....

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(b) Complete the following sentences by choosing some of the words below. [3]

similar cells different organ organism specialised

A root hair cell is an example of a ..... cell. Xylem and phloem are both tissues. Tissues are groups of similar ..... with a similar function. A leaf is an ..... which is made up from different tissues working together.

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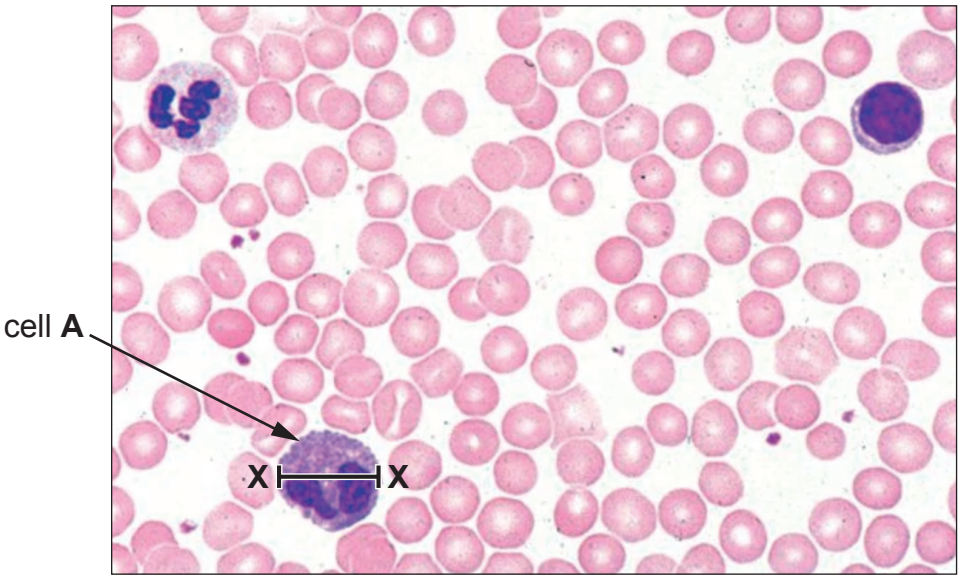
3. (a) **Use a ruler** to draw lines to match up the parts of blood with their functions. [2]

Part of blood		Function
plasma	●	● carry oxygen
white blood cells	●	● defend against disease
red blood cells	●	● clot blood
platelets	●	● carries carbon dioxide and dissolved food

(b) **Image 3.1** shows a sample of human blood as seen down a microscope.

Image 3.1



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(i) Measure the length of the line **X–X** in **Image 3.1**. [1]

Length of line **X–X** = ... mm

(ii) The magnification of **Image 3.1** is ×1 000. Use the following equation to calculate the actual size of cell **A**. [2]

$$\text{Actual size of cell } \mathbf{A} = \frac{\text{measured length of line } \mathbf{X–X}}{\text{magnification of } \mathbf{Image\ 3.1}}$$

Space for working

Actual size of cell **A** = ... mm

(iii) Identify the type of blood cell labelled **A** and give a reason for your answer. [2]

Type of blood cell .....

Reason .....

7

Turn over.

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4. A scientist was investigating changes in lactic acid concentration in the blood of two students, Cerys and Blodwen. They both ran on a treadmill at the same speed for the same time.

(a) **Table 4.1** shows the results for Cerys.

Table 4.1

Time (minutes)	Concentration of lactic acid (mg per dm^3)
0	60
10	120
20	180
30	200
40	150
50	110
60	70
70	60

(i) Complete **Graph 4.2** of these results by:

- Plotting the concentration of lactic acid for Cerys [2]
- Joining your plots with a ruler. [1]

The first three plots for Cerys and all the plots for Blodwen have been done for you.

(ii) From **Graph 4.2**, describe **one** difference between the results for Cerys and Blodwen. [1]

.....

.....

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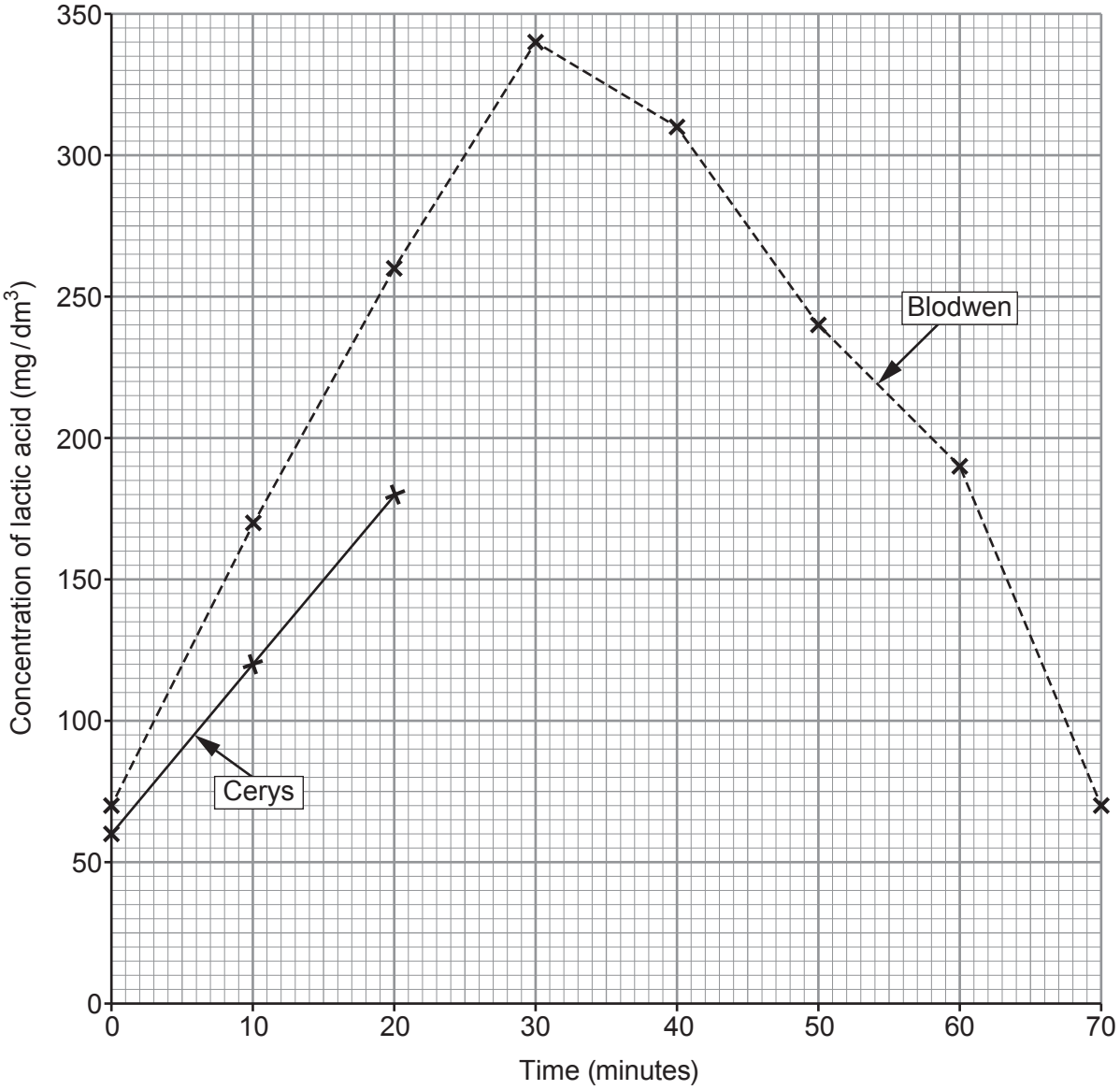
Graph 4.2



(b) Use **Graph 4.2** to:

(i) calculate the maximum increase in lactic acid in the blood for Blodwen; [1]

Increase = ... mg per dm^3

(ii) suggest what time Blodwen stopped running. [1]

Time = ...minutes

Turn over.

Examiner only

(c) The students are using anaerobic respiration for part of the time they are running. Complete the word equation for anaerobic respiration. [2]

..... ⟶ ..... (+ energy)

(d) The students continued to breathe deeply and rapidly after they had finished running. Explain the reason for this. [2]

.....

.....

.....

.....

10

5. The amount of pollution in water can be determined by measuring oxygen levels, pH levels or by using indicator species. Polluted water will have low oxygen levels, as bacteria use up oxygen. The water will become more acidic.

Air pollution can be assessed using indicator species, such as lichens. Lichens are organisms that consist of fungi and algae living together. Lichens can grow on tree bark and rocks. There are many species of lichen which can be grouped into three main types: bushy, leafy and crusty. The number of types of lichens present can indicate the level of air pollution.

- Bushy lichens can only survive in unpolluted air.
- Leafy lichens can survive a small amount of air pollution.
- Crusty lichens can survive in more polluted air.
- The more types of lichen growing in an area, the lower the level of air pollution.

(a) Use the information above to **complete Table 5.1** by writing true or false next to each statement. [4]

Table 5.1

Statement	True/False
Bacteria use oxygen for respiration	
Polluted water will be pH 7 (neutral)	
Lichens are plants	
There will be a higher number of different types of lichen in polluted areas	
Bushy lichens can survive in more polluted areas	

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(b) (i) In 2019, a study rated the air quality in the centre of Cardiff as being worse than the centre of London.

Image 5.2 shows the three main types of lichen.

In **Image 5.2 circle the letter (A, B, C)** of the type of lichen you may expect to find growing in Cardiff city centre if there was a lot of air pollution present. [1]

Image 5.2

A **B** **C**

Bushy Leafy Crusty

A scientist counted the number of species of lichens growing at different distances from the centre of Cardiff. Her results are shown in **Table 5.3**.

Table 5.3

Distance from Cardiff centre (km)	Number of species of lichen
0	2
1	5
2	8
3	10
4	15
5	.....
6	26
7	30
8	48
9	56
10	60

(ii) **Complete Table 5.3** by estimating the number of species of lichen likely to be found 5 km from Cardiff centre. [1]

(iii) State the independent and dependent variables in this investigation. [2]

Independent variable .....

Dependent variable .....

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(iv) I. State the relationship between the number of lichen species and the distance from the centre of Cardiff. [1]

.....

.....

II. Use the information given to explain the relationship between the number of species of lichen and the distance from the centre of Cardiff. [2]

.....

.....

.....

.....

(v) State how the scientist could improve her confidence in these results. [1]

.....

.....

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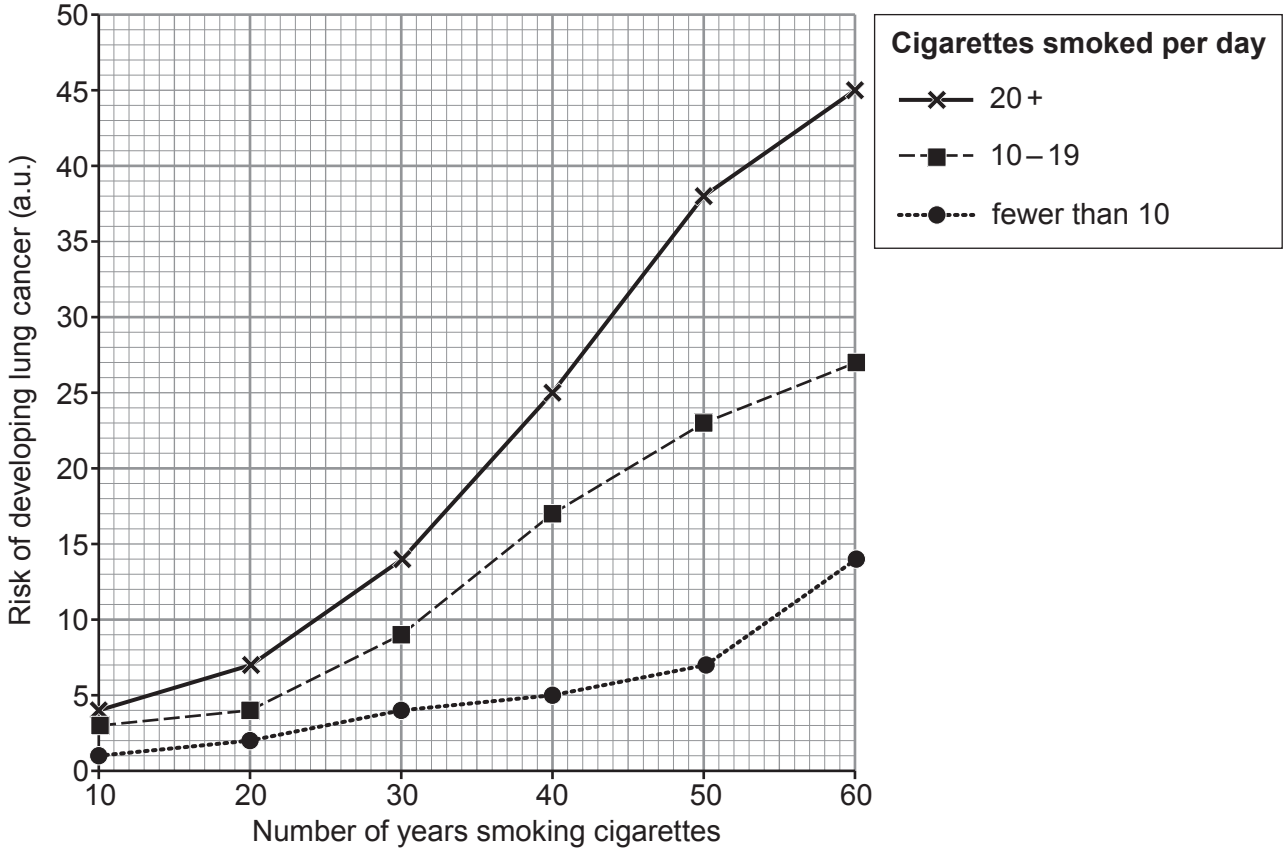
6. **Graph 6.1** shows the relationship between smoking cigarettes and the risk of developing lung cancer.

Graph 6.1



(a) State **two** conclusions that can be drawn from **Graph 6.1**. [2]

1. .....

.....

2. .....

.....

(b) State **one** chemical found in cigarette smoke and its effect on the body. [2]

Chemical .....

Effect .....

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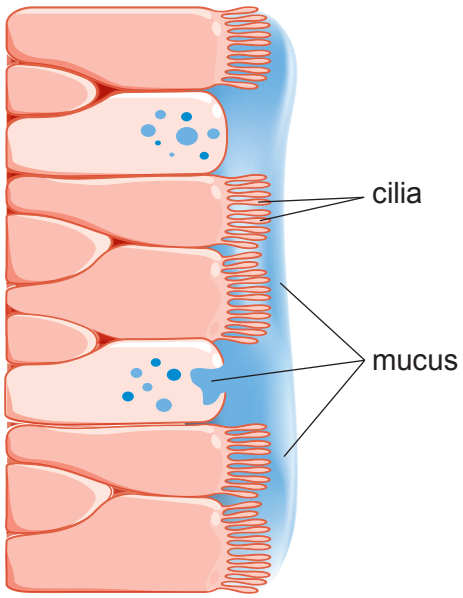
(c) **Image 6.2** shows the cells that line the airways of the lungs.

Image 6.2



(i) Describe the function of:

I. mucus; [1]

.....

II. cilia. [1]

.....

(ii) Describe the effect of smoking on the cilia and mucus. [2]

.....

.....

.....

(iii) Other than lung cancer, state the name of **one** disease which can be caused by cigarette smoking. [1]

.....

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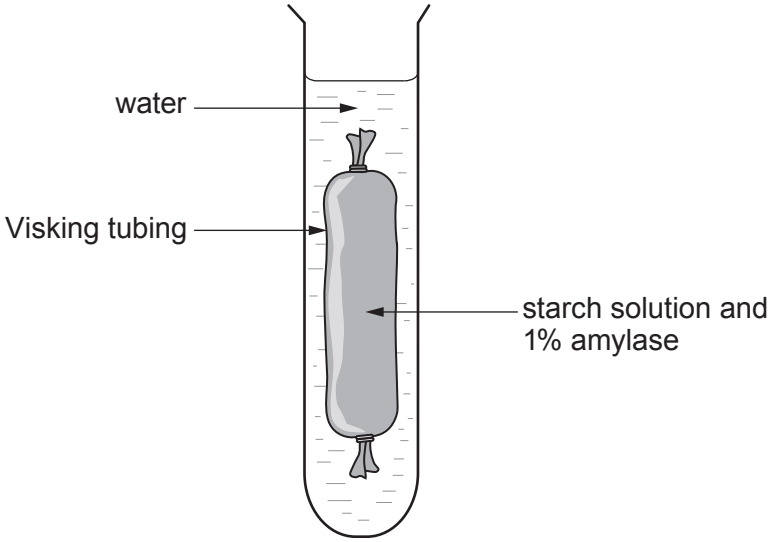
7. An experiment was set up using Visking tubing as a model gut. The Visking tubing was filled with a solution containing starch and the enzyme amylase.

Image 7.1



(a) The water surrounding the Visking tubing was tested for starch and glucose at the start and at 30 minutes. The results are shown in **Table 7.2**.

Table 7.2

Substance	At start	At 30 minutes
glucose	absent	present
starch	absent	absent

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Describe the chemical tests for starch and glucose. Explain the results obtained in this experiment at **30 minutes**. [6 QER]

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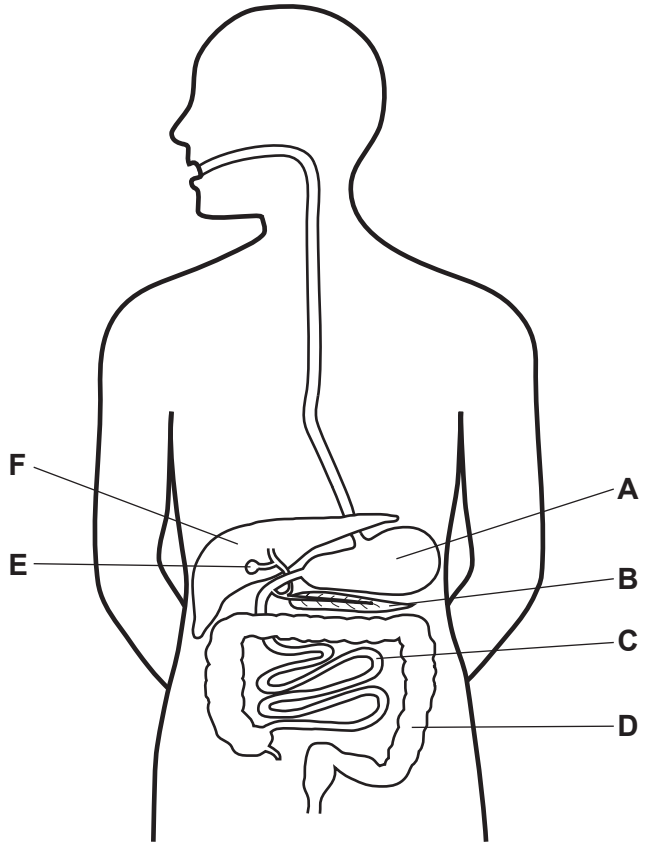
(b) **Image 7.3** shows the human digestive system.

Image 7.3



(i) State the letter of the organ **(A–F)** where bile is: [2]

I. made; .....

II. stored. .....

(ii) Explain the function of bile in the digestion of fat. [2]

.....

.....

.....

.....

(iii) State the name of the organ where digestion of fat takes place. [1]

.....

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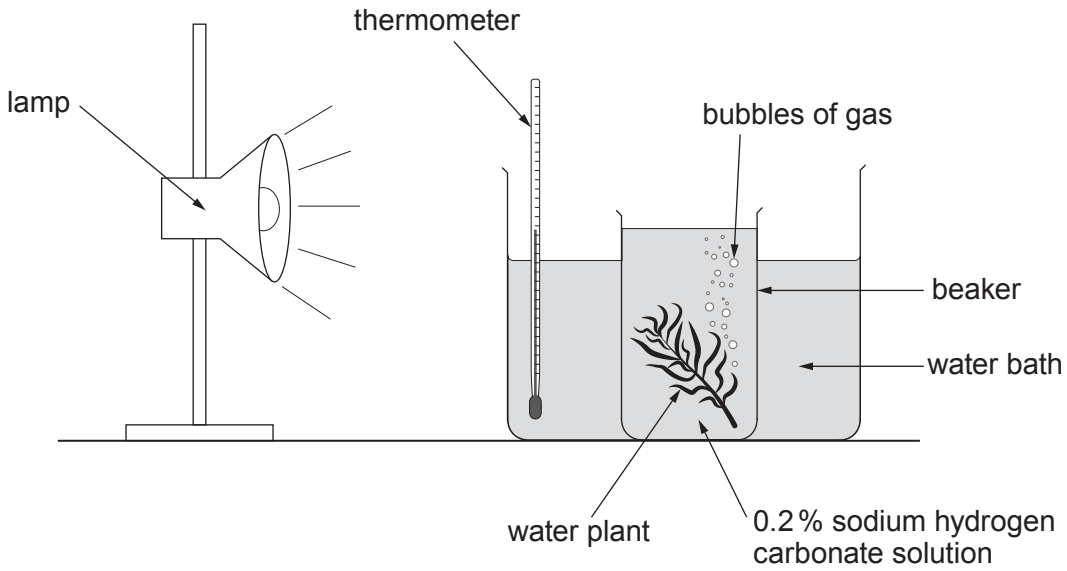
8. Students were instructed to investigate the effect of temperature on photosynthesis. They used the apparatus shown in **Image 8.1**.

Image 8.1



- The number of bubbles of gas produced by the water plant per minute was counted at different temperatures.
- The experiment was carried out three times at each temperature.
- The results are shown in **Table 8.2**. Means were calculated to the nearest whole number.

Table 8.2

Temperature of water bath (°C)	Number of bubbles of gas produced per minute			
	Test 1	Test 2	Test 3	Mean
20	18	21	12	17
25	15	24	21	20
30	24	27	30	27
35	26	25	26	26
40	14	13	10	12
45	3	5	6	.....
50	0	0	0	0

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(a) (i) State the name of the gas produced during photosynthesis. [1]

.....

(ii) State **two** ways in which plants use the glucose produced during photosynthesis. [2]

I. .....

II. .....

(b) (i) Calculate the mean number of bubbles per minute for 45 °C. **Write your answer in Table 8.2.** [2]

(ii) Describe the relationship between the temperature and the number of bubbles produced per minute. [2]

.....

.....

.....

.....

.....

.....

(iii) Explain the result for 50 °C. [2]

.....

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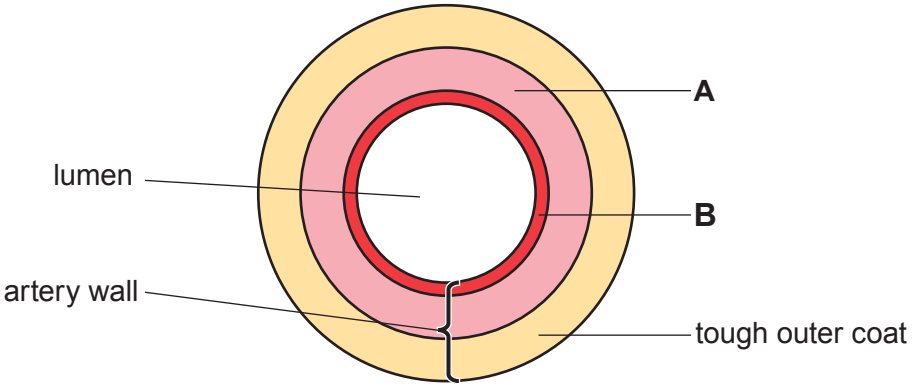
9. **Image 9.1** shows a cross section through a healthy coronary artery.

Image 9.1



(a) (i) State the names of **tissues A** and **B**. [2]

A .....

B .....

(ii) Suggest how the diameter of the lumen would differ in an individual with cardiovascular disease and explain the difference. [2]

.....

.....

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.....

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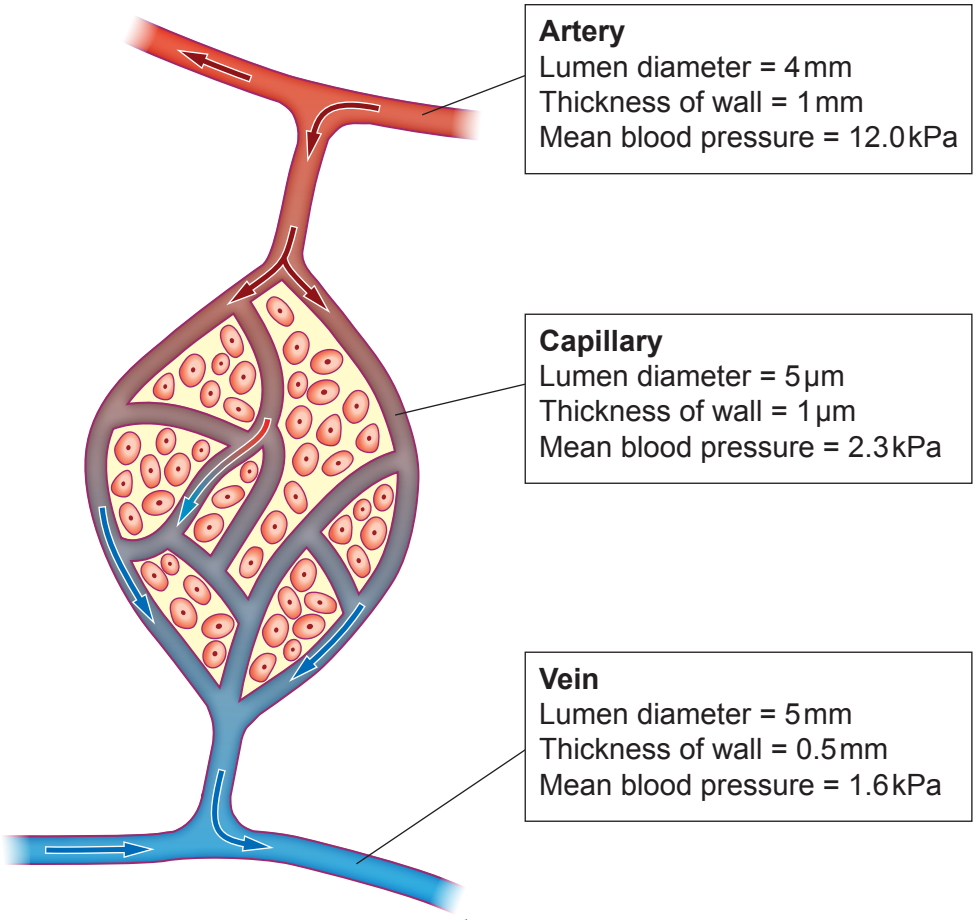
(b) **Image 9.2** shows a cross section of blood vessels found in muscle tissue, along with some information about them.

Image 9.2



(i) Use **Image 9.2** to give **two** differences between the structure of an artery and a vein. [2]

.....

.....

.....

.....

(ii) Veins contain structures that are not present in arteries or capillaries. State the name of these structures and describe their function. [2]

Name of structures .....

Function .....

.....

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(c) (i) State the name of **one** substance which passes from the blood into the body cells. [1]

.....

(ii) State **one** way in which capillaries are adapted for their function. Give an advantage for this adaptation. [2]

Adaptation

.....

Advantage

.....

.....

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END OF PAPER

Question number	Additional page, if required. Write the question number(s) in the left-hand margin.

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