Surname	Centre Number	Candidate Number
First name(s)		0

GCSE

3430U10-1

Z22-3430U10-1

WEDNESDAY, 15 JUNE 2022 – MORNING

SCIENCE (Double Award)

Unit 1: BIOLOGY 1
FOUNDATION TIER

1 hour 15 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**5**	
2.	**6**	
3.	**10**	
4.	**13**	
5.	**11**	
6.	**9**	
7.	**6**	
Total	**60**	

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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 a 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 **5**(b) is a quality of extended response (QER) question where your writing skills will be assessed.

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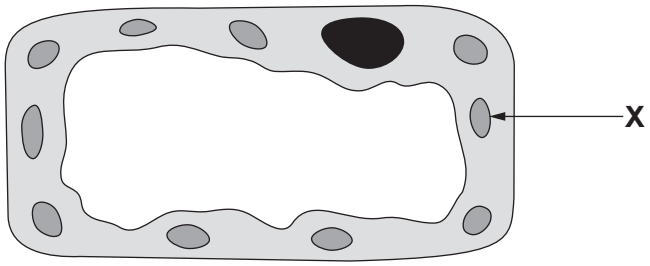
Answer **all** questions.

1. (a) An **incomplete** diagram of a plant leaf cell is shown in **Image 1.1**.

Image 1.1



(i) **Complete Image 1.1 by drawing** the **cell wall**. [1]

(ii) Structure **X** contains chlorophyll and absorbs light.

I. **Complete the following sentence** by underlining the correct term in the brackets. [1]

Structure **X** is a **(vacuole / chloroplast / mitochondrion)**.

II. State the name of the **process** that uses the light absorbed by structure **X**. [1]

.....

(b) The cell in **Image 1.1** is adapted for one function.

Complete the following sentences by underlining the correct term in the brackets. [2]

(i) Cells adapted for one function are called **(special / specialised / specific)**.

(ii) Groups of similar cells are called **(tissues / organs / organisms)**.

5

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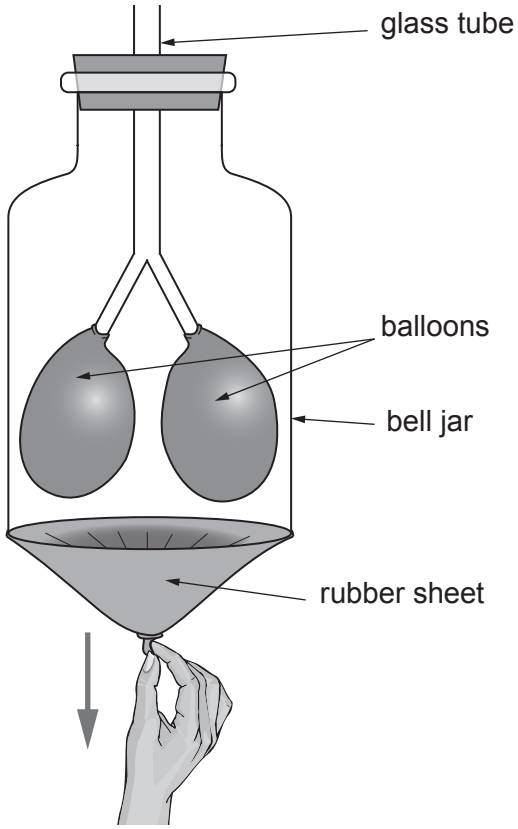
2. The bell jar model in **Image 2.1** is used to show how breathing occurs.

Image 2.1



(a) **Use words from the list** to complete the following sentences. [3]

inflates **decreases** **deflates** **equalises** **increases**

When the rubber sheet is pulled down the volume of the space inside the bell jar ..... and the air pressure ..... .

As a result, air is forced down the glass tubes and each balloon ..... .

(b) The equipment labelled on the bell jar model in **Image 2.1** represent different structures in the body. Name the structures represented by:

(i) the glass tube; ..... [1]

(ii) the bell jar; ..... [1]

(iii) the rubber sheet. ..... [1]

6

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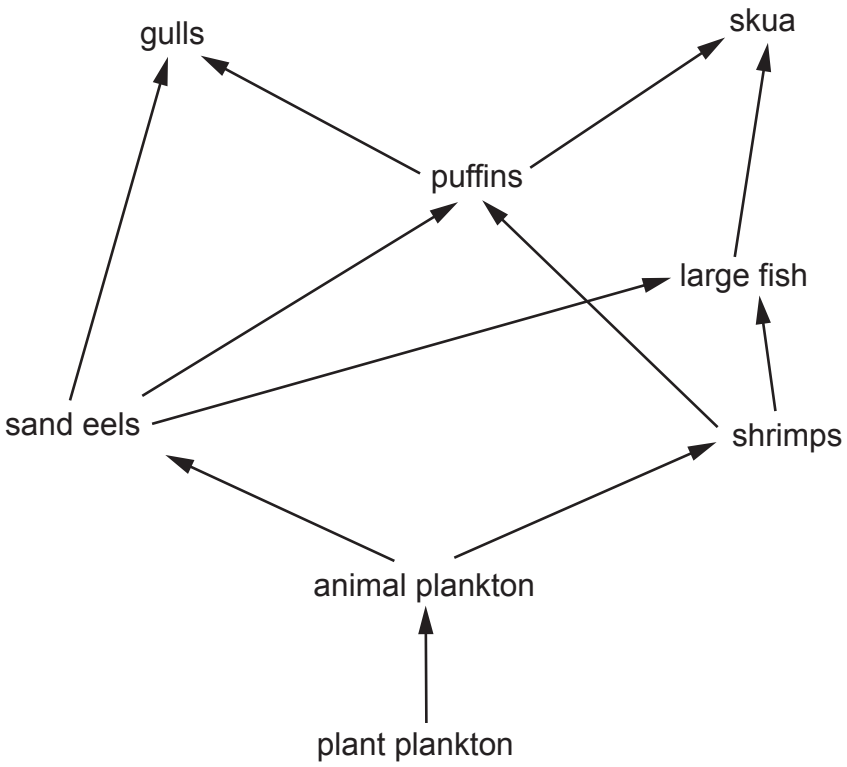
3. **Image 3.1** shows part of a marine food web.

Image 3.1



(a) Use the food web in **Image 3.1** to complete a food chain below which **includes puffins**. [3]

plant plankton → ..... → ..... → puffins → .....

(b) (i) State the **source** of the energy that enters the plant plankton. [1]

.....

(ii) Energy is used by the organisms in the food web.
State **one** way energy is used by organisms. [1]

.....

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(c) Read the following information about puffins.

- Puffins are seabirds.
- Each year, puffins spend eight months at sea. The other four months are spent on land during the breeding season.
- Puffins nest on the ground where there may be many predators such as foxes and rats.
- Natural factors cause puffin numbers to vary. However, oil pollution and rising sea temperatures from climate change have reduced puffin numbers in most areas.
- Some puffins breed on the Welsh island of Skomer. Here, their numbers increased from 14 000 in 2013 to 31 000 in 2018.

Skomer Island

walesonline.co.uk

Use the above information to answer the following questions.

(i) Explain why the Welsh Wildlife Trusts prevent rats from being introduced onto Skomer. [1]

.....

(ii) **Complete the table** by writing true or false for each statement about puffins. [4]

Statement	True or False
Puffins face predators only at sea.	False
Puffin numbers are affected by variations in natural factors.	.....
Puffin numbers generally are rising.	.....
Puffin numbers on Skomer increased by over 100% between 2013 and 2018.	.....
Puffins are at risk from climate change.	.....
Puffins spend only one third of the year at sea.	.....

10

3430U101
05

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4. (a) The photograph shows a fitness smartwatch.

Bethan used a smartwatch to investigate the resting heart rates of ten students in her class.

- Five girls and five boys were chosen at random.
- Each student sat at rest for one minute.
- Then the heart rate shown on the smartwatch was recorded.

The results are shown in **Table 4.1**.

Table 4.1

Girls		Boys	
Name	Resting heart rate (beats per minute)	Name	Resting heart rate (beats per minute)
Seren	69	Dan	62
Katya	74	Jim	65
Nia	73	Ifor	67
Tracy	59	Rhys	60
Angharad	70	Mohamed	63
	mean = 69		mean = ...

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(i) I. Calculate the mean resting heart rate for the boys.
Give your answer to the nearest whole number. Write your answer in Table 4.1. [3]
Space for working.

II. State the conclusion that can be made from a comparison of the two means. [1]

.....

.....

(ii) State **one** way that this investigation is a fair test. [1]

.....

.....

3430U101
07

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(b) **Table 4.2** shows the mean resting heart rates by age in women and men from thousands of fitness smartwatch users of many nations and ethnicities.

Table 4.2

Age (years)	Mean resting heart rate (beats per min)	
	Women	Men
20	67.0	62.5
30	67.5	63.5
40	68.0	64.0
50	67.0	64.5
60	66.0	64.0
70	65.0	62.0
80	64.0	61.0

(i) **Graph 4.3** shows the plotted data for women and two plots for men. Complete **Graph 4.3** by: [3]

I. plotting the remaining points for the **men** on the grid.

II. joining **all** the plots **for men** with a ruler.

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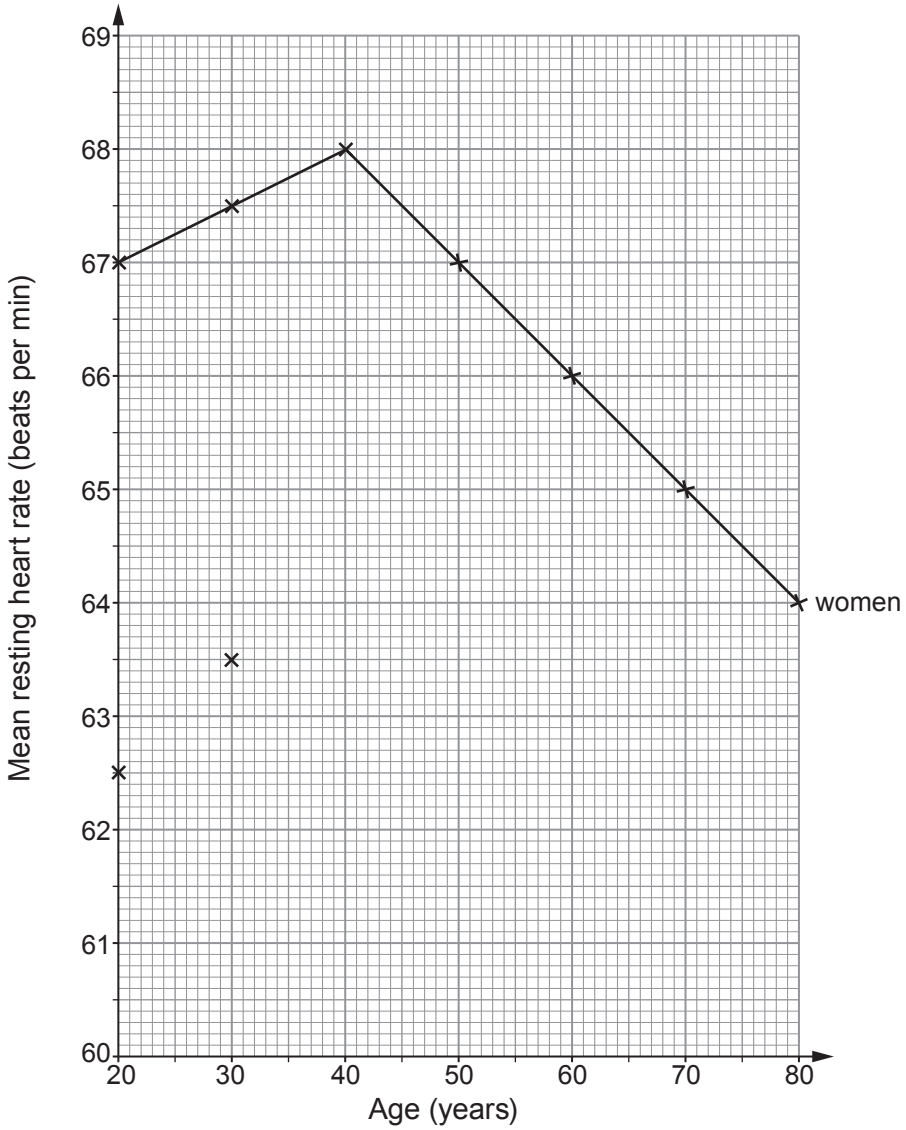
Graph 4.3



(ii) From **Graph 4.3**:

State whether the data support the results of Bethan's investigation and explain your answer. [1]

.....

.....

(iii) Describe how the mean resting heart rate in **men** changes between the ages of 20 and 80 years. [2]

.....

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3430U101
09

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(c) Give **two** reasons why the smartwatch data in **Table 4.2** are more representative of mean human resting heart rates than those in **Table 4.1**. [2]

1. .....

2. .....

13

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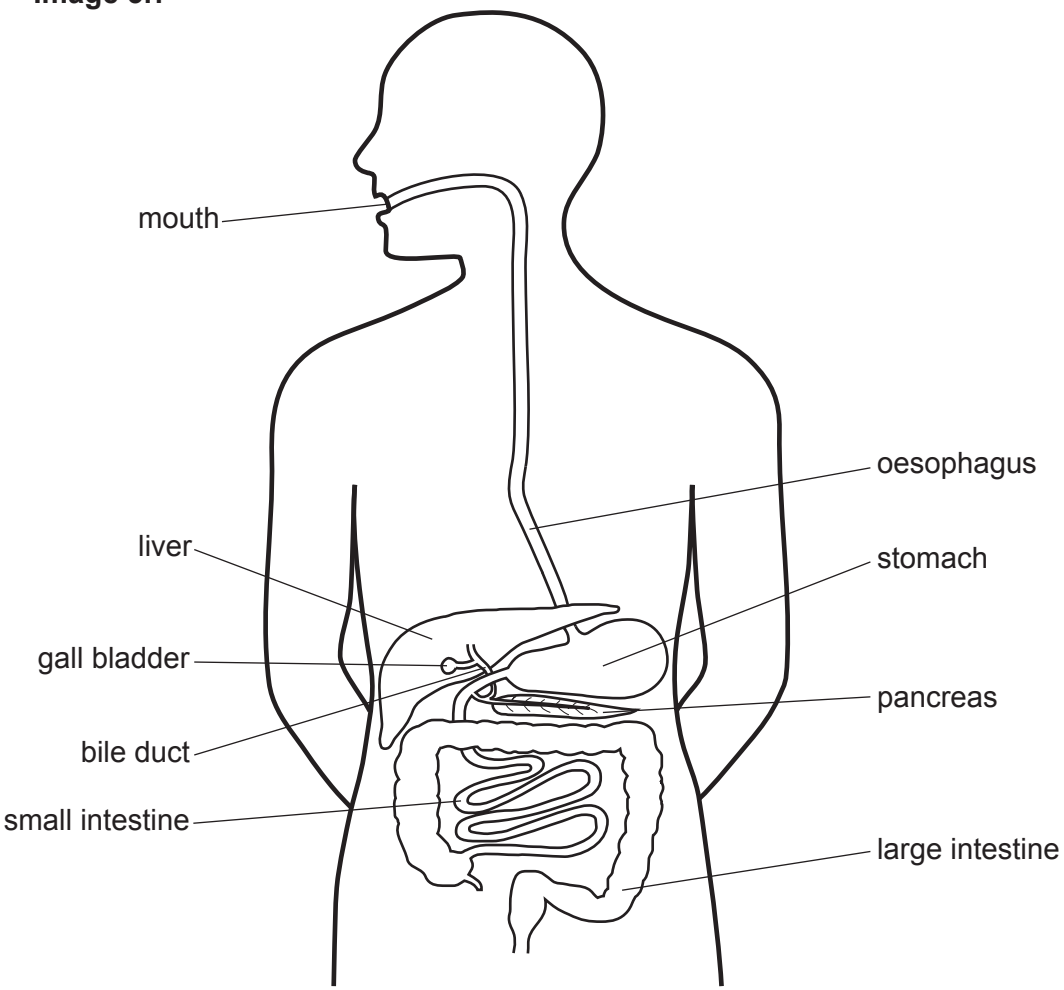
5. (a) **Image 5.1** shows the digestive system.

Image 5.1



Choose named structures from **Image 5.1** to complete **Table 5.2**. [5]

Table 5.2

Function	Name of structure
Starts digestion of starch	.....
Carries bile from gall bladder	.....
Absorbs water from undigested food waste	.....
Absorbs digested food molecules into the blood	.....
Makes lipase	.....

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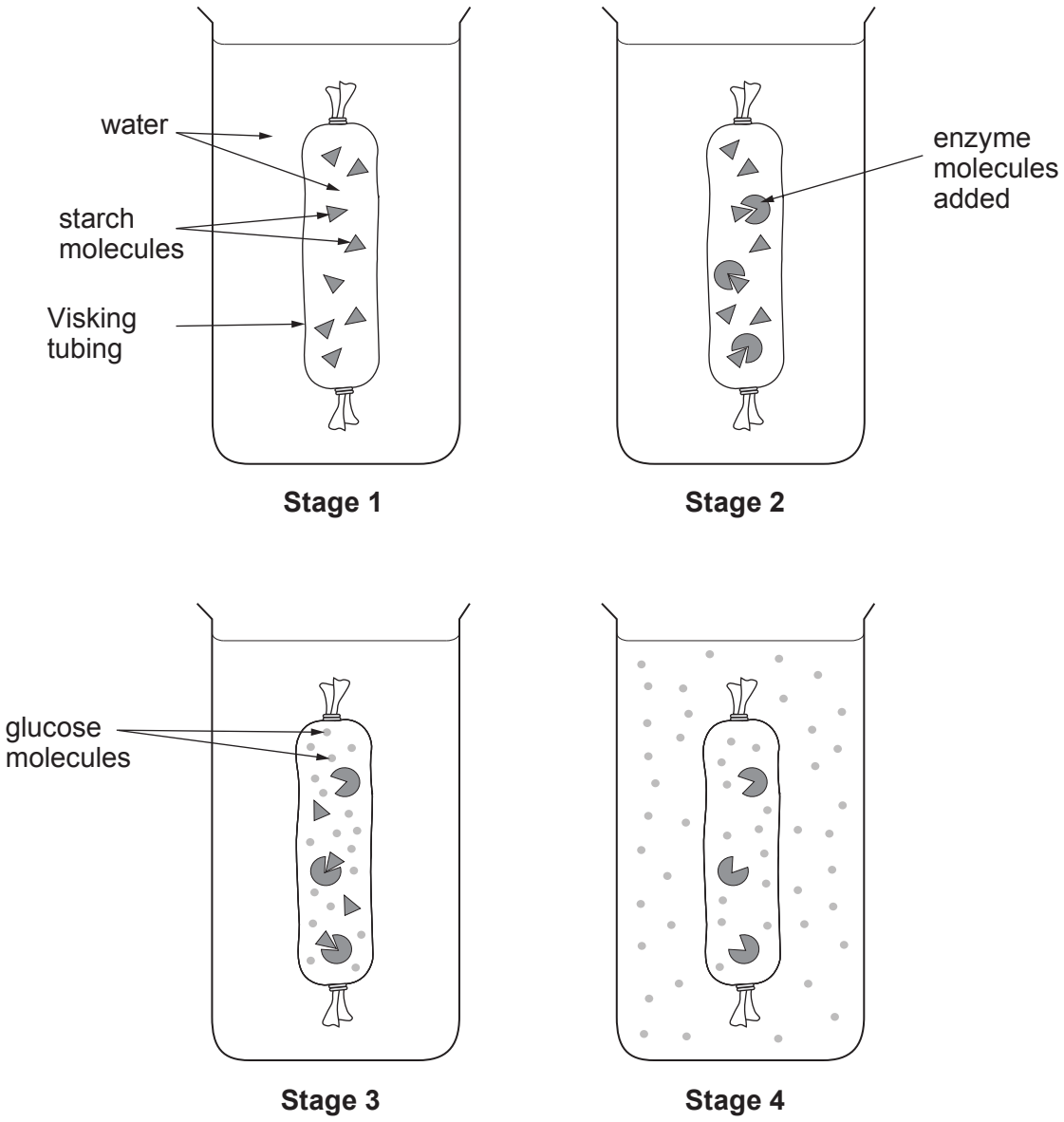
(b) Visking tubing has small holes in its wall which only allow small molecules to pass through.

Dafydd studies a computer model which uses Visking tubing to show part of the digestive system in action.
The stages involved are shown in **Image 5.3**.

Image 5.3



Using **all** the information shown in **stages 1, 2, 3 and 4**, explain how glucose appears in the water outside the Visking tubing in **stage 4**. [6 QER]

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11

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6. The nutrition information in **Table 6.1** is taken from a pack of dried pasta.

Table 6.1

TYPICAL VALUES	Per 100 g (of dried pasta)
Energy	761 kJ
Fat	1.3 g
of which – saturated	0.1 g
of which – unsaturated	..... g
Carbohydrates	25.0 g
of which – sugars	2.3 g
Fibre	7.7 g
Protein	13.0 g
Salt	0.05 g

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(a) (i) Calculate the value for unsaturated fats. **Write your answer in Table 6.1**. [1]
Space for working.

(ii) State the name of the nutrient which makes up most of the carbohydrates in the dried pasta. [1]

.....

(iii) State the importance of a low-salt diet. [1]

.....

.....

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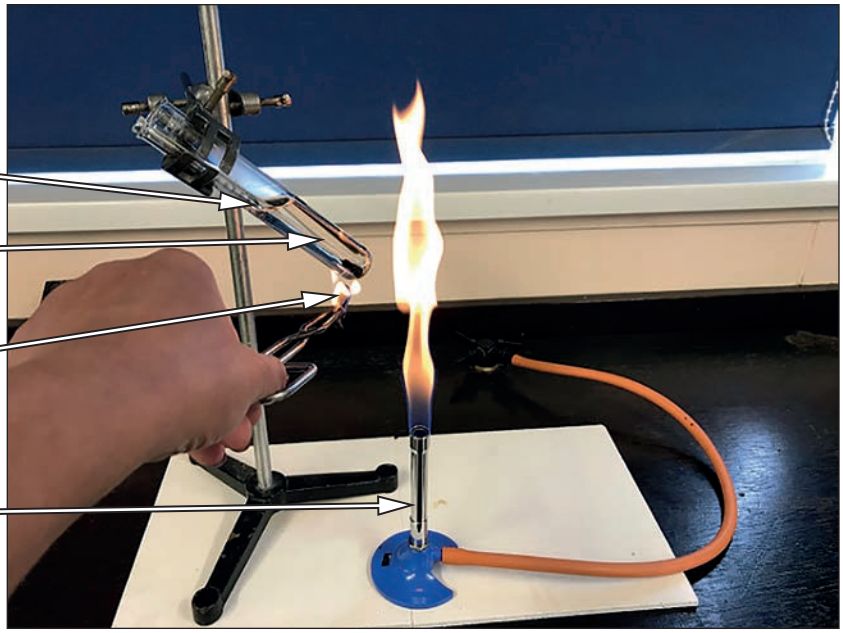
(b) Lloyd and Emma carried out an experiment to compare the energy values in **Table 6.1** with values they obtained using the apparatus shown in **Image 6.2**.

Image 6.2



They ignited a 1.6 g piece of dried pasta using the Bunsen burner and immediately held the burning pasta at the base of the boiling tube until it stopped burning. The results Lloyd and Emma obtained are shown in **Table 6.3**.

Table 6.3

Mass of pasta (g)	Initial temperature of water (°C)	Final temperature of water (°C)	Increase in temperature of water (°C)	Energy released per gram of food (kJ)
1.6	14	58	44	.....

(i) Use the following formula to calculate the energy released per gram of food (kJ). **Write your answer in Table 6.3**. [2]

$$\text{Energy released per gram (kJ)} = \frac{\text{volume of water (cm}^3\text{)} \times \text{temperature increase (°C)} \times 0.0042}{\text{mass of pasta sample (g)}}$$

Space for working.

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(ii) I. State how the energy content of dried pasta in **Table 6.3** compares to the energy content indicated in **Table 6.1**. You must use numerical data in your answer. [2]

.....

.....

.....

.....

II. Give **one** reason for the difference between the energy content of dried pasta obtained by Lloyd and Emma, as shown in **Table 6.3** and the energy content indicated in **Table 6.1**. [1]

.....

.....

(iii) Evaluate the arrangement of the apparatus shown in **Image 6.2** by identifying **one** source of error. [1]

.....

.....

.....

9

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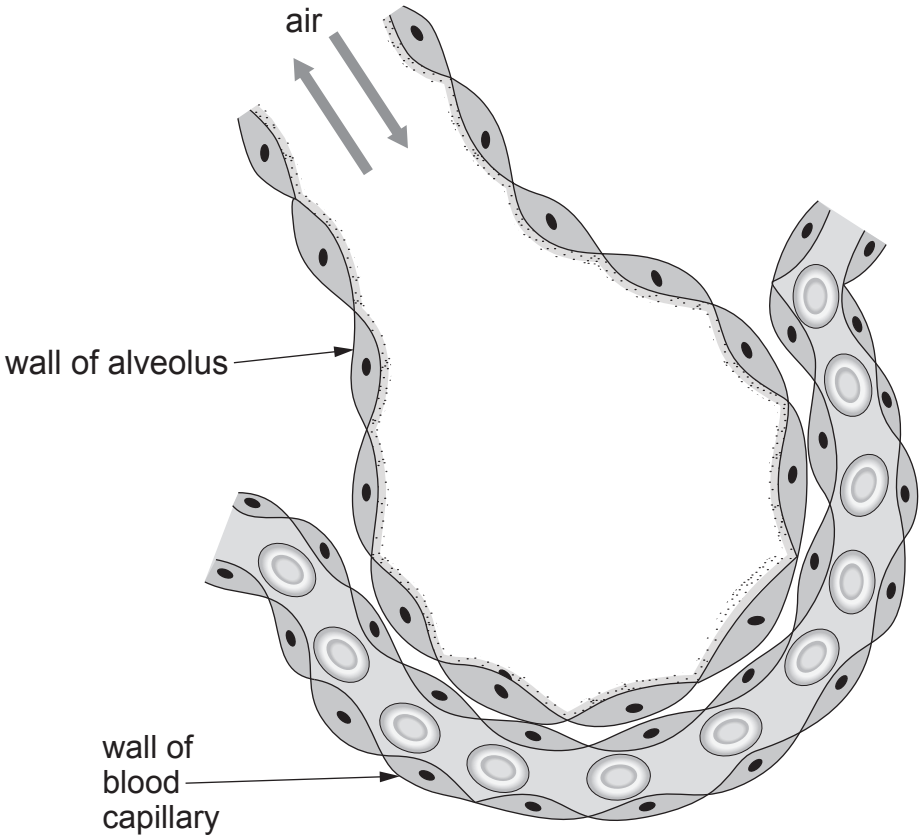
7. **Image 7.1** shows an alveolus.

Image 7.1



(a) **Use labelled arrows** to identify the following structures on **Image 7.1**: [2]

(i) bronchiole;

(ii) blood plasma.

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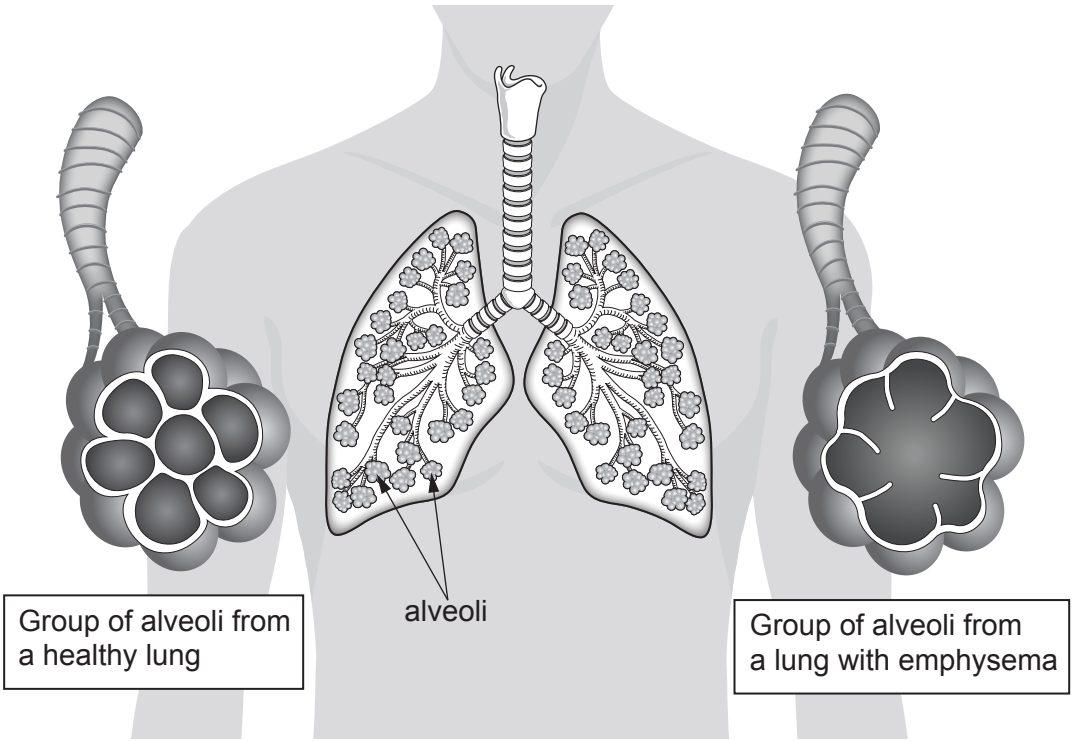
(b) **Image 7.2** shows groups of alveoli from a healthy lung and from a lung of a person with emphysema. The tables below **Image 7.2** show the concentrations of oxygen and carbon dioxide in the blood capillaries.

Image 7.2



Healthy lung	
Gas	Concentration of gases in the blood capillaries (arbitrary units)
oxygen	86
carbon dioxide	45

Lung with emphysema	
Gas	Concentration of gases in the blood capillaries (arbitrary units)
oxygen	53
carbon dioxide	62

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(i) Using **Image 7.2**, explain the differences in the concentrations of gases in the blood capillaries of a healthy lung and a lung with emphysema. [2]

.....

.....

.....

.....

(ii) State the effect on breathing of the difference in concentrations of these gases for a person suffering from emphysema. [1]

.....

(iii) State **one** cause of emphysema. [1]

.....

6

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

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