

Surname	Centre Number	Candidate Number
Other Names		0

**GCSE**

3430UA0-1



S19-3430UA0-1

FRIDAY, 7 JUNE 2019 – AFTERNOON**SCIENCE (Double Award)****Unit 1: BIOLOGY 1
HIGHER TIER**

1 hour 15 minutes

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	6	
2.	9	
3.	11	
4.	14	
5.	7	
6.	6	
7.	7	
Total	60	

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. Do not use correction fluid.

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

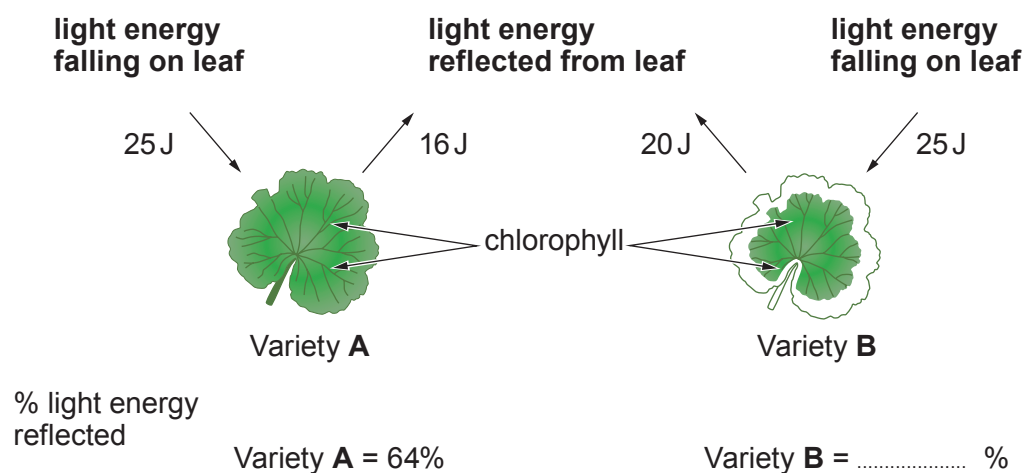


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Answer all questions.

1. (a) Write the word equation for photosynthesis. [2]

- (b) The diagram shows leaves from two varieties of geranium **A** and **B** of the genus *Pelargonium*. Light energy falling on the two leaves and the light energy reflected from each leaf, during a period of one hour is also shown.



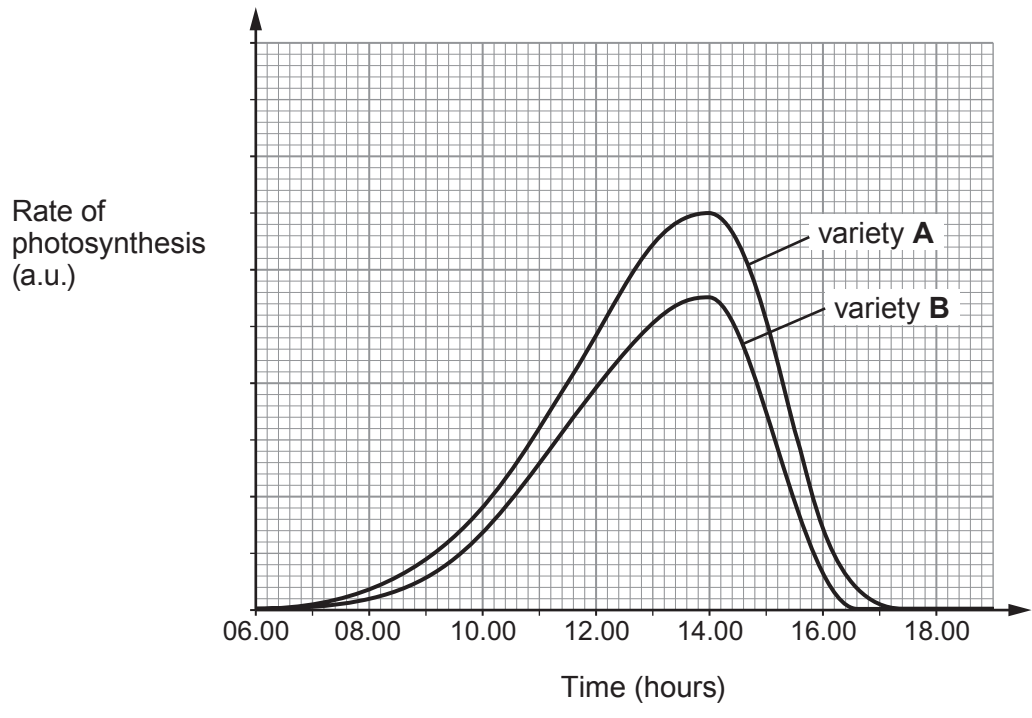
Calculate the percentage of light energy falling on leaf **B** that is reflected.
Write your answer in the diagram.

[2]

Space for working.



(c) The graph shows the rate of photosynthesis in the two plants between 06.00 and 18.00.



Use the diagram opposite and the graph above to explain why the mass of variety **A** is likely to increase at a faster rate than the mass of variety **B**. [2]

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2. (a) (i) State the products of protein digestion. [1]

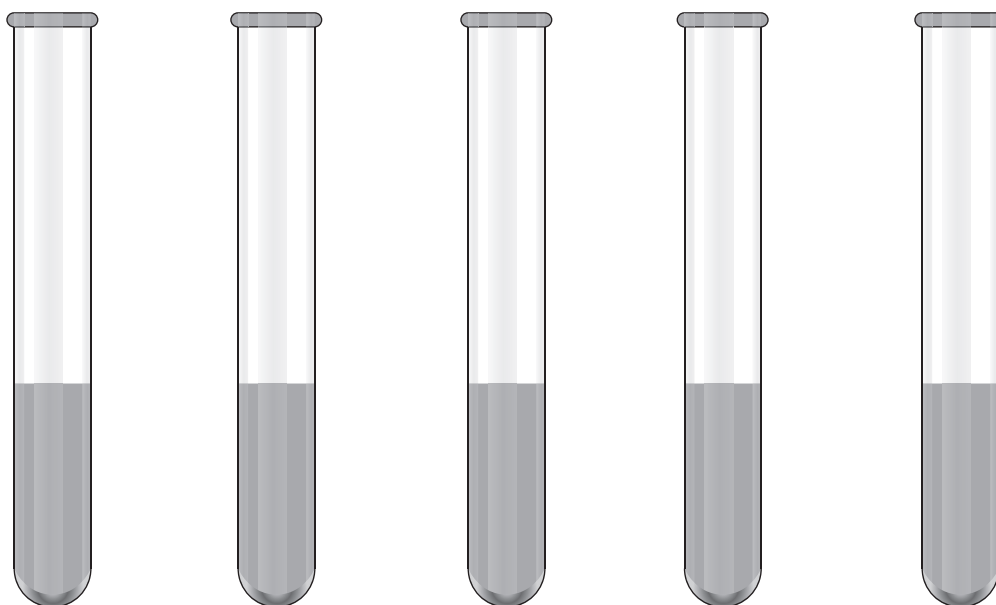
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(ii) State the part of the digestive system that absorbs digested food molecules. [1]

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(b) Protein digestion starts in the stomach.

Students investigated protein digestion. They set up five tubes **A** to **E**, as shown below.



Tube **A** **B** **C** **D** **E**

Tube A	Tube B	Tube C	Tube D	Tube E
5 cm ³ of 1% protein	5 cm ³ of 1% protein	5 cm ³ of 1% protein	5 cm ³ of 1% protein	5 cm ³ of 1% protein
5 cm ³ of 0.1% protease	15 cm ³ liquid from the stomach	5 cm ³ of 0.1% protease	15 cm ³ distilled water	15 cm ³ distilled water
10 cm ³ distilled water		10 cm ³ distilled water		
pH 2.0		pH 7.0	pH 2.0	pH 7.0



The students measured the percentage protein digested at one hour. The results are shown in the table.

Tube	Percentage protein digested
A	100
B	98
C	5
D	0
E	0

- (i) Compare the results for tubes **A** and **D**. State the conclusion that can be made about the digestion of protein. [1]

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- (ii) State the conclusions that can be made about the contents of the liquid from the stomach in Tube **B**. [2]

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- (iii) All the 1% protein added to Tube **A** had been fully digested after one hour. State why the contents of Tube **A** would still test positive for protein. [1]

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- (iv) The students carried out a similar investigation, but instead of using 0.1% protease, they used 5 cm³ of 0.1% lipase in both tubes **A** and **C**. They found there had been no digestion of protein in either tube. Use your knowledge of enzyme structure and function to explain the results that the students obtained. [2]

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- (v) State **one** further variable that should be controlled during this investigation. [1]

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3. The thoracic cavity is the space in the body that contains the lungs. The volume of this space in a healthy adult man is about 5500 cm³. The lungs occupy 70% of the thoracic cavity. This is around 3850 cm³.

(a) State **two** other structures which occupy the remaining 30% of the space of the thoracic cavity. [2]

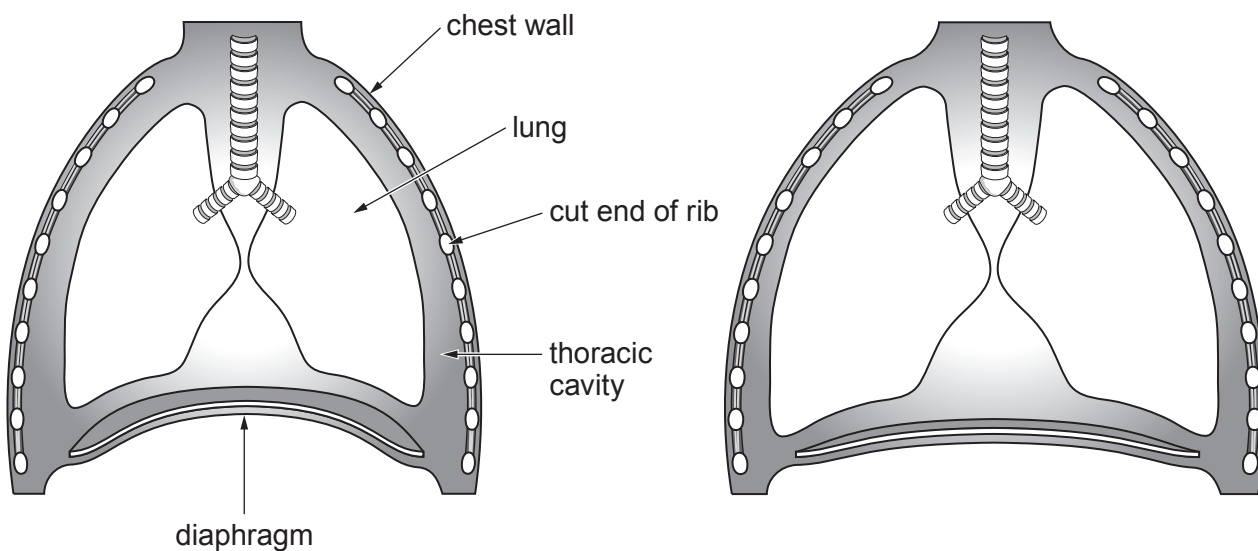
I.

II.

(b) The diagrams below show front views of the thorax during expiration and inspiration.

EXPIRATION

INSPIRATION



Use the information in the diagrams above, and your own knowledge, to explain how **inspiration** occurs. [5]

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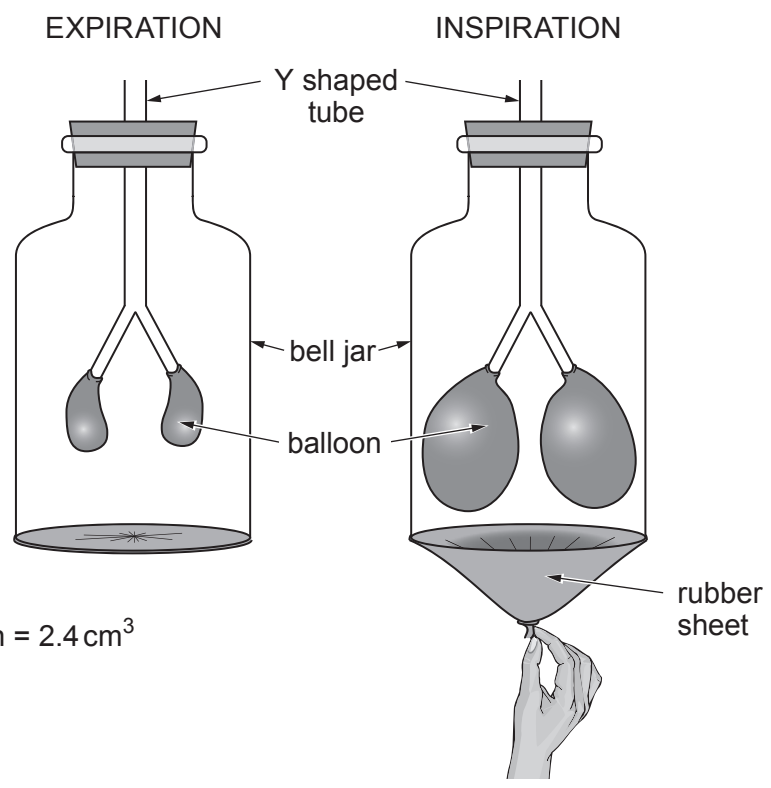
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(c) The bell jar model can be used to demonstrate expiration and inspiration as shown below.



Volume of one deflated balloon = 2.4 cm^3

Volume of bell jar = 5500 cm^3

(i) Calculate the percentage of the volume of the bell jar taken up by the **two** deflated balloons. Give your answer to **two decimal places**. [2]

% of volume of bell jar taken up by deflated balloons =

(ii) Using **only** the information and diagrams given and the calculation above, describe **two** limitations of the bell jar model compared with the human thorax. [2]

I.

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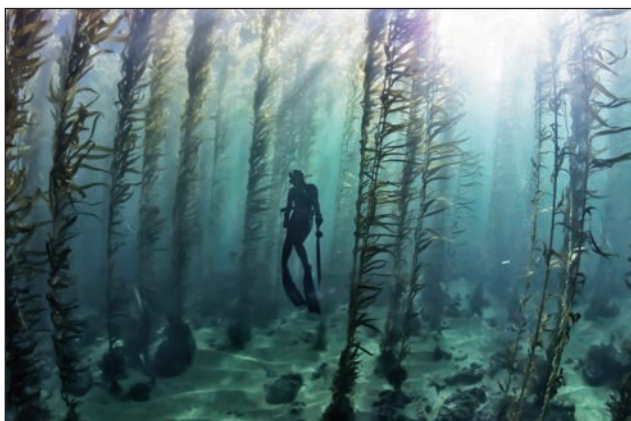
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4. Seaweeds (marine algae) contain large amounts of iodine in their tissues. The iodine is obtained from the seawater in which they live and is needed to maintain healthy growth of the plant. The iodine content of seawater is about 0.055 mg/kg. Some of the largest seaweeds are the kelps that live in kelp 'forests' in shallow seas and oceans where light can penetrate. Some kelp species are over 80 m in length and can grow 0.5 m in a day.

Photo showing part of a kelp 'forest' with sub-aqua diver



- (a) State the reason why kelp only grows in seawater where sunlight can penetrate. [1]

- (b) Kelp is of commercial importance. It is harvested for many reasons including as a source of iodine and other chemicals for the pharmaceutical industry. Conservationists are concerned that in some parts of the world kelp harvesting is reducing the number of other organisms living in the kelp forests.

Harvesting kelp in Canada



Examiner
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Using **only the information given**, what could you, as a scientist, say to the conservationists that would help them understand that a certain level of kelp harvesting could be maintained? [1]

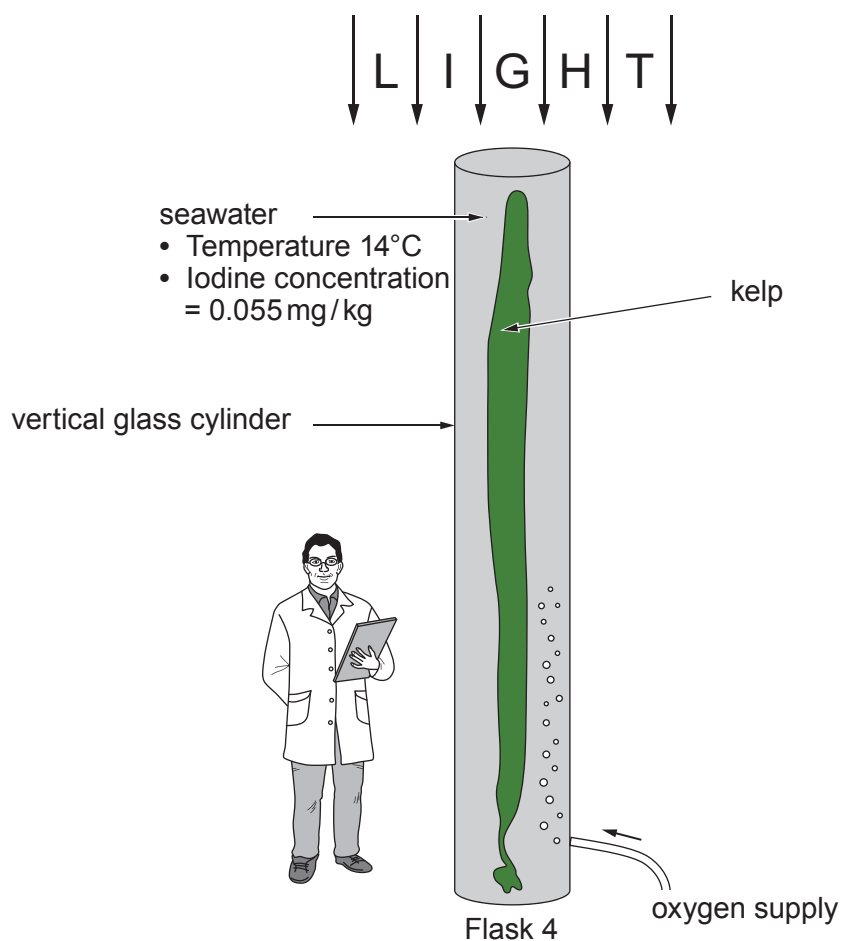
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- (c) The increasing importance of the commercial use of kelp has led scientists to conduct experiments in an attempt to grow them in land based factories. In one experiment sugar kelp (*Laminaria saccharina*) was grown in seawater in large vertical glass flasks. Scientists were trying to establish if the concentration of oxygen contained in the seawater affected the absorption of iodine by the kelp.

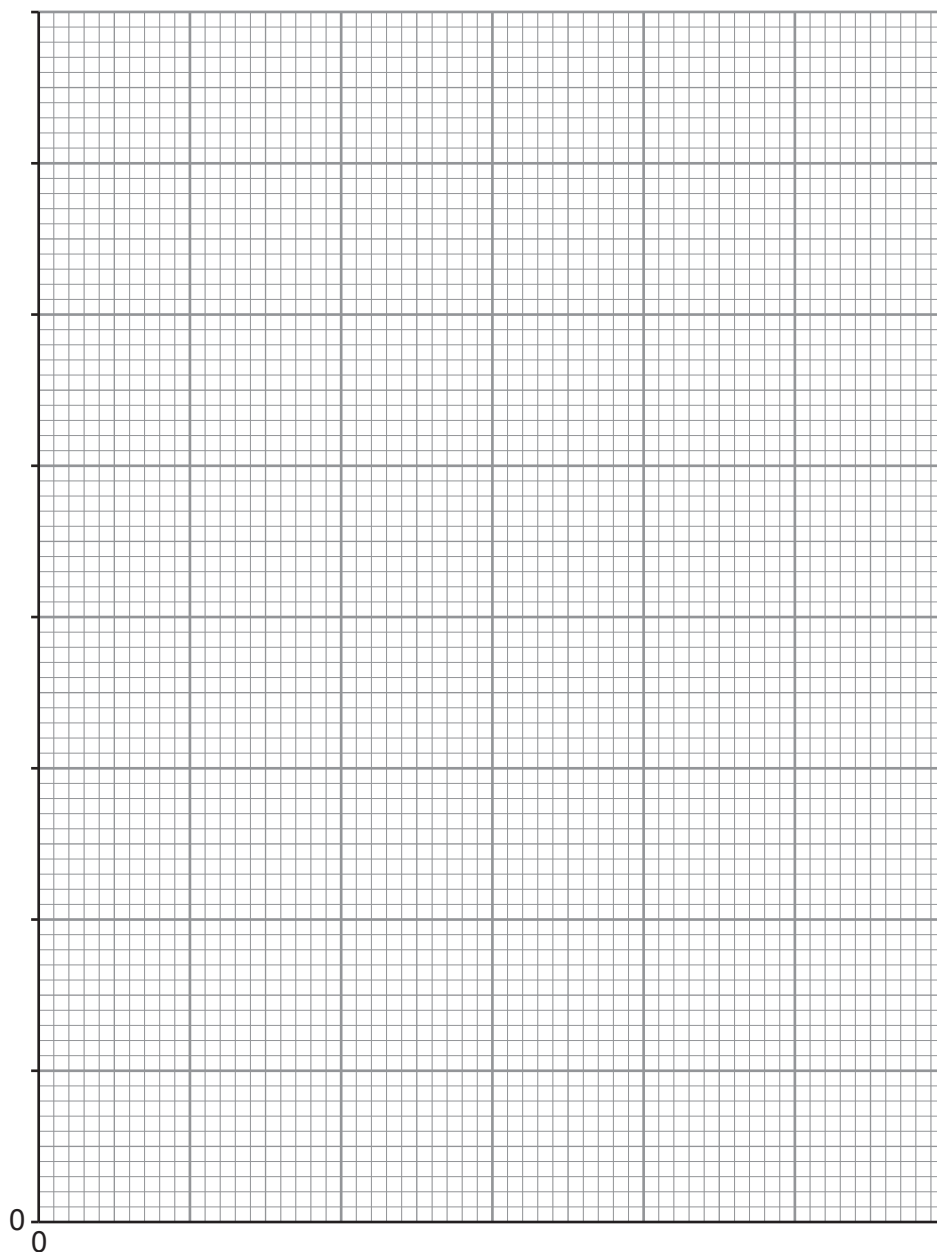


One set of results from the experiment is shown in the table.

Flask No.	Rate of flow of oxygen into flask (dm ³ /minute)	Mass of iodine extracted from kelp (mg/kg)
1	0.0	45
2	0.5	140
3	1.0	259
4	1.5	676
5	2.0	740
6	2.5	780
7	3.0	780



- (i) On the grid below plot a line graph for the mass of iodine against the rate of oxygen flow. You must add suitable scales to each axis. Join the plots with a ruler. [4]

Examiner
only

Examiner only

(ii) Describe the effect of increasing the rate of flow of oxygen above $2.5 \text{ dm}^3 / \text{minute}$ on the mass of iodine extracted. [1]

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(iii) The kelp used in the 7 flasks were of different sizes but the experimental results could still be compared. Explain how this was possible. [1]

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(iv) For **Flask 4** calculate how many times greater the concentration of iodine is in the kelp compared to the concentration of iodine in seawater. **Give your answer in standard form.** [2]

Answer = × greater

(v) The only source of iodine for kelp is the seawater in which they live. Explain how kelp is able to accumulate iodine against a concentration gradient. [3]

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(d) Another group of scientists want to test the reproducibility of the above experiment. State **one other** controlled variable, the value of which they would need to know, before they could proceed. [1]

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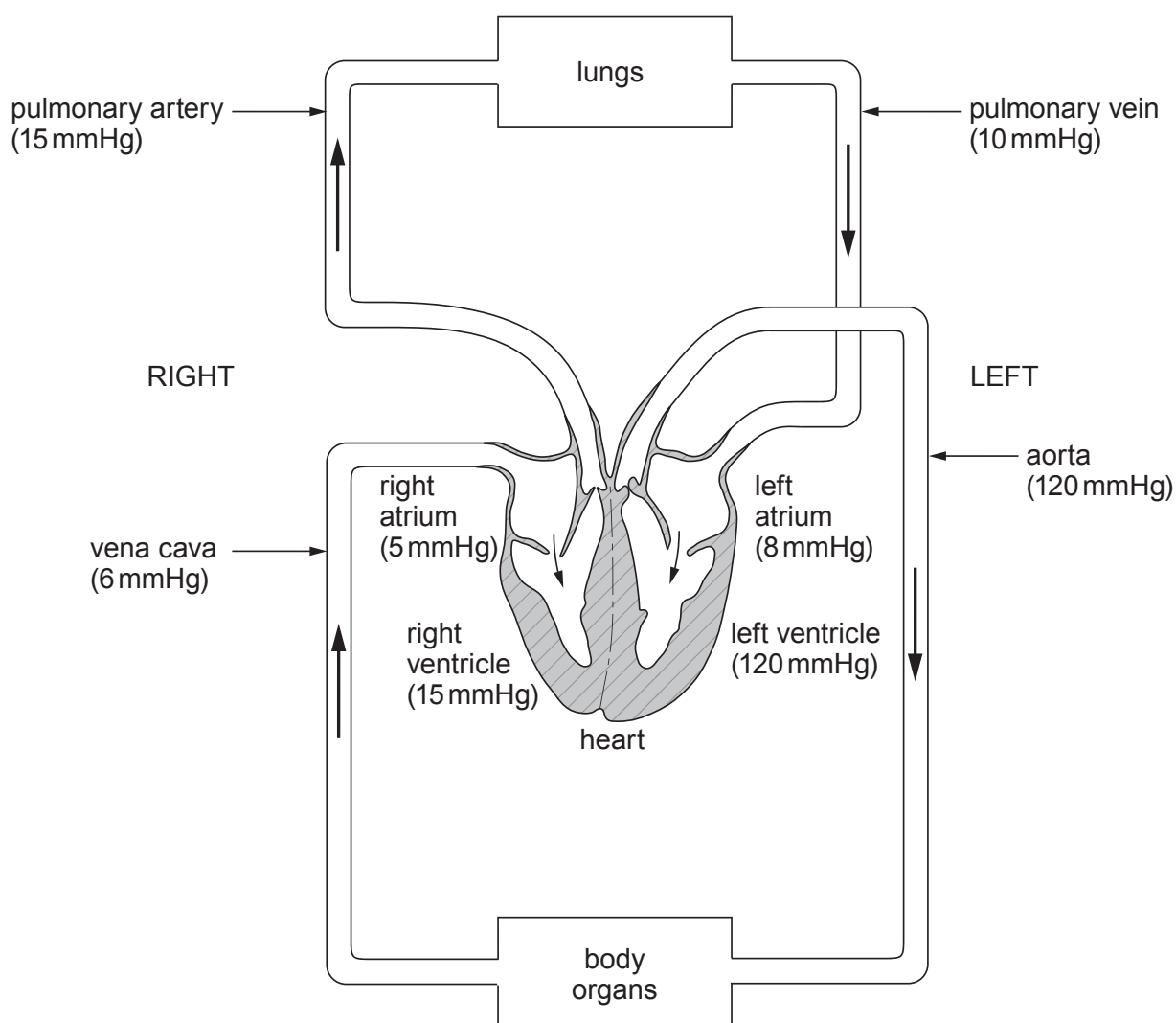


5. In one complete circulation of the body, blood passes through the heart twice. The blood travels:
- from the heart to the lungs and then back to the heart in the pulmonary circulation and then;
 - from the heart to the other organs of the body and back to the heart in the systemic circulation.

This double circulation is essential for the functioning of highly active animals such as mammals.

The diagram below represents the double circulation in humans. It shows the direction of blood flow and the pressure of the blood in various blood vessels in a healthy 25 year-old woman at rest.

The pressure of the blood is measured in mmHg (millimetres of mercury).



Examiner
only

(a) Suggest a reason for the difference in the:

(i) thickness of the walls of the atria and the ventricles; [1]

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(ii) blood pressure between the pulmonary artery and pulmonary vein; [1]

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(iii) blood pressure between the pulmonary artery and the aorta. [2]

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(b) Using the data for blood pressure in the **diagram opposite**, suggest why, after leaving the lungs, the blood has to return to the heart before it is sent to the other organs of the body. [2]

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(c) Describe how the direction of blood flow is maintained in the circulatory system. [1]

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Examiner
only

6. Explain the function of cilia and mucus in the cleaning mechanism of the lungs and describe the effect smoking has upon this cleaning mechanism. [6 QER]

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7. Carwyn and Anwen are year 10 students who are concerned that they are overweight. They think that their health may be affected in later life. They both agree to help each other follow a balanced diet.

They research the topic on the Internet and find the following information:

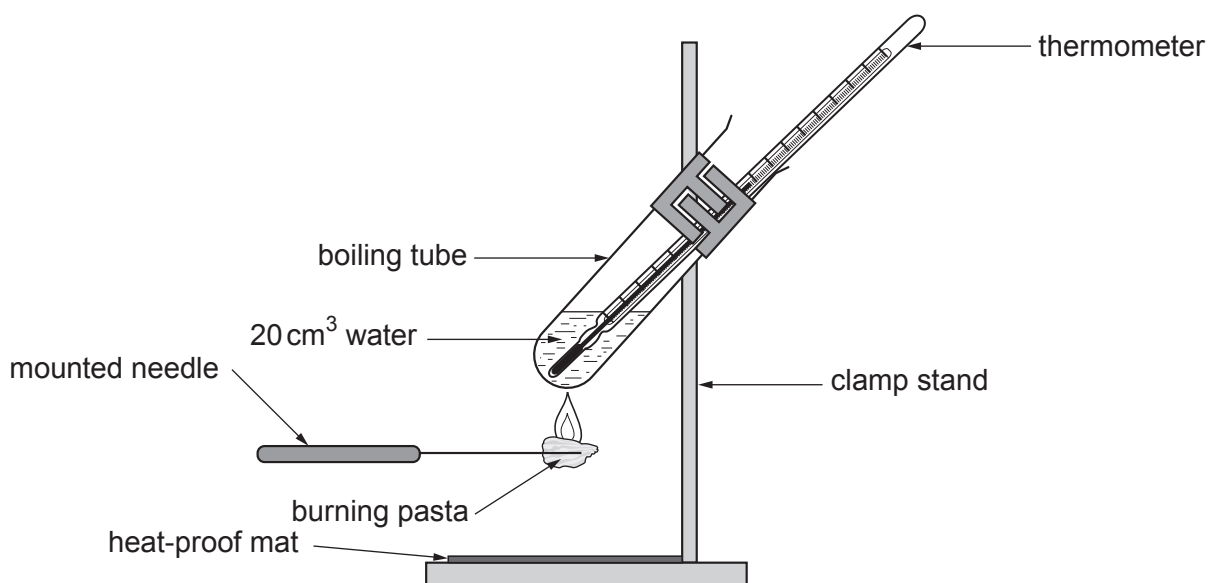
As part of a healthy balanced diet, it is recommended that people of their age should be eating the following every day:

Energy	8400 kJ
Total fat	70 g
Starchy carbohydrate (e.g. bread, pasta, rice)	260 g
Total sugar (from milk, fruit and added sugar)	90 g
Protein	50 g
Salt	6 g

Carwyn does not want more than one third of his recommended energy input per day to come from starchy carbohydrates.

For his evening meal he has decided to have pasta, the only carbohydrate he eats in the day. He wants to know the energy content of 1 g of pasta in order to calculate how much pasta to allow himself in his evening meal.

Carwyn and Anwen used the following simple calorimeter to measure the energy content of a 7 g piece of dried pasta.



Examiner only

The table shows one set of results they obtained.

Type of food	Mass of food (g)	Initial temp of water (°C)	Final temp of water (°C)	Increase in temp (°C)	Energy released per gram of food (J)	Energy released per gram of food (kJ)
Pasta	7	19	65	46

(a) (i) **Complete the table** above by using the following formula. [2]

$$\text{Energy released from pasta per gram (J)} = \frac{\text{volume of water (cm}^3\text{)} \times \text{temp increase (}^\circ\text{C)} \times 4.2}{\text{mass of pasta sample (g)}}$$

Space for working

(ii) Calculate the mass of pasta Carwyn can eat in his evening meal to get one third of his daily energy intake. [2]

Mass of pasta = g

(iii) Carwyn was surprised to discover that he could have that much pasta for his evening meal. Anwen said ‘there’s something wrong, that’s over ten bags of pasta! We have to evaluate our scientific method to find where the error lies.’

Evaluate the design of the apparatus and identify **one** source of error. [1]

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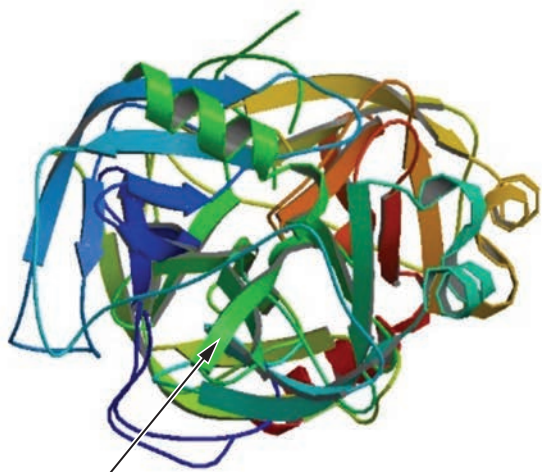
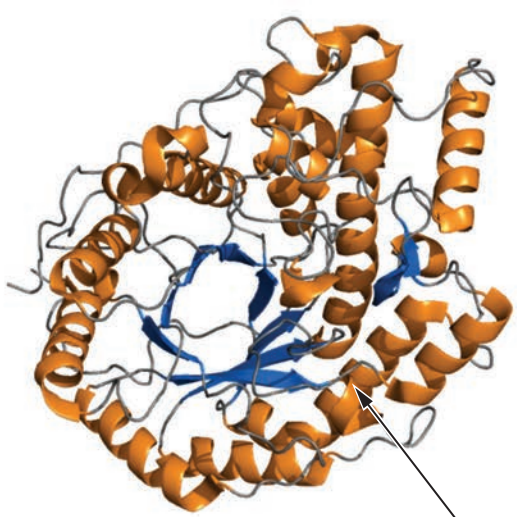
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(b) Carbohydrase is the enzyme that digests the starch in pasta into simple sugars. Protease is an enzyme that digests protein.

Structure of a molecule of carbohydrase

Structure of a molecule of protease



long chains of amino acids joined together

With reference to the diagrams suggest how each of the enzyme molecules are different and state why it is important that the chains of amino acids are folded. [2]

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END OF PAPER

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