

Surname	Centre Number	Candidate Number
Other Names		0



GCSE – NEW

3400U10-1



**BIOLOGY – Unit 1:
Cells, Organ Systems and Ecosystems**

FOUNDATION TIER

MONDAY, 11 JUNE 2018 – MORNING

1 hour 45 minutes

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	5	
2.	9	
3.	6	
4.	7	
5.	5	
6.	9	
7.	11	
8.	8	
9.	10	
10.	10	
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. 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 8(a) is a quality of extended response (QER) question where your writing skills will be assessed.



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Answer all questions.

1.

What is a healthy diet?



In 2015, the UK Food Standards Agency and the Department of Health provided advice on which food should be eaten to maintain good health. This is summarised below.

The energy content of food should be balanced weekly according to a person's activity over the seven days.

To ensure a healthy diet everyone should have:

- *a high proportion of foods containing starch*
- *plenty of fruits and vegetables as these are high in fibre and useful micronutrients such as vitamins and minerals*
- *more fish as it contains protein and omega 3 oils*
- *fewer 'ready meals' to avoid high levels of sugar, saturated fat and salt as well as excess energy content*
- *less processed meat such as sausages, which do contain protein but also high levels of salt*
- *plenty of water and also skimmed milk, which contains vitamins and is low in fat*



Use the information opposite and your own knowledge to answer the following questions.

(a) Based on this information, write 'true' or 'false' for each of the following statements. [3]

	Statement	True or False
1	All fats and oils should be avoided.	
2	All micronutrients come from fruits and vegetables.	
3	Fruits and vegetables provide bulk during digestion.	
4	It is better to obtain protein from fish than from processed meat.	
5	The energy in the diet needs to be balanced every day.	

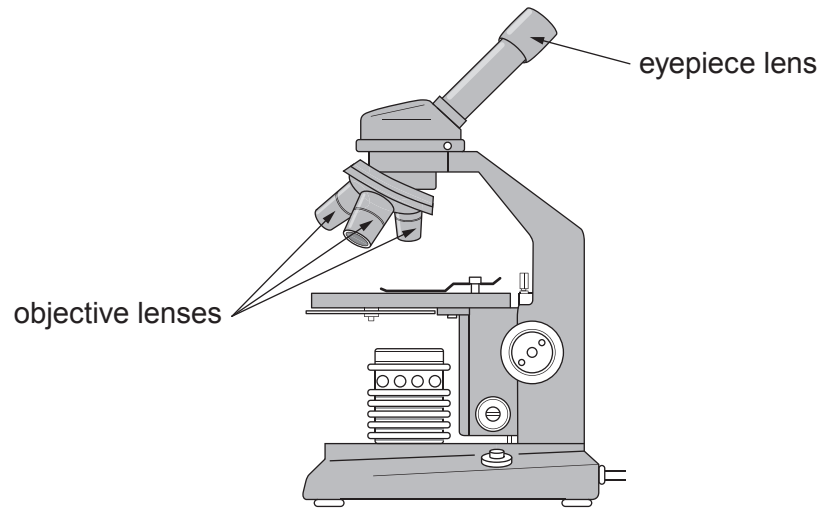
(b) Eating large numbers of 'ready meals', can lead to ill health in humans. State **one** condition that can arise from eating high levels of:

(i) sugar [1]

(ii) salt [1]



2. Rheinallt observed some plant cells using a light microscope.



- (a) He set up the microscope so that it had a total magnification of $\times 240$.

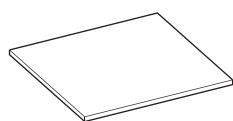
The magnification of the eyepiece lens on his microscope was $\times 6$. Which of the following objective lenses did he use? [1]

Objective lens power	Magnification
low	$\times 8$
medium	$\times 15$
high	$\times 40$

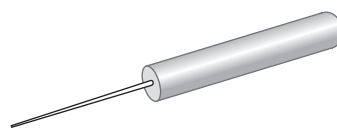
Objective lens magnification = $\times$



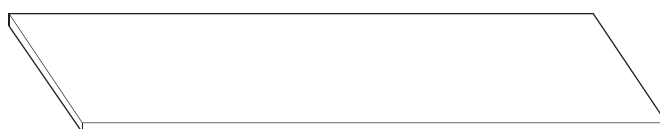
(b) The diagram shows the apparatus Rheinallt used to prepare a slide of onion cells.



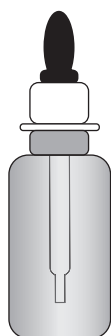
glass coverslip



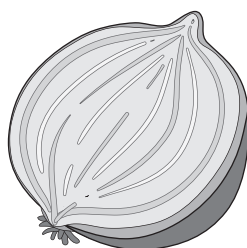
mounted needle



glass microscope slide



Iodine solution



onion



forceps

Continue and complete the method below, which he used to prepare his slide for observation under the microscope. [3]

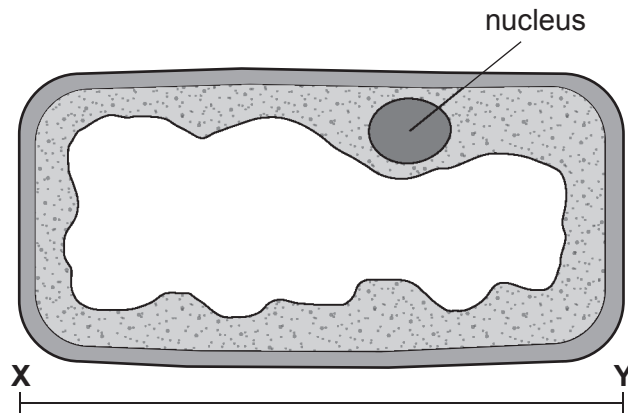
Method

- Take a piece of freshly cut onion.
- Use forceps to carefully peel a thin layer of cells from the inner surface of the onion.
- Place the layer of onion cells onto the centre of a microscope slide.

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- (c) Rheinallt made a large drawing of one of the cells he observed.



- (i) I. Measure the length of the cell in Rheinallt's drawing along line **X–Y**. [1]

Length of cell in drawing = mm

- II. The actual length of cells of this type is usually 0.02 mm.
Use your answer to part I. to calculate the magnification of Rheinallt's drawing. [2]

Magnification of drawing = $\times$

- (ii) From the drawing, give **one** feature of the cell which shows that it is a plant cell. [1]

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- (d) Rheinallt compared his drawing with an image obtained from an electron microscope. Why would the electron microscope image give more information about the structure of an onion cell? [1]

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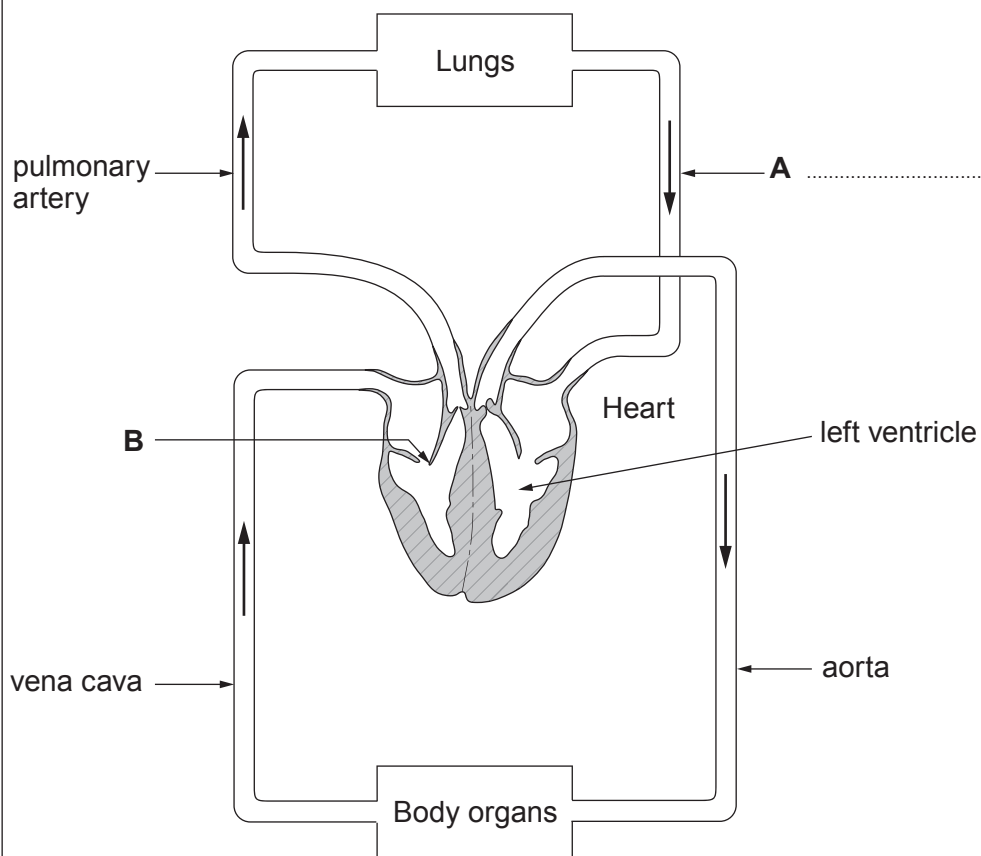


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3. The diagram shows the human circulatory system.



(a) (i) Label the blood vessel **A** on the diagram.

[1]

(ii) State the function of structure **B**.

[1]

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(b) The table shows blood pressures in different parts of the circulatory system.

Blood vessel	Maximum blood pressure (kPa)
pulmonary artery	3.3
aorta	16.0
capillary in body organ	2.0
left ventricle	17.0
right ventricle	3.5

- (i) I. Calculate the difference in the maximum blood pressure between the aorta and the pulmonary artery. [1]

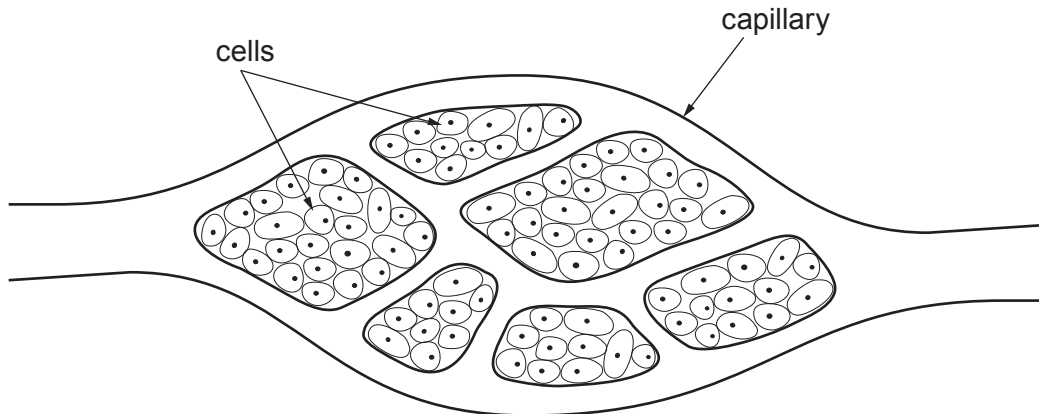
Difference in pressure = kPa

- II. State the reason for the difference in blood pressure in these two blood vessels. [1]

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- (ii) The diagram shows some capillaries in an organ of the body.



Blood flows very slowly through the capillaries, allowing useful substances in the blood and waste products in cells to be exchanged.

- I. From the table above, what is the evidence that the blood flows slowly through the capillaries? [1]

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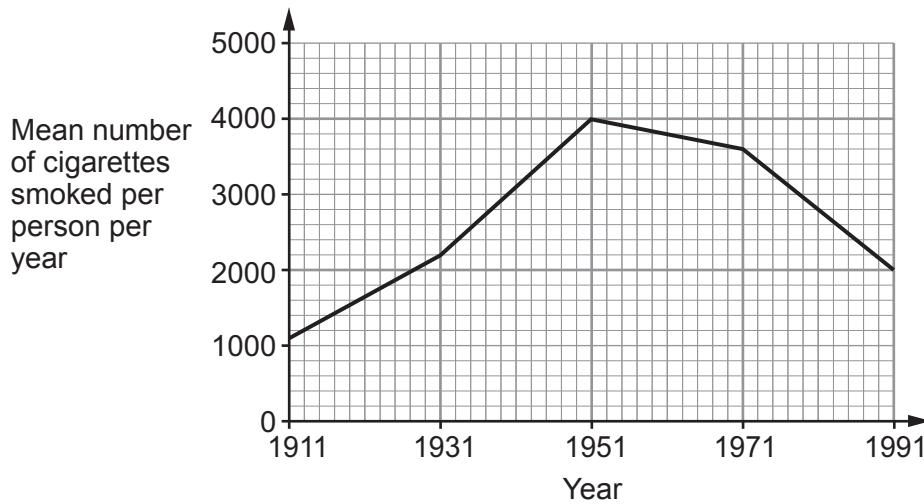
- II. State how the capillary walls are well adapted for the exchange of substances. [1]

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4. (a) Cigarettes contain chemicals which cause cancer.

The graph below shows the mean number of cigarettes smoked per person per year and the table shows the number of deaths caused by lung cancer in the UK over a period of 80 years.



Year	Deaths per year from lung cancer
1911	600
1931	1 500
1951	14 000
1971	22 000
1991	19 000

Describe what the data in the graph and the table show about the link between the mean number of cigarettes smoked per year and the deaths from lung cancer over the time period 1911-1991. [3]

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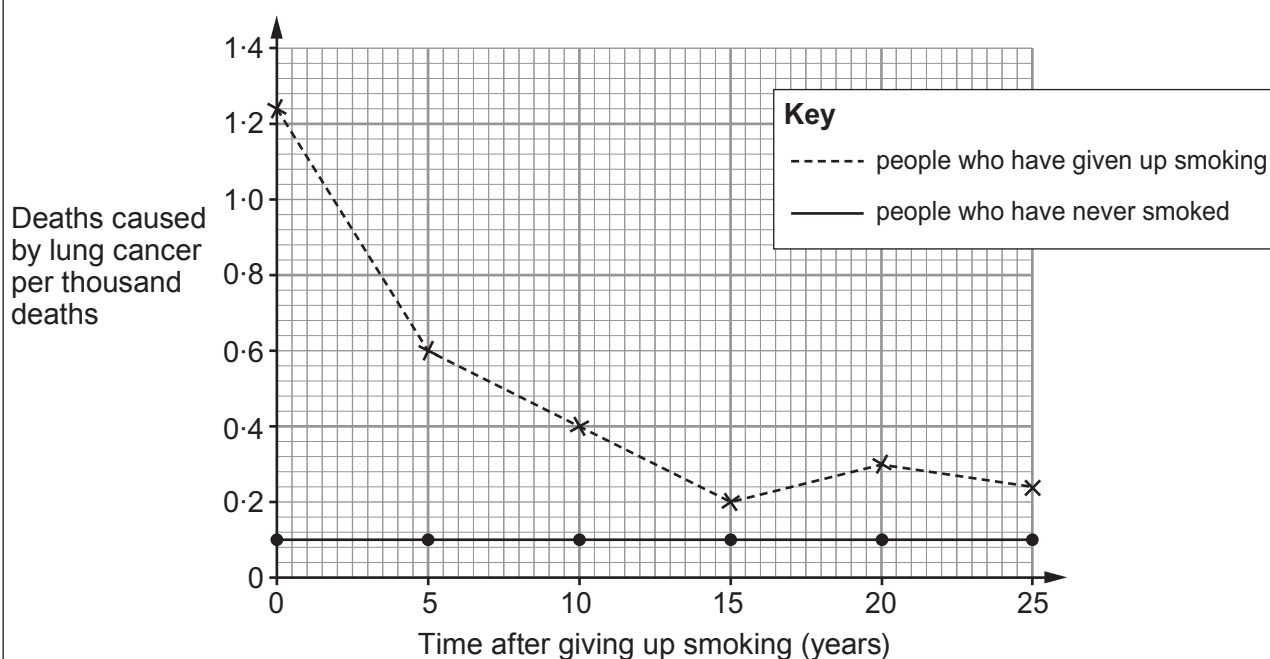
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(b) The graph shows the effect of giving up smoking on deaths from lung cancer.



Use the graph above to complete the sentences. Choose the correct answer.

(i) If a person gives up smoking, the risk of dying from lung cancer will be: [1]

- A the same as a non-smoker after 10 years.
- B twice the risk of a non-smoker after 15 years.
- C removed completely after 25 years.
- D unchanged even after 20 years.

Answer

(ii) The data in the graph show that: [1]

- A Cigarettes cause lung cancer.
- B Over 1200 smokers die from lung cancer every year.
- C It is possible for a non-smoker to die from lung cancer.
- D The number of people who do not smoke has increased in recent years.

Answer



- (c) In an investigation of 600 cigarette smokers, almost half said they wanted to give up. At the end of one year only 42 had actually succeeded.

Explain why many people find it very difficult to give up smoking cigarettes. [2]

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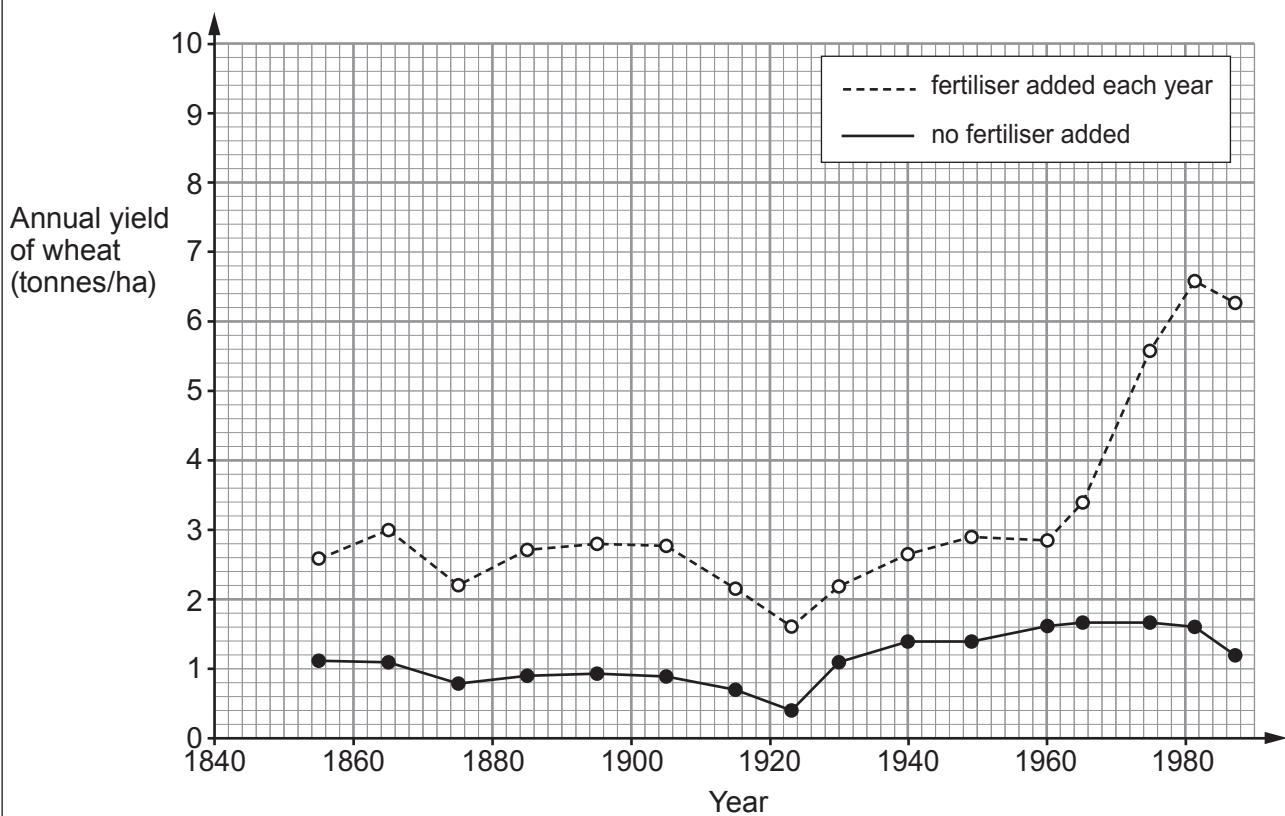


5. The information below is about the growth of wheat plants in a long-term investigation.



Wheat growth experiment at a research centre in Mid Wales

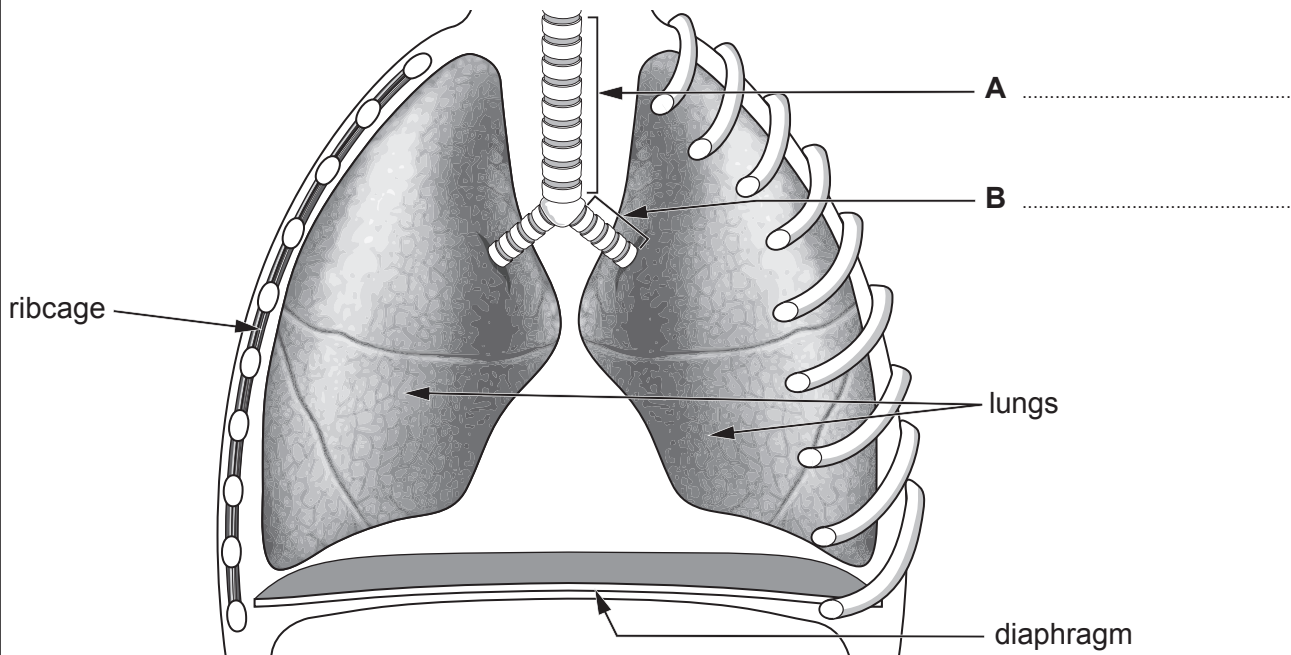
The graph shows the results of an investigation into the use of fertiliser. One field had the same mass of fertiliser added each year from 1855. Another field had no fertiliser added in that time.



- (a) (i) From the graph, what evidence is there that:
- I. the addition of fertiliser increased the growth of wheat plants; [1]
-
- II. the fertiliser took a long time to reach its full effect? [1]
-
- (ii) How were the data from the field without fertiliser important to the scientists in interpreting their results? [1]
-
- (b) Farmers now frequently add NPK fertiliser to their fields.
State the way in which the following mineral nutrients in NPK fertiliser affect the growth of their crop plants. [2]
- (i) Effect of phosphate
- (ii) Effect of potassium



6. The diagram shows a vertical section through the human thorax after inspiration.



- (a) (i) Label structures **A** and **B** on the diagram. [1]
- (ii) Describe the movement of the diaphragm during **expiration** and how this affects the volume and pressure in the chest cavity. [3]

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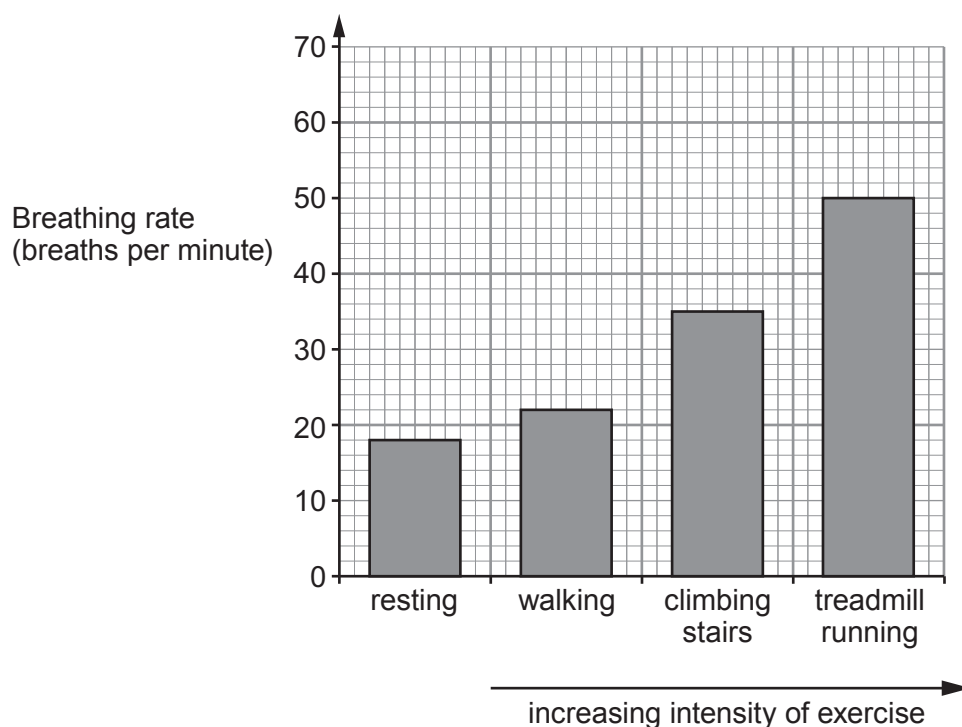
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- (b) Two students investigated breathing rates (the number of breaths per minute) while at rest for five minutes and during three different activities, each of which lasted five minutes.

One student did the activities and the other recorded the results.



- (i) From these results, what could you conclude about the effect of exercise on the breathing rate? [2]

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- (ii) State **one** way in which the students could have increased the confidence they had in their results. [1]

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- (c) Explain why the breathing rate changes when a person starts exercising. [2]

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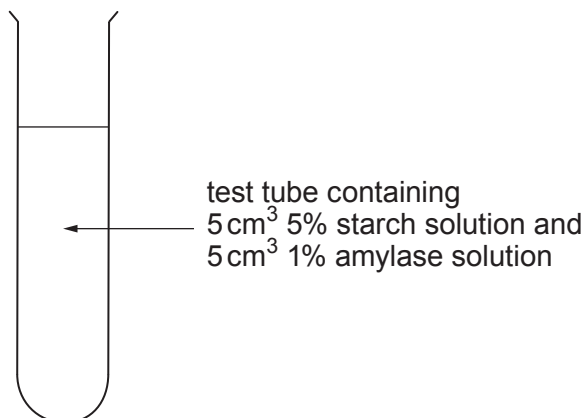
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7. Students investigated the activity of amylase enzyme from the bacterium *Bacillus licheniformis* which is used in industry. Amylase digests starch.

They set up six test tubes, each as shown in the diagram below, at a range of temperatures from 10–60°C and measured the amylase activity after 5 minutes.



- (a) The students tried to ensure that their investigation was a fair test.

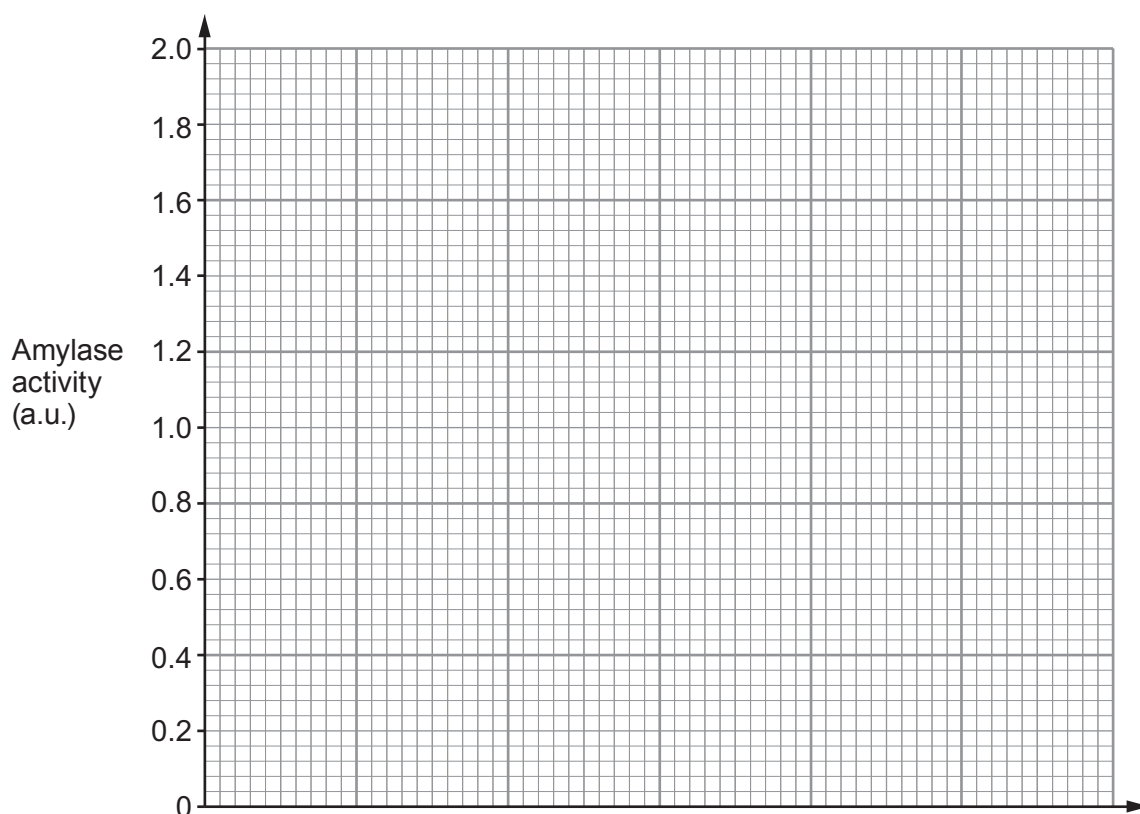
State **one other** variable which they should have kept constant in all the test tubes. [1]

The results of the investigation are shown in the table below.

Temperature (°C)	Amylase activity (a.u.)
10	0.3
20	0.9
30	1.4
35	1.6
40	1.8
60	0.4

- (b) Draw a graph of the results on the grid opposite by
- (i) Choosing a scale for temperature and labelling the axis. [1]
 - (ii) Plotting the points. [2]
 - (iii) Join your plots using a ruler. [1]





(c) From your graph,

- (i) State how the amylase activity changes between 15°C and 35°C and explain the reason for this change. [2]

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- (ii) State the reason for the change in the amylase activity between 40°C and 60°C. [1]

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- (iii) I. Use your graph to suggest the optimum temperature for this enzyme. [1]

Optimum temperature = °C

- II. State why the optimum temperature cannot be identified with accuracy from these results. Suggest how the investigation could be improved to allow this temperature to be identified more accurately. [2]

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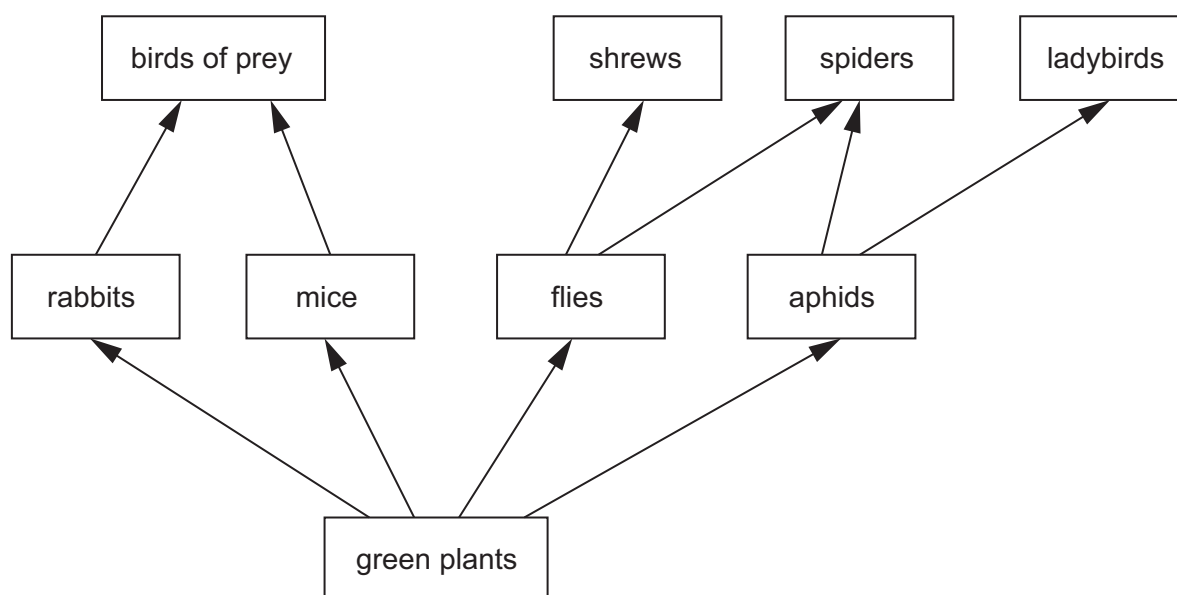
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Examiner
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8. The diagram below shows a food web in an area of grassland.



Farmers were concerned that the rabbit population was increasing and called in a pest control company to destroy the rabbits.

- (a) Identify the herbivores and second stage consumers in the food web above. Explain how the populations of each would be affected if all the rabbits were destroyed. [6 QER]



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- (b) Explain how the levels of mineral nutrients in the soil would be increased if the dead bodies of rabbits were not removed by the pest control company. [2]
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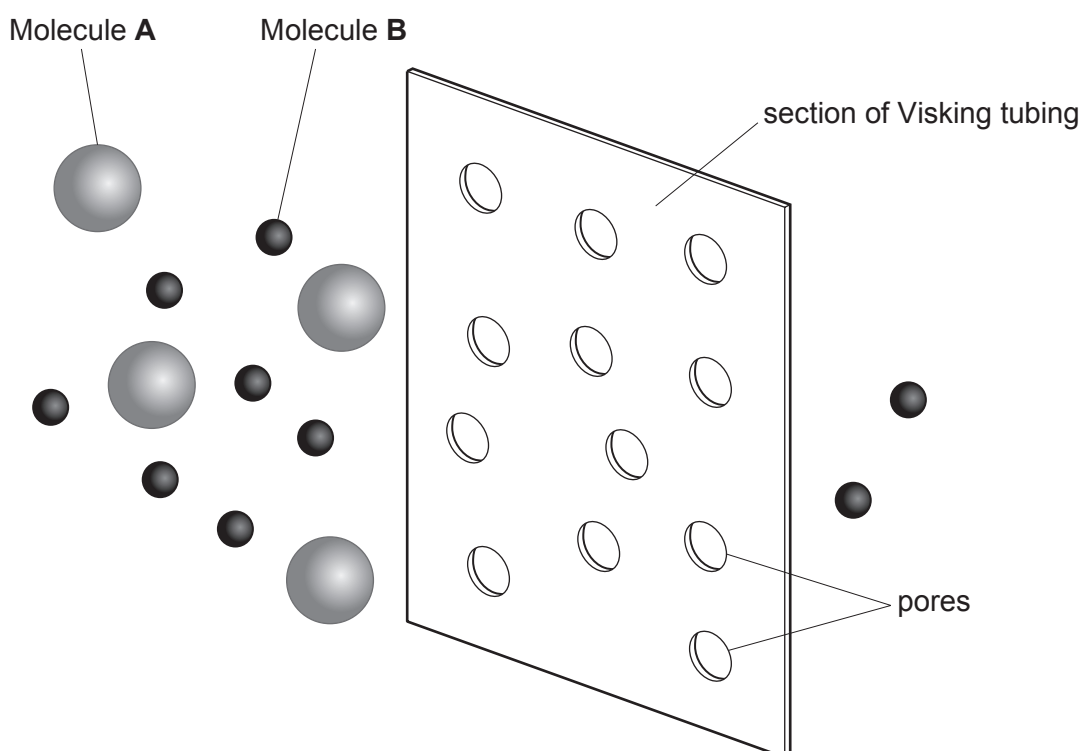
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9. (a) What is meant by the term selectively permeable membrane? [1]

Visking tubing can be used as a model of the cell membrane.

The diagram below shows a section of Visking tubing working in the same way as a selectively permeable membrane.



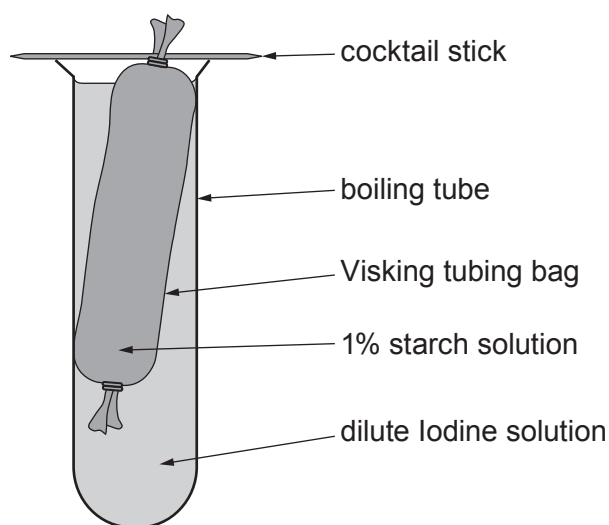
Use the diagram above and your own knowledge to answer the following:

- (b) (i) State the process by which molecules could pass through the Visking tubing. [1]

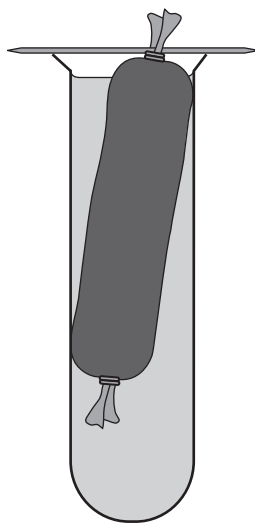
- (ii) Identify which molecules pass through the Visking tubing. Explain your answer. [2]



- (c) Students were instructed to set up the following apparatus.



The appearance of the apparatus after 15 minutes is shown below.



- (i) Explain why the colour of the contents inside the Visking tubing turned blue black. [3]

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(ii) Explain why the colour of the iodine solution in the boiling tube did not change. [2]

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(d) Name **one** substance required for respiration that would pass into a cell. [1]

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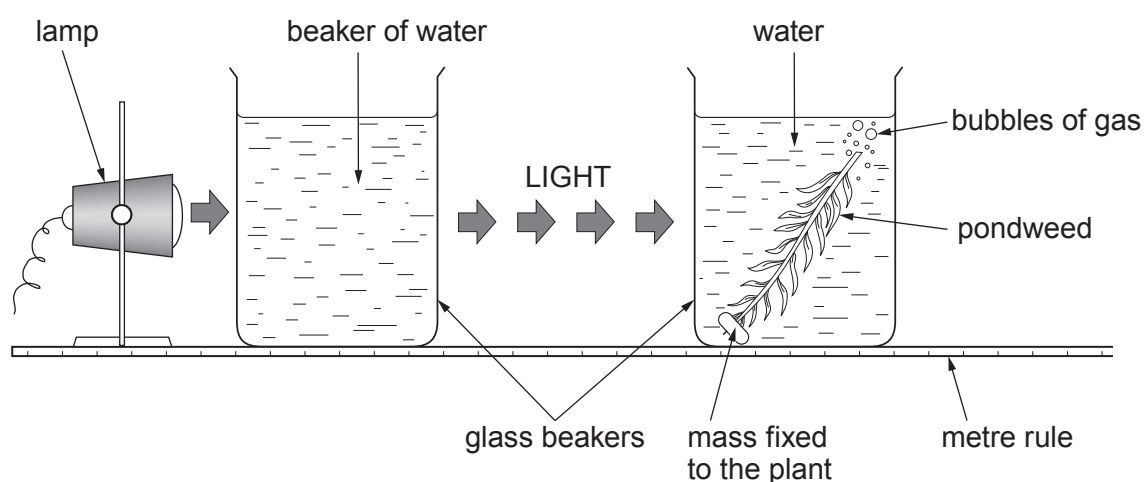
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10. (a) (i) Write the **word** equation for photosynthesis. [2]

(ii) State the name of the pigment present in plant cells which absorbs light. [1]

Phoebe and Adam used the apparatus below to study the rate of photosynthesis in the pondweed (*Elodea sp.*).



The number of gas bubbles per minute produced by the pondweed was counted at different distances from the light.

The experiment was carried out three times at each distance.

The results are shown below. Means were calculated to the nearest whole number.

Distance of lamp from pondweed (cm)	Number of bubbles per minute			
	Test 1	Test 2	Test 3	Mean
10	19	32	25	25
20	14	20	20	18
30	11	15	17	
40	7	10	13	10
50	5	9	11	8



(b) **Complete the table** opposite by calculating the mean number of bubbles for a distance of 30 cm. **Write your answer in the table.** [2]

(c) State the relationship between the distance of the lamp from the pondweed and number of bubbles produced per minute. Explain your answer. [3]

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(d) Explain why a beaker of water was placed between the lamp and the pondweed. [1]

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(e) State how you could improve the accuracy of this investigation. [1]

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END OF PAPER

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