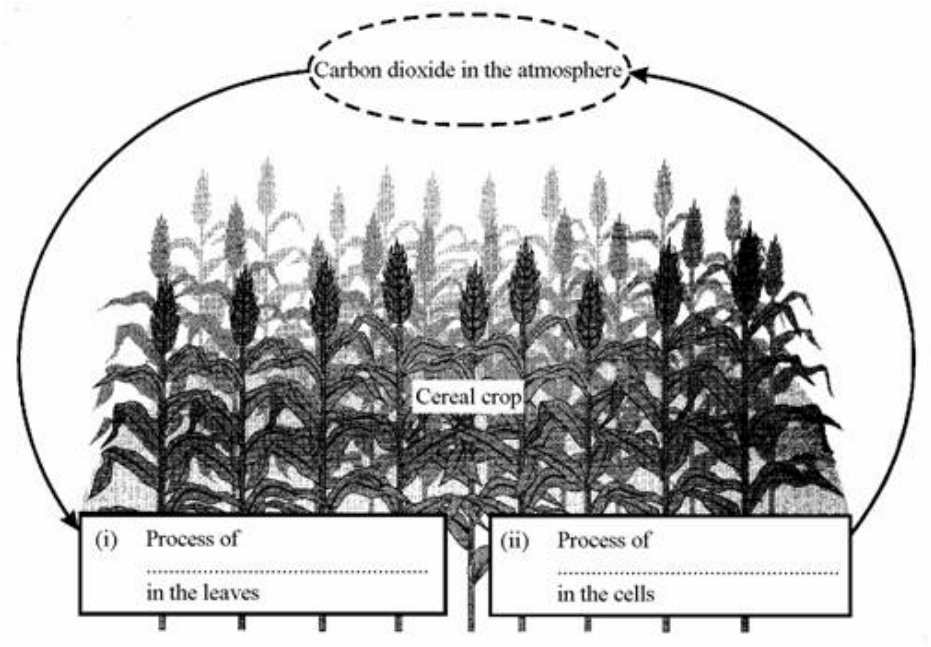
AQA B3.1 Movement of molecules in and out of cells LEVEL 2 Q

89 minutes

89 marks

Q1. (a) The diagram shows a cereal crop.

Complete spaces (i) and (ii).



(2)

(iii) What sort of weather may cause the cereal crop to wilt?

.....

(1)

(b) Describe the process of transpiration in plants.

.....

.....

.....

.....

.....

.....

(3)
(Total 6 marks)

Q2. The table shows the composition of blood entering and leaving the lungs.

Gas	Concentration in arbitrary units	
	Blood entering lungs	**Blood leaving lungs**
Oxygen	40	100
Carbon dioxide	46	40

(a) Describe, in as much detail as you can, the changes that take place in the composition of blood as it passes through the lungs.

.....

.....

.....

.....

.....

.....

(3)

(b) Which part of the blood:

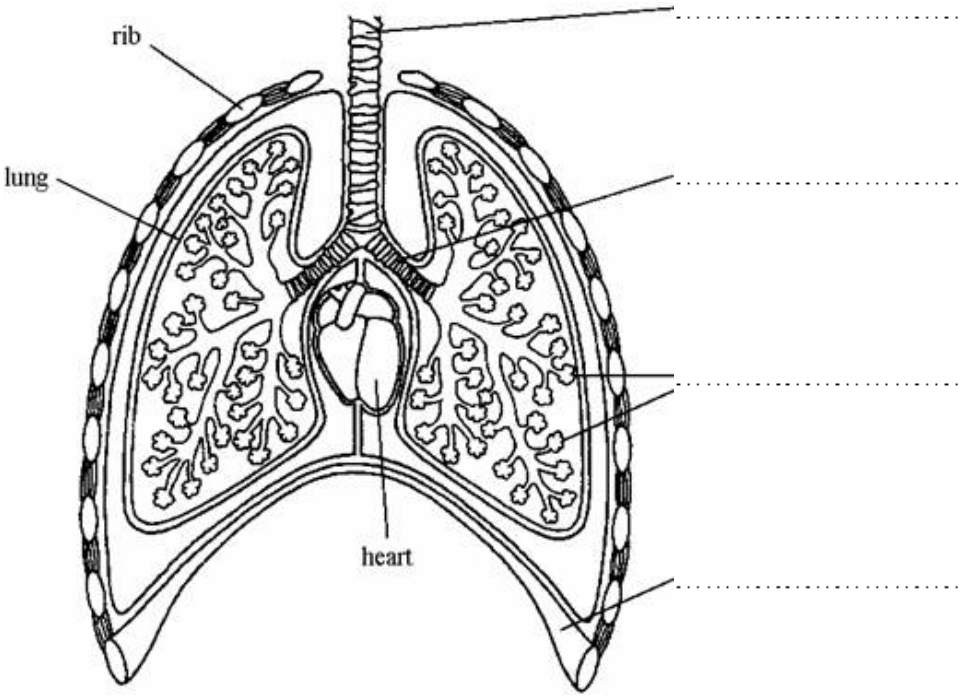
(i) transports most carbon dioxide; .....

(ii) transports most oxygen? .....

(2)

(Total 5 marks)

Q3. The diagram shows part of the breathing system in a human.



(a) Use words from the list to label the parts on the drawing.

alveoli bronchiole bronchus diaphragm trachea (windpipe)

(4)

(b) Where in the lungs does oxygen enter the blood?

.....

(1)

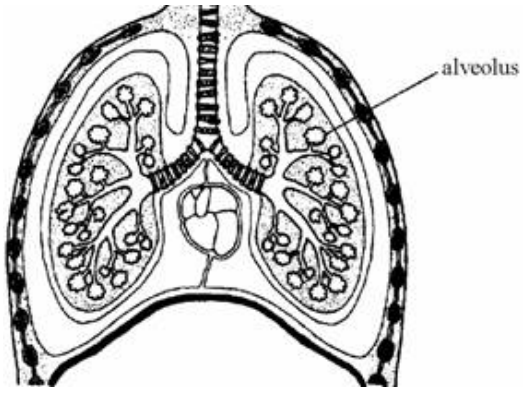
(c) Which process in cells produces carbon dioxide?

.....

(1)

(Total 6 marks)

Q4. (a) The drawing shows some of the organs in the human thorax.



On the drawing, use guidelines to label:

(i) the heart;

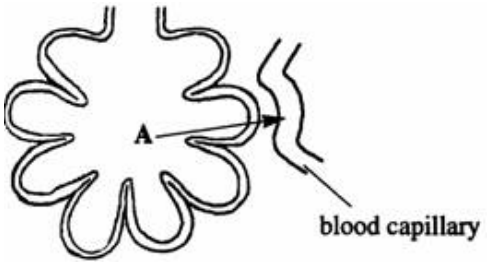
(ii) a rib;

(iii) the diaphragm;

(iv) the trachea.

(4)

(b) The drawing shows a section through an alveolus.



At **A**, oxygen moves from the air in the alveolus into the blood capillary.
Explain, as fully as you can, how oxygen moves into the blood.

.....

.....

.....

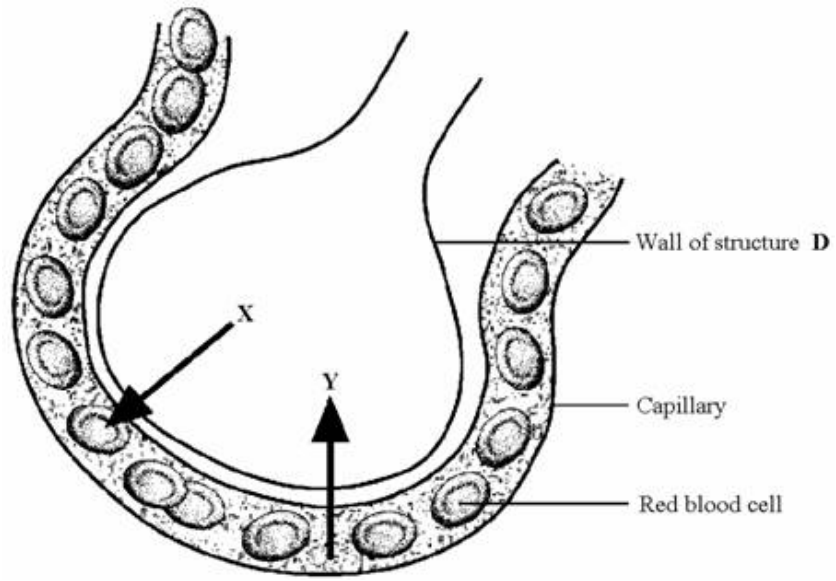
.....

.....

.....

(2)
(Total 6 marks)

Q5. The diagram shows an enlargement of structure **D**.



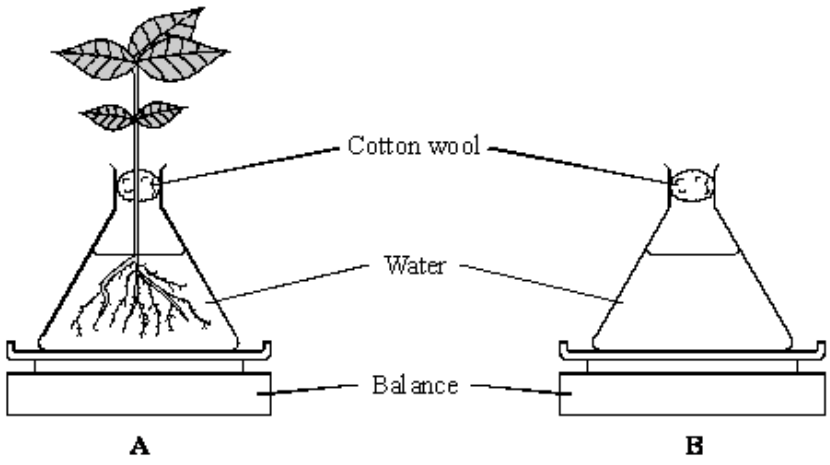
The arrows show the direction of the gases exchanged in this structure. Name gas **X** and gas **Y**.

X .....

Y .....

(Total 2 marks)

Q6. Some students set up the following apparatus.



The balances show the same mass at the start of the investigation.

After 24 hours the mass of flask **B** was the same but the mass of flask **A** had changed.

(i) Describe and explain the change to the mass of flask **A**.

.....

.....

.....

.....

.....

(3)

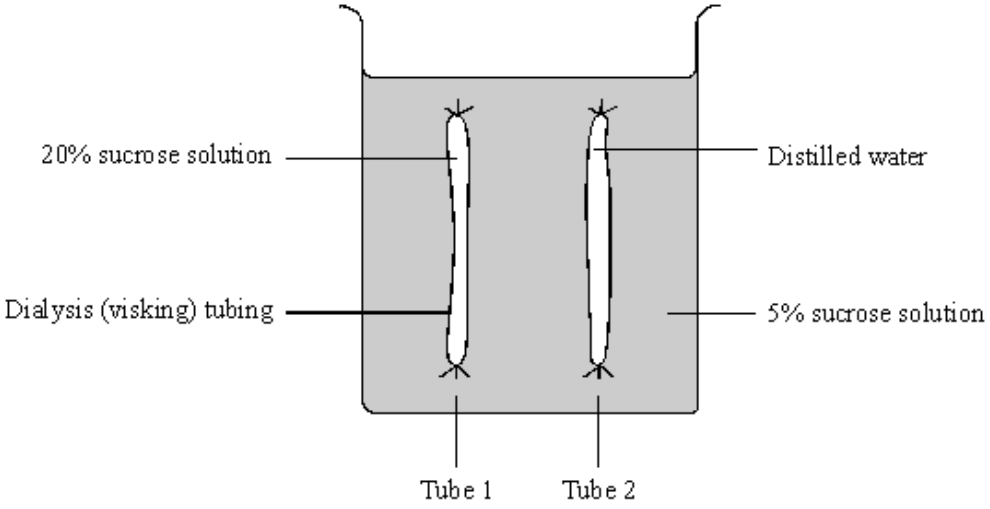
(ii) Why did the students need to set up flask **B**?

.....

.....

(1)
(Total 4 marks)

Q7. Some students set up this experiment to investigate osmosis. They filled two pieces of dialysis [visking] tubing with different liquids and left them both in a beaker of *5%* sucrose solution for an hour.



(a) Describe and explain the likely results after one hour.

.....

.....

.....

.....

.....

.....

.....

.....

(6)

(b) Describe **two** examples where osmosis is used in living things.

.....

.....

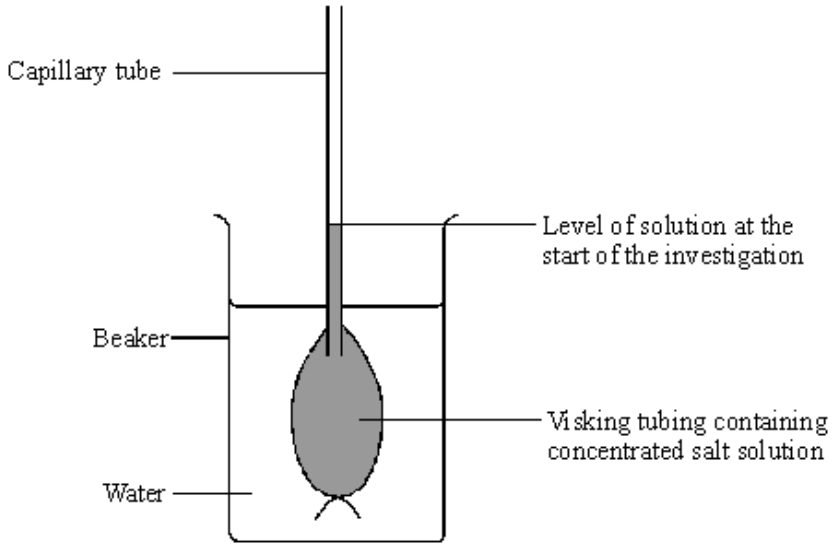
.....

.....

(2)

(Total 8 marks)

Q8. Some students set up the equipment below to investigate osmosis.



(a) What is osmosis?

.....

.....

.....

(3)

(b) (i) What will happen to the water level in the capillary tube during the investigation because of osmosis?

.....

(1)

(ii) Use your knowledge of osmosis to explain why this happens.

.....

(2)

(Total 6 marks)

Q9. Four leaves were removed from the same plant. Petroleum jelly (a waterproofing agent) was spread onto some of the leaves, as follows:

Leaf **A**: on both surfaces
Leaf **B**: on the lower surface only
Leaf **C**: on the upper surface only
Leaf **D**: none applied

Each leaf was then placed in a separate beaker, as shown in diagram **1**.

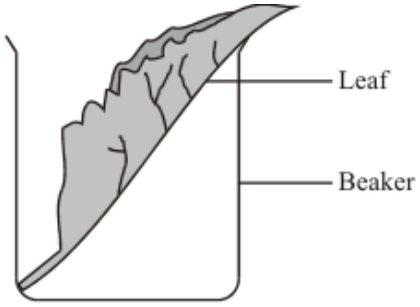
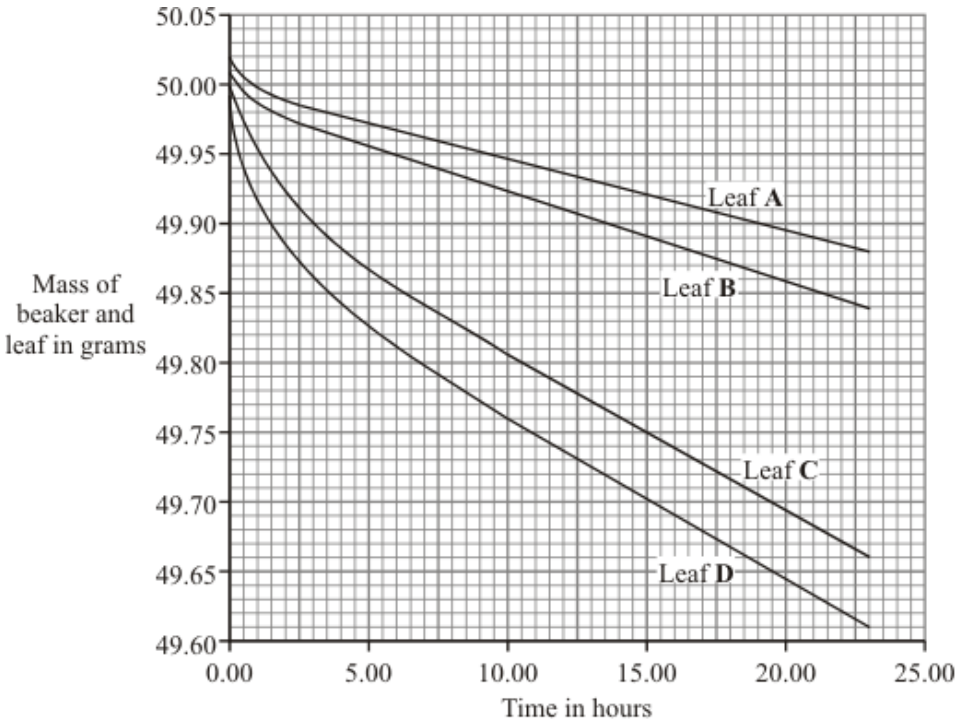


Diagram 1

Each beaker was weighed at intervals. The results are shown in the graph.



(a) Give evidence from the graph in answering the following questions.

(i) Which surface (upper or lower) loses water most rapidly? .....

Evidence .....

.....

(1)

(ii) Is water lost from both surfaces of the leaf? .....

Evidence .....

.....

(1)

(b) Diagram **2** shows the appearance of each surface of the leaf as seen through a microscope.

Upper Surface of Leaf **Lower Surface of Leaf**

Diagram 2

(i) Name space **X** and cell **Y**.

X .....

Y .....

(2)

(ii) Use information in diagram **2** to explain why the results are different for leaves **B** and **C**.

.....

.....

.....

.....

(2)
(Total 6 marks)

Q10. A group of students looked at stomata on four different species of plants, **A, B, C** and **D**.
They estimated the number of stomata per cm^2 on the upper and lower surfaces of the leaves of the four species.

Their results are shown in the table.

Plant species	**Estimated number of stomata per cm^2 of leaf surface**	
	Upper surface of leaf	**Lower surface of leaf**
A	4000	28 000
B	0	800
C	8500	15 000
D	8000	26 000

(a) Which plant species probably lives in a dry region? ☐

Explain the reason for your answer.

.....

.....

.....

.....

.....

.....

(3)

(b) All four species have more stomata on the lower surface of their leaves than on the upper surface.

Suggest how this could help the plants to survive better.

.....

.....

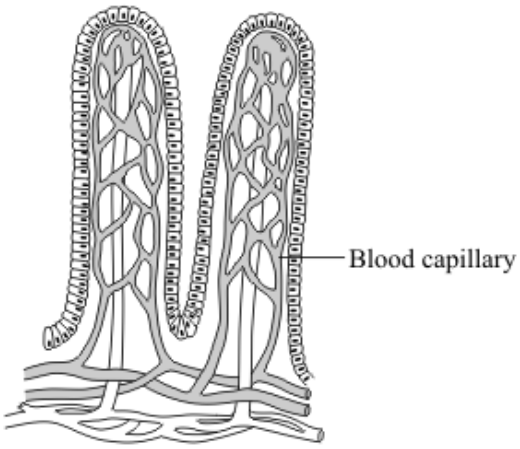
.....

.....

(2)
(Total 5 marks)

Q11. **Diagram 1** shows two villi in the small intestine of a healthy person.

Diagram 1



(a) Describe **two** features of the villi which help the small intestine to function.

1 .....

.....

2 .....

.....

(2)

(b) **Diagram 2** shows two villi in the small intestine of a person with coeliac disease.

Diagram 2

(i) How do the villi of the person with coeliac disease differ from those of a healthy person?

.....

.....

(1)

(ii) Suggest how this difference might affect how well the small intestine functions.

.....

.....

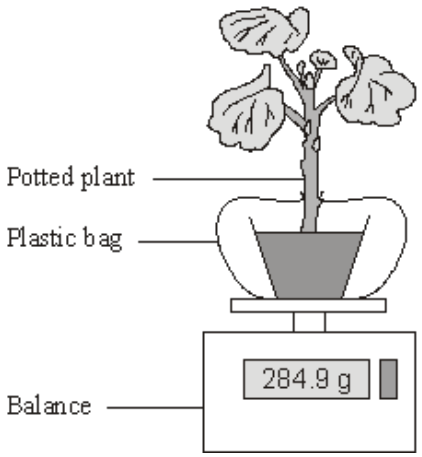
(1)
(Total 4 marks)

Q12. (a) Name the process by which water is lost from plant leaves.

.....

(1)

(b) Some students set up the apparatus shown in the diagram to measure the water loss from a potted plant.



The apparatus was placed in different environmental conditions:

A in still air at 20 °C.
B in still air at 25 °C.
C in a wind at 20 °C.
D in a wind at 25 °C.

Readings from the balance were recorded by a datalogger at 10-minute intervals.

The results are given in the table.

Time in minutes	Balance reading in grams			
	A	**B**	**C**	**D**
0	285.6	284.6	282.9	280.9
10	285.3	284.2	282.4	280.2
20	284.9	283.8	281.9	279.4
30	284.7	283.4	281.4	278.8

(i) Under which conditions, **A**, **B**, **C** or **D**, was water lost most rapidly? ☐

(1)

(ii) Explain, as fully as you can, why water was lost most rapidly under these conditions.

.....

.....

.....

.....

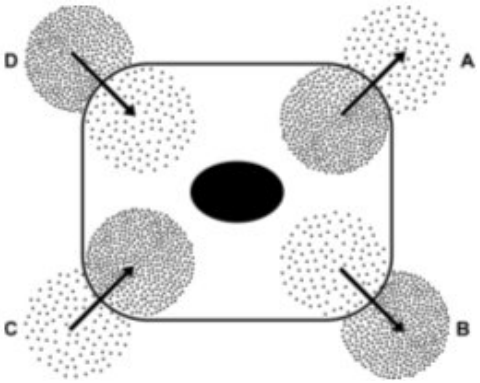
.....

(2)

(Total 4 marks)

Q13. The diagram shows four ways in which molecules may move into a cell and out of a cell.

The dots show the concentration of molecules.



The cell is respiring aerobically.

Write the correct letter, **A**, **B**, **C** or **D**, next to each process.

Process	**Arrow** **A, B, C** or **D**
The movement of oxygen molecules	
The movement of carbon dioxide molecules	
The active uptake of glucose molecules	

(Total 3 marks)

Q14. A student removed three similar leaves from a plant. The student spread petroleum jelly (a waterproofing substance) on some of the leaves, as follows:

Leaf A: on the lower surface

Leaf B: on the upper surface

Leaf C: none.

The student placed each leaf in a separate beaker. He weighed each beaker at intervals. The results are shown in the table.

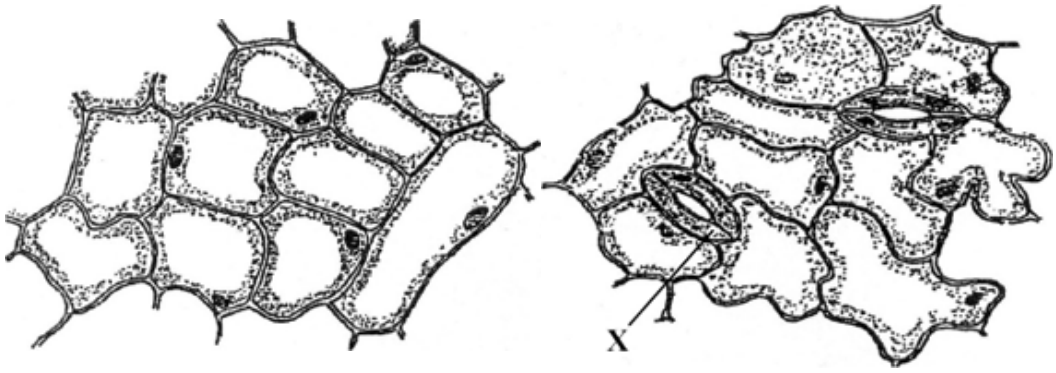
Time in hours	Mass of leaf + beaker in grams		
	Leaf A	Leaf B	Leaf C
0	50.00	55.01	51.99
0	49.99	54.95	51.90
3	49.97	54.90	51.85
5	49.95	54.86	51.80

(a) Which leaf, **A**, **B** or **C**, lost most water? ☐

(1)

(b) The diagram shows the appearance of the upper and lower surfaces of one of the leaves under a microscope.

Upper surface of leaf **Lower surface of leaf**



(i) Name cell **X**. .....

(1)

(ii) The petroleum jelly had a greater effect when it was spread on the lower surface than when it was spread on the upper surface.

Use information from the diagram to explain why.

.....

.....

.....

.....

.....

(2)
(Total 4 marks)

Q15. Cells contain a solution of salts and sugars.

A student is investigating how cells change when they are put into water.

(a) The student:

- looks at a plant cell using a microscope
- adds water to the cell.

The plant cell swells up.

Explain why, as fully as you can.

.....

.....

.....

.....

.....

.....

(3)

(b) When **animal** cells are put in water, they swell up, and then burst.
When **plant** cells are put in water, they swell up, but do **not** burst.

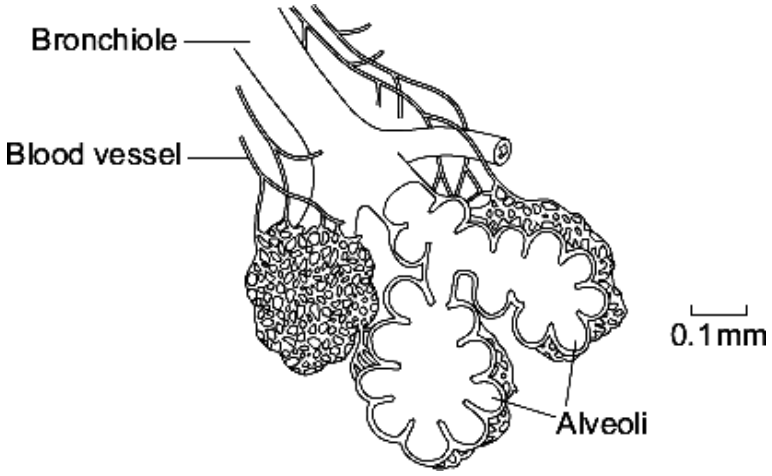
How does the structure of plant cells prevent them from bursting?

.....

.....

(1)
(Total 4 marks)

Q16. The human lung has about 80 million alveoli.
The diagram shows some alveoli in a human lung.



(a) Give **three** features of the alveoli that allow large amounts of oxygen to enter the blood.

1 .....

.....

2 .....

.....

3 .....

.....

(3)

(b) (i) Name the process by which oxygen passes from the air into the blood.

.....

(1)

(ii) Breathing allows large amounts of oxygen to enter the blood.

Explain how breathing does this.

.....

.....

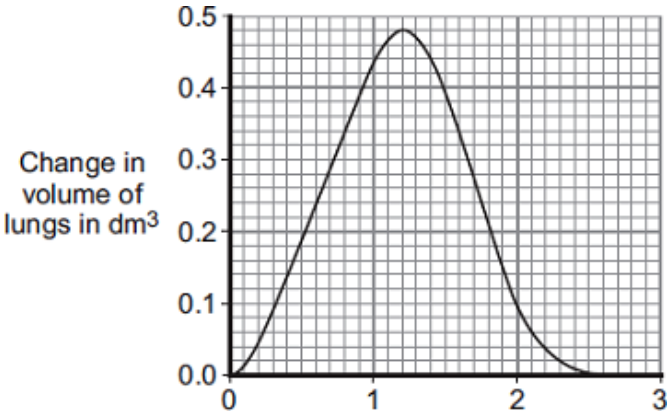
.....

.....

(2)
(Total 6 marks)

Q17. The diaphragm and ribcage move air into the lungs and out of the lungs.

The graph shows changes in the volume of the lungs in one breathing cycle.



(a) (i) Describe the changes in the volume of the lungs in one breathing cycle.

.....

.....

.....

.....

.....

.....

(3)

(ii) Explain how the diaphragm and ribcage cause the changes in lung volume shown in the graph.

.....

.....

.....

.....

.....

.....

(3)

(b) Sometimes patients are unable to breathe for themselves.
Mechanical ventilators are used to make these patients breathe.

Photograph 1 shows a patient in an iron lung ventilator.

Photograph 1

CDC [Public domain], via Wikimedia Commons

Air is pumped out of the iron lung, creating a very low pressure.
This low pressure causes the thorax to expand, causing air to flow into the lungs.
When air is pumped back into the iron lung the pressure inside the tank increases, causing air to move out of the lungs.

Photograph 2 shows a modern ventilator.

Photograph 2

By Calleamanecer (Own work) [CC-BY-SA-3.0], via Wikimedia Commons

Modern ventilators increase the pressure in the patient's airways using a tube put into the trachea.
The increased pressure in the patient's airways causes air to flow into the patient's lungs.
Then, the ventilator causes the pressure in the patient's airways to drop to zero, and the patient breathes out.

(i) The ventilators shown in **Photographs 1** and **2** make the patient inhale in a very different way.

Describe this difference.

.....

.....

.....

.....

(2)

(ii) The iron lung ventilator was used mainly in the 1900s.

Most patients are now treated with the type of ventilator shown in **Photograph 2**.

Give **one** advantage and **one** disadvantage of using the modern ventilator rather than the iron lung ventilator.

.....

.....

.....

.....

.....

.....

(2)
(Total 10 marks)