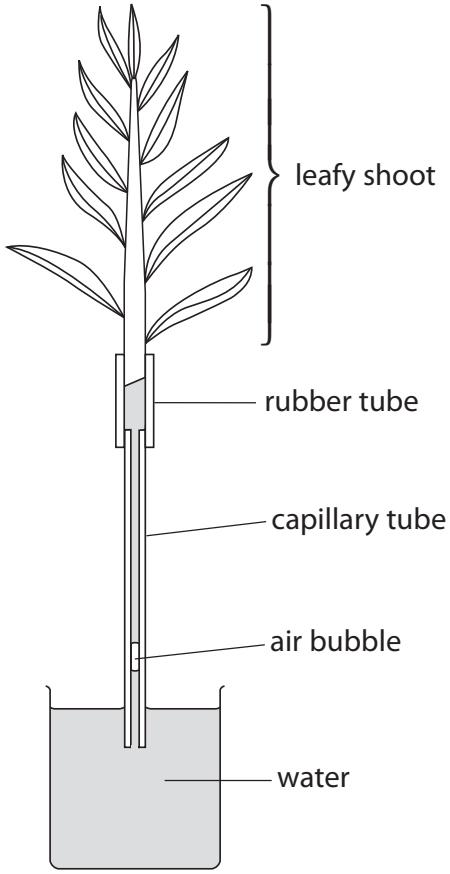
2 Steven wanted to measure the rate of water loss from a leafy shoot. He set up this apparatus in normal laboratory conditions.



(a) Name the apparatus Steven used.

(1)

a potometer

(b) Name the process by which a plant loses water.

(1)

transpiration

(c) Describe how Steven should set up the apparatus and how he should then use it to estimate the rate of water loss from the leafy shoot.

(4)

Cut the stem underwater and then connect it to the capillary tube using the rubber tube. Make sure there is a water-tight seal between all three. Squash the rubber tube and bring the end of the capillary tube out of the water release the tube and suck some air into the tube and then put it back beneath the water. Use a ruler to record the position of the bubble in cm from the bottom of the capillary tube every minute. Repeat this at least once.

(d) Steven carried out three further experiments. He used the same plant, but changed one condition in each experiment.

The table shows the percentage change in rate of water loss for each condition when compared to Steven's original experiment.

Condition	Percentage change in rate of water loss (%)
wind increased	+23
light intensity reduced	–40
half of the leaves removed	–48

Explain the change in water loss when

(i) wind was increased

(2)

The wind removes a layer of moist air around the leaves and so maintains a steep concentration gradient of moisture between the leaf and the air.

(ii) light intensity was reduced

(1)

The leaves stop photosynthesising and so their stomata close.

(iii) half of the leaves were removed.

(2)

There is a lower surface area over which to lose moisture, also there are fewer stomata which water vapour can escape through.

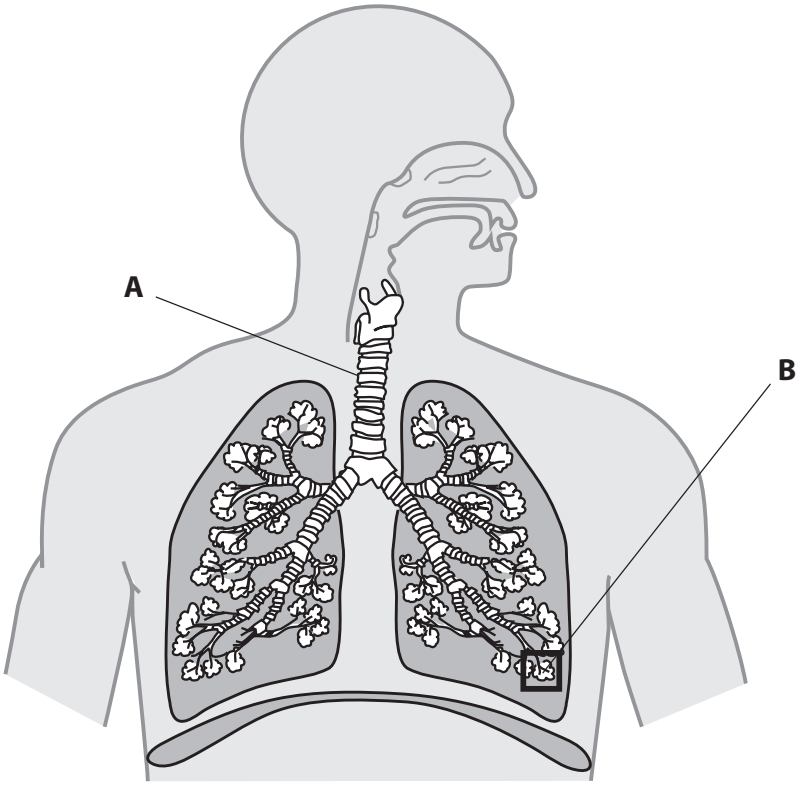
(e) Suggest how Steven could increase the wind around the leafy shoot.

(1)

use an electric fan

(Total for Question = 12 marks)

4 The diagram shows some structures in the human breathing system.



(a) Name structures **A** and **B**.

(2)

A trachea / wind pipe / cartilage

B alveoli / air sacs

(b) The table shows the level of two gases, **X** and **Y**, in blood entering and leaving the lungs during the process of gas exchange.

Gas	Level of gas in cm^3 per 100 cm^3 of blood	
	Blood entering lungs	Blood leaving lungs
X	10.6	19.0
Y	58.0	50.0

(i) Name the two gases.

(2)

gas **X** Oxygen O2

gas **Y** Carbon dioxide CO2

(ii) How much of gas **X** enters 100 cm^3 of blood, before the blood leaves the lungs?

(1)

19 - 10.6 = 8.4 ..... cm^3

(iii) What term is used to describe how the process of gas exchange takes place?

Put a cross ☒ in the box to indicate your answer.

(1)

☒ **A** active transport

☑ **B** diffusion

☒ **C** transpiration

☒ **D** osmosis

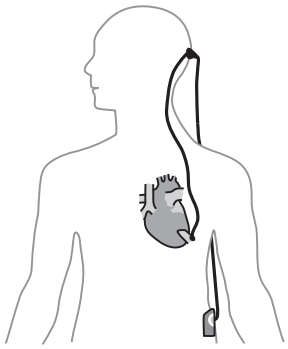
(Total for Question = 6 marks)

1 Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

Artificial heart pump gives life to dying patients

In June 2000, a 61-year-old man in the United Kingdom became the first person to have a permanent artificial heart pump fitted. Before the pump was fitted, the man was told that he had only a few weeks left to live. However, the pump has taken on the work of his heart: taking blood from the heart and delivering it to the rest of the body. Pumps like these could be a possible alternative to heart transplants, which are usually performed on patients whose heart has begun to fail.

The operation to insert the pump took several hours but the surgeons were very pleased with the speed of the man's recovery. During the operation, the pump was fitted into the left ventricle of the man's heart. This heart chamber provides much of the pumping power of the heart when it contracts.



The pump is powered by batteries, which are usually carried around the patient's waist. The batteries are connected to the pump by wires which enter the body at the back of the skull. The wires then pass down through the neck, into the chest cavity and connect to the pump in the heart. The batteries are rechargeable and need changing every eight hours.

The surgeon who performed this operation wrote about it in a medical journal. He said that the pump had helped to lower the patient's blood pressure and had done no damage to his red blood cells. He also reported that, six weeks after the operation, the patient's heart and liver were working much better than before the procedure and that the man was able to take exercise. As the patient takes exercise, he can change the speed of the pump.

The important medical advance with this pump is that it is fitted permanently. Previous artificial heart pumps had to be replaced every few months and were also much larger and noisier. The new pumps give doctors hope that this treatment could solve the problem of a shortage of hearts available for transplants. The heart surgeon said, 'Currently, the outlook for patients who are not able to have a transplant is poor. Our laboratory experience and the result from this first operation with a small, silent intraventricular device suggests a potential alternative for many patients.'

(a) Name **two** of the blood vessels that carry blood away from the heart.

(2)

1 **Aorta**

2 **Pulmonary artery**

(b) Suggest why the batteries for the heart pump are placed outside the body (lines 12 and 13).

(1)

So that they can be easily replaced or recharged.

(c) Describe how the blood in the left side of the heart differs from the blood in the right side of the heart.

(2)

The blood in the left side has more dissolved Oxygen and less dissolved CO_2. It is also at a higher pressure.

(d) Explain why the patient might need to change the speed of the pump (line 22).

(2)

If the patient is exercising their muscles will need more Oxygen and glucose for respiration.

(e) Explain why some patients are 'not able to have a transplant' (line 28).

(1)

There are not enough donor hearts, or their is a danger their immune system might reject the donated heart.

(f) Suggest what is meant by the term **intraventricular** (line 29).

(1)

inside the ventricle, not between.

(g) Suggest **two** advantages of using the new artificial heart pump compared to previous artificial heart pumps.

(2)

1 It's smaller and quieter

2 It doesn't need to be replaced.

(Total for Question = 11 marks)