



Exampro GCSE Biology

B3.1 Exchange
Foundation tier

Name:

Class:

Author:

Date:

Time: 66

Marks: 66

Comments:

Q1. Plants lose water vapour from their leaves. Most of this water vapour is lost through the stomata.

(a) Draw a ring around the correct answer to complete the sentence.

Plants lose water vapour by

distillation.
filtration.
transpiration.

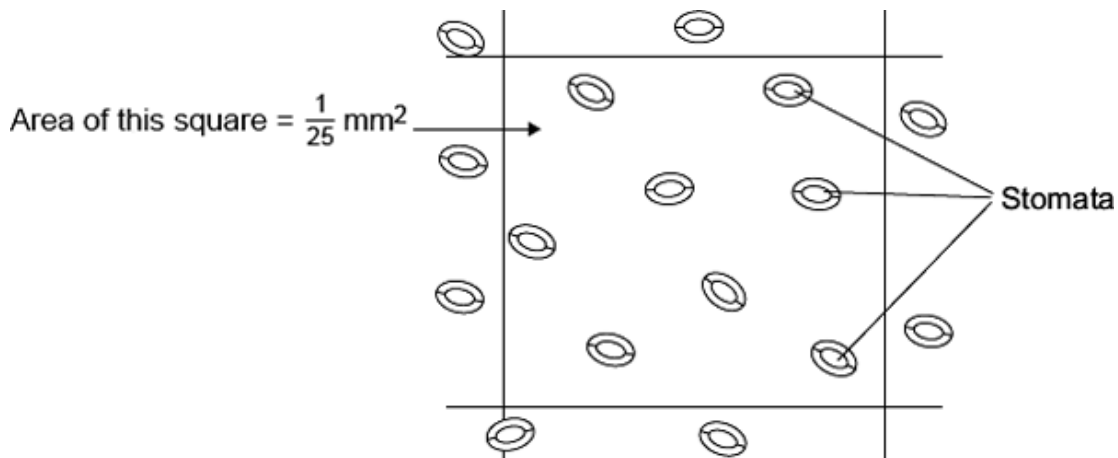
(1)

(b) A class of students investigated the number of stomata per mm^2 on the upper surface and on the lower surface of the leaves of three species of plant, **P**, **Q** and **R**.

The students placed samples of the surface cells onto a grid on a microscope.

Student **X** counted the stomata on the lower surface of a leaf from one of the plant species.

The diagram shows part of the grid that student **X** saw under the microscope.



(i) Complete the calculation to estimate the number of stomata per mm^2 on the lower surface of this leaf.

Number of stomata in $\frac{1}{25} \text{ mm}^2 = \dots\dots\dots$

Number of stomata in $1 \text{ mm}^2 = \dots\dots\dots$

(2)

The table shows the mean results for the class.

Plant species	Mean number of stomata per mm ² of leaf	
	Upper surface of leaf	Lower surface of leaf
P	40	304
Q	0	11
R	85	195

- (ii) Student **X** had counted the stomata on the lower surface of a leaf from one of the plant species.

Use your answer to part **(b)(i)**, and information in the table, to help you to answer this question.

From which plant species, **P**, **Q** or **R**, was student **X**'s leaf most likely to have

been taken?

(1)

- (iii) Species **Q** is normally found growing in hot, dry conditions.

Explain **one** way in which species **Q** is adapted for living in hot, dry conditions.

Use information from the table.

.....

.....

.....

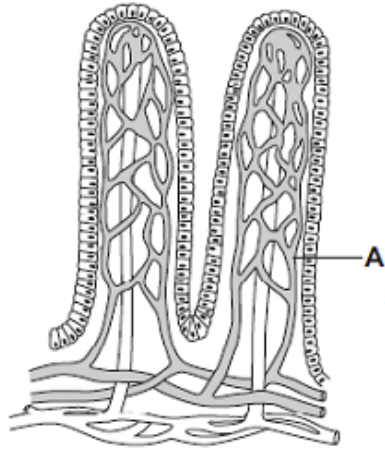
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(2)
(Total 6 marks)

Q2. Villi are found in some parts of the digestive system.

Diagram 1 shows two villi.

Diagram 1



(a) Draw a ring around the correct answer to complete each sentence.

(i) Structure A is a

- muscle.
- nerve.
- capillary.

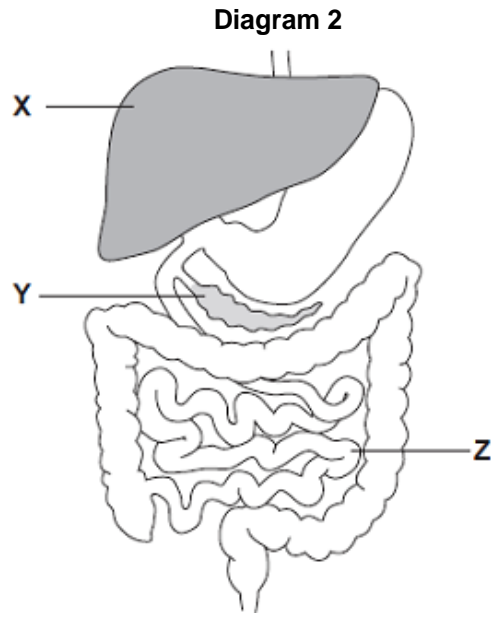
(1)

(ii) The villi absorb the products of digestion by

- dialysis.
- diffusion.
- osmosis.

(1)

(b) **Diagram 2** shows the digestive system.



(i) In which part of the digestive system, **X**, **Y** or **Z**, are most villi found?

(1)

(ii) There are about 2000 villi in each cm^2 of this part of the digestive system.

Why is it helpful to have lots of villi?

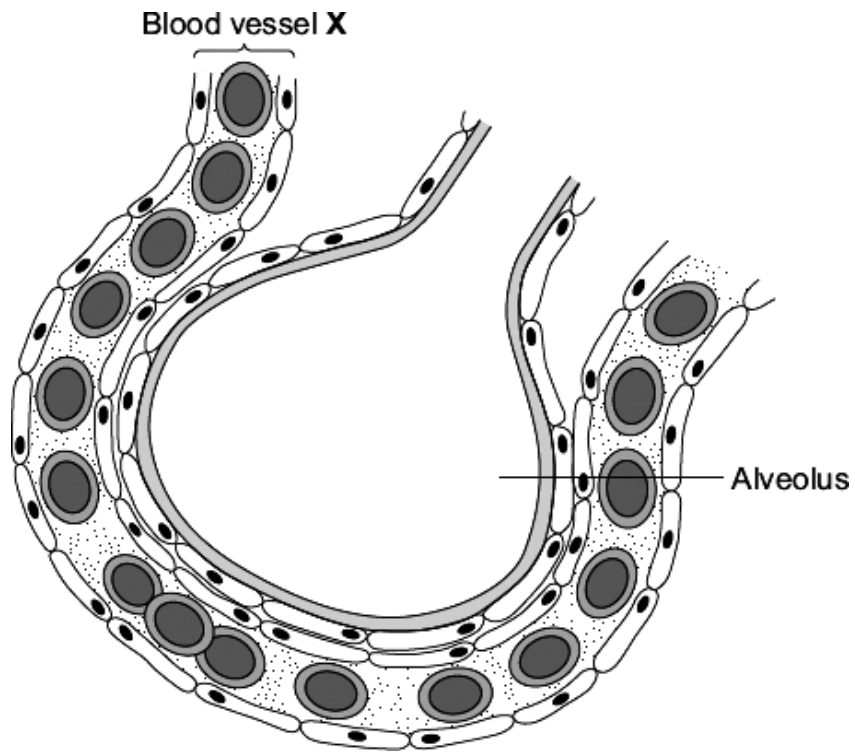
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(1)

(Total 4 marks)

Q3. The diagram shows an alveolus and a blood vessel in the lung.



(a) Draw a ring around the correct answer to complete each sentence.

(i) Blood vessel X is

- an artery.
- a capillary.
- a vein.

(1)

(ii) Gases pass across the wall of the alveolus by

- diffusion.
- evaporation.
- fermentation.

(1)

(iii) The table compares the concentrations of some gases in inhaled air and exhaled air.

Complete the table.

Write 'lower' or 'higher' in each box.

One line has been completed for you as an example.

Gas	Concentration	
	Inhaled air	Exhaled air
Water vapour	lower	higher
Carbon dioxide		
Oxygen		

(2)

(b) Draw a ring around the correct answer to complete each sentence.

(i) Oxygen is carried in the blood mainly in

blood plasma.
red blood cells.
white blood cells.

(1)

(ii) In the blood, the oxygen combines with

carbon dioxide.
haemoglobin.
urea.

(1)

(Total 6 marks)

Q4. Substances can move into cells and out of cells.

(a) Draw a ring around the correct answer to complete each sentence.

Water moves into cells and out of cells by

active transport.
osmosis.
reabsorption.

The water moves through a

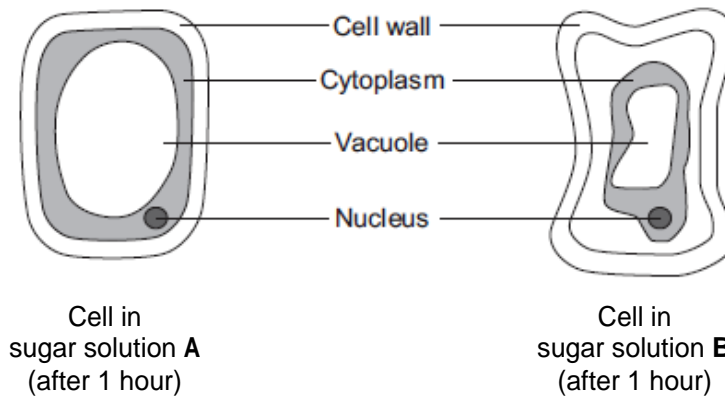
freely permeable
non-permeable
partially permeable

membrane.

(2)

- (b) Students put plant cells into two different strengths of sugar solutions, **A** and **B**.

The diagram below shows what the cells looked like after 1 hour.



- (i) Describe **two** ways in which the cell in sugar solution **B** is different from the cell in sugar solution **A**.

1

.....

2

.....

(2)

- (ii) A student put red blood cells into water.
Suggest what would happen to the cells.

.....

.....

.....

(1)

- (c) In the human body, glucose is absorbed into the blood from the small intestine.

The small intestine contains many villi.

Which **two** of the following help the absorption of glucose in the small intestine?

Tick (✓) **two** boxes.

Villi have a cell wall.

Villi are covered in thick mucus.

Villi give the small intestine a large surface area.

Villi have many blood capillaries.

(2)
(Total 7 marks)

Q5. Substances can move into and out of cells.

(a) (i) How does oxygen move into and out of cells?

Draw a ring around **one** answer.

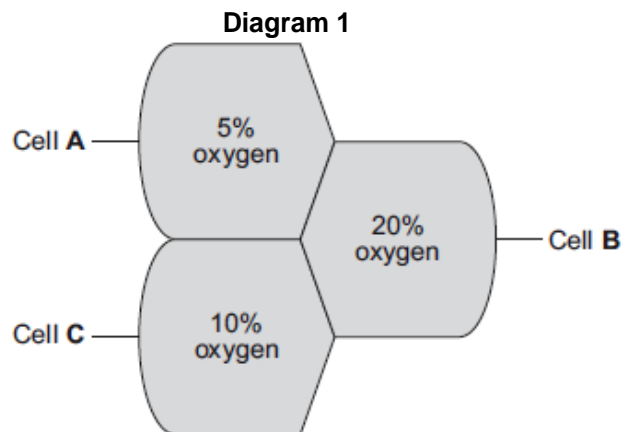
diffusion

digestion

photosynthesis

(1)

(ii) **Diagram 1** shows the percentage concentration of oxygen in three cells, **A**, **B** and **C**.



Oxygen can move from cell to cell.

Into which cell, **A**, **B** or **C**, will oxygen move the fastest?

(1)

(b) (i) How does water move into and out of cells?

Draw a ring around **one** answer.

breathing

osmosis

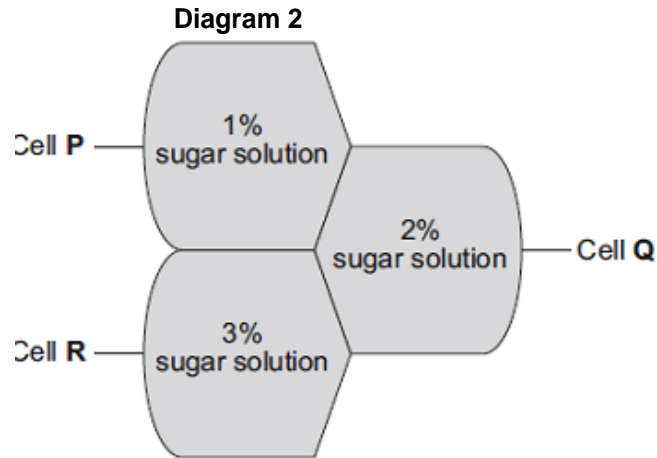
respiration

(1)

- (ii) Differences in the concentration of sugars in cells cause water to move into or out of cells at different rates.

Diagram 2 shows three different cells, **P**, **Q** and **R**.

The information shows the percentage concentration of sugar solution in cells **P**, **Q** and **R**.



Water can move from cell to cell.

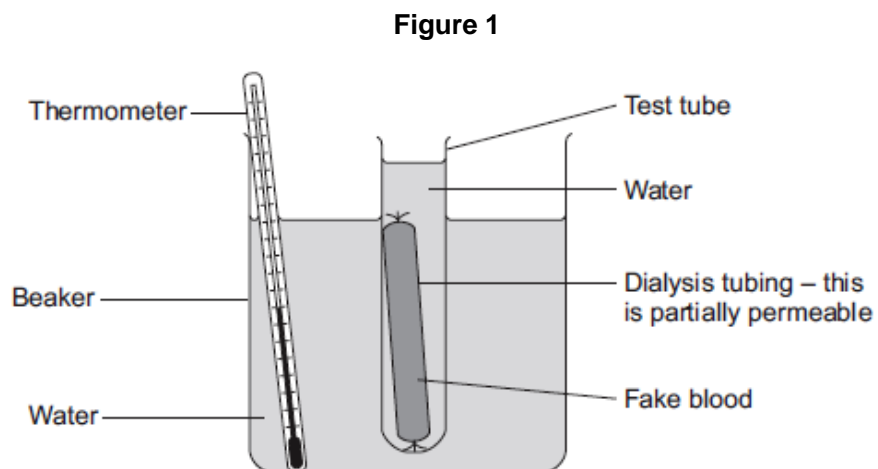
Into which cell, **P**, **Q** or **R**, will water move the fastest?

(1)
(Total 4 marks)

Q6. A person's kidneys stop working. The person may be treated using a dialysis machine.

Some students made a model of a dialysis machine.

Figure 1 shows the students' model.



The fake blood contained:

- water
- sodium ions
- urea
- glucose
- protein.

(a) (i) Suggest why the students kept the water in the beaker at 37 °C.

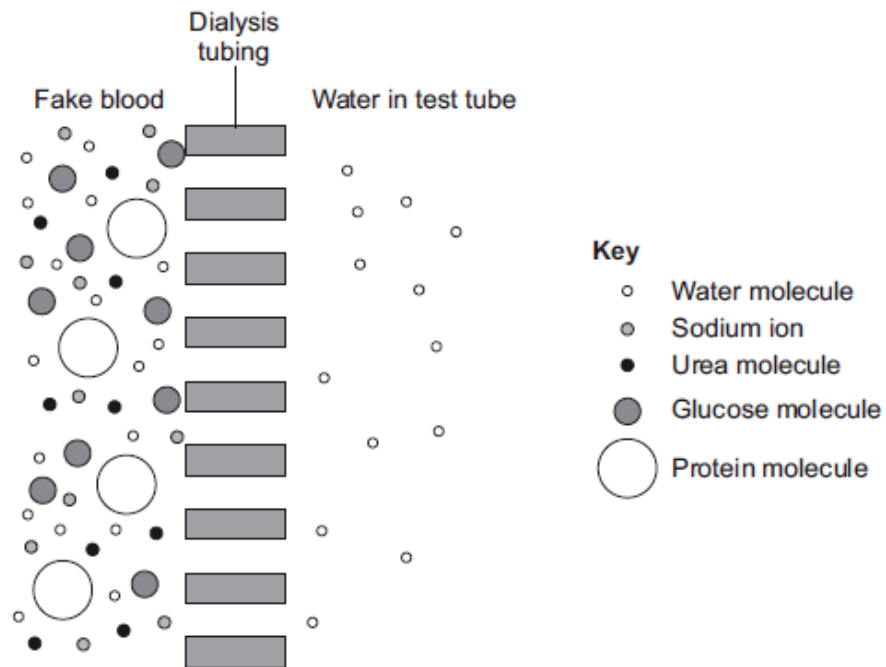
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(1)

(ii) The dialysis tubing separates the fake blood from the water in the test tube.

Figure 2 shows the fake blood, the dialysis tubing and the water in the test tube.

Figure 2



After 1 hour, the students tested the water in the test tube to see which substances had filtered through from the fake blood.

Name **one** substance that the students would find in the water in the test tube after 1 hour.

.....

(1)

(iii) Give a reason for your answer to part **(a)(ii)**.

.....
.....
.....

(1)

(iv) In hospitals, dialysis machines use dialysis fluid, not pure water.

Dialysis fluid contains the same concentration of useful substances as the blood.

Which substance is at the same concentration in dialysis fluid as in blood?

Tick (✓) **one** box.

Glucose

Insulin

Oxygen

(1)

(b) When the kidneys stop working, the person can be treated by a continuous process called CPD.

In CPD:

- dialysis fluid is put into the abdomen
- the fluid is changed four times a day at home
- changing the fluid takes about 45 minutes.

Suggest **two** advantages of having CPD instead of treatment on a dialysis machine.

1

.....

2

.....

(2)

(Total 6 marks)

Q7. Plant roots absorb water from the soil by osmosis.

(a) What is osmosis?

.....

.....

.....

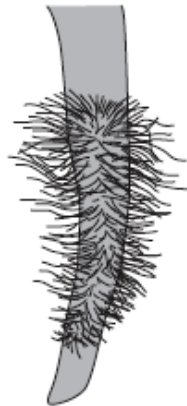
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.....

(3)

(b) The image below shows part of a plant root.



The plant root is adapted for absorbing water from the soil.

Use information from the diagram to explain how this plant root is adapted for absorbing water.

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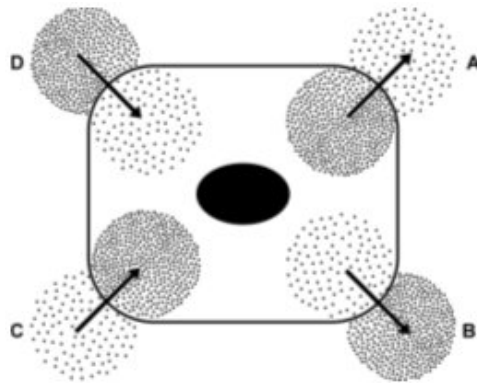
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(3)
(Total 6 marks)

Q8. 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)

Q9. 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

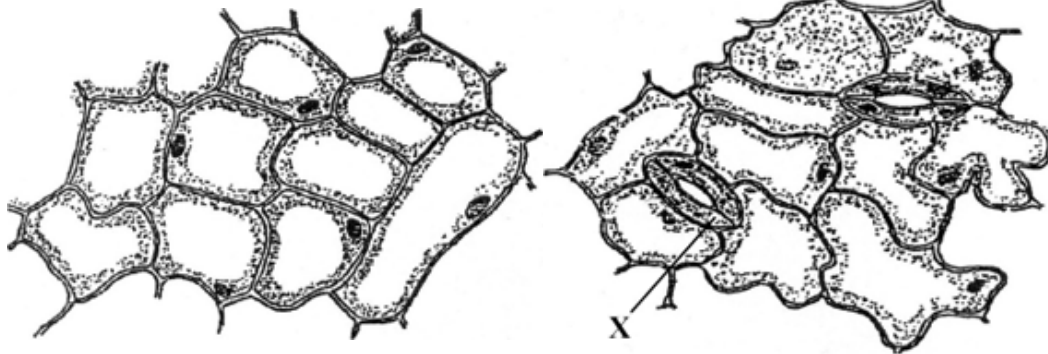
(a) Which leaf, **A**, **B** or **C**, lost most water?

(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.

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.....
.....
.....
.....

(2)
(Total 4 marks)

Q10. 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.

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.....
.....
.....
.....
.....

(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.

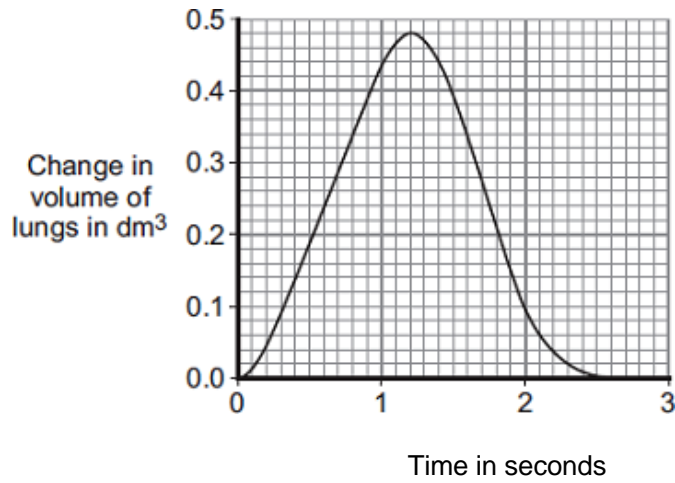
How does the structure of plant cells prevent them from bursting?

.....
.....

(1)
(Total 4 marks)

Q11. 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.

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.....

.....

(3)

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

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.....

.....

(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.

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.....
.....
.....

(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**.

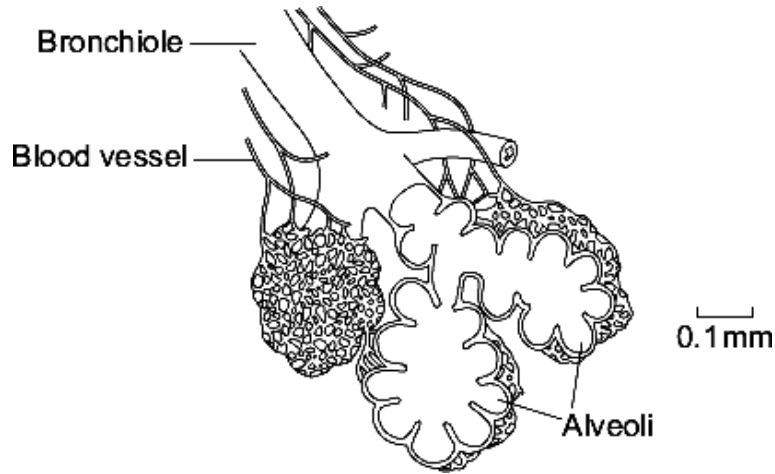
Give **one** advantage and **one** disadvantage of using the modern ventilator rather than the iron lung ventilator.

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.....
.....
.....
.....
.....

(2)

(Total 10 marks)

Q12. 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)

M1.	(a)	transpiration	1	
	(b)	(i) 200		
		<i>correct answer with or without working</i>		
		<i>if answer incorrect:</i>		
		<i>allow 1 mark for 8 × 25 or</i>		
		<i>allow 1 mark for answer from candidate's count × 25</i>	2	
	(ii)	R		
		<i>allow P or Q if candidate's answer to (b)(i) nearer to value for one of those</i>		
		<i>do not allow R if the answer to (b)(i) would give an answer of P or Q</i>		
		<i>allow R if (b)(i) is blank</i>	1	
	(iii)	few stomat		
		<i>allow no stomata on upper surface / all stomata on lower surface</i>	1	
		little / less transpiration or little / less water (vapour) loss / enable water to be retained		
		<i>allow no water loss from upper surface</i>	1	
				[6]
M2.	(a)	(i) capillary	1	
		(ii) diffusion	1	
	(b)	(i) Z		
		<i>ignore any names</i>	1	
		(ii) <u>large</u> / <u>increased</u> surface / area		
		<i>allow <u>all</u> food absorbed</i>		
		or to absorb <u>more</u> food		
		or improved diffusion	1	
				[4]
M3.	(a)	(i) capillary	1	
		(ii) diffusion	1	

(iii)	Carbon dioxide	low(er)	high(er)
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1

Oxygen	high(er)	low(er)
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1 mark for each correct row

1

(b) (i) red blood cells

1

(ii) haemoglobin

1

[6]

M4. (a) osmosis

1

partially permeable

1

(b) (i) any **two** from:

allow correct answers in terms of A

- vacuole is small(er)
- cytoplasm has shrunk
allow cytoplasm is smaller
- gap between cytoplasm and cell wall
- cell wall curves inwards
allow cell B is flaccid or cell A is turgid
- the (cell) membrane has moved away from the wall

2

(ii) any **one** from:

- water will move / diffuse in
- (cells) will swell
- (cells) will burst
ignore turgid

1

(c) villi give the small intestines a large surface area

1

villi have many blood capillaries

1

[7]

- M5.** (a) (i) diffusion
apply list principle 1
- (ii) **A**
apply list principle 1
- (b) (i) osmosis
apply list principle 1
- (ii) **R**
apply list principle 1
- [4]**
- M6.** (a) (i) (37C is the same as human) body temperature 1
- (ii) any **one** from:
- urea
 - glucose
 - sodium
- ignore water* 1
- (iii) (as they are) small enough to pass through (the membrane)
allow because there is a high concentration in the fake blood and a low concentration in the water (so will diffuse across) 1
- (iv) glucose 1
- (b) any **two** from:
- don't have to go to hospital **or** done at home rather than hospital
 - less effect on lifestyle / can be mobile
 - always filtering urea out
continuous is insufficient
 - don't need a medical professional (to do it for you)
allow takes a shorter time
allow does not have to be connected to blood vessels
ignore 'less painful'
- 2
- [6]**
- M7.** (a) any **three** from:
- (water through a) partially permeable
accept 'semi permeable' / selectively permeable

- membrane
- from dilute to (more) concentrated solution
 - allow 'from a high concentration of water to a lower concentration (of water)'*
 - allow 'from high water potential to low water potential'*
 - allow 'down a concentration gradient of water'*
 - do **not** accept 'along a concentration gradient of water'*
- (it's a) passive (process)
 - allow requires no energy*

3

(b) (there are) many hairs **or** thin hairs **or** hairs are one cell thick

1

(which gives) large / increased surface area **or** short diffusion pathway

1

(so there is) more diffusion / osmosis (of water into the root)

ignore absorption

1

[6]

M8. D

1

A

1

C

1

[3]

M9. (a) C

1

(b) (i) guard (cell)

1

(ii) temperature water movement / transpiration
through stomata / pores / holes / (region) X

or

petroleum jelly blocks / covers stomata / pores / holes / X

1

stomata / pores / holes / X found on lower surface

1

[4]

M10. (a) because water enters (the cell / it / named cell)
do **not** accept salt / sugar / solution entering 1

by osmosis / diffusion

*if osmosis / diffusion not given accept concentration inside cell
greater than outside cell*

*assume concentration refers to solute concentration unless answer
indicates otherwise*

allow water goes up the concentration gradient

allow water goes down its concentration gradient

do **not** accept if diffusion of salt / sugar 1

through a partially permeable membrane

*allow semi / selectively permeable membrane **or** description* 1

(b) (plant cells) have (cell) wall

accept animal cells have no (cell) wall

ignore reference to cell membrane

*do **not** accept reference to other organelles **or** any implication that
animal cells have a cell wall eg plant cells have a thicker cell wall*

1

[4]

M11. (a) (i) rise then fall 1

to peak at 0.48 dm^3 / after 1.2s 1

(fall) back to 0 / (falling) back after 2.5s

allow 2.6s

allow after a further 1.3s / 1.4s 1

(ii) rise / air in caused by upward/outward movement of ribcage 1

decrease / air out caused by return of ribcage to original
position/downward 1

and (rise / air in) by downward movement / flattening of
diaphragm

or

(decrease / air out) by upward movement / doming of diaphragm

ignore contraction and relaxation of muscles

ignore reference to pressures, ribcage expanding 1

(b) (i) in iron lung atmospheric / outside pressure forces air into lungs
allow air sucked / drawn into lungs 1

in modern respirator air forced (mechanically) into lungs
allow for one mark pressures acts externally in iron lung and internally in modern ventilator 1

(ii) advantage

any **one** from:

- more freedom of movement for patient
- more portable
- does not affect blood flow in lower body
ignore cost

1

disadvantage

any **one** from:

- (tube in trachea) uncomfortable
- more difficult to eat / talk
allow it can damage / overinflate the lungs / over breathe

1

[10]

M12. (a) large surface / large area 1

thin / short distance (from air to blood) / one cell thick / two cells thick 1

good blood supply / many capillaries / capillary network / many blood vessels
ignore moist surface 1

(b) (i) diffusion
ignore gaseous exchange 1

(ii) brings (more) oxygen / air into the lungs / alveoli 1

keeps O₂ level high in alveoli

or

maintains concentration difference (between alveoli and blood) / keeps O₂ concentration in alveoli > O₂ concentration in blood gains **2** marks

1

[6]

