AQA GCSE Biology | 8461

SPECIFICATION POINT 4.1.3.1

Diffusion

Past-paper questions

Tier	**Foundation**
Question groups	**20**
Available paper years	**2008–2022**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

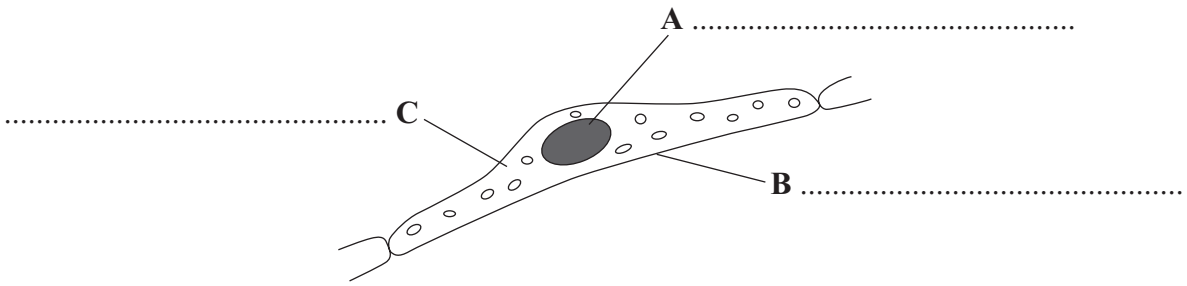
Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.1.3.1 Diffusion

Question 01

June 2008 | BLY2F | Original Q1 | Legacy

1 The diagram shows a cell from the lining of the lung. This cell is specialised to allow gases to pass through quickly.



1 (a) Use words from the box to label structures **A**, **B** and **C**.

cell membrane	**chloroplast**	**cytoplasm**	**mitochondria**	**nucleus**

(3 marks)

1 (b) (i) Which feature of this cell allows oxygen to pass through quickly?

Put a tick (✓) in the box next to your choice.

It is thin. ☐

It has a large nucleus. ☐

It has many mitochondria. ☐

(1 mark)

1 (b) (ii) Complete the sentence by drawing a ring around the correct answer in the box.

Oxygen passes through this cell by [diffusion / osmosis / respiration] .

(1 mark)

5

4.1.3.1 Diffusion

Question 02

June 2008 | BLY2F | Original Q2 | Legacy

2 Green plants are able to make their own food.

Complete each sentence by drawing a ring around the correct answer in the box.

2 (a) Green plants make their own food during the process of

diffusion
photosynthesis
respiration

.

(1 mark)

2 (b) This process can be summarised by the equation:

carbon dioxide + water → glucose +

mineral salts
light
oxygen

.

(1 mark)

2 (c) The energy needed for this process is trapped for the plant by

chlorophyll
glucose
light

.

(1 mark)

2 (d) Some of the food made by plants is stored as insoluble

chlorophyll
glucose
starch

.

(1 mark)

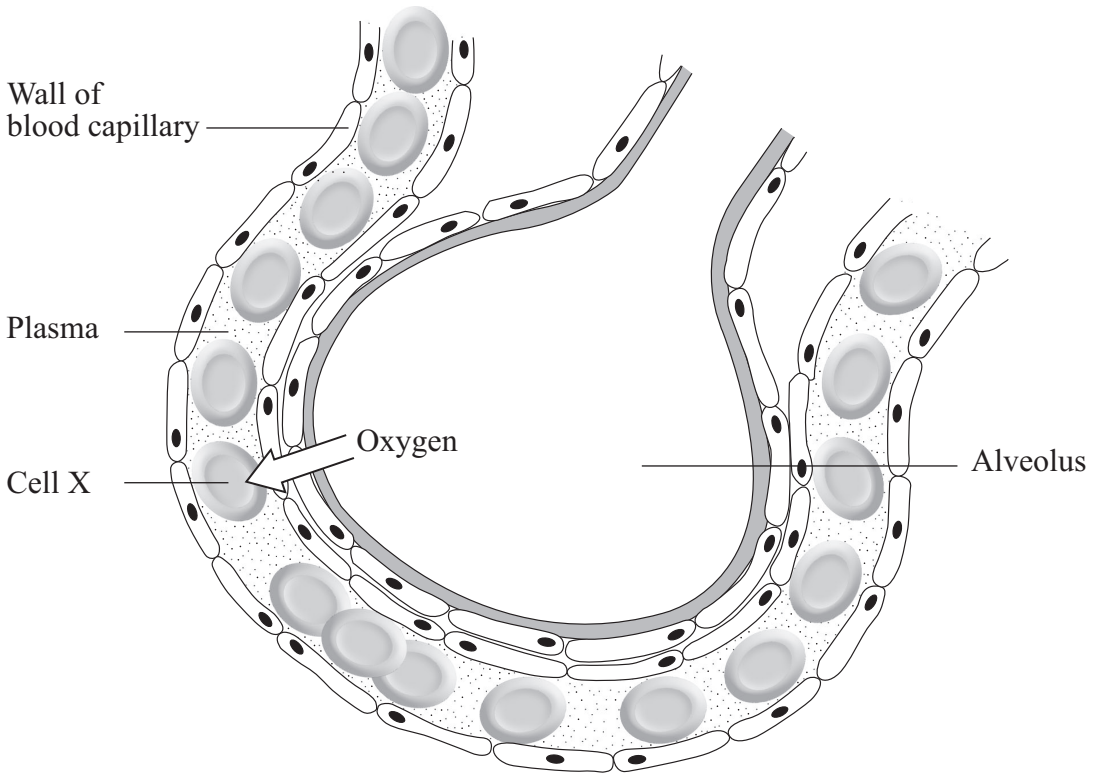
4

4.1.3.1 Diffusion

Question 03

June 2008 | BLY3F | Original Q4 | Legacy

4 The diagram shows a small part of a lung.



4 (a) The arrow on the diagram shows the movement of oxygen from the air in the alveolus to cell **X**.

Complete the sentences by drawing a ring around the correct answer.

4 (a) (i) Cell **X** is a platelet / red cell / white cell .

(1 mark)

4 (a) (ii) Oxygen moves from the air in the alveolus into cell **X** by diffusion / filtration / respiration .

(1 mark)

4 (a) (iii) The substance in cell **X** that combines with oxygen is called glycogen / haemoglobin / lactic acid .

(1 mark)

4.1.3.1 Diffusion

Question 03 · continued

for mark

4 (a) (iv) Cell **X** does **not** have

a cell membrane
cytoplasm
a nucleus

.

(1 mark)

4 (b) **On the diagram**, draw an arrow to show the movement of carbon dioxide during gas exchange. *(1 mark)*

5

4.1.3.1 Diffusion

Question 04

January 2009 | BLY2F | Original Q4 | Legacy

4 Waste products, such as carbon dioxide and urea, have to be removed from the body.

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

4 (a) Carbon dioxide is produced by [breathing / diffusion / respiration].

(1 mark)

4 (b) Most carbon dioxide leaves the body through the [kidneys / lungs / skin].

(1 mark)

4 (c) Urea is produced in the [kidneys / liver / lungs].

(1 mark)

4 (d) Urea is produced from the breakdown of [amino acids / glucose / urine].

(1 mark)

4

4.1.3.1 Diffusion

Question 05

January 2009 | BLY3F | Original Q1 | Legacy

1 (a) Draw a ring around **one** word to answer each of the following questions.

1 (a) (i) Which type of blood vessel carries blood out of the heart?

artery **capillary** **vein**

(1 mark)

1 (a) (ii) Which type of blood vessel allows substances to enter and leave the blood?

artery **capillary** **vein**

(1 mark)

1 (b) Use words from the box to complete the sentences.

alveoli	**cell membrane**	**nucleus**
plasma	**red blood cells**	**villi**

Oxygen enters the blood through the walls of the ..... .

Most of the oxygen transported by the blood is carried in the

..... .

A red blood cell is different from other body cells because it does not have a

..... .

(3 marks)

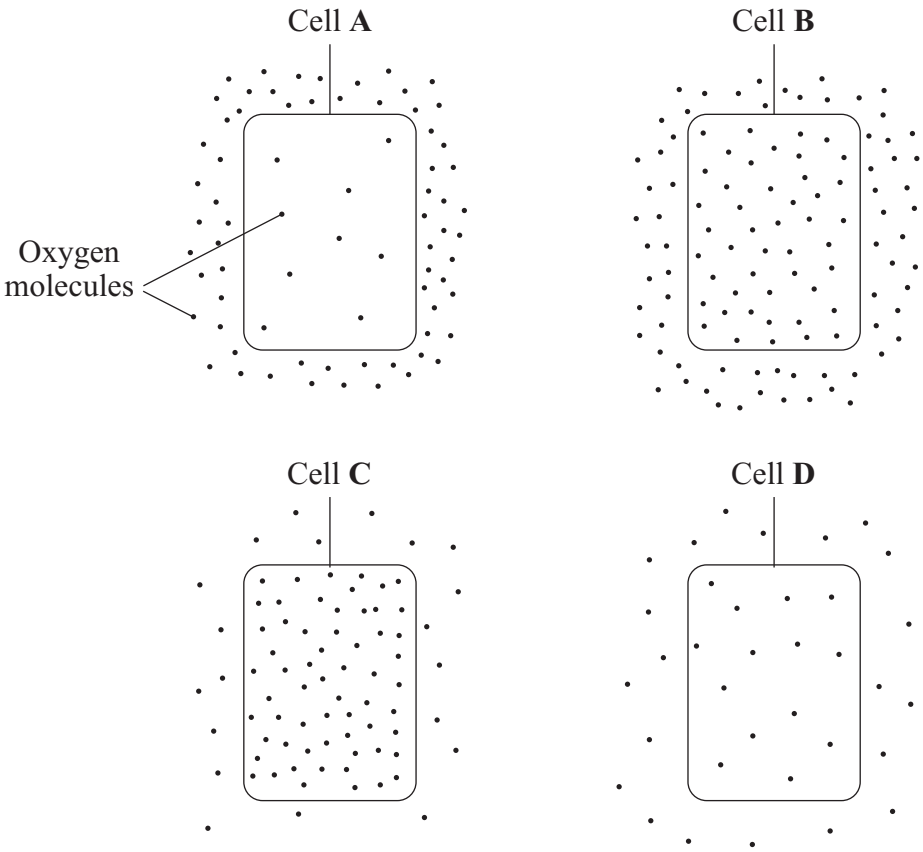
5

4.1.3.1 Diffusion

Question 06

June 2009 | BLY2F | Original Q2 | Legacy

2 (a) The diagrams show cells containing and surrounded by oxygen molecules. Oxygen can move into cells or out of cells.



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

Write your answer, **A**, **B**, **C** or **D**, in the box. ☐

(1 mark)

4.1.3.1 Diffusion

Question 06 · continued

for mark

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

2 (b) (i) Oxygen is taken into cells by the process of

diffusion
osmosis
respiration

.

(1 mark)

2 (b) (ii) Cells need oxygen for

breathing
photosynthesis
respiration

.

(1 mark)

2 (b) (iii) The parts of cells that use up the most oxygen are the

membranes
mitochondria
nuclei

.

(1 mark)

2 (b) (iv) Some cells produce oxygen in the process of

diffusion
photosynthesis
respiration

.

(1 mark)

5

4.1.3.1 Diffusion

Question 07

June 2009 | BLY3F | Original Q2 | Legacy

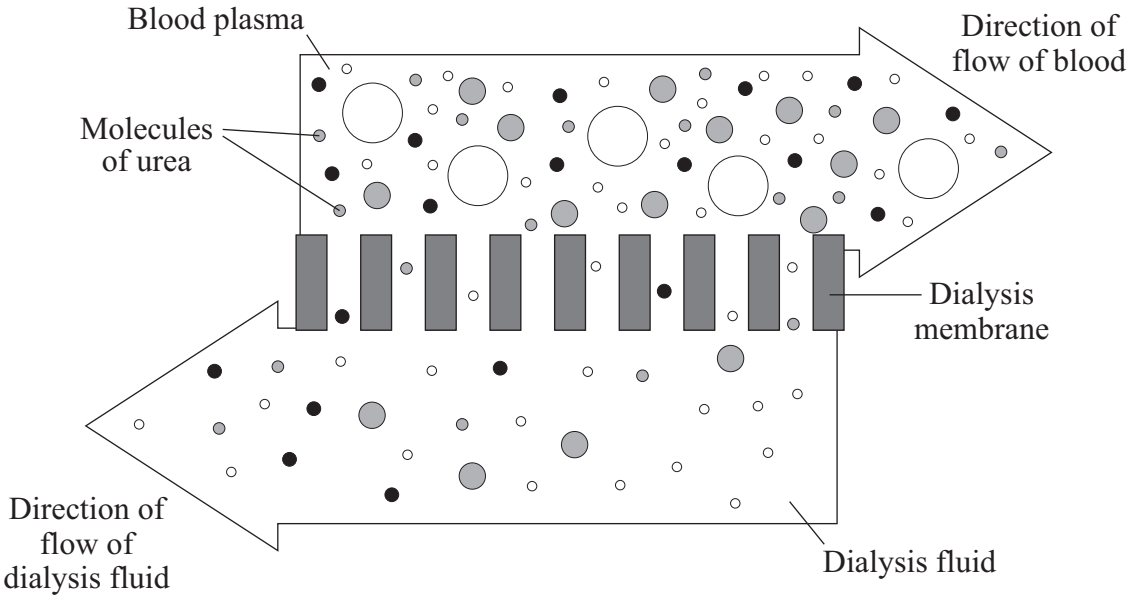
2 (a) Which **two** of the following substances are found in the urine of a healthy person?

Tick (✓) **two** boxes.

Glucose	☐
Mineral ions	☐
Proteins	☐
Water	☐

(2 marks)

2 (b) A person with kidney disease can be treated by dialysis.
The diagram shows how dialysis works.
The circles represent molecules of different substances.



Draw a ring around the correct word or phrase to complete each sentence.

2 (b) (i) During dialysis, urea moves out of the

blood cells
blood plasma
dialysis fluid

.

(1 mark)

4.1.3.1 Diffusion

Question 07 · continued

for mark

2 (b) (ii) During dialysis, urea moves into the [blood cells / blood plasma / dialysis fluid] .

(1 mark)

2 (b) (iii) Urea moves by the process of [diffusion / digestion / transpiration] .

(1 mark)

2 (b) (iv) To allow the movement of urea, the dialysis membrane is [impermeable / partially permeable / thick] .

(1 mark)

2 (b) (v) The urea can pass through the membrane because

the urea molecules are [large / round / small] .

(1 mark)

2 (c) For most patients a kidney transplant is better than continued dialysis treatment.

Tick (✓) **one** box to complete the sentence.

One major problem with a kidney transplant is that

drug treatment is needed to suppress the immune system. ☐

hospital visits are needed three times a week. ☐

yearly costs are higher than for dialysis. ☐

(1 mark)

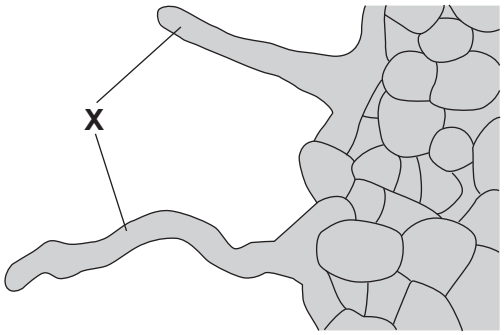
8

4.1.3.1 Diffusion

Question 08

June 2010 | BLY3F | Original Q1 | Legacy

1 The diagram shows part of a plant root. A large number of structures like the ones labelled **X** grow out of the surface of the root.



1 (a) (i) What is the name of structure **X**?

Draw a ring around **one** answer.

root hair **stoma** **villus**

(1 mark)

1 (a) (ii) Name **two** substances which structure **X** absorbs from the soil.

1 .....

2 .....

(2 marks)

4.1.3.1 Diffusion

Question 08 · continued

1 (b) The substances in (a)(ii) are transported from the roots to the leaves.
Carbon dioxide also enters the leaves.

Draw a ring round the correct answer to complete each sentence.

1 (b) (i) Carbon dioxide enters leaves through

alveoli.

stomata.

villi.

(1 mark)

1 (b) (ii) Carbon dioxide enters leaf cells by

active transport.

diffusion.

reabsorption.

(1 mark)

5

4.1.3.1 Diffusion

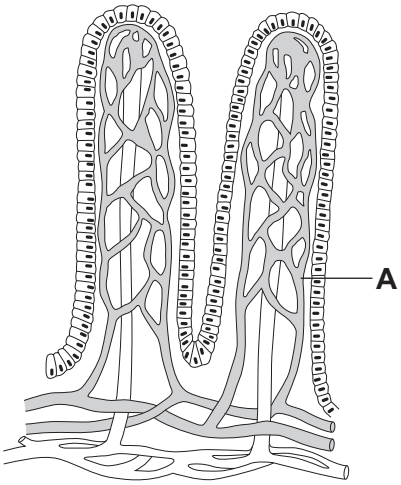
Question 09

January 2011 | BLY3F | Original Q2 | Legacy

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

Diagram 1 shows two villi.

Diagram 1



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

2 (a) (i) Structure **A** is a

muscle.

nerve.

capillary.

(1 mark)

2 (a) (ii) The villi absorb the products of digestion by

dialysis.

diffusion.

osmosis.

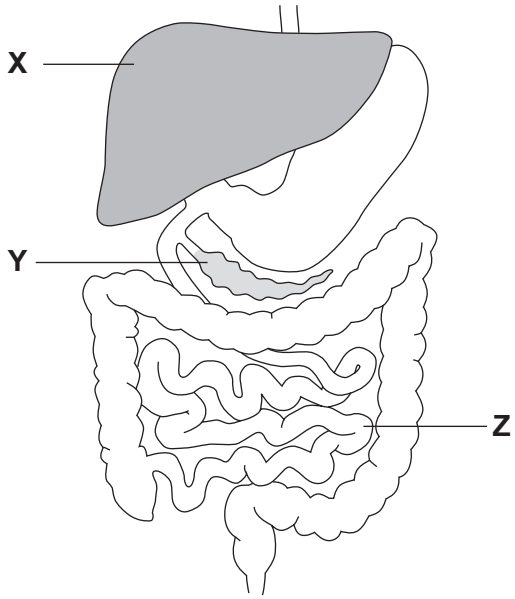
(1 mark)

4.1.3.1 Diffusion

Question 09 · continued

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

Diagram 2



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

(1 mark)

2 (b) (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?

.....

.....

(1 mark)

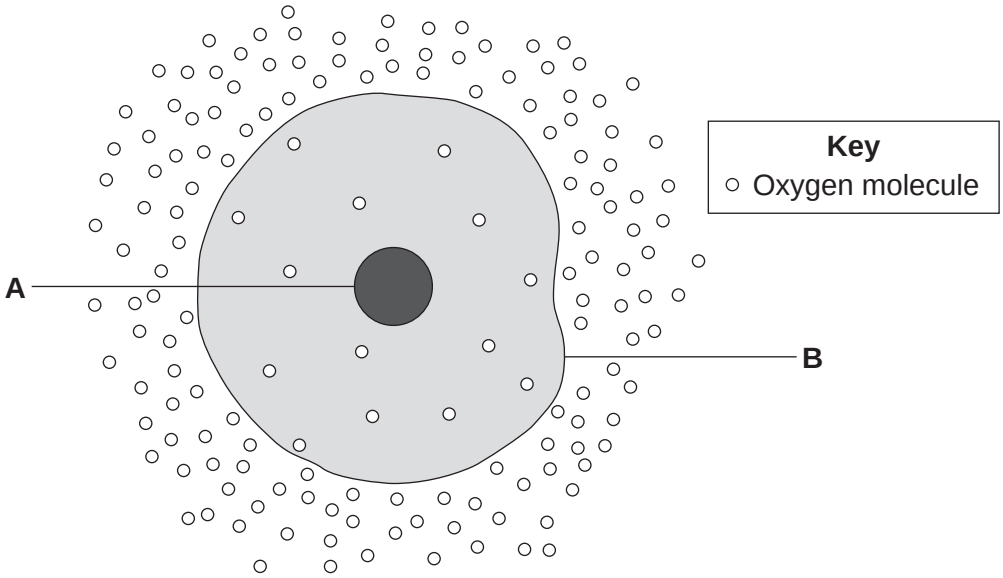
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4.1.3.1 Diffusion

Question 10

January 2013 | BL2FP | Original Q1 | Legacy

1 The diagram shows a cell.



1 (a) (i) Use words from the box to name the structures labelled **A** and **B**.

cell membrane	chloroplast	cytoplasm	nucleus

A .....

B .....

(2 marks)

1 (a) (ii) The cell in the diagram is an animal cell.

How can you tell it is an animal cell and **not** a plant cell?

Give **two** reasons.

1 .....

.....

2 .....

.....

(2 marks)

4.1.3.1 Diffusion

Question 10 · continued

1 (b) Oxygen will diffuse into the cell in the diagram.

Why?

Use information from the diagram.

.....

.....

(1 mark)

1 (c) The cell shown in the diagram is usually found with similar cells.

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

Scientists call a group of similar cells

- an organ.
- a system.
- a tissue.

(1 mark)

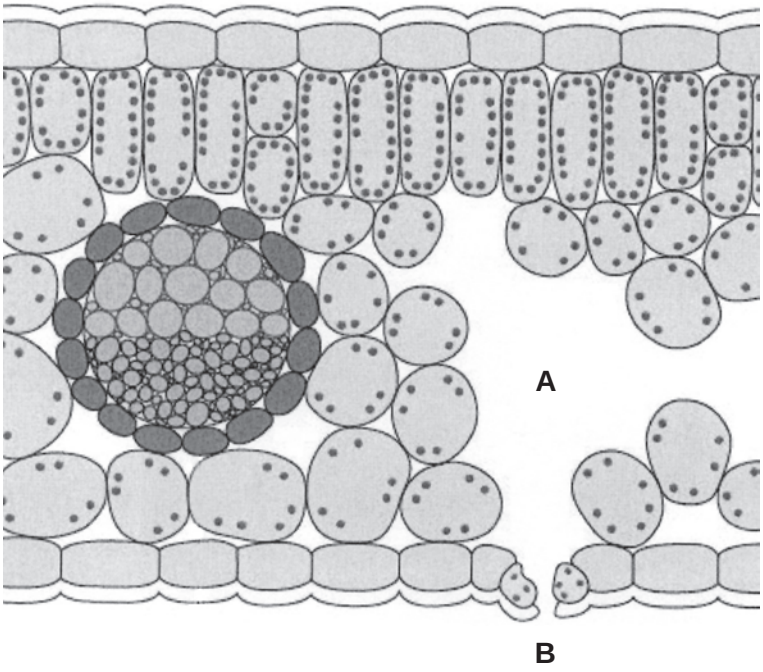
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4.1.3.1 Diffusion

Question 11

June 2013 | BL2FP | Original Q7 | Legacy

7 The diagram shows a section through a plant leaf.



7 (a) Use words from the box to name **two** tissues in the leaf that transport substances around the plant.

epidermis	**mesophyll**	**phloem**	**xylem**

..... and .....

(1 mark)

7 (b) Gases *diffuse* between the leaf and the surrounding air.

7 (b) (i) What is *diffusion*?

.....

.....

.....

.....

(2 marks)

7 (b) (ii) Name **one** gas that will diffuse from point **A** to point **B** on the diagram on a sunny day.

.....

(1 mark)

4

4.1.3.1 Diffusion

Question 12

June 2014 | BL2FP | Original Q8 | Legacy

8 **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Diffusion is an important process in animals and plants.

The movement of many substances into and out of cells occurs by diffusion.

Describe why diffusion is important to animals and plants.

In your answer you should refer to:

- animals
- plants
- examples of the diffusion of named substances.

[6 marks]

.....

.....

.....

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Extra space .....

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6

4.1.3.1 Diffusion

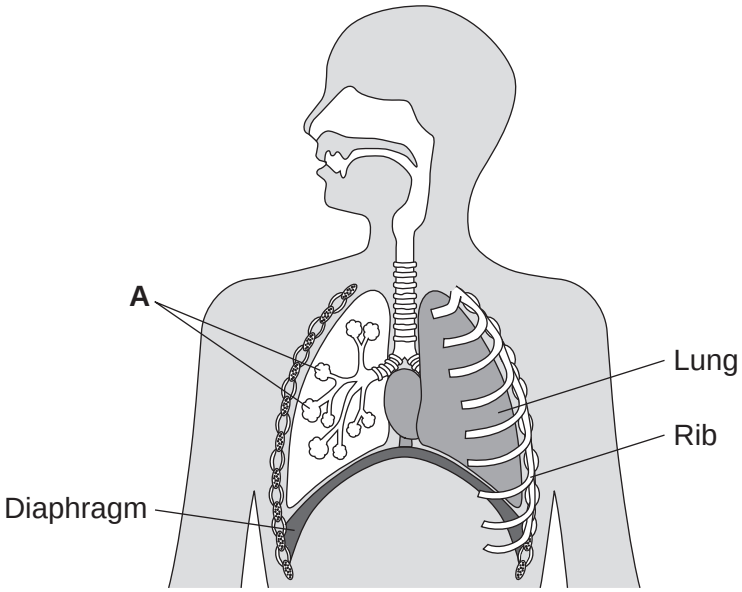
Question 13

June 2015 | BL3FP | Original Q1 | Legacy

1 Our lungs help us to breathe.

Figure 1 shows the human breathing system.

Figure 1



1 (a) (i) Name part **A** in **Figure 1**.

[1 mark]

.....

1 (a) (ii) Give **one** function of the ribs.

[1 mark]

.....

1 (b) (i) Use the correct answer from the box to complete the sentence.

[1 mark]

active transport	**diffusion**	**osmosis**

Oxygen moves from the air inside the lungs into the blood by the process of ..... .

4.1.3.1 Diffusion

Question 13 · continued

1 (b) (ii) Use the correct answer from the box to complete the sentence.

[1 mark]

arteries	capillaries	veins

Oxygen moves from the lungs into the blood through the walls

of the ..... .

1 (b) (iii) Inside the lungs, oxygen is absorbed from the air into the blood.

Give **two** adaptations of the lungs that help the rapid absorption of oxygen into the blood.

[2 marks]

1 .....

.....

2 .....

.....

6

4.1.3.1 Diffusion

Question 14

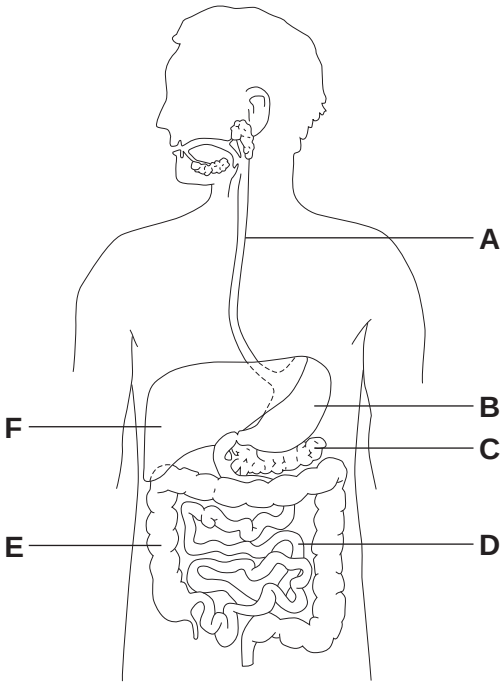
June 2016 | BL2FP | Original Q2 | Legacy

2 The digestive system breaks down food into small molecules.

The small molecules can be absorbed into the blood.

Figure 2 shows the human digestive system.

Figure 2



2 (a) (i) Which letter, **A**, **B**, **C**, **D**, **E** or **F**, shows each of the following organs?

[3 marks]

Write **one** letter in each box.

large intestine ☐

small intestine ☐

stomach ☐

4.1.3.1 Diffusion

Question 14 · continued

2 (a) (ii) Different organs in the digestive system have different functions.

Draw **one** line from each function to the organ with that function.

[3 marks]

Function	Organ
Digestion of fat	Large intestine
Absorption of water into the blood	Liver
Production of hydrochloric acid	Small intestine
	Stomach

2 (b) Glucose is absorbed into the blood in the small intestine.

Most of the glucose is absorbed by diffusion.

How does the glucose concentration in the blood compare to the glucose concentration in the small intestine?

[1 mark]

Tick (✓) **one** box.

- The concentration in the blood is higher. ☐
- The concentration in the blood is lower. ☐
- The concentration in the blood is the same. ☐

7

4.1.3.1 Diffusion

Question 15

June 2017 | BL2FP | Original Q6 | Legacy

6 There are many different types of cell in the human body.

6 (a) (i) Describe where epithelial cells are found in the human body.

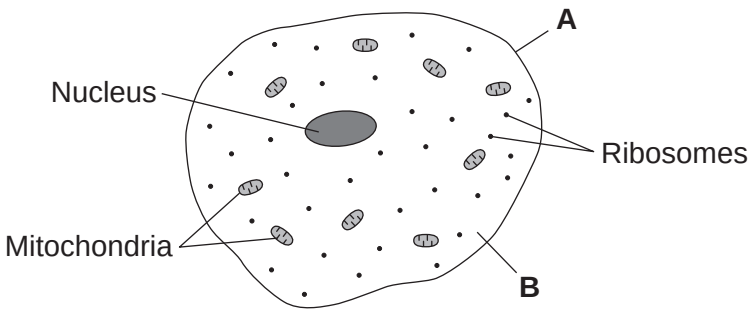
[1 mark]

_____

_____

6 (a) (ii) **Figure 6** shows an epithelial cell.

Figure 6



Name part **A** and part **B**.

[2 marks]

A _____

B _____

6 (b) What is the function of ribosomes?

[1 mark]

Tick (✓) **one** box.

Aerobic respiration ☐

Digestion ☐

Photosynthesis ☐

Protein synthesis ☐

4.1.3.1 Diffusion

Question 15 · continued

6 (c) Carbon dioxide moves out of an epithelial cell by diffusion.

[2 marks]

What is diffusion?

_____

_____

_____

_____

6

Turn over for the next question

4.1.3.1 Diffusion

Question 16

June 2018 | 8461/1F | Original Q6

0 6 Earthworms are small animals that live in soil. Earthworms have no specialised gas exchange system and absorb oxygen through their skin.

0 6 . 1 What is the name of the process in which oxygen enters the skin cells?

[1 mark]

Tick **one** box.

- Active transport ☐
- Diffusion ☐
- Osmosis ☐
- Respiration ☐

Table 3 shows information about four skin cells of an earthworm.

Table 3

Cell	Percentage of oxygen	
	Outside cell	Inside cell
A	9	8
B	12	8
C	12	10
D	8	12

0 6 . 2 Which cell has the smallest difference in percentage of oxygen between the outside and the inside of the cell?

[1 mark]

Tick **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

4.1.3.1 Diffusion

Question 16 · continued

0 6 . 3 Which cell will oxygen move **into** the fastest?

[1 mark]

Tick **one** box.

A		B		C		D	

0 6 . 4 Earthworms have a large surface area to volume ratio.

Suggest why a large surface area to volume ratio is an advantage to an earthworm.

[1 mark]

0 6 . 5 The earthworm uses enzymes to digest dead plants.

Many plants contain fats or oils.

Which type of enzyme would digest fats?

[1 mark]

Question 6 continues on the next page

4.1.3.1 Diffusion

Question 16 · continued

0 6 . 6 Earthworms move through the soil.

This movement brings air into the soil.

Dead plants decay faster in soil containing earthworms compared with soil containing **no** earthworms.

Explain why.

[3 marks]

0 6 . 7 When earthworms reproduce, a sperm cell from one earthworm fuses with an egg cell from a different earthworm.

Name the process when an egg cell and a sperm cell fuse.

[1 mark]

0 6 . 8 Some types of worm reproduce by a process called fragmentation.

In fragmentation, the worm separates into two or more parts. Each part grows into a new worm.

What type of reproduction is fragmentation?

[1 mark]

10

4.1.3.1 Diffusion

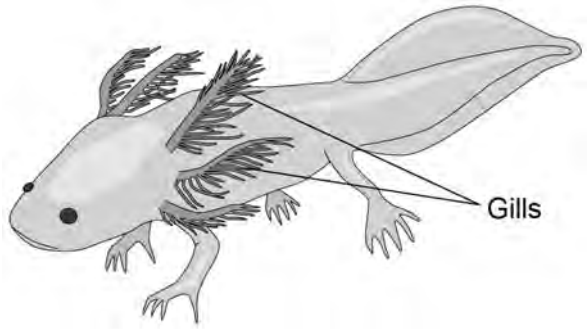
Question 17

June 2019 | 8461/1F | Original Q2

0 2 An animal called an axolotl lives in water.

Figure 3 shows an axolotl.

Figure 3



Oxygen enters the axolotl's bloodstream through the gills by diffusion.

0 2 . 1 What is diffusion?

[1 mark]

Tick (✓) **one** box.

The movement of particles from a high concentration to a low concentration ☐

The movement of particles from a low concentration to a high concentration ☐

The movement of water from a concentrated solution to a more dilute solution ☐

0 2 . 2 Describe how **one** feature of the axolotl's gills increases the rate of diffusion of oxygen.

Use information from **Figure 3**.

[2 marks]

Feature _____

Description _____

_____

_____

4.1.3.1 Diffusion

Question 17 · continued

If a gill of an axolotl is removed, stem cells in the damaged area will divide and a new gill will grow.

0 2 . 3 Complete the sentence.

[1 mark]

Choose the answer from the box.

adaptation	**differentiation**	**evolution**	**variation**

When stem cells specialise to produce gill cells, this process is known as _____.

0 2 . 4 Complete the sentence.

[1 mark]

Choose the answer from the box.

binary fission	**mitosis**	**mutation**

To grow a new gill the stem cells divide by _____.

0 2 . 5 Which **one** of the following does **not** contain stem cells?

[1 mark]

Tick (✓) **one** box.

- Bone marrow ☐
- Embryos ☐
- Hair ☐
- Meristem tissue ☐

4.1.3.1 Diffusion

Question 17 · continued

0 2 . 6 Axolotls are small animals. Axolotls are used in stem cell research.

What are **two** advantages of using axolotls in stem cell research?

[2 marks]

Tick (✓) **two** boxes.

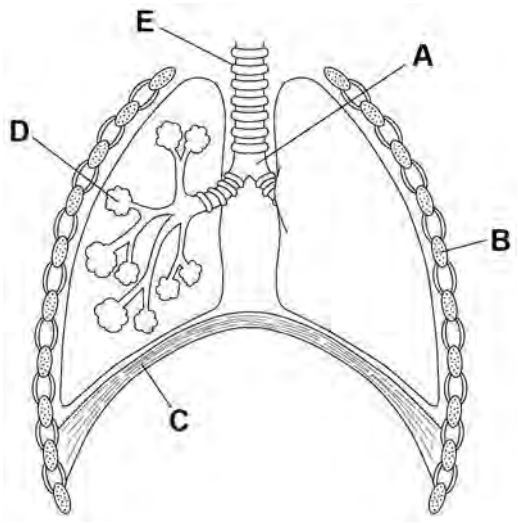
- Axolotls are cheap to feed. ☐
- Axolotls are easy to breed. ☐
- Axolotls are endangered. ☐
- Axolotls live in water. ☐
- Axolotl research is cruel. ☐

Question 17 · continued

Oxygen uptake in humans takes place in the lungs.

Figure 4 shows the human breathing system.

Figure 4



0 2 . 7 Where does oxygen enter the bloodstream?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 2 . 8 Name part **E** on **Figure 4**.

[1 mark]

0 2 . 9 Which blood vessel carries blood to the lungs?

[1 mark]

Tick (✓) **one** box.

Aorta ☐

Pulmonary artery ☐

Vena cava ☐

11

4.1.3.1 Diffusion

Question 18

November 2020 | 8461/1F | Original Q8

0 8 Diffusion is an important process in animals and plants.

0 8 . 1 What is meant by the term diffusion?

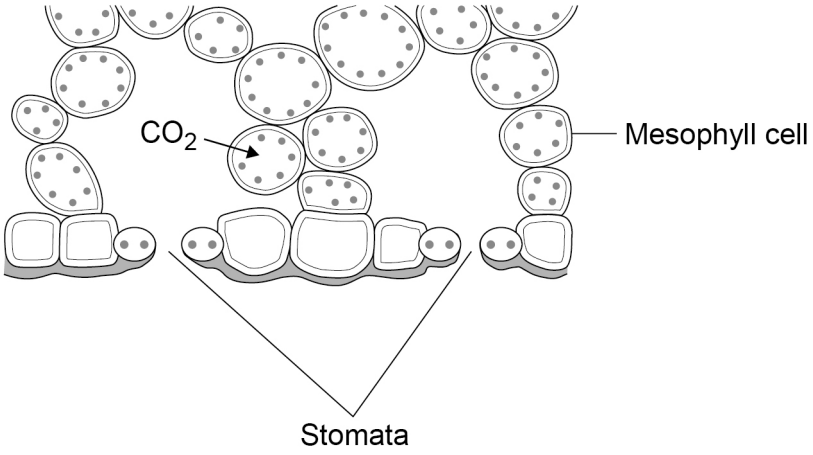
[2 marks]

4.1.3.1 Diffusion

Question 18 · continued

0 8 . 2 **Figure 11** shows part of a leaf.

Figure 11



Molecules of carbon dioxide diffuse from the air into the mesophyll cells.

Which **two** changes will increase the rate at which carbon dioxide diffuses into the mesophyll cells?

[2 marks]

Tick (✓) **two** boxes.

- Decreased number of chloroplasts in the cells ☐
- Decreased surface area of cells in contact with the air ☐
- Increased carbon dioxide concentration in the air ☐
- Increased number of stomata that are open ☐
- Increased oxygen concentration in the air ☐

Question 8 continues on the next page

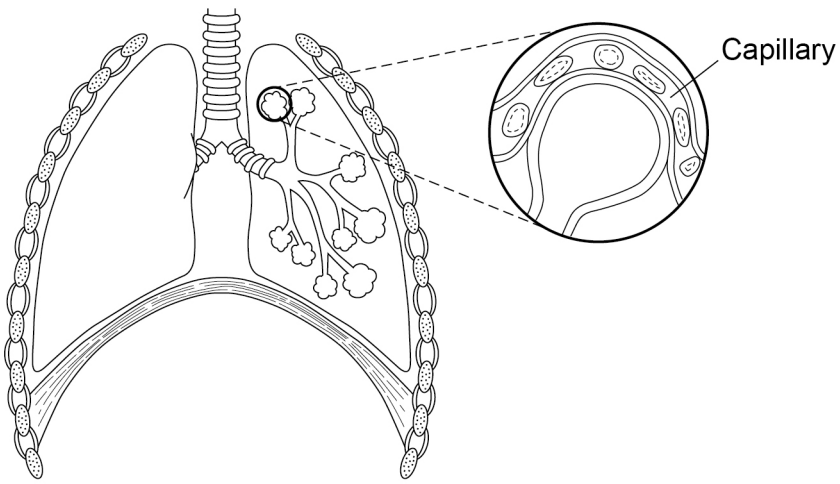
4.1.3.1 Diffusion

Question 18 · continued

0 8 . 3 Diffusion also happens in the human lungs.

Figure 12 shows the human breathing system.

Figure 12



Explain how the human lungs are adapted for efficient exchange of gases by diffusion.

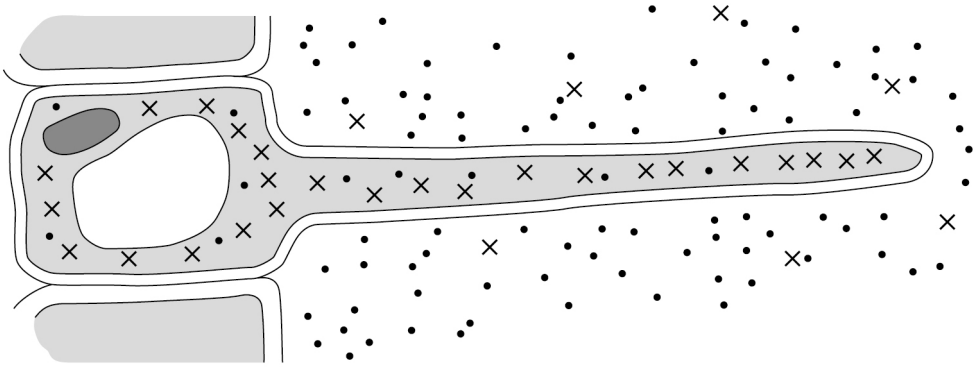
[6 marks]

4.1.3.1 Diffusion

Question 18 · continued

Figure 13 shows a root hair cell.

Figure 13



Key

Water molecules

Nitrate ions

0 8 . 4 Name the process by which water molecules enter the root hair cell.

[1 mark]

0 8 . 5 Nitrate ions need a different method of transport into the root hair cell.

Explain how the nitrate ions in **Figure 13** are transported into the root hair cell.

Use information from **Figure 13** in your answer.

[3 marks]

Name of process _____

Explanation _____

_____

_____

_____

_____

14

4.1.3.1 Diffusion

Question 19

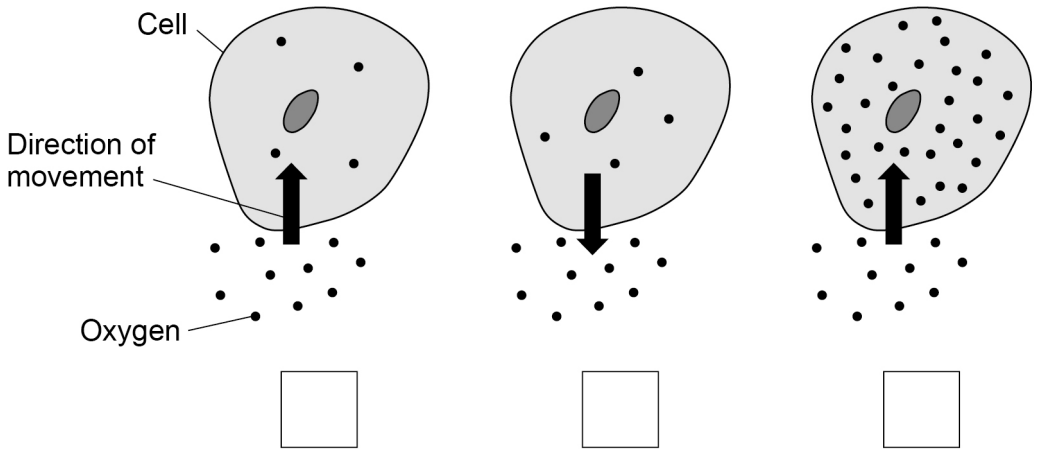
November 2021 | 8461/1F | Original Q1

0 1 This question is about cells.

0 1 . 1 Which diagram shows oxygen moving by diffusion?

[1 mark]

Tick (✓) **one** box.



☐ ☐ ☐

0 1 . 2 Complete the sentences.

[3 marks]

Choose answers from the box.

carbon dioxide	**chlorophyll**	**energy**
light	**mineral ions**	**water**

Plant cells absorb substances from the soil.

Plant cells use osmosis to absorb _____.

Plant cells use active transport to absorb _____.

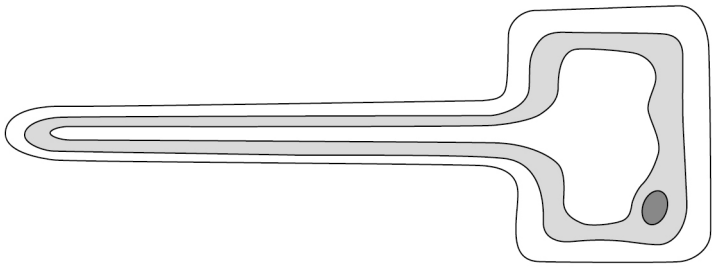
Active transport moves substances against the concentration gradient and needs _____.

4.1.3.1 Diffusion

Question 19 · continued

Figure 1 shows a specialised cell that absorbs substances from the soil.

Figure 1



0 1 . 3 Name the type of specialised cell in **Figure 1**.

[1 mark]

0 1 . 4 Describe how the cell in **Figure 1** is adapted to increase the absorption of substances from the soil.

[1 mark]

Question 1 continues on the next page

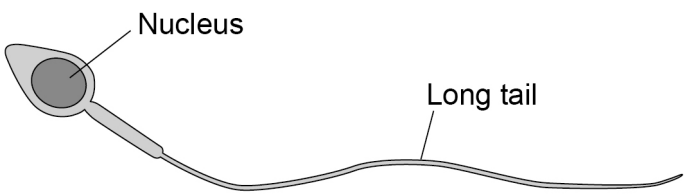
4.1.3.1 Diffusion

Question 19 · continued

A sperm cell is another specialised cell.

Figure 2 shows a sperm cell.

Figure 2



0 1 . 5 Draw **one** line from each feature to how the feature helps the sperm cell carry out its function.

[2 marks]

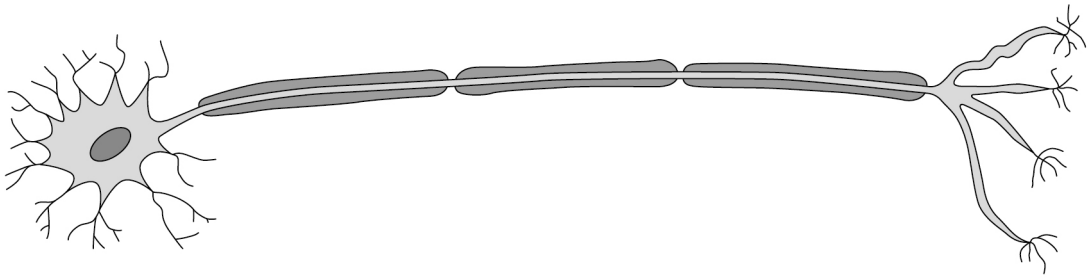
Feature of sperm cell	How the feature helps
Contains a nucleus	To break the outer layer of the egg
	To help the cell to swim to the egg
Has a long tail	To provide the chromosomes for fertilisation
	To release energy

4.1.3.1 Diffusion

Question 19 · continued

Figure 3 shows another specialised cell.

Figure 3



0 1 . 6 Name the type of cell in **Figure 3**.

Describe **one** feature of the cell that helps it to carry out its function.

[2 marks]

Name of the cell _____

Feature of the cell _____

_____

10

4.1.3.1 Diffusion

Question 20

June 2022 | 8461/1F | Original Q6

0 6 **Table 4** shows information about four jellyfish.

The jellyfish are listed in order of increasing size.

Table 4

Jellyfish	Size of jellyfish	Surface area in mm^2	Volume in mm^3	Surface area to volume ratio
A	Smallest ↓	3 600	1 200	**X**:1
B		50 000	25 000	2:1
C		1 800 000	6 000 000	0.3:1
D	Largest	7 500 000	125 000 000	0.06:1

0 6 . 1 Calculate value **X** in **Table 4**.

[2 marks]

X = _____

0 6 . 2 Describe the relationship between the size of a jellyfish and its surface area to volume ratio.

Use **Table 4**.

[1 mark]

4.1.3.1 Diffusion

Question 20 · continued

The jellyfish in **Table 4** take oxygen into their cells by diffusion.

0 6 . 3 Name **one** other substance that enters cells by diffusion.

Do **not** refer to oxygen in your answer.

[1 mark]

0 6 . 4 Suggest **two** factors that affect the rate of diffusion of oxygen into a jellyfish.

[2 marks]

1 _____

2 _____

0 6 . 5 Some organisms take in oxygen using a respiratory system.

In humans, gas exchange takes place in the lungs.

Name the organs where gas exchange takes place in **fish**.

[1 mark]

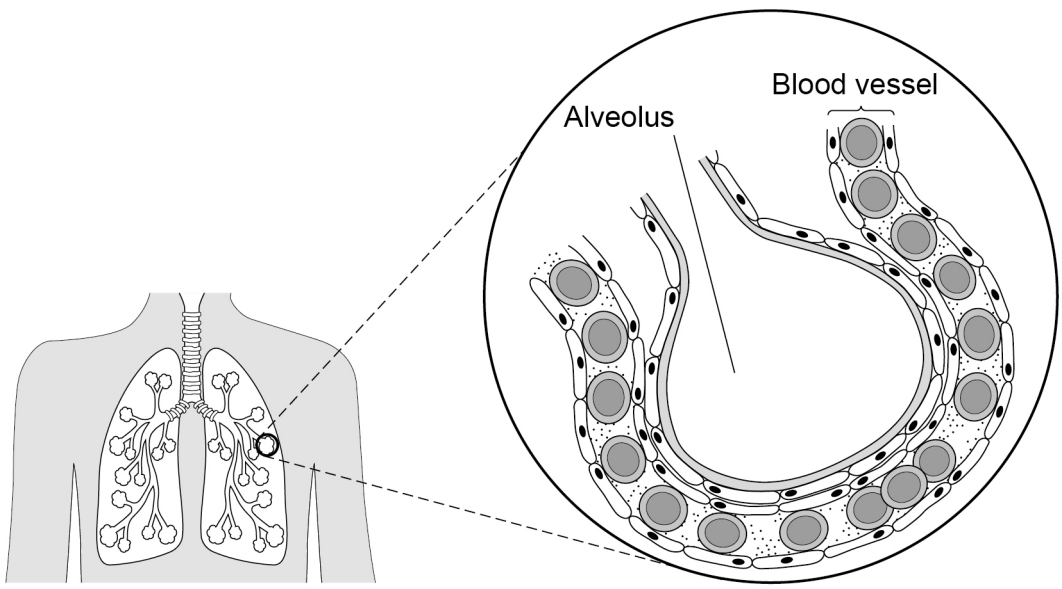
Question 6 continues on the next page

4.1.3.1 Diffusion

Question 20 · continued

0 6 . 6 **Figure 8** shows parts of the human breathing system.

Figure 8



Explain how the human breathing system is adapted to maximise the rate of gas exchange.

[6 marks]

13