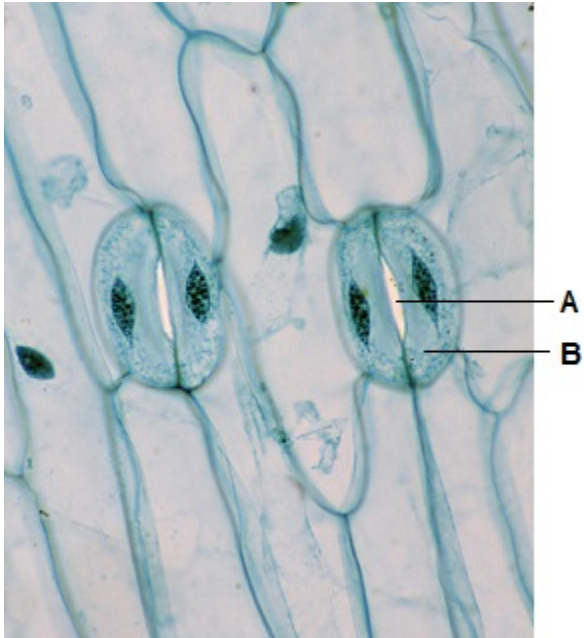


1

The photograph below shows the lower surface of a leaf magnified 800 times.



(a) Name hole **A** in the leaf surface.

(1)

(b) Name cell **B**.

(1)

(c) Cell **B** can lose or gain water.

Complete the sentences.

Choose answers from the box.

active transport	condensation
osmosis	photosynthesis
	transpiration

Cell **B** can gain water by _____ .

Water vapour can escape from the leaf through hole **A**

by _____ .

(2)

(d) Which factors increase the rate of water loss from hole **A**?

Tick **two** boxes.

Increasing acidity

Increasing nitrogen concentration

Increasing oxygen concentration

Increasing temperature

Increasing wind speed

(2)

(e) Give **one** reason why the movement of water in a plant is important.

(1)

(f) The African Baobab tree has no leaves for up to 9 months of the year.

Suggest how this helps the tree to survive in an area where there is not much rain.

(1)

(g) The photograph above is a photograph taken through a microscope.

The image is magnified 800 times.

One of the cells in the image has a width of 12 mm

Calculate the real width of this cell in micrometres.

Complete the following steps.

Use the equation to work out the real width of the cell in millimetres.

$$\text{real width of object} = \frac{\text{width of image}}{\text{magnification}}$$

Real width of cell = _____ millimetres

Convert the real width of the cell from millimetres to micrometres.

1 millimetre = 1000 micrometres.

Real width of cell = _____ millimetres

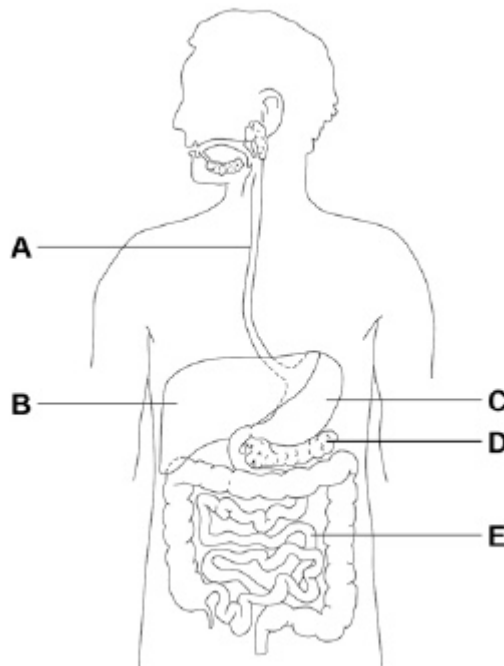
(3)

(Total 11 marks)

2

Figure 1 shows the human digestive system.

Figure 1



(a) Which organ in **Figure 1** produces acid?

Tick **one** box.

A B C D E

(1)

(b) Which organ in **Figure 1** produces bile?

Tick **one** box.

A B C D E

(1)

(c) Where in **Figure 1** are digested foods absorbed into the blood?

Tick **one** box.

A B C D E

(1)

(d) Food molecules such as proteins **cannot** be absorbed unless they are digested.

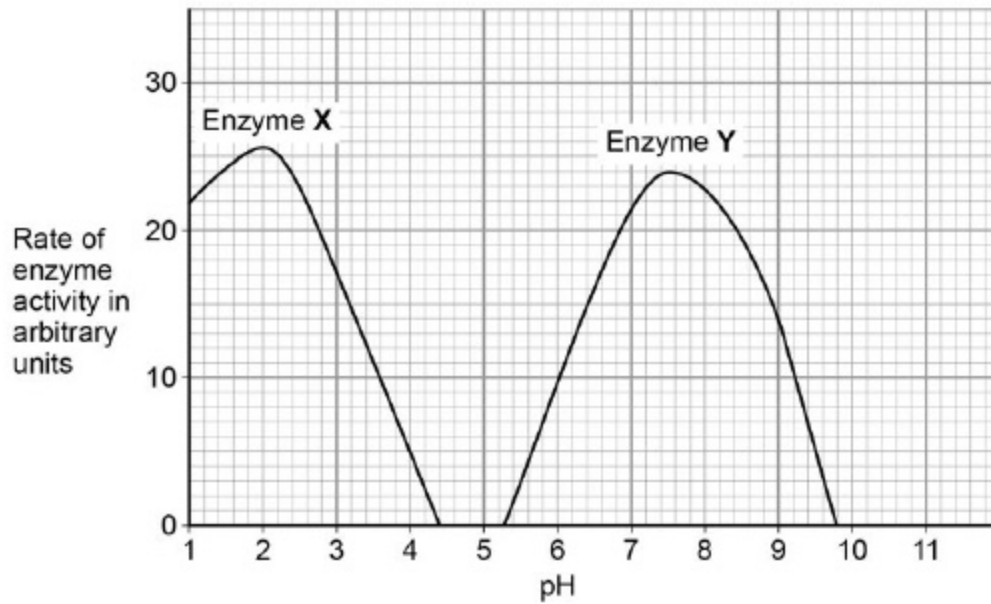
Give **one** reason why.

(1)

A scientist investigated the effect of pH on the activity of two protease enzymes.

Figure 2 shows the results.

Figure 2



(e) What is the optimum pH for enzyme Y?

pH _____

(1)

(f) Where in the digestive system might the two protease enzymes be produced?

Tick **one** box.

Enzyme X	Enzyme Y	
Mouth	Stomach	<input type="checkbox"/>
Pancreas	Mouth	<input type="checkbox"/>
Small intestine	Pancreas	<input type="checkbox"/>
Stomach	Small intestine	<input type="checkbox"/>

(1)

Figure 3 shows a model of an enzyme molecule.

Figure 3



(g) Which substrate fits the enzyme molecule in Figure 3?

Tick **one** box.

	<input type="checkbox"/>
	<input type="checkbox"/>
	<input type="checkbox"/>
	<input type="checkbox"/>

(1)

(h) The enzyme and substrate diagrams are used as a model for a theory of enzyme action.

What is the name of this theory?

Tick **one** box.

Evolution	<input type="checkbox"/>
Lock and key	<input type="checkbox"/>
Natural selection	<input type="checkbox"/>
Protein synthesis	<input type="checkbox"/>

(1)

(i) Explain why pH affects enzyme activity.

(2)
(Total 10 marks)

3

Plants have tissues that are specialised for the transport of food and water molecules.

(a) Which is a description of the role of the xylem?

Tick **one** box.

Transports dissolved sugars using translocation

Transports starch in the transpiration stream

Transports water in the transpiration stream

Transports water using translocation

(1)

(b) Which is a description of the role of the phloem?

Tick **one** box.

Transports dissolved sugars in the transpiration stream

Transports dissolved sugars using translocation

Transports starch using translocation

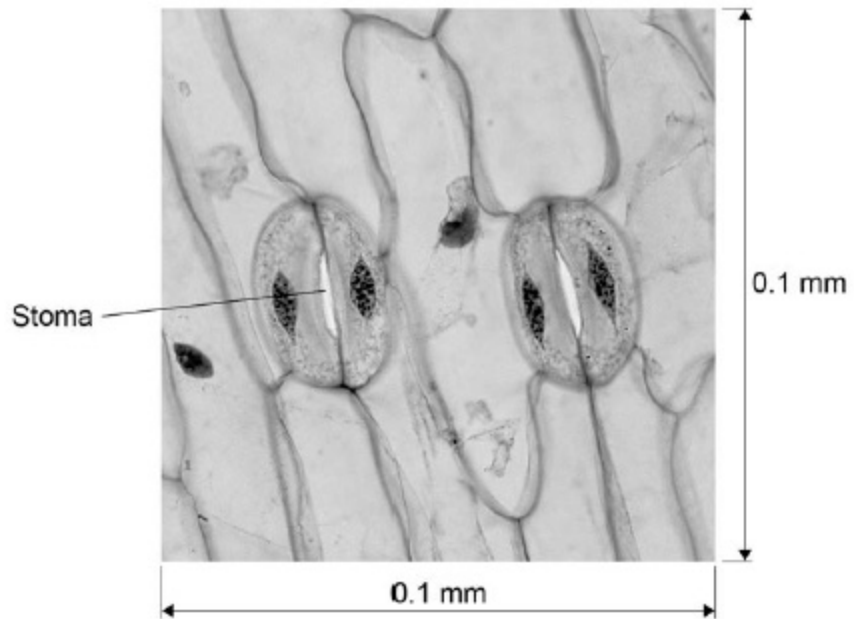
Transports water in the transpiration stream

(1)

In plants water is lost through stomata.

Figure 1 shows stomata on the lower surface of a leaf.

Figure 1



(c) Calculate the number of stomata per mm^2 for the leaf shown in **Figure 1**.

Number of stomata = _____

(2)

- (d) Most plants have more stomata on the lower surface of a leaf than on the upper surface.

Explain why there are more stomata on the lower surface of a leaf.

(3)

4

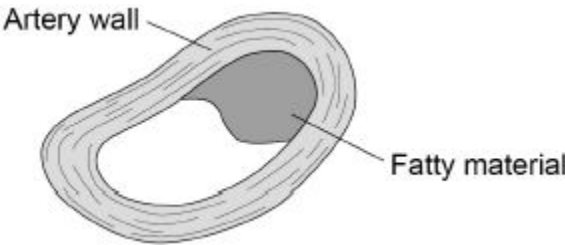
Coronary heart disease (CHD) is a non-communicable disease.

CHD is caused when fatty material builds up in the coronary arteries.

(a) Explain what a non-communicable disease is.

(2)

The diagram below shows a coronary artery of someone with CHD.



(b) Explain how CHD can cause a heart attack.

(3)

(c) Explain how lifestyle and medical risk factors increase the chance of developing CHD.

(6)

(Total 11 marks)

5

Oxygen is transported round the body by the blood.

Blood leaving the human lung can carry about 250 milligrams of oxygen per litre. However, only 7 milligrams of oxygen will dissolve in one litre of water at body temperature.

(a) Suggest an explanation for the difference.

(2)


- (b) Blood leaving the skeletal muscles during exercise may contain only 30 milligrams of oxygen per litre.

Explain what causes the difference in oxygen concentration between the blood leaving the lungs and the blood leaving the skeletal muscles.

(4)
(Total 6 marks)

Mark schemes

- 1** (a) stoma / stomata
ignore pore 1
- (b) guard (cell) 1
- (c) osmosis
in this order only 1
- transpiration 1
- (d) increasing temperature 1
- increasing wind speed 1
- (e) any **one** from:
• for photosynthesis
• to bring mineral (ions) into / up the plant
allow correctly named ions e.g. nitrates
• translocation
allow to cool the plant 1
- (f) any **one** from:
• decreased transpiration
allow no transpiration
• less water lost
allow no water lost 1
- (g) $\frac{12}{800}$ 1
- 0.015 (millimetres) 1
- 15 (micrometres)
allow 1 mark for incorrect width $\times 1000$ 1
an answer of 15 (micrometres) scores 3 marks
- [11]
- 2** (a) C 1

- (b) **B** 1
- (c) **E** 1
- (d) any **one** from:
- they are too big
 - they are insoluble
- 1
- (e) (pH) 7.5
allow answers in range 7.4 to 7.6 1
- (f) (enzyme **X**) stomach
(enzyme **Y**) small intestine 1
- (g)  1
- (h) lock and key 1
- (i) (some pH values):
change the shape of the active site
allow some pH values denature enzymes 1
- (so) so substrate will no longer fit / bind to the active site 1

[10]

- 3** (a) transports water in the transpiration stream 1
- (b) transports dissolved sugars using translocation 1
- (c) $2/(0.1 \times 0.1)$
or
 $2/0.01$ 1
- 200
an answer of 200 scores 2 marks 1

(d) cooler around lower surface

1

more humid around lower surface

allow converse argument for upper surface of leaf if qualified

1

(so) less water evaporated

allow less breeze around lower surface

1

(e)

Level 3: Relevant points (correct processes / explanations) are identified, given in detail and linked logically to form a clear account.	5-6
Level 2: Relevant points (correct processes / explanations) are identified and there are attempts at logical thinking. The resulting account is not fully clear.	3-4
Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical thinking.	1-2
No relevant content	0
Indicative content <ul style="list-style-type: none">• water is absorbed by osmosis• osmosis is a passive process, or described• water in soil is at a higher concentration than inside cell• water moves down concentration gradient• through a partially permeable membrane• phosphate ions absorbed by diffusion• diffusion is a passive process, or described• phosphate ions are in a higher concentration in soil than inside cells• magnesium ions are absorbed by active transport• magnesium ions are in lower concentration in soil than inside cells• magnesium ions move from an area of lower concentration to an area of higher concentration inside the cells• magnesium ions move up the concentration gradient• process requires energy• energy from respiration	

6

[13]

4

(a) is not caused by a pathogen / infective organism
allow not caused by a microorganism / microbe
ignore not caused by infection
ignore named pathogen unless bacteria, virus and fungus all mentioned

1

(so) is not passed / spread (from person to person)

allow cannot be spread / caught
allow is not infectious / contagious

1

(b) reduced / restricted / stopped blood flow

it does not matter where blood flow is restricted to – heart / body

1

(so) less oxygen reaches heart (muscle / cells)

must reference heart / it
allow no oxygen reaches the heart (muscle / cells)

1

(so heart muscle / cells) cannot respire (enough)

or

(so heart muscle / cells) do not release (enough) energy

*do **not** accept do not make / produce / create energy*
ignore references to breathing / suffocation
ignore blood clots / blockages

1

allow 'it' for heart

(c) **Level 3:** Relevant points (factors / effects) are identified, given in detail and logically linked to form a clear account.

5–6

Level 2: Relevant points (factors / effects) are identified and there are attempts at logical linking. The resulting account is not fully clear.

3–4

Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.

1–2

No relevant content

0

Indicative content

medical risk factors:

- high blood pressure
- high cholesterol
- diabetes
- genetic factors
- medications

lifestyle risk factors:

- smoking
- obesity
- lack of exercise
- high fat / energy diet
- eating insufficient fruit / vegetables
- alcohol
- high salt intake
- exposure to air pollution
- certain drugs / correct named drug

examples of links:

- smoking – high bp / cholesterol / fatty deposition
- obesity – lack of exercise / high bp / cholesterol / fatty deposition / diabetes
- exercise – obesity / bp / diabetes
- diet – obesity / cholesterol / diabetes
- alcohol – bp / cholesterol
- high salt intake – high blood pressure
- genetic factors – bp / cholesterol / diabetes / obesity
- medication – can affect blood / blood vessels / metabolism

the main discriminator is the quality of linking
both lifestyle and medical factors are required for **level 3**

[11]

5

- (a) blood has red (blood) cells / haemoglobin 1
- haemoglobin combines with / carries oxygen
ignore 'mix'
NB Blood can form oxyhaemoglobin = 2 marks 1
- (b) blood gains oxygen / becomes oxygenated (in the lungs)
idea of acquiring oxygen must be unambiguous 1
- blood loses oxygen to the muscles / cells 1
- because muscles are respiring (aerobically) 1

to provide energy (for exercise)

1

[6]