

1 Enzymes are made and used in all living organisms.

(a) What is an enzyme?

(2)

(b) Many enzymes work inside cells.

In which part of a cell will most enzymes work?

Draw a ring around the correct answer.

cell membrane

cytoplasm

nucleus

(1)

(c) We can also use enzymes in industry.

Hydrogen peroxide is a chemical that can be used to preserve milk.

Adding a small amount of hydrogen peroxide to the milk kills the bacteria that cause decay. Hydrogen peroxide does not kill all disease-causing bacteria.

The enzyme catalase can be added later to break down the hydrogen peroxide to oxygen and water.

A different way of preserving the milk is by heating it in large machines to 138 °C for a few seconds.

Suggest **one** advantage and **one** disadvantage of using hydrogen peroxide and catalase to preserve milk instead of using heat treatment.

Advantage of hydrogen peroxide and catalase _____

Disadvantage of hydrogen peroxide and catalase _____

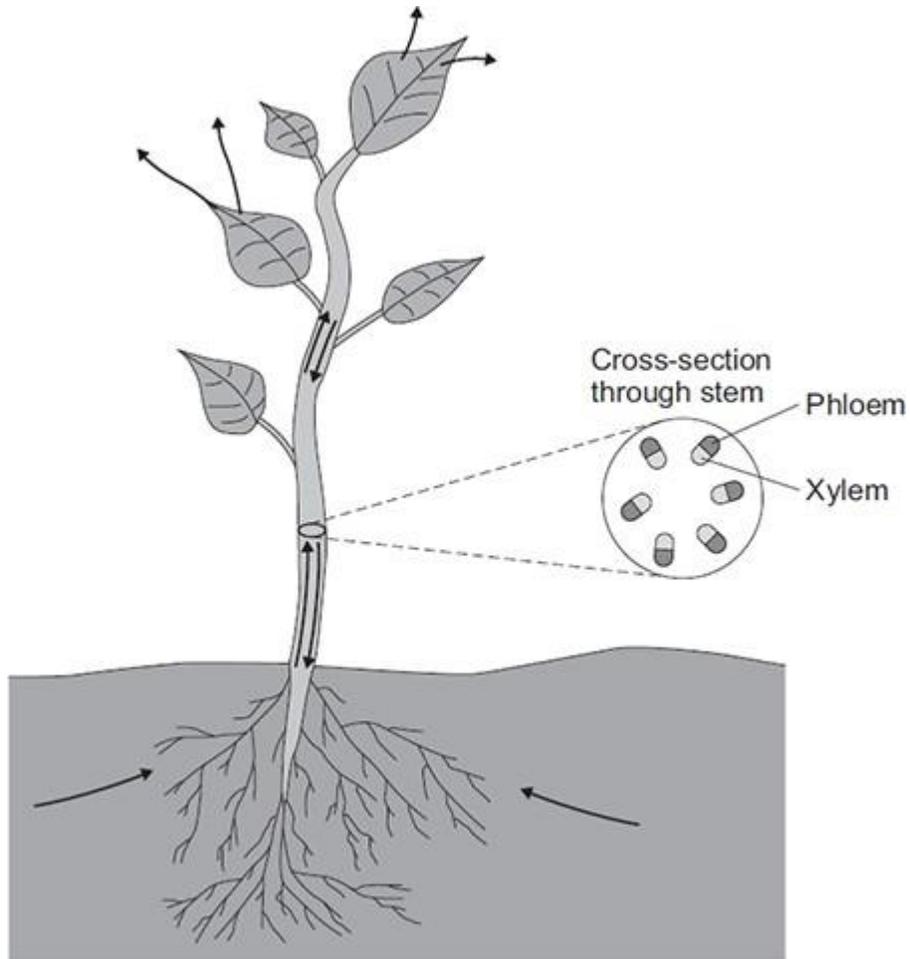
(2)

(Total 5 marks)

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

Plants transport many substances between their leaves and roots.

The diagram below shows the direction of movement of substances through a plant.



3

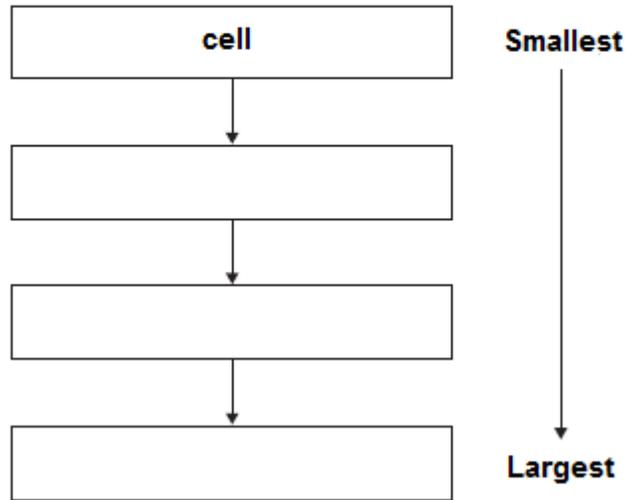
The human body is organised to carry out many different functions.

- (a) Use words from the box to complete **Figure 1** by putting the parts of the body in order of size from smallest to largest.

The smallest one has been done for you.



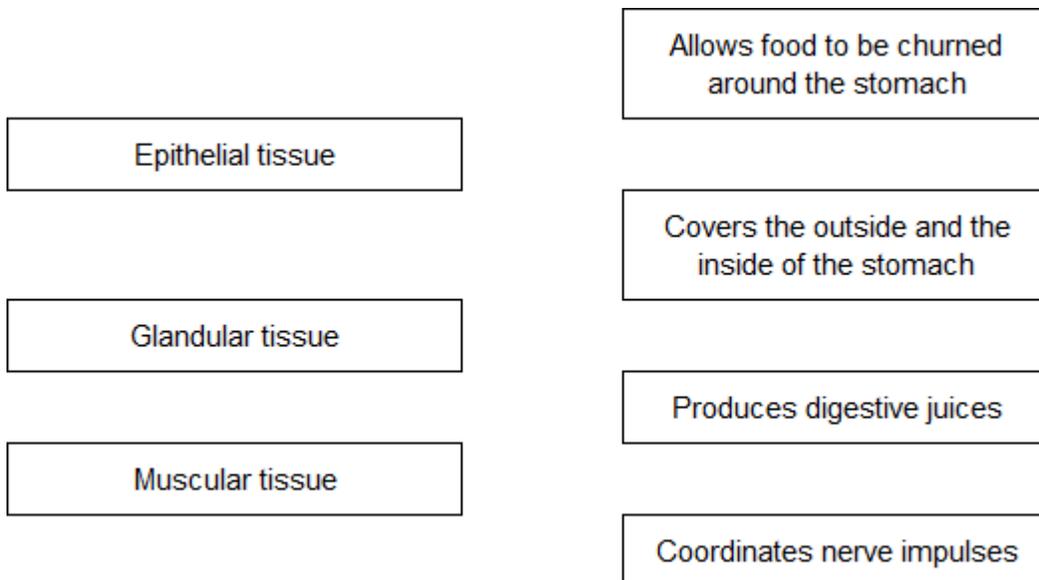
Figure 1



(2)

- (b) The stomach is made of different types of tissue.

Draw **one** line from each type of stomach tissue to the correct description.



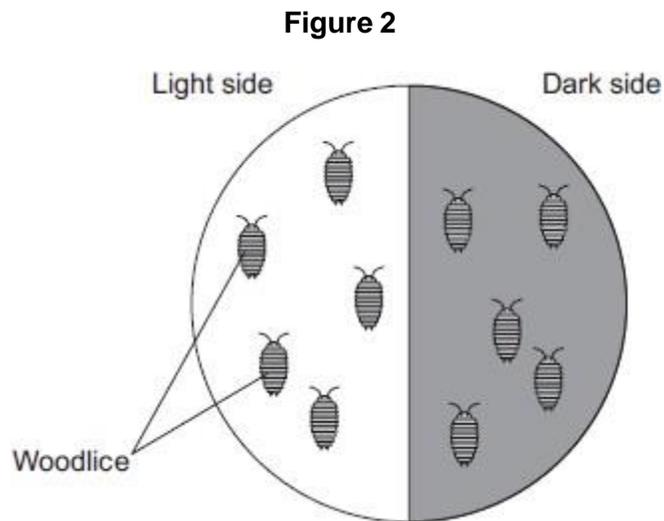
(3)

(c) Animals can react to their surroundings because they have nervous systems.

A student investigated the behaviour of small animals called woodlice.

The student set up the investigation as shown in **Figure 2**.

- The student covered one half of a Petri dish with black paper to make that side of the Petri dish dark.
- The other side had no cover.
- The student put five woodlice into each side of the dish and then put the clear Petri dish lid back on the dish.



After 30 minutes, all the woodlice had moved to the dark side of the Petri dish.

(i) In this investigation, what is the **stimulus** that the woodlice responded to?

(1)

(ii) In this investigation, what is the **response** that the woodlice made?

(1)

(iii) The student concluded that woodlice prefer dark conditions.

Give **two** ways in which the student could improve the investigation to be sure that his conclusion was correct.

1. _____

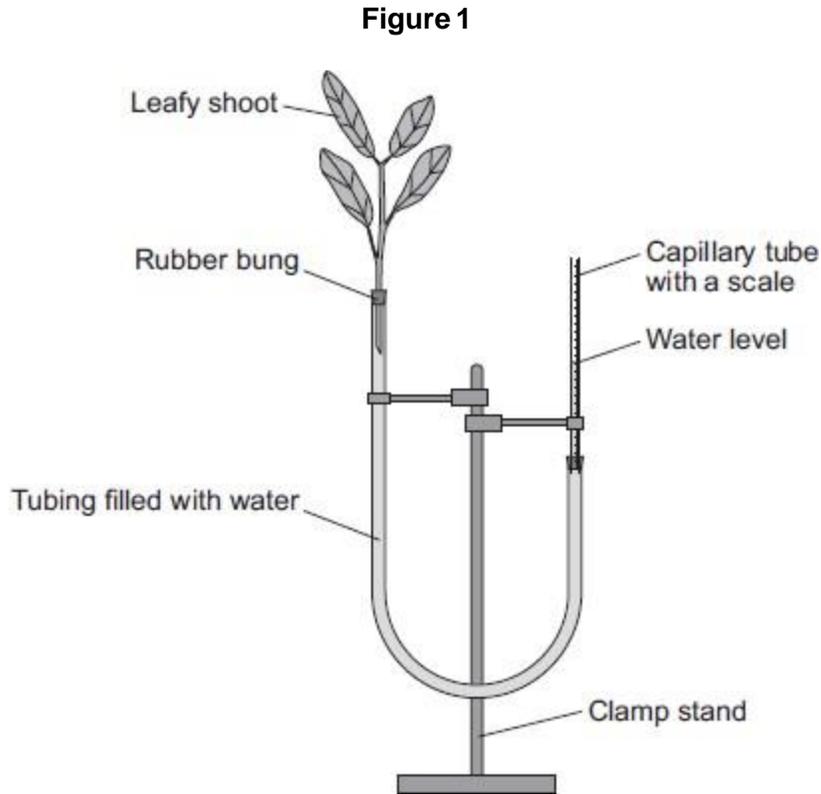
2. _____

(2)

(Total 9 marks)

4 A potometer is a piece of apparatus that can be used to measure water uptake by a leafy shoot.

Figure 1 shows a potometer.



Some students used a potometer like the one shown in Figure 1.

- They measured the water taken up by a shoot in normal conditions in a classroom.
- As the water was taken up by the shoot, the level of water in the capillary tube went down.
- The students recorded the level of the water in the capillary tube at 2-minute intervals for 10 minutes.

Table 1 shows the students' results.

Table 1

Time in minutes	0	2	4	6	8	10
Level of water (on scale) in capillary tube in mm	2.5	3.6	4.4	5.4	6.5	7.5

The area of the cross section of the capillary tube was 0.8 mm^2 .

- (a) (i) Complete the following calculation to find the volume of water taken up by the shoot in mm^3 per minute.

Distance water moved along the scale in 10 minutes = _____ mm

Volume of water taken up by the shoot in 10 minutes = _____ mm^3

Therefore, volume of water taken up by the shoot in 1 minute = _____ mm^3

(3)

- (ii) The students repeated the investigation but this time placed the potometer next to a fan blowing air over the leafy shoot.

Suggest how the results would be different. Give a reason for your answer.

(2)

(b) The students repeated the investigation at different temperatures.

The results are shown in **Table 2**.

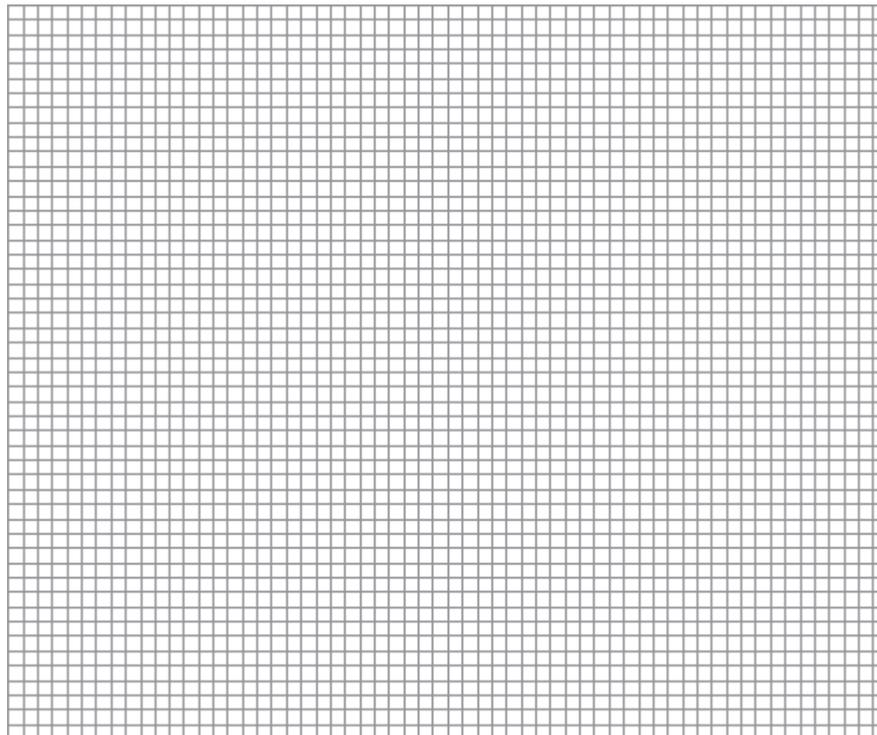
Table 2

Temperature in °C	Rate of water uptake in mm ³ per minute
10	0
15	0.4
20	1.0
25	2.1
30	3.2
35	4.0
40	4.4

Plot the data from **Table 2** on the graph paper in **Figure 2**.

Choose suitable scales, label both axes and draw a line of best fit.

Figure 2



(5)

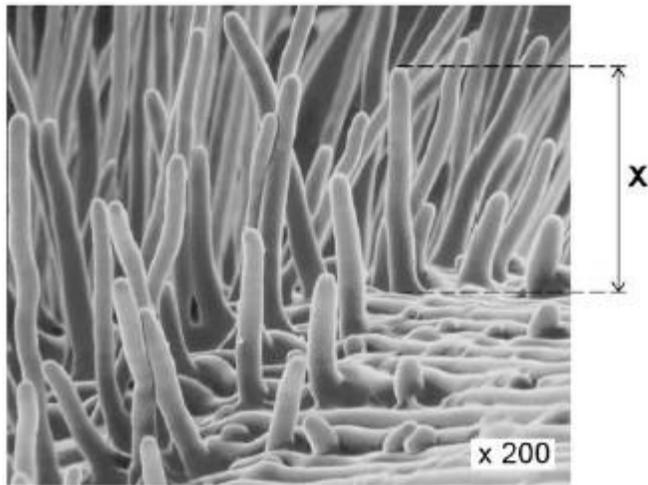
(c) What would happen to the leaves if the potometer was left for a longer time at 40 °C?

Explain your answer.

(3)
(Total 13 marks)

5

The image below shows part of a root from a cress plant.



(a) What type of microscope was used to create the image above?

(1)

- (b) The magnification of the cross root in the image above is $\times 200$.
There are 1000 micrometres (μm) in a millimetre (mm).

Calculate the real length of the root hair, **X**.

Give your answer in micrometres (μm).

Real length **X** = _____ μm

(2)

- (c) Root hair cells take up water from the soil.

Explain **one** way in which the root hair cell is adapted to this function.

(2)

The table shows the water uptake by a plant's roots on two different days.

	Mean water uptake in cm^3 per hour
Cold day	1.8
Hot day	3.4

- (d) Explain why the mean rate of water uptake is higher on a hot day than on a cold day.

(3)

- (e) The concentration of mineral ions in the soil is lower than in root hair cells.
 Root hair cells take up mineral ions from the soil.
 Root hair cells contain mitochondria.

Explain why root hair cells contain mitochondria.

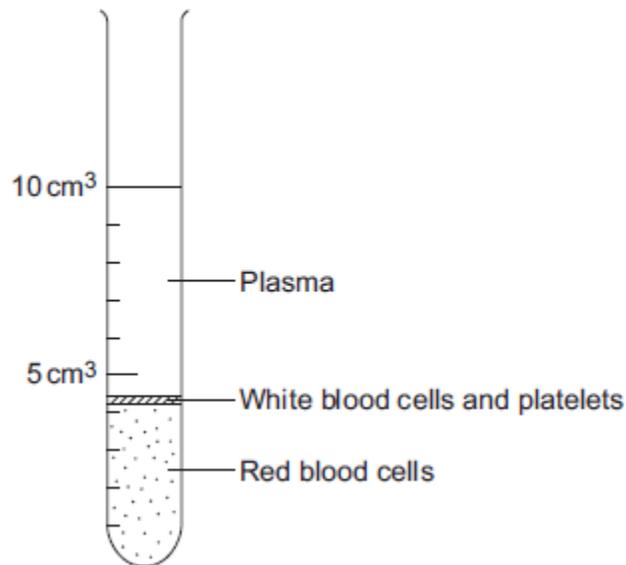
(4)

(Total 12 marks)

6

The parts of the blood can be separated from each other by spinning the blood in a centrifuge.

The image below shows the separated parts of a 10 cm³ blood sample.



- (a) Calculate the percentage of the blood that is made up of plasma.

Answer = _____%

(2)

Mark schemes

1 (a) a catalyst / speeds up a reaction
ignore it is not used up 1

it is a protein **or** it is specific / described **or** it has an active site
allow it only acts on one molecule 1

(b) cytoplasm 1

(c) **Advantage:**

any **one** from:

- heat would denature proteins in milk
 - heat alters texture or flavour of milk
 - catalase / enzyme is specific **or** only affects hydrogenperoxide
 - less energy / fuel / lower temperature used so less expensive **or** lesspollution
- 1

Disadvantage:

any **one** from:

- (some pathogens may survive) causing illness
 - catalase / enzyme left in milk **or** may cause allergies **or** may altertaste
- 1

[5]

2

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response.

Level 3 (5–6 marks):

Processes used for obtaining specified materials are given.

and

correctly linked to the vessels that the materials are transported in

or

correctly linked to a description of the direction of movement of the materials.

For full credit, in addition to the above descriptors at least **one** of the processes must be linked to the vessel that the material is transported in **and** the direction of the movement of the material.

Level 2 (3–4 marks):

At least **one** process for obtaining a specified material is given

and

is correctly linked to the vessel that the material is transported in

or

correctly linked to a description of the direction of movement of the material

Level 1 (1–2 marks):

At least **one** process (P) for obtaining a material is given

or

at least **one** vessel (V) and the material it carries is given

or

there is a description of the direction of movement (M) for at least **one** material

0 marks:

No relevant points are made

examples of points made in the response ions:

(P) taken up by diffusion or active transport

- from an area of high to low concentration (diffusion) **or** an area of low to high concentration (active transport)
(V) travels in the xylem
(M) to the leaves **or** from the roots / soil

Water:

(P) taken up by osmosis

- from an area of low to high concentration
allow high concentration of water to low concentration of water
allow from high water potential to low water potential
ignore along a concentration gradient
(V) travels in the xylem
(M) to the leaves **or** from the roots / soil
(P) transpiration stream
- movement replaces water as it evaporates from leaves
(V) in the xylem

Sugar:

(P) made during photosynthesis

(V) travels in the phloem

(M) to other parts of the plant **or** to storage organs **or** travels up and down

- 3 (a) tissue → organ → organ system
one right for 1 mark
three right for 2 marks 2
- (b) **Epithelial tissue** → covers the outside and the inside of the stomach
more than one line from a tissue = no mark 1
- Glandular tissue** → produces digestive juices 1
- Muscular tissue** → allows food to be churned around the stomach 1
- (c) (i) light
ignore dark 1
- (ii) moving (to the dark) 1
- (iii) any **two** from:
 - use more woodlice
 - repeat the experiment
 - run for a longer time 2

- 4 (a) (i) 5.0 1
- (5 × 0.8) **or** 4
allow ecf from distance 1
- 0.4
allow ecf from 10-min volume 1
- (ii) increased (rate of uptake) 1
- more transpiration / evaporation 1

- (b) correct scales
allow reversed axes 1
- correctly labelled axes with units 1
- correct points
one plot error = max 1 mark 2
- curved line of best fit
allow correct straight line 1

- (c) leaves wilt 1
- because plants lose too much water (by evaporation) 1
- through the stomata
or
because cells become plamolysed
or
stomata close
controlled by guard cells
to prevent wilting 1

[13]

- 5** (a) electron (microscope) 1
- (b) $\frac{30000}{200}$
an answer of 150 (µm) scores 2 marks 1
- 150 (µm)
if answer is incorrect allow for 1 mark sight of 0.015 / 0.15 / 1.5 / 15
allow ecf for incorrect measurement of line X for max 1 mark 1

- (c) **either**
 large surface area
allow (vacuole contains) cell sap that is more concentrated than soil water (1) 1
- for more / faster osmosis
create / maintain concentration / water potential gradient (1)
- or**
- allow thin (cell) walls
 for short(er) diffusion distance 1
- (d) (on hot day) more water lost
allow converse for a cold day if clearly indicated 1
- more transpiration
or
 more evaporation 1
- so more water taken up (by roots) to replace (water) loss (from leaves) 1
- (e) (aerobic) respiration occurs in mitochondria
*do **not** accept anaerobic respiration* 1
- (mitochondria / respiration) release energy
*do **not** accept energy produced / made / created* 1
- (energy used for) active transport 1
- to transport ions, against the concentration gradient
or
 from a low concentration to a high concentration 1

[12]

- 6** (a) 55%
2 marks for correct answer alone
accept 54 – 56
5.5 / 10 × 100 alone gains 1 mark 2

(b) any **three** from:

- amino acids
- antibodies
- antitoxins
- carbon dioxide
- cholesterol
- enzymes
- fatty acid
- glucose
- glycerol
- hormones / named hormones
- ions / named ions
- proteins
- urea
- vitamins
- water.

ignore blood cells and platelets

ignore oxygen

max 1 named example of each for ions and hormones

allow minerals

3

(c) Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking Guidance and apply a 'best-fit' approach to the marking.

0 marks

No relevant content.

Level 1 (1 – 2 marks)

There is a description of pathogens with errors or roles confused.

or

the immune response with errors or roles confused.

Level 2 (3 – 4 marks)

There is a description of pathogens **and** the immune response with some errors or confusion

or

a clear description of either pathogens **or** the immune response with few errors or little confusion.

Level 3 (5 – 6 marks)

There is a good description of pathogens **and** the immune response with very few errors or omissions.

Examples of biology points made in the response:

- bacteria and viruses are pathogens
credit any ref to bacteria and viruses
- they reproduce rapidly inside the body
- bacteria may produce poisons / toxins (that make us feel ill)
- viruses live (and reproduce) inside cells (causing damage).

white blood cells help to defend against pathogens by:

- ingesting pathogens / bacteria / (cells containing) viruses
credit engulf / digest / phagocytosis
- to destroy (particular) pathogen / bacteria / viruses
- producing antibodies
- to destroy particular / specific pathogens
- producing antitoxins
- to counteract toxins (released by pathogens)
credit memory cells / correct description
- this leads to immunity from that pathogen.

6

[11]