1 The photograph shows an organism called lichen growing on the surface of a tree.



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Lichens are unusual because they consist of a fungus and an algae living together.

(a) The fungus grows hyphae that help it feed by saprotrophic nutrition.

Explain what is meant by the term **saprotrophic nutrition**.

(2)

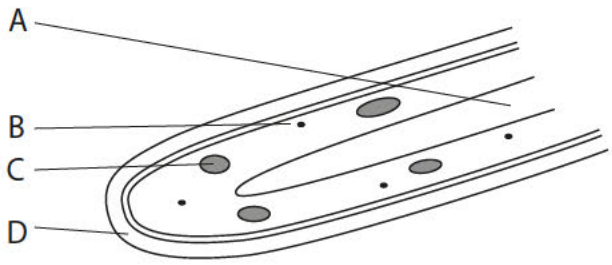
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(b) The diagram shows a fungal hypha with parts labelled A to D.



(i) Which letter labels the part made from chitin?

(1)

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(ii) Which letter labels the part made from glycogen?

(1)

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(c) Algae are green organisms that carry out photosynthesis.

(i) Name the molecule that makes algae look green.

(1)

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(ii) Write the word equation for photosynthesis.

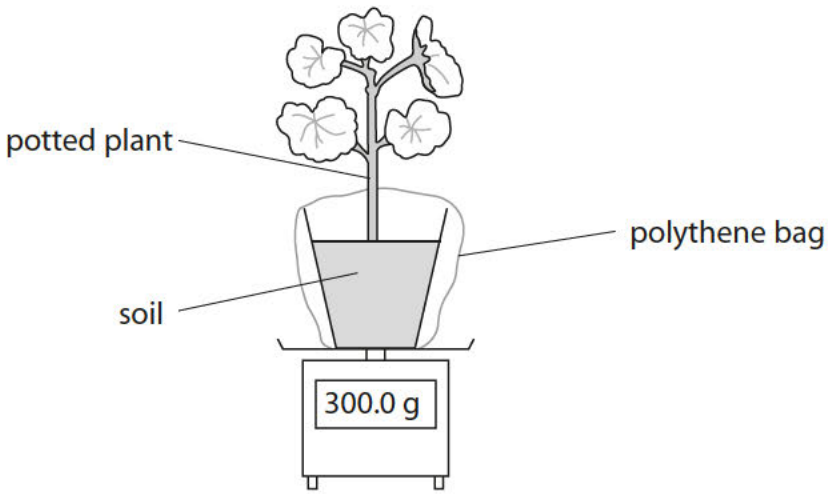
(2)

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(Total for Question = 7 marks)

2 Two potted plants, A and B, have the same surface area of leaves. They each have a mass of 300.0 g.

The mass of each potted plant was measured on the balance as shown.



The plants were placed in different environmental conditions for 12 hours and their masses were measured again.

Plant	Environmental condition	Mass in grams (after 12 hours)
A	cold air in darkness	299.8
B	warm air in light	294.4

(a) The mass of both plants was less after 12 hours because of transpiration.

What is meant by the term **transpiration**?

(2)

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(b) Suggest why a polythene bag was put around the pot of soil.

(1)

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(c) Explain why plant B lost more mass than plant A.

(4)

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(Total for Question = 7 marks)

3 Describe an investigation to find out the most suitable amount of calcium ions needed to get the best growth in rats.

(6)

(Total for Question = 6 marks)

4 During photosynthesis, plants absorb carbon dioxide through their leaves.

(a) Describe how the structure of a leaf is adapted to absorb carbon dioxide.

(3)

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(b) Write the balanced chemical equation for photosynthesis.

(2)

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(c) A simple controlled experiment can be carried out to show that a plant leaf produces starch when exposed to light.

(i) At the start of the experiment, all of the starch should be removed from the leaf.

Suggest how this could be done.

(1)

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(ii) Describe the control you would set up in this experiment.

(1)

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(iii) Describe how you would test a leaf for starch.

Include the safety precautions you would take and the results you would expect to see.

(3)

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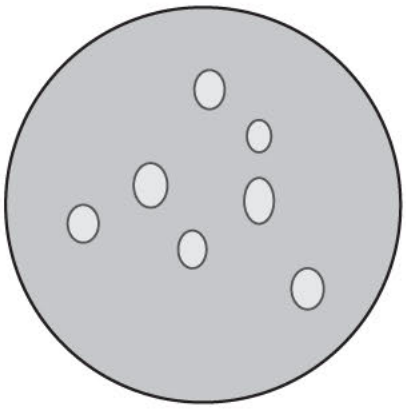
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(Total for Question = 10 marks)

5 A student adds oil (lipid) to water.

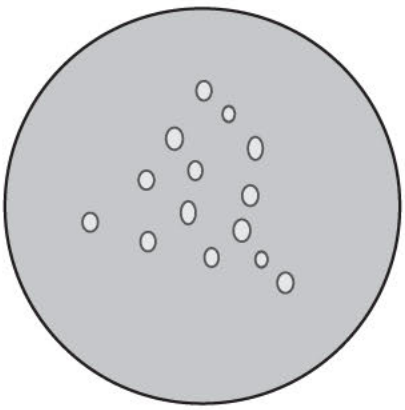
He then puts drops of the mixture onto a microscope slide.

The diagram shows oil droplets floating on the water, as seen using a microscope.

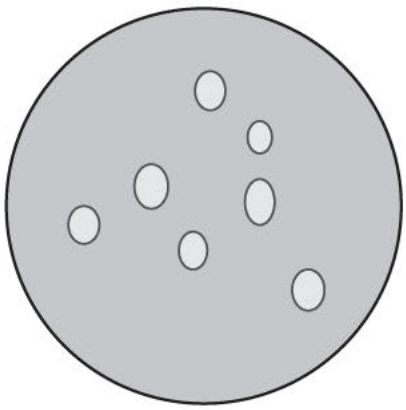


The student then adds different solutions to four separate samples of oil droplets floating on the water.

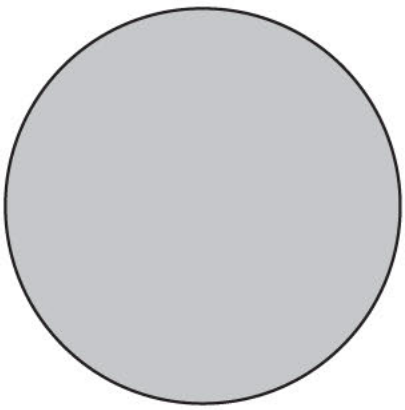
Diagrams A, B and C show the possible appearance of the oil droplets after each solution is added.



A



B



C

(a) (i) The table lists the solutions added to the oil and water mixture.

Complete the table to show which diagram the mixture would look like after each solution is added.

You may use each letter once, more than once or not at all.

One has been done for you.

(3)

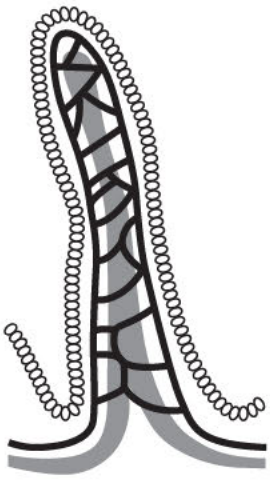
Solution added	Diagram
bile	
bile and lipase	C
boiled lipase	
bile and protease	

(ii) Explain why no droplets are seen after bile and lipase solution is added to the oil and water mixture.

(4)

(b) Starch is digested in the small intestine. The small intestine contains many structures that absorb glucose.

The diagram shows one of these structures.



(i) Name this structure.

(1)

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(ii) Explain how this structure is adapted to absorb glucose.

(5)

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(Total for Question = 13 marks)

6 The photograph shows a variegated leaf. The dark (green) part of the leaf has cells that contain chloroplasts. The white part of the leaf has cells that do not contain chloroplasts.



(a) Describe the role of chloroplasts in leaf cells.

(2)

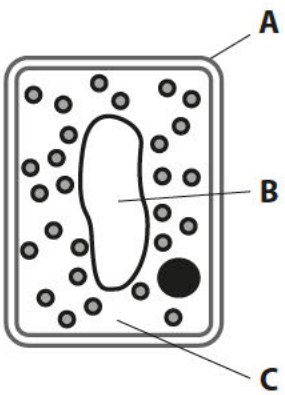
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(b) The diagram shows a leaf cell from the green part of the leaf.



Name the parts labelled **A**, **B** and **C**.

(3)

A .....

B .....

C .....

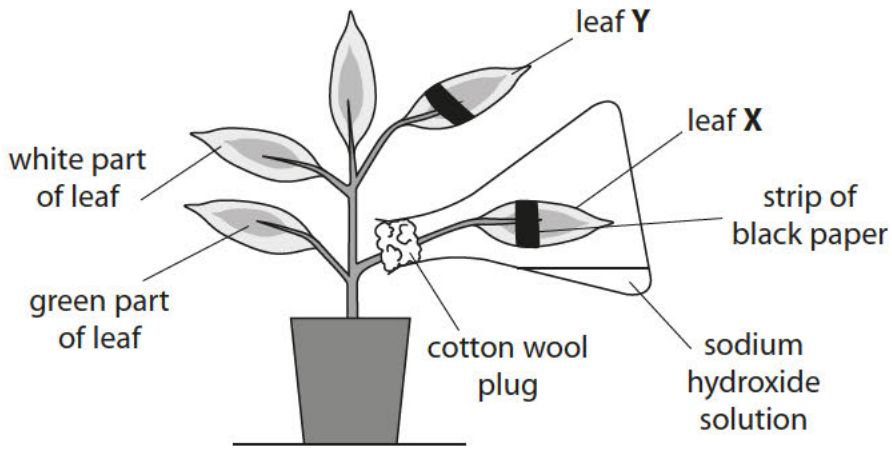
(c) The diagram shows a plant with variegated leaves.

The plant was destarched by leaving it in the dark for 24 hours.

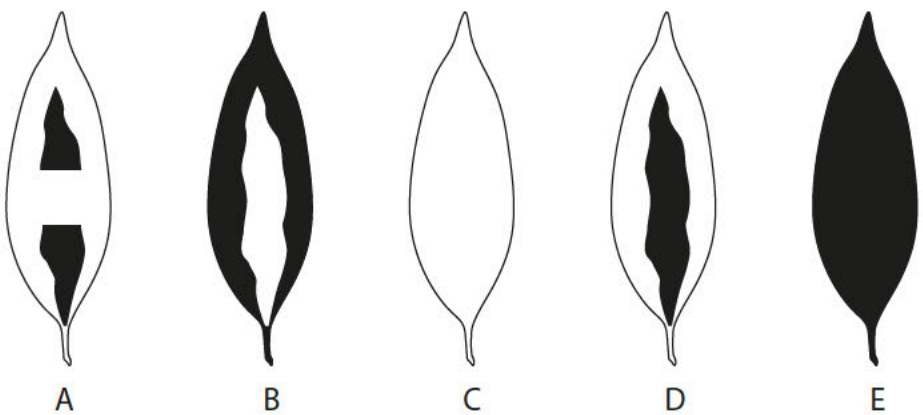
Leaf **X** then had a strip of black paper attached to both the upper and lower surfaces. It was then sealed in a flask containing a solution of sodium hydroxide, a substance that absorbs carbon dioxide.

Leaf **Y** also had a strip of black paper attached to both the upper and lower surfaces.

The plant was then placed in the light for 24 hours and then a starch test was carried out on leaf **X** and leaf **Y**.



The five leaves, A to E, show the possible appearance of leaf **X** and leaf **Y** after the starch test.



(i) Which of the leaves A to E matches the result you would obtain after testing leaf **X** and leaf **Y** for starch?

(2)

leaf **X** .....

leaf **Y** .....

(ii) Explain what happens in a leaf when it is destarched.

(2)

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(iii) Describe how the green pigment in leaf cells is removed safely before testing a leaf for the presence of starch.

(3)

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(iv) Name the chemical used to test for starch.

(1)

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(Total for Question = 13 marks)