

Q1.(a) (i) Give **two** ways in which the structure of starch is **similar** to cellulose.

1

2

(2)

(ii) Give **two** ways in which the structure of starch is **different** from cellulose.

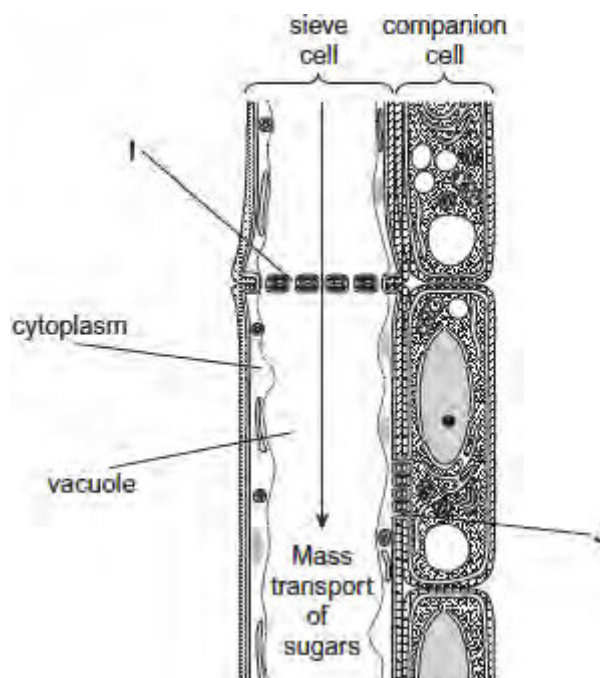
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(2)

- (b) In plants, mass transport of sugars takes place through columns of sieve cells in the phloem. Other cells, called companion cells, transport sugars into, and out of, the sieve cells.

The diagram shows the structure of phloem.



Structures **I** and **J** allow the transport of sugars between cells.

- (i) Using the diagram, suggest and explain **one** other way in which sieve cells are adapted for mass transport.

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(2)

- (ii) Using the diagram, suggest and explain **one** other way in which companion cells are adapted for the transport of sugars between cells.

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(2)

(Total 8 marks)

Q2.Organic compounds synthesised in the leaves of a plant can be transported to the plant's roots.

This transport is called translocation and occurs in the phloem tissue of the plant.

- (a) One theory of translocation states that organic substances are pushed from a high pressure in the leaves to a lower pressure in the roots.

Describe how a high pressure is produced in the leaves.

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(Extra space)

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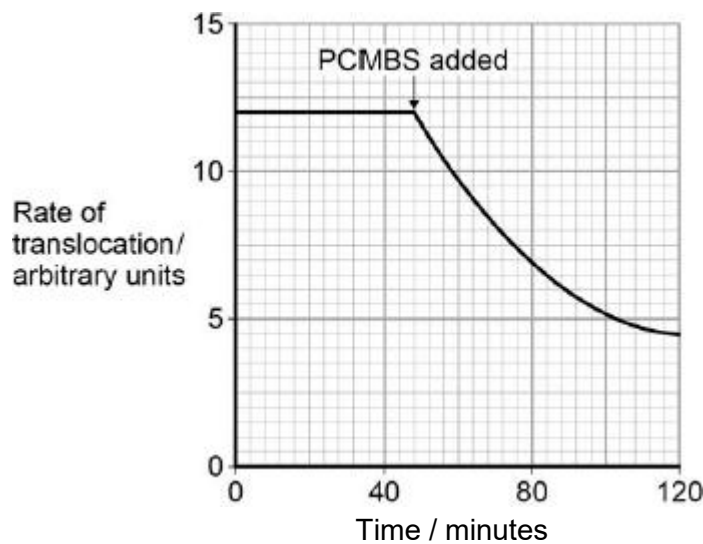
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(3)

PCMBS is a substance that inhibits the uptake of sucrose by plant cells.

Scientists investigated the effect of PCMBS on the rate of translocation in sugar beet.

The figure below shows their results.



- (b) During their experiment, the scientists ensured that the rate of photosynthesis of their plants remained constant.
Explain why this was important.

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(2)

- (c) The scientists concluded that some translocation must occur in the spaces in the cell walls.
Explain how the information in the figure above supports this conclusion.

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(2)
(Total 7 marks)

Q3.(a) Contrast the processes of facilitated diffusion and active transport.

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(Extra space)

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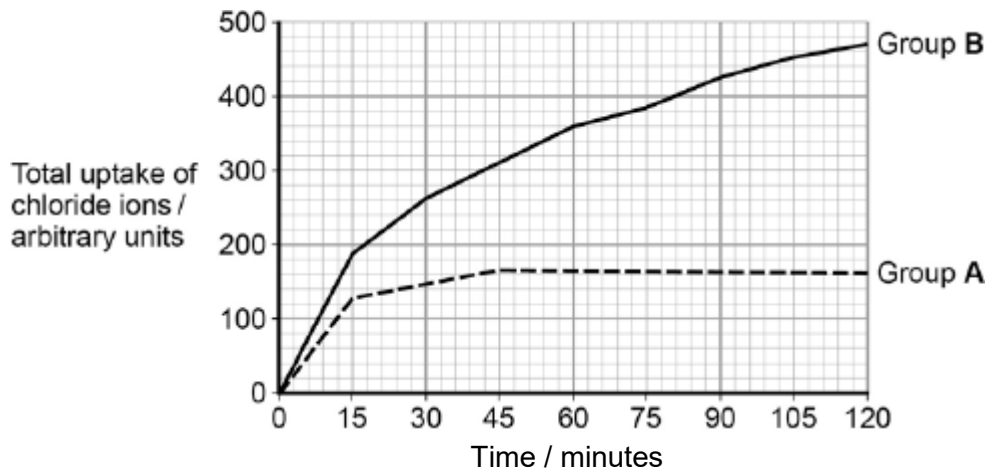
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(3)

Students investigated the uptake of chloride ions in barley plants. They divided the plants into two groups and placed their roots in solutions containing radioactive chloride ions.

- Group **A** plants had a substance that inhibited respiration added to the solution.
- Group **B** plants did not have the substance added to the solution.

The students calculated the total amount of chloride ions absorbed by the plants every 15 minutes. Their results are shown in the figure below.



- (b) Calculate the ratio of the mean **rate** of uptake of chloride ions in the first hour to the **rate** of uptake of chloride ions in the second hour for group **B** plants.

Ratio = ... :1

(2)

- (c) Explain the results shown in the figure above.

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(Extra space)

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(4)
(Total 9 marks)

Q4.(a) Describe the mass flow hypothesis for the mechanism of translocation in plants.

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(Extra space)

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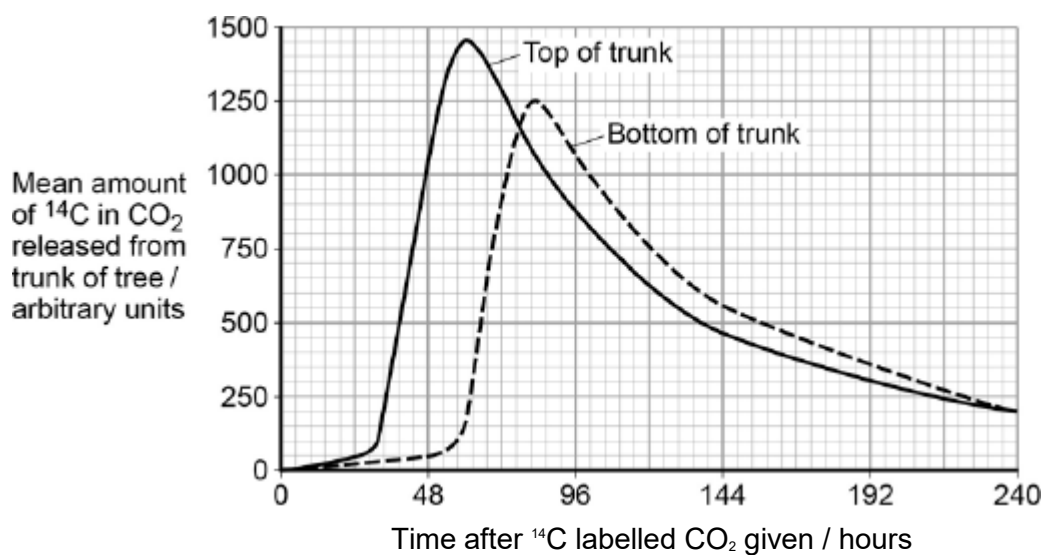
(4)

Scientists measured translocation in the phloem of trees. They used carbon dioxide labelled with radioactive ^{14}C .

They put a large, clear plastic bag over the leaves and branches of each tree and added $^{14}\text{CO}_2$. The main trunk of the tree was not in the plastic bag.

At regular intervals after adding the $^{14}\text{CO}_2$ to the bag, the scientists measured the amount of $^{14}\text{CO}_2$ released from the top and bottom of the main trunk of the tree. On the surface of the trunk of these trees, there are pores for gas exchange.

The following figure shows the scientists' results.



- (b) Name the process that produced the $^{14}\text{CO}_2$ released from the trunk.

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(1)

- (c) How long did it take the ^{14}C label to get from the top of the trunk to the bottom of the trunk? Explain how you reached your answer.

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(2)

- (d) What other information is required in order to calculate the mean rate of movement of the ^{14}C down the trunk?

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(1)

(Total 8 marks)