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BIOLOGY

ORGANISMS EXCHANGE SUBSTANCES

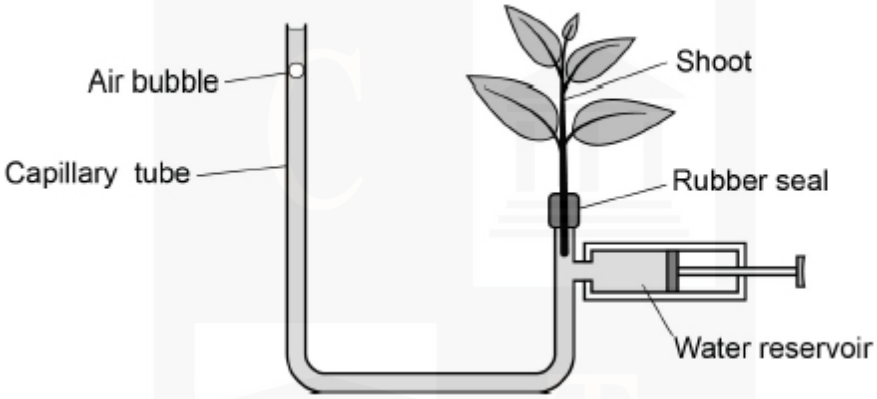
Level & Board	AQA (A-LEVEL)
TOPIC:	MASS TRANSPORT IN PLANTS
PAPER TYPE:	QUESTION PAPER - 2
TOTAL QUESTIONS	5
TOTAL MARKS	38

Mass Transport in Plants - 2

1.

A pupil using a potometer to gauge the amount of water passing through a plant's shoot. In Figure 1, the potometer is displayed. Water from the capillary tube replaces the water lost from the shoot.

Figure 1



(a) The air bubble in one experiment traveled 7.5 mm in a quarter of an hour. The capillary tube had a diameter of 1.0 mm.

Determine how quickly the experiment's shoot is absorbing water.

Please respond in milliliters per hour. Display your work. (A circle area can be calculated using the formula area = πr^2). **(2)**

_____ mm^3 $hour^{-1}$

(b) The student's goal was to calculate the rate of water loss per millimeter squared of the shoot's leaf surface area in Figure 1.

Describe an approach she could have taken to determine this rate. It is best to presume that the leaves are the source of all water loss from the shoot.

(3)

(c) It possible that the rate of water movement through a shoot in a potometer and the rate of water movement through a plant entire shoot will differ.

Give one explanation for this. **(1)**

4.

(a) Explain the mass flow theory of the plant translocation process. **(4)**

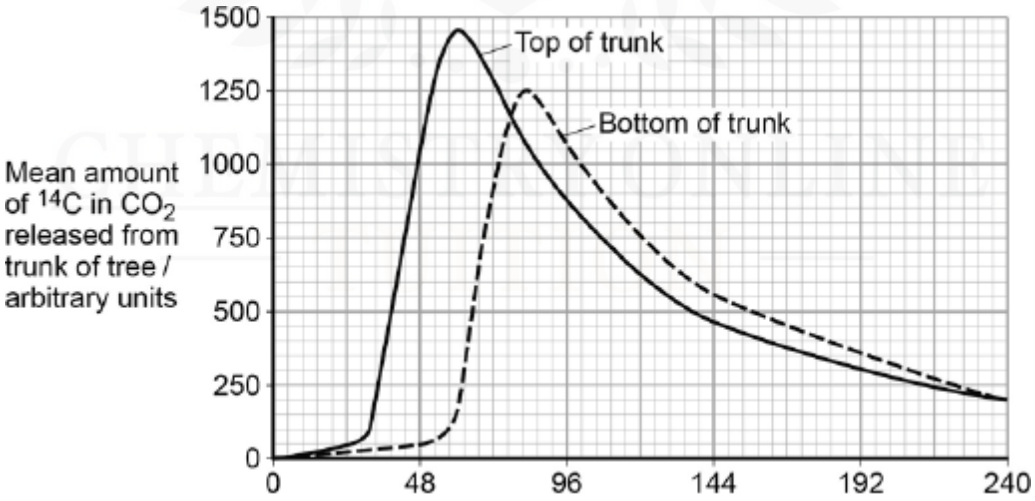
Translocation in the phloem of trees was measured by scientists. They made use of radioactively tagged ^{14}C carbon dioxide.

Each trees leaves and branches were covered with a sizable, transparent plastic bag, and $^{14}CO_2$ was added. The plastic bag did not contain the trees main trunk.

The scientists monitored the amount of $^{14}CO_2$ released from the top and bottom of the tree's main trunk at regular intervals after adding the gas to the bag.

These trees have pores on their trunks that allow gases to circulate.

The scientist findings are displayed in the following figure.



(a) Identify the procedure that led to the $^{14}CO_2$ being expelled from the trunk.

(1)

(b) What was the duration required for the 14C label to go from the top to the bottom of the trunk? Tell us how you arrived at your response. **(2)**

(c) What further data is needed to determine the average speed at which the ^{14}C moves down the trunk? **(1)**

I am Sorry !!!!!

3.

(a) Describe two ways that starch and cellulose structures are comparable.

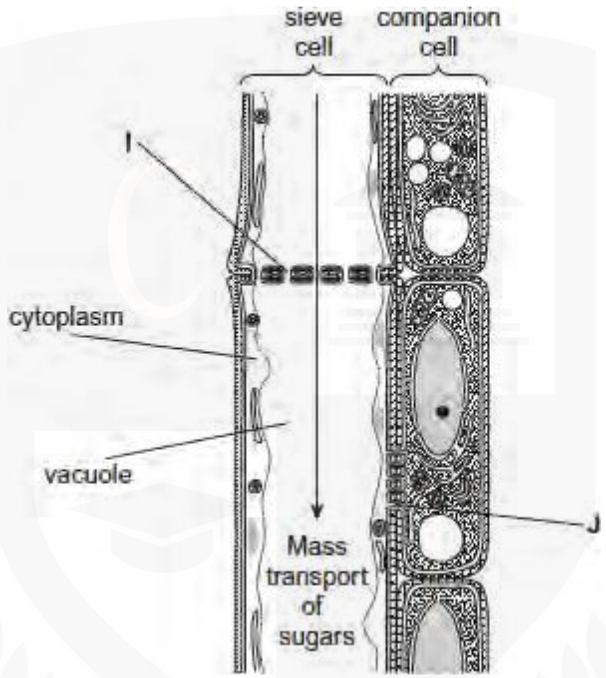
(2)

(b) Describe the two ways that starch and cellulose differ structurally. **(2)**

I am Sorry !!!!!

The phloem of plants has columns of sieve cells through which sugars are transported in large quantities. Companion cells are other types of cells that move sugars into and out of the sieve cells.

The phloem structure is depicted in the diagram.



(c) Provide another example of how sieve cells are modified for mass transit using the diagram. **(2)**

(d) Provide an additional explanation and suggestion for how companion cells are suited for the movement of sugars between cells using the diagram.

(2)

4.

A plant roots can receive organic chemicals that are synthesized in its leaves.

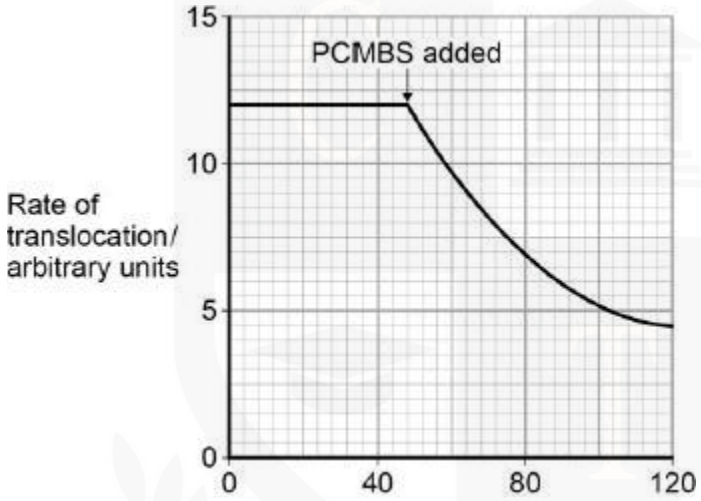
This movement, known as translocation, takes place in the plant's phloem tissue.

(a) Organic materials are forced from a high pressure in the leaves to a lower pressure in the roots, according to one explanation of translocation.

Explain the process by which the leaves generate tremendous pressure. **(3)**

PCMBS is a chemical that prevents plant cells from absorbing sucrose.

Researchers looked into how PCMBS affected the sugar beet plant's rate of translocation. Their results are shown in the image below.



The scientists made sure that their plants rate of photosynthesis didn't change throughout the experiment.

Describe the significance of this**. (2)**

I am Sorry !!!!!

(c) The researchers came to the conclusion that there had to be some translocation taking on in the cell wall gaps. Describe how the data in the aforementioned figure leads to this conclusion. **(2)**

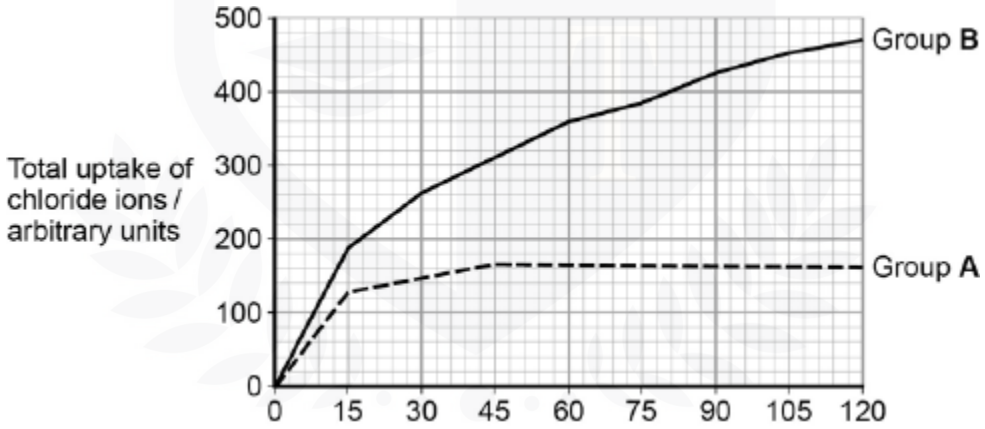
5.

(a) Compare and contrast active transport with facilitated diffusion. **(3)**

Students looked into how barley plants absorbed chloride ions. Plants were split into two groups, and the roots were submerged in liquids containing radioactive chloride ions.

- A material that prevented respiration was added to the solution for the plants in Group A.
- The chemical was not added to the solution for the plants in Group B.

Every fifteen minutes, the students determined how much chloride ions the plants had taken in overall. The figure below displays their findings.



(b) Determine the ratio between the group B plants' mean rate of chloride ion uptake in the first hour and their rate in the second hour**. (2)**

Ratio = ... :1

(c) Describe the outcomes displayed in the above figure. **(4)**

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