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BIOLOGY

ORGANISMS EXCHANGE SUBSTANCES

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

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Mass Transport in Plants - 2

1.

(a)

The diameter of the capillary tube = 1.0

Air bubble moved in 15 min = 7.5 mm

$$1.0\text{mm}/2=0.5\times 0.5=0.25\times \text{PI}=0.78$$

$$0.79\times 7.5= 5.9/0.25=23.6\text{mm}^3 \text{ hour}^{-1}$$

(b)

- Method for measuring area
- Of both sides of each leaf
- Divide rate of water loss by total surface area of leaves

(c) One reason why the rate of water movement through a shoot in a potometer may not be the same as the rate of water movement through the shoot of a whole plant is the absence of stomata and the regulation of transpiration in the potometer setup.

2.

(a) It is stated by the mass flow hypothesis that the translocation of glucose and other sugars within phloem are caused by a never-ending flow of water and dissolved nutrients between the source a place where sugars are made and sink where sugars are utilized.

OR

In source sugars actively transported into phloem by companion cells. This lowers water potential of sieve cells and so water enters phloem by osmosis. This Increase in hydrostatic pressure causes mass movement towards sink. Sugars are used in root for respiration or are converted to starch for storage.

(b) Respiration.

(c)

- About 30 hours
- Time between peak ^{14}C at top of trunk and bottom.

(d) Length of trunk between top and bottom.

3.

(a)

- Both are polymers made of monosaccharides
- Both contain glycosidic bonds
- Both have hydrogen bonding within the structure

(b)

- Starch contains alpha glucose whereas cellulose contains beta glucose
- Starch is helical and branched, whereas cellulose is straight and unbranched

(c) Sieve cells have few organelles, very little cytoplasm, large vacuole, and thick walls. This leads to more flow because strong walls resist pressure so flow is unrestricted.

(d) They contain mitochondria which releases energy for active transport.

4.

(a) Water potential becomes lower as sugar enters phloem. Water enters phloem by osmosis. Increased volume of water causes increased pressure.

(b)

- Rate of photosynthesis related to rate of sucrose production
- Rate of translocation higher when sucrose concentration is higher

(c)

- Rate of translocation does not fall to zero / translocation still occurs after 120 minutes
- But sucrose no longer able to enter cytoplasm of phloem cells

5.

(a)

- Facilitated diffusion involves channel or carrier proteins whereas active transport only involves carrier proteins

- Facilitated diffusion does not use ATP / is passive whereas active transport uses ATP
- Facilitated diffusion takes place down a concentration gradient whereas active transport can occur against a concentration gradient

(b)

$$360/60=6$$

$$470-360=110$$

$$110/60=1.8$$

$$6/1.8=3.3$$

$$\text{Ratio}=3.3:1$$

(c)

Group A: initial uptake slower because by diffusion only

Group A: levels off because same concentrations inside cells and outside cells / reached equilibrium

Group B: uptake faster because by diffusion plus active transport

Group B: fails to level off because uptake against gradient / no equilibrium to be reached

Group B: rate slows because fewer

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I am Sorry !!!!!



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