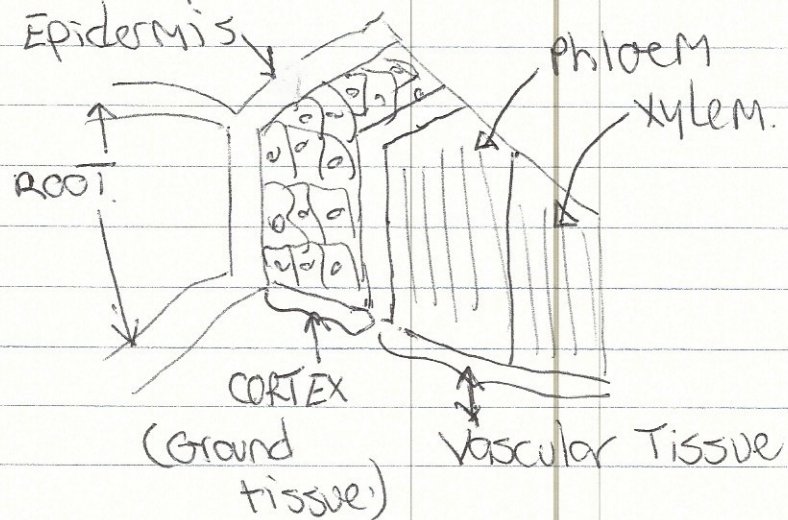


Biol 0871 CH 23-2 Transport in PLANTS p 586-588;

1
ROOT
PRESSURE

the pressure created by watering entering the tissues of a root can push water upward in a plant stem.
→ the pressure forces water into the vascular system and out of the root.



2

Most of WATER is by OSMOSIS

1 ROOT HAIR → 2 CORTEX → 3 ENDODERMIS
→ 4 VASCULAR TISSUE. → XYLEM, water is transported throughout the plant.

3

Most of MINERALS by ACTIVE transport

1 ROOT HAIR → 2 CORTEX → 3 ENDODERMIS → 4 V.T.
→ phloem.

→ creates a high mineral concentration inside cells
∴ water moves passively with the flow of minerals into the V.T.

B/c the casparian strip prevents the back flow of water, there is only one place for the water to go in a plant, as the water accumulates and that is up!!

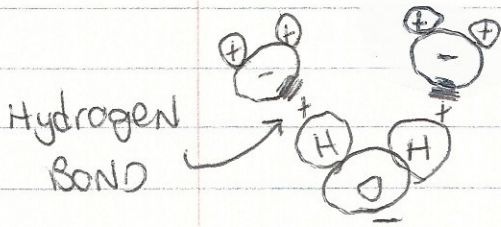
ROOT PRESSURE DOES NOT EXERT ENOUGH PRESSURE TO LIFT WATER UP INTO TREES, TO DO THIS, PLANTS TAKE ADVANTAGE OF 2 OF WATER'S MOST INTERESTING PHYSICAL PROPERTIES: CAPILLARY ACTION AND TRANSPIRATION

A. CAPILLARY ACTION: CONTRIBUTES TO THE MOV'T OF WATER

- water molecules are attracted to another by a force called cohesion.

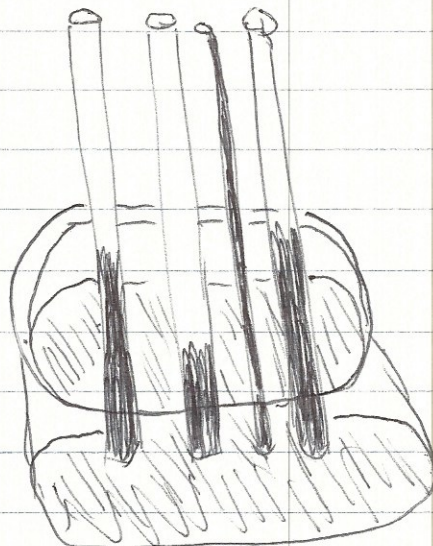
↓ attraction of molecules of the same substance to each other.

THROUGH A PLANT.



- water molecules can form H-Bonds with other substances. => this is called adhesion. (attraction of unlike molecules.)

- water will rise if placed in a thin tube
→ this is called capillary action. Water is attracted to the walls of the tube and water molecules are attracted to one another. The thinner the tube, the higher the water will rise inside it.



B. TRANSPIRATION

ROOT PRESSURE + CAPILLARY ACTION ALONE CAN NOT MOVE water to the tops of PLANTS.

The Major force in water mov't is transpiration. When water is lost thru transpiration, osmotic pressure moves water out of V.T. of the leaf. ~~The~~ The mov't of water out of V.T. "pulls" water upward thru the vascular system all the way from the roots. This process is known as transpirational pull.

How Does a PLANT CONTROL TRANSPIRATION?

OPENING/ CLOSING OF STOMATA.	↑ water pressure in a leaf will ^{cause} close guard cells to keep the stomata open. ↑ water pressure = ↑ water loss. When water is scarce SCARCE, there is ↓ water pressure → stomata close → reduces the loss of water by transpiration.
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WILTING (Helps a plant to conserve water.)

- results from water loss. → pressure in a plant cell ↓s, plant cell walls bend inward, plants leaves + stems wilt. → stomata close → transpiration slows down.

NUTRIENT TRANSPORT

- Many plants pump sugars into their fruits. → this requires moving sugars from the leaf or root, into stems, thru stems to the fruits. All of this takes place in the phloem.

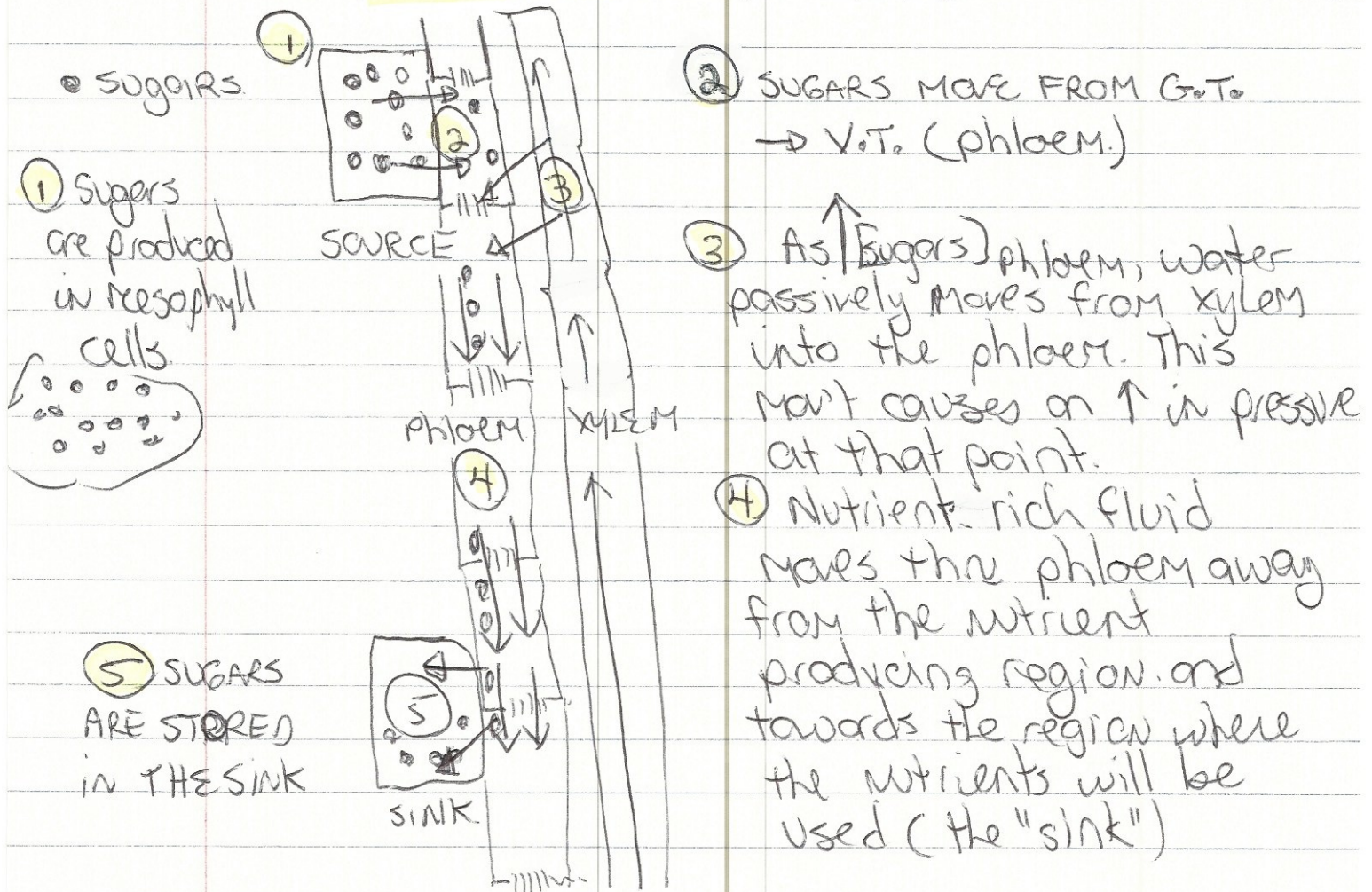
- in cold climates, plants may pump the sugars into their roots for winter storage. This stored food must be moved back into the trunk and branches of the plant before growth begins in spring.

Refer to Diagram Fig. 23-24 p. 602

Mov't from Source to Sink

↓
any cell in which sugars are produced by photosynthesis.
↘ cell where sugars are stored or used.

How does phloem transport take place?
Pressure Flow Hypothesis.



* when nutrients are pumped into or removed from the phloem system, the change in concentration ($[C]$) causes a mov't of fluid in that same direction. As a result, phloem is able to move nutrients in either direction to meet the nutritional needs of the plant.