Beautiful! answer

72. Explain BOTH the pressure-flow model and the cohesion-tension model of fluid movement in plants. (8 pts) +8

→ Pressure-Flow Model:

* Only works to push H_2O for short distances (several meters) — must have cohesion-tension to pull the water up large trees.

Because Ψ_s is more negative in the roots of the plant, water will enter into the xylem. The increase in water causes an increase in pressure within the tube (because it has thick sturdy walls & ridgid primary walls that will not expand significantly). Finally the increased pressure pushes the water up the xylem to the stem/branches of the plant/tree. (9)

* Book explained this as the primary way sugar/other molecules are transported in the phloem... but unlike xylem it has a bidirectional flow... causing water to enter in when the Ψ_s is more negative due to ↑ solute concentration.

→ Cohesion-Tension Model:

This model is described as the pulling of H_2O up the plant/tree, explained by the properties of water.

(1st) Property: water is extremely cohesive due to extensive Hydrogen-bonds btw water molecules. Therefore it likes to stick together

(2nd) The Hydrogen bonds also create a high surface tension for water.

Next, we know that transpiration (evaporation) of water is occurring all the time in plants through their stomata on leaves. Each time a water molecule evaporates, it causes a tension/pulling upward force on subsequent H_2O molecules to replace the vacant spot.

This pulling force creates a chain reaction of pulling starting @ the leaves (where the transpiration occurred) running all the way down to the roots. Thus, there is always a bulk flow of H_2O being pulled up the xylem to replace water that has evaporated.