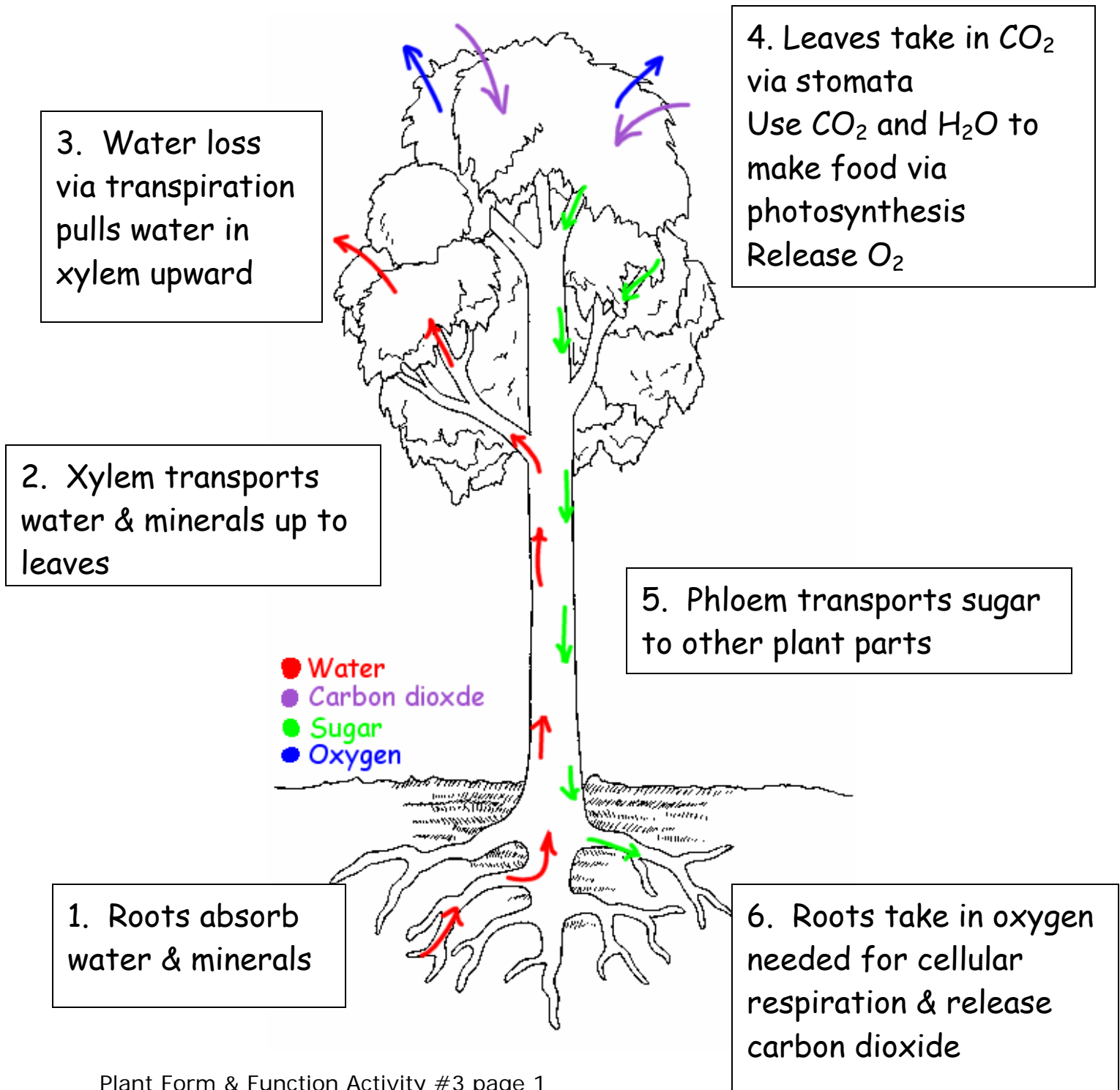


## TRANSPORT IN PLANTS

### OVERVIEW OF TRANSPORT IN PLANTS



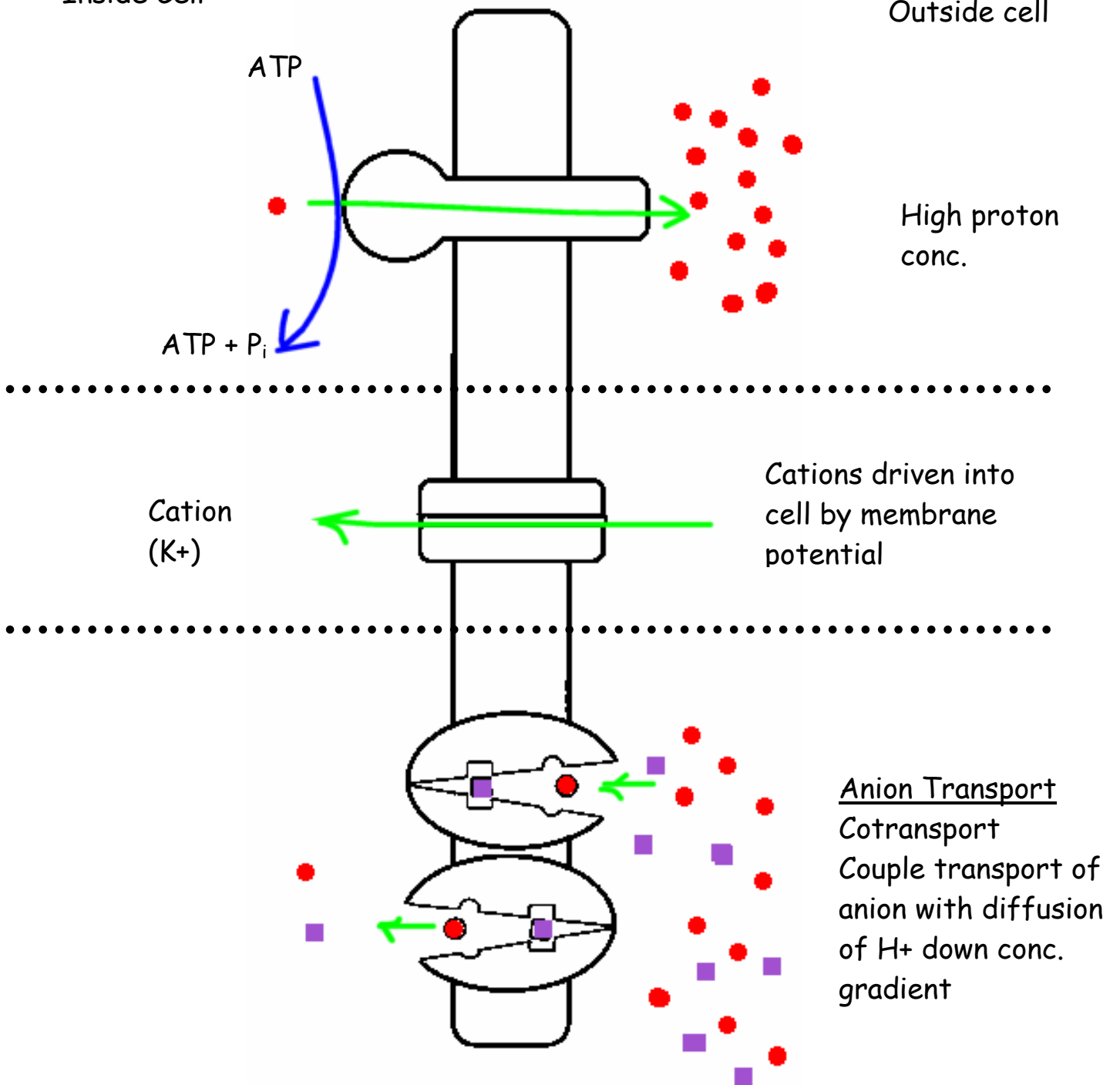
● Proton (H<sup>+</sup>)

■ Anion

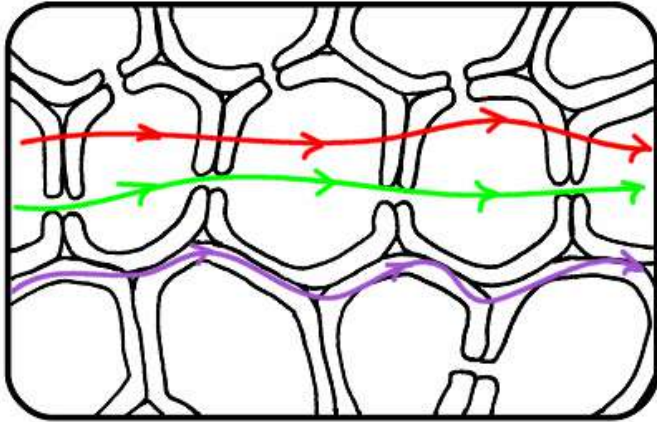
### PROTON PUMPS

Inside Cell

Outside cell

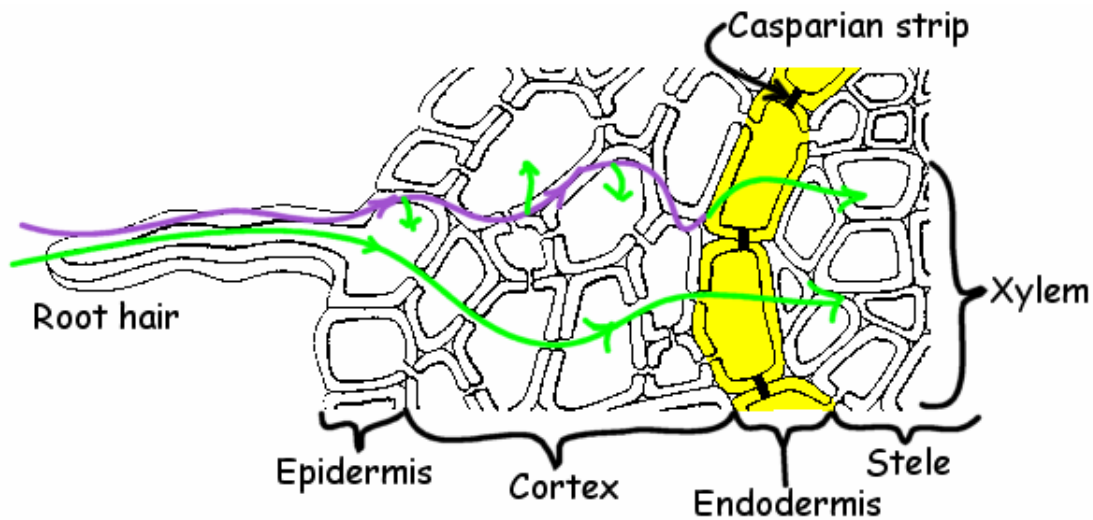


## LATERAL TRANSPORT ROUTES IN PLANTS



	<p>Transmembrane transport          Across cell membrane, through cell wall, across cell membrane, through cell, across cell membrane, etc.</p>
	<p>Symplast          From cell to cell via plasmodesmata</p>
	<p>Apoplast          Transport through cell wall matrix          Substance never enters cell</p>

## LATERAL TRANSPORT IN ROOTS



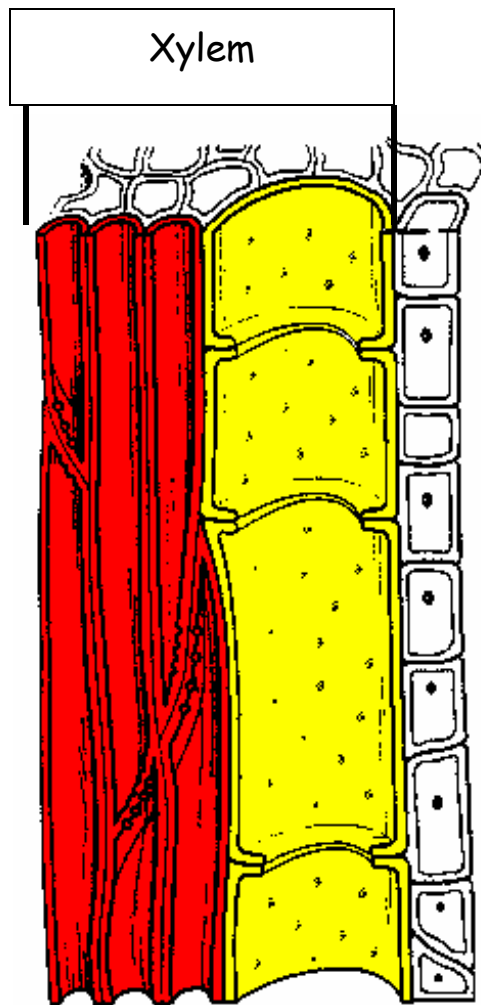
	<p>Symplast</p>
	<p>Apoplast          Materials cannot enter stele until they pass through living cell; Casparian strip prevents apoplastic transport into stele</p>

## WATER TRANSPORT IN STEM

### Transport of Water

Adhesion of water to cell wall keeps column of water from falling

Cohesion between water molecules forms column of water



### Types of Cells

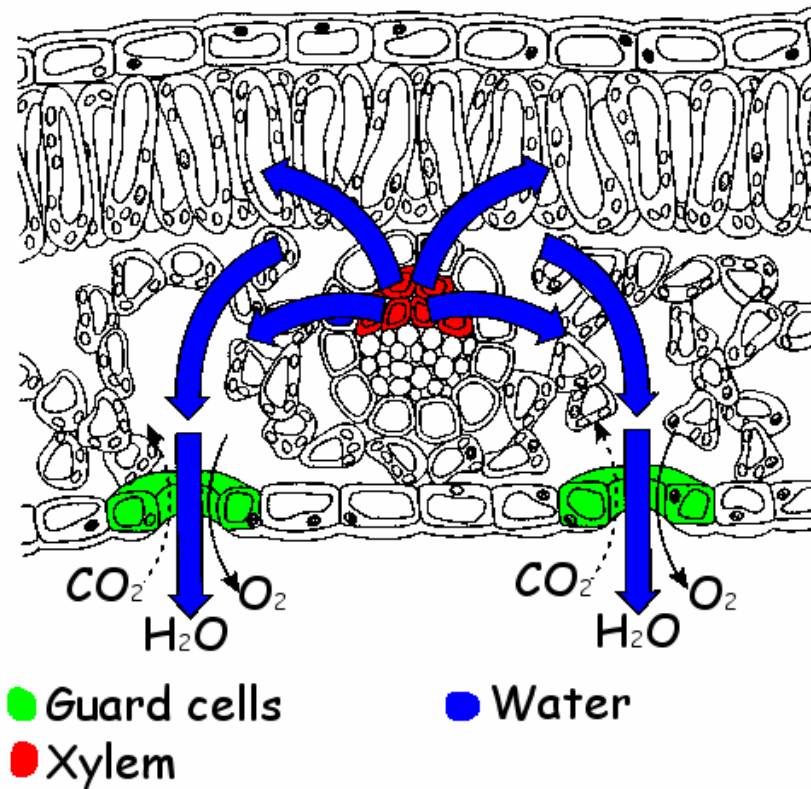
#### Tracheids

- Dead at functional maturity
- Long, thin cells with tapered ends
- Water moves from cell to cell through pits
- Secondary cell walls thickened with lignin; provide support

#### Vessel Element

- Wider, shorter cells with thinner cell walls
- Ends of cells perforated to allow water to flow freely between cells
- Dead at functional maturity

TRANSPIRATION = Evaporation of water from leaf

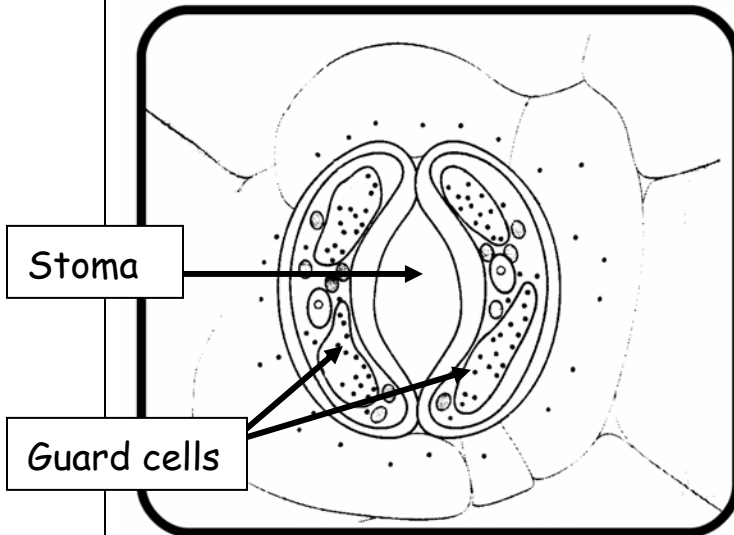


- Water exits leaf via stomata
- Water potential in air spaces decreases
- Water pulled from mesophyll cells
- Water potential inside mesophyll cells decreases
- Water pulled from top of xylem
- Water potential at top of xylem decreases
- Water pulled up xylem from roots

## GUARD CELLS

### Control of stomata

#### Stomata open (day)



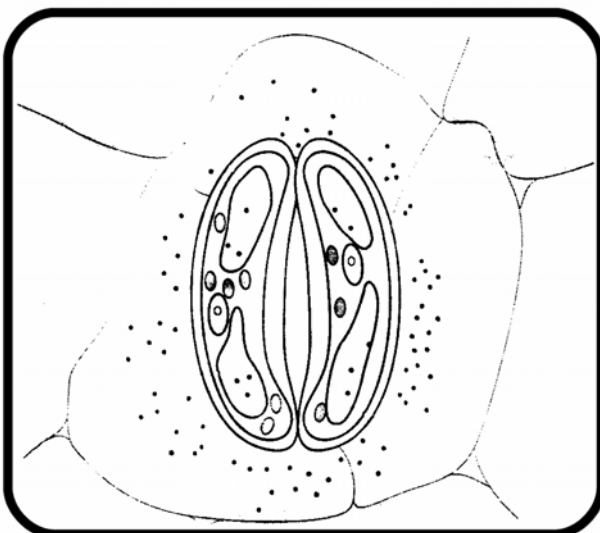
- Guard cells accumulate  $K^+$
- Water potential inside guard cells becomes more negative
- Water enters guard cells
- Guard cells swell
- Stoma opens



#### Triggers

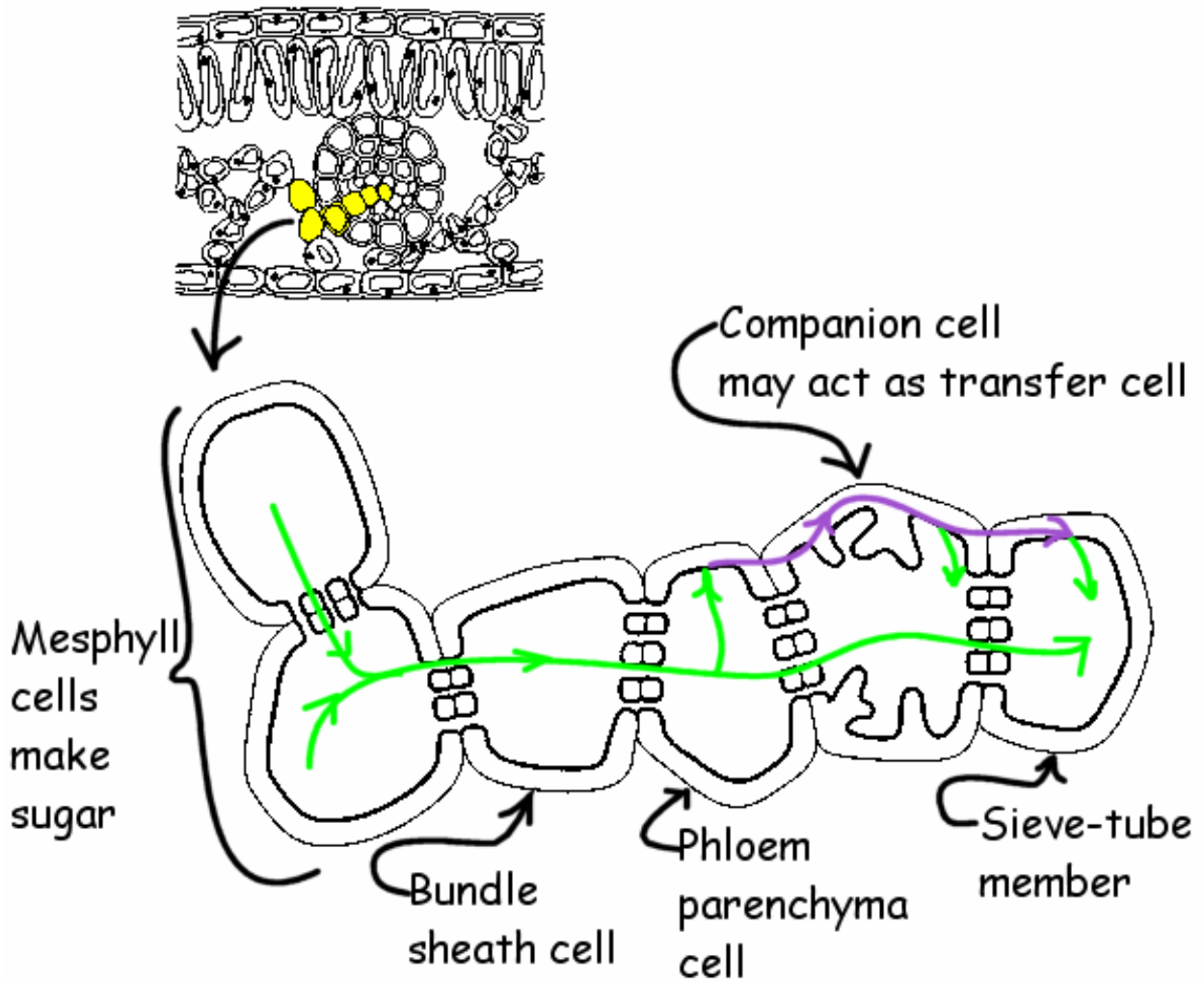
1. light triggers blue-light receptor
2. Depletion of  $CO_2$  in air spaces
3. Internal clock

#### Stomata close (night)



- Guard cells lose  $K^+$
- Water potential inside guard cells becomes less negative
- Water exits
- Guard cells become flaccid
- Stoma closes

## PHLOEM LOADING



	Symplast
	<p>Apoplast</p> <ul style="list-style-type: none"> <li>• Requires active transport into companion cells &amp; sieve-tube members</li> <li>• Proton pumps used</li> </ul>

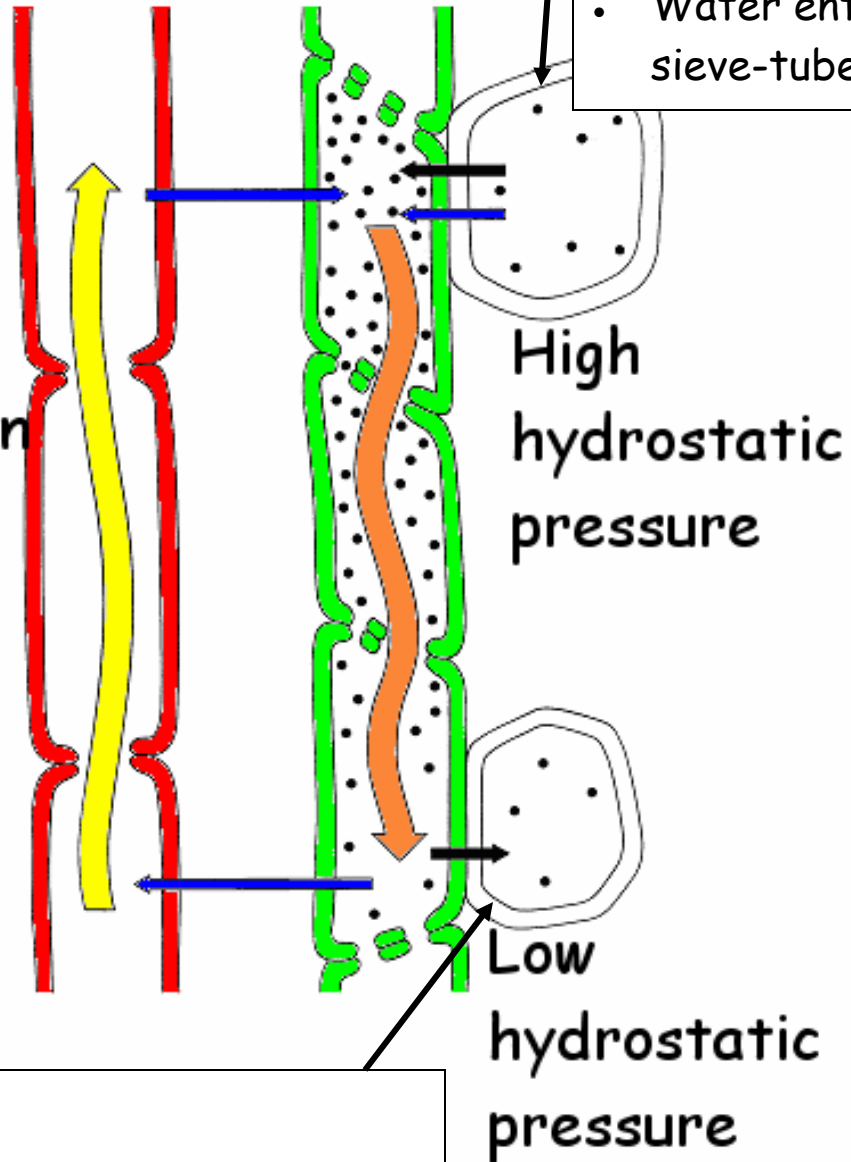
### BULK TRANSPORT IN PHLOEM

Phloem sap flows from high hydrostatic pressure to low (from source to sink)

#### Source cell

- Sucrose enters sieve-tube member
- Water potential becomes more negative
- Water enters sieve-tube member

- Xylem
- Phloem
- Water
- Sucrose
- Transpiration flow
- Pressure flow



#### Sink Cell

- Removes sucrose
- Water potential in sieve-tube member becomes less negative
- Water enters sieve-tube member