

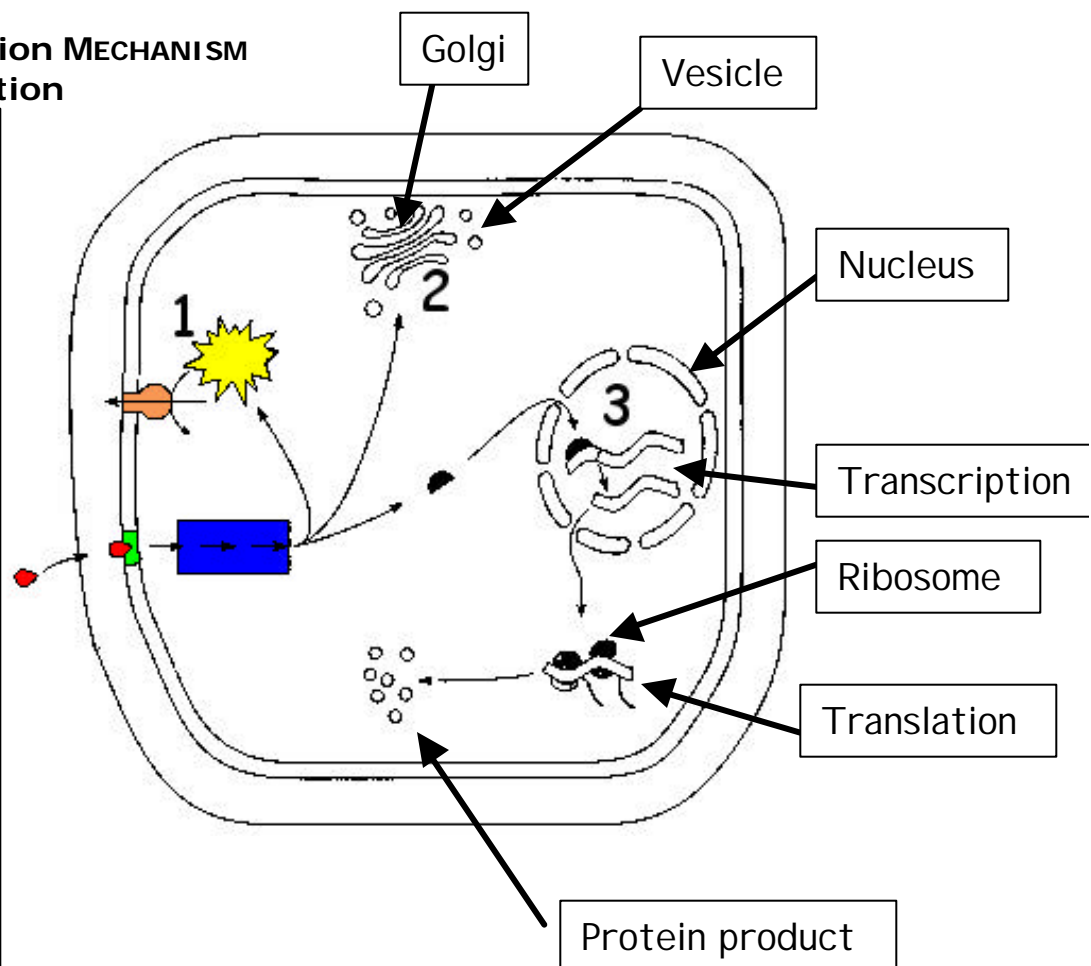
CONTROL SYSTEMS IN PLANTS

HORMONES

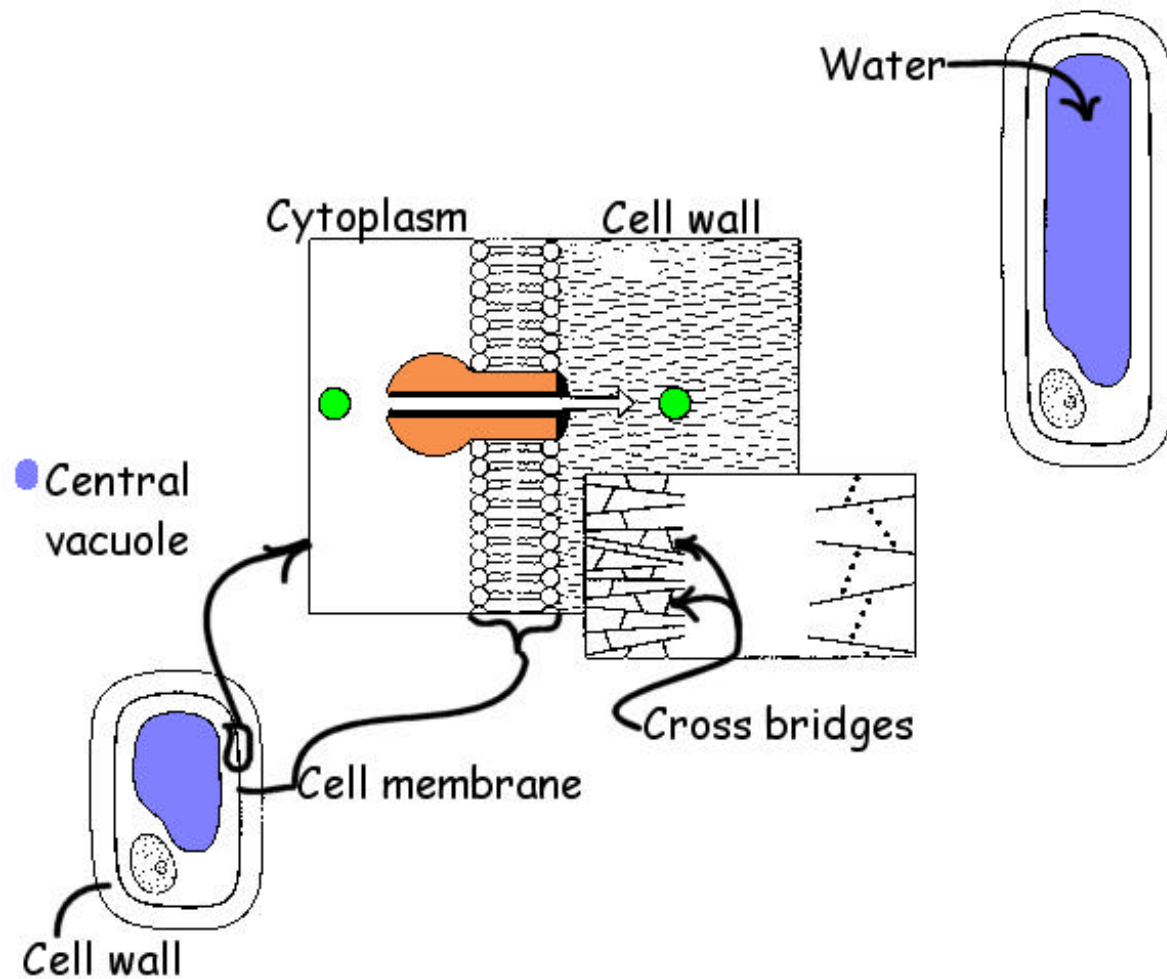
- Chemical signals
- Produced in one part
Transported to other parts
Trigger responses in target cells & tissues
- Small amounts produce substantial changes

Signal Transduction MECHANISM For Hormone Action

- Hormone** binds to
receptor
Triggers **2nd messenger**
2nd messenger triggers
- **Proton pumps**
 - Production of Golgi vesicles with cell product
 - Transcription & translation (production of protein product)



CONTROL OF CELL ELONGATION Acid growth hypothesis

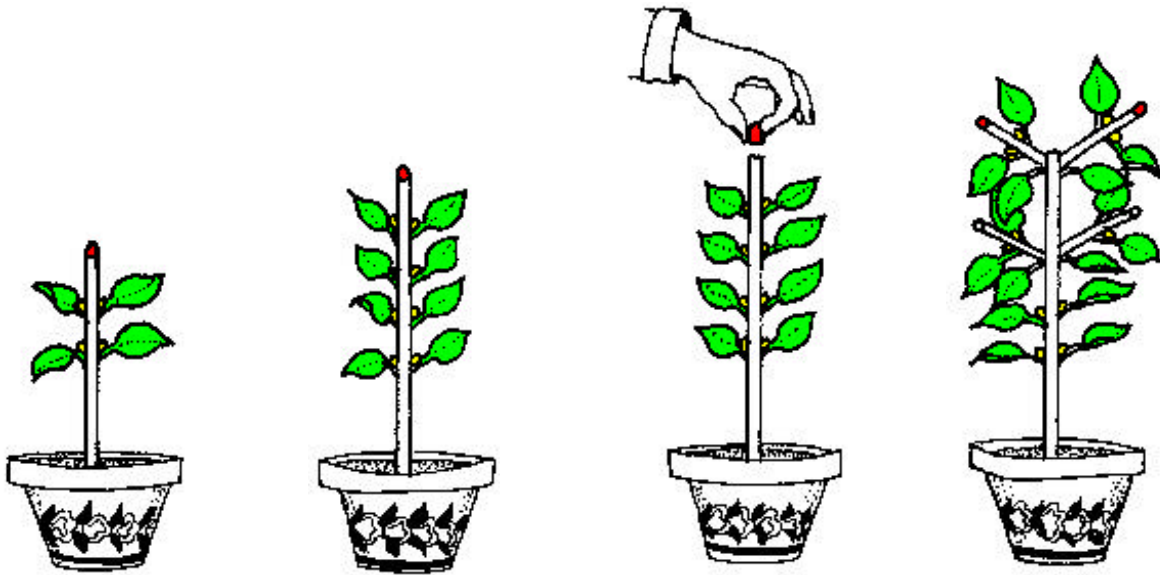


1. Auxin, produced by apical meristem in bud, triggers proton pumps	5. Cell wall weakens
2. Proton pumps move H^+ into cell wall matrix	6. Water enters cell
3. Acidity in wall increases	7. Cell elongates
4. Increased acidity breaks cross bridges between cellulose fibers	8. Cell produces additional cytoplasm & cell wall materials

CONTROL OF APICAL DOMINANCE

Auxin produced by **terminal bud** inhibits growth of **axillary buds**

Result = plant gets taller



- Cytokinins produced by roots stimulate axillary bud growth
- Lower buds grow before those closer to terminal bud
- If remove terminal bud axillary buds grow
- Result = plant gets bushier



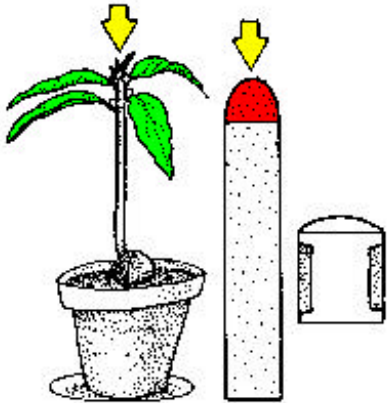
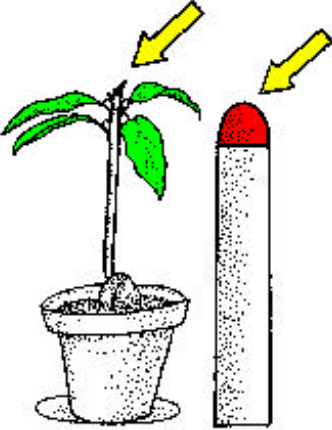
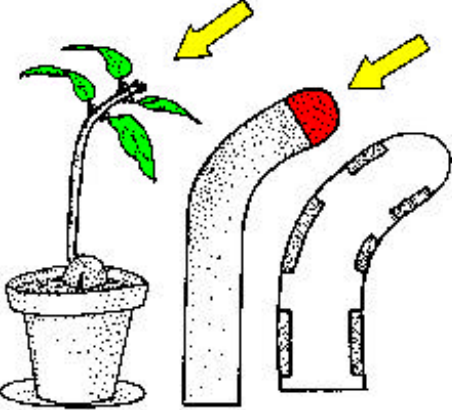
Roots

Auxin stimulates root branching

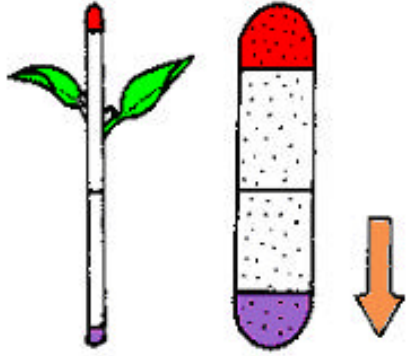
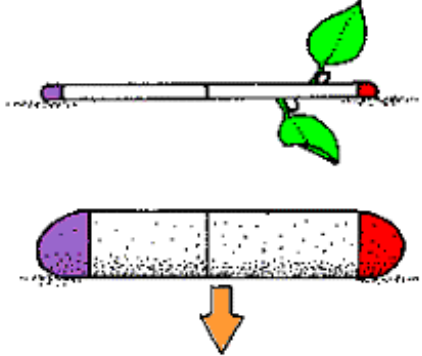
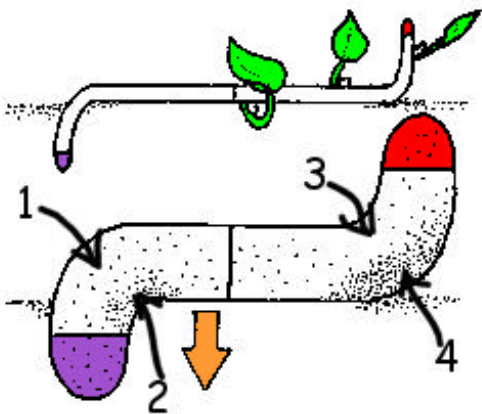
Cytokinins inhibit root branching

Light
Terminal bud

PHOTOTROPISM

	<ul style="list-style-type: none"> • Light straight above plant • Amount of auxin on each side equal Amount of chemical messenger on each side equal • Cell elongation on each side equal <p>Result = stem grows straight up</p>
	<ul style="list-style-type: none"> • Light source at angle • Auxin accumulates/migrates to shaded side Chemical messenger accumulates on sunny side
	<ul style="list-style-type: none"> • Increase auxin on shaded side stimulates cell elongation • Increase chemical messenger on sunny side inhibits cell elongation <p>Result:</p> <ul style="list-style-type: none"> • Stem grows toward light source • Positive phototropism because plant grows toward stimulus (light)

GRAVITROPISM

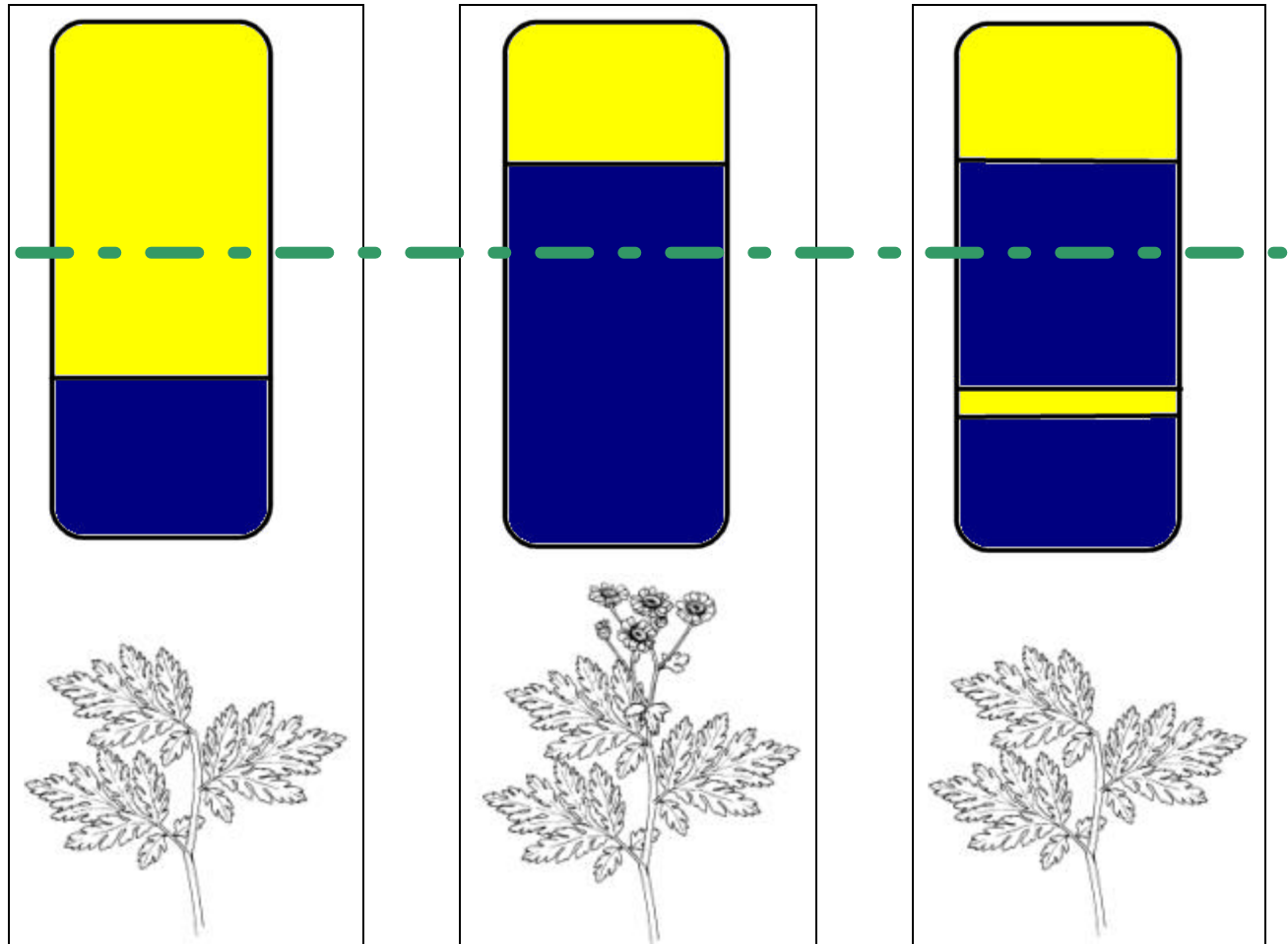
	<p>Shoot</p> <ul style="list-style-type: none"> • Grows away from pull of gravity • Negative Gravitropism <p>Root</p> <ul style="list-style-type: none"> • Grows toward pull of gravity • Positive gravitropism
	<p>In Roots</p> <ul style="list-style-type: none"> • Statoliths (starch grains) settle to bottom of cell • Triggers movement of Ca^{2+} • Causes lateral movement of auxin
	<ol style="list-style-type: none"> 1. Low auxin conc. stimulates cell elongation 2. High auxin conc. inhibits cell elongation <p>Result = root curves downward</p> <ol style="list-style-type: none"> 3. Low auxin conc. inhibits cell elongation 4. High auxin conc. stimulates cell elongation <p>Result = shoot curves upward</p>

Light
Dark
Critical night

CONTROL OF FLOWERING: SHORT-DAY PLANTS

AKA Long night plants

Flower only when dark is longer than critical night length



Dark less than
critical night
length

Result = No
flowers

Dark greater
than critical night
length

Result = Flowers

Total dark greater
than critical night
length
Dark interrupted
by flash of light

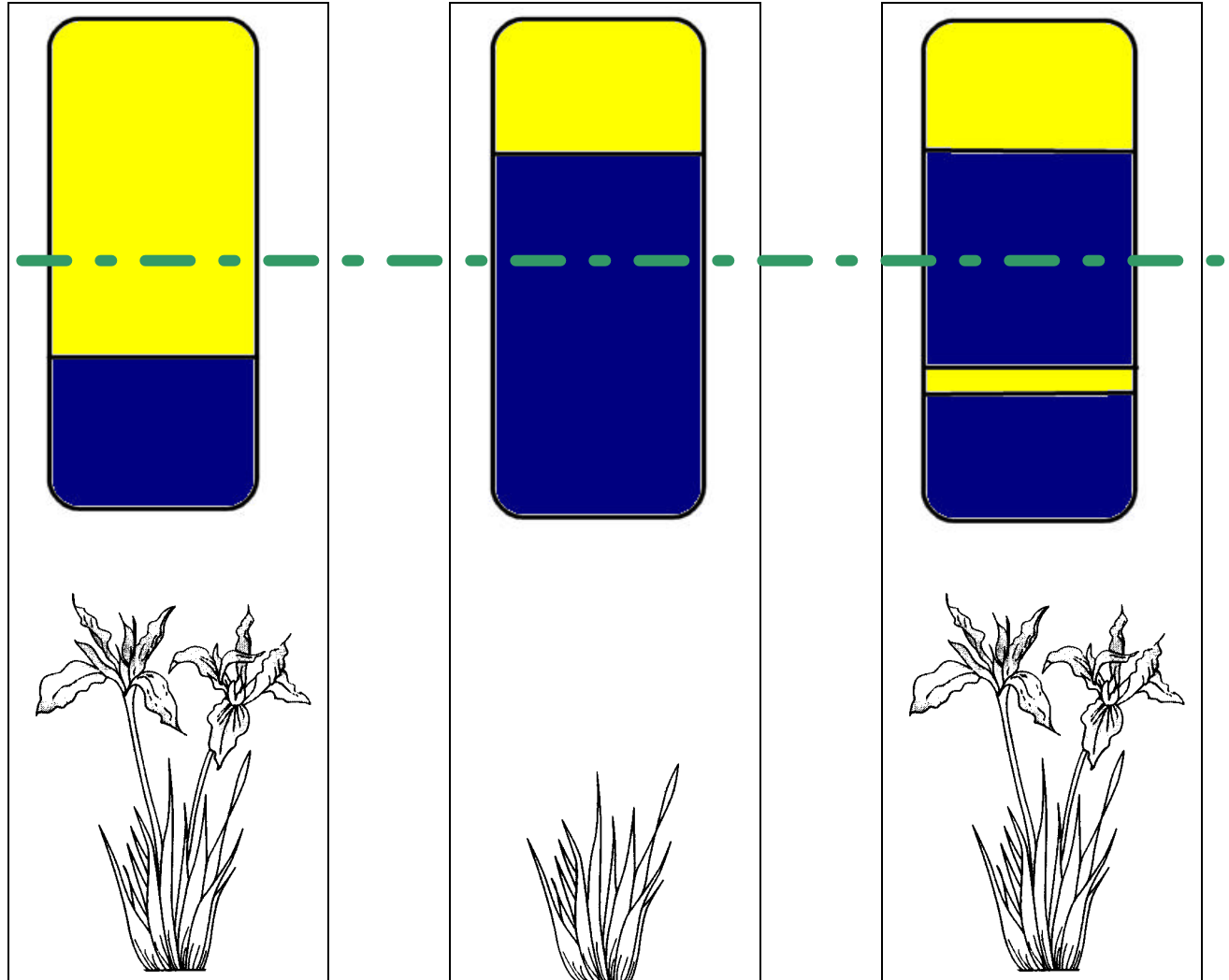
Result = No
flowers

CONTROL OF FLOWERING: LONG-DAY PLANTS

AKA short night plants

Flower only when dark is less than critical night length

Light
Dark
Critical night



Dark less than
critical night
length

Result = Flowers

Dark greater
than critical night
length

Result = No
flowers

Total dark greater
than critical night
length

Dark interrupted
by flash of light

Result = Flowers