PLANT TISSUES

meristematic tissue
→ actively dividing tissues thru mitosis

Apical meristematic tissues
- growing upwards
- shoot tips/ root tips

Lateral meristematic tissues
- growing sideways
- vascular cambium/ cork cambium

permanent tissues
→ matured tissues which no experienced / experiencing different ration

Epidermal tissues
- layer the outermost surface of stems, leaves + roots of young plants
- has cuticle ⇒ waxy + waterproof layer
  ↳ reduces water loss during transpiration
- modified epidermall cells
  ① Guard cells: control opening + closing of stoma
  ② Root hair cells: increase SA. of root for H_2O + mineral salts absorption

Ground tissue

Parenchyma tissues
- simplest living cells
- x differentiation
- thinnest cell wall
- always turgid
  → provide support
  → maintaining the shape of herbaceous plant
- help in storage of sugar + starch, gaseous exchange, repair + regeneration

Collenchyma tissues
- living cells which mature into cells that are flexible
- cell wall: pectin + hemicellulose
  ↳ thicker > parenchyma
- provide mechanical support + elasticity to plants

Sclerenchyma tissues
- dead cells when matured
- cell walls thickest
- provide support + mech. strength to parts of matured plants
- help in transp. of H_2O + nutrients

vascular tissues

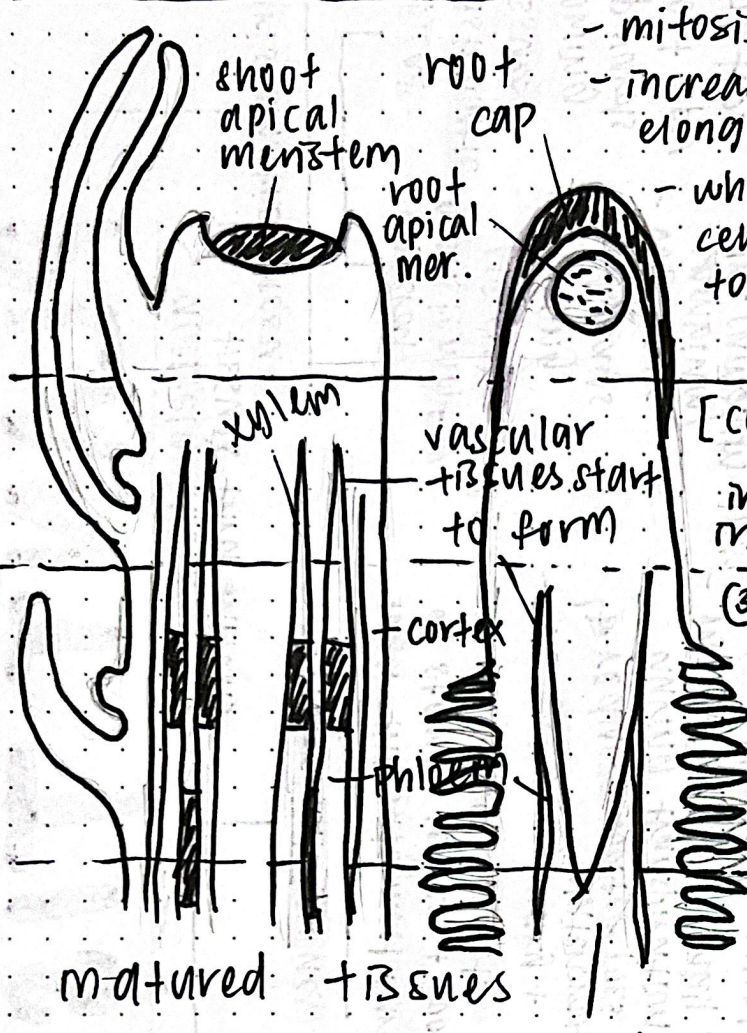
xylem
- dead cells w/ x cytoplasm
- lignified cell wall
- xylem vessels
  → elongated
  → hollow
  → connected to each other from roots to leaves
  enable xylem to transp. water + mineral salts to all parts of plant

phloem
- made of companion cells + sieve tubes + living cells (w/ cytoplasm)
- sieve tube x organelles
  → decompose @ maturity state
  → arranged from end to end
  ↳ form elongated + cont. tube struc.
- transport sugars (from photosyn.) from leaves to storage organs
  → roots, fruits, tubers

GROWTH

Zone of Cell Growth

① Zone of cell division @ apical meristem
- mitosis [actively dividing cells]
- increase of no. of cells causes the elongation of the plant stem
- when new cells are forming, cells previously formed are pushed to zone of cell elongation



② Zone of cell elongation
[cells that are increasing in size]
- happens thru H_2O diffusion + absorption of nutrients
  ↳ stored in vacuoles
- small vacuoles fuse to form a large vacuole
  ↳ vacuolation
- diffused water exerts pressure against cell walls
  ↳ pushes, elongates + widens the cells

③ zone of cell differentiation
[diff. cell that diff. once reached max size
- form permanent tissue:
  → cortex → epidermis → xylem
- change shapes + struc. to form specialised cells w/ epecific func.
  ↳ epidermal cells ⇒ guard cells / root hair cells

Primary growth
- growth that occurs after germination
- takes place in all plants
- elongate stem + roots

@ apical meristems
- shoot tips
- root tips
  ↳ root cap exhausted ↳ replaced by meristem.
- leaf primordia + shoot primordia grow to form new leaves + shoots

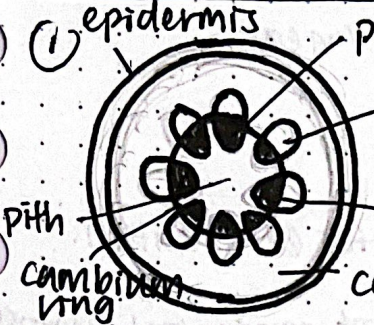
Secondary growth
- occurs mainly in eudicots + small no. of monocots
- increase the circumference / diameter of plant stem + root

@ Lateral meristem
- ↳ vascular cambium
- ↳ cork cambium

- necessity:
  → max elongation
    ↳ absorb sunlight
  → primary phloem: transp. photosyn.'s product ↳ provide mech. support
  → primary xylem: transp. H_2O + mineral salts

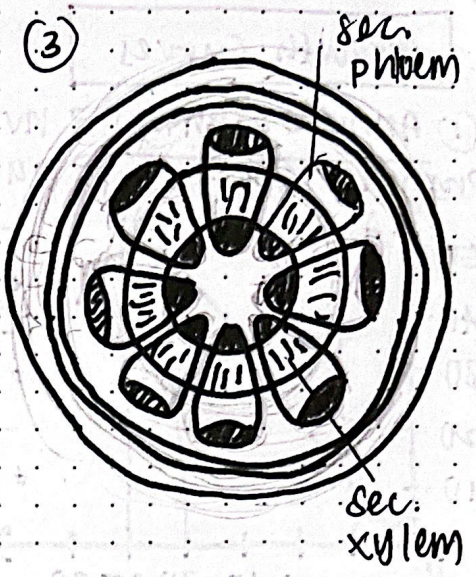
- necessity:
  → provide stability
    ↳ increasing the stem + root diameters ⇒ suit the height
  → mech. support
  → more x + p tissues
    ↳ replace old + damaged x + p tissues
  → stronger + thicker bark
    ↳ protection from H_2O loss, physical injuries, pathogen infection
  → live longer
    ↳ ++ chance of seed production + reproduction

Secondary Growth at the Stem

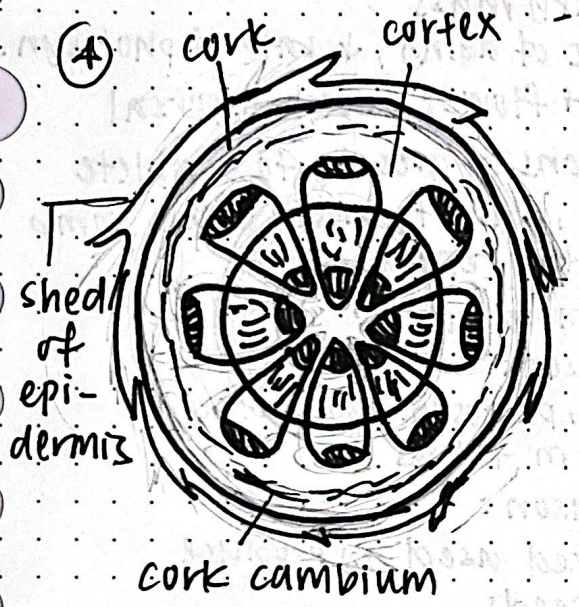


① - starts when the vascular cambium divides mitotically

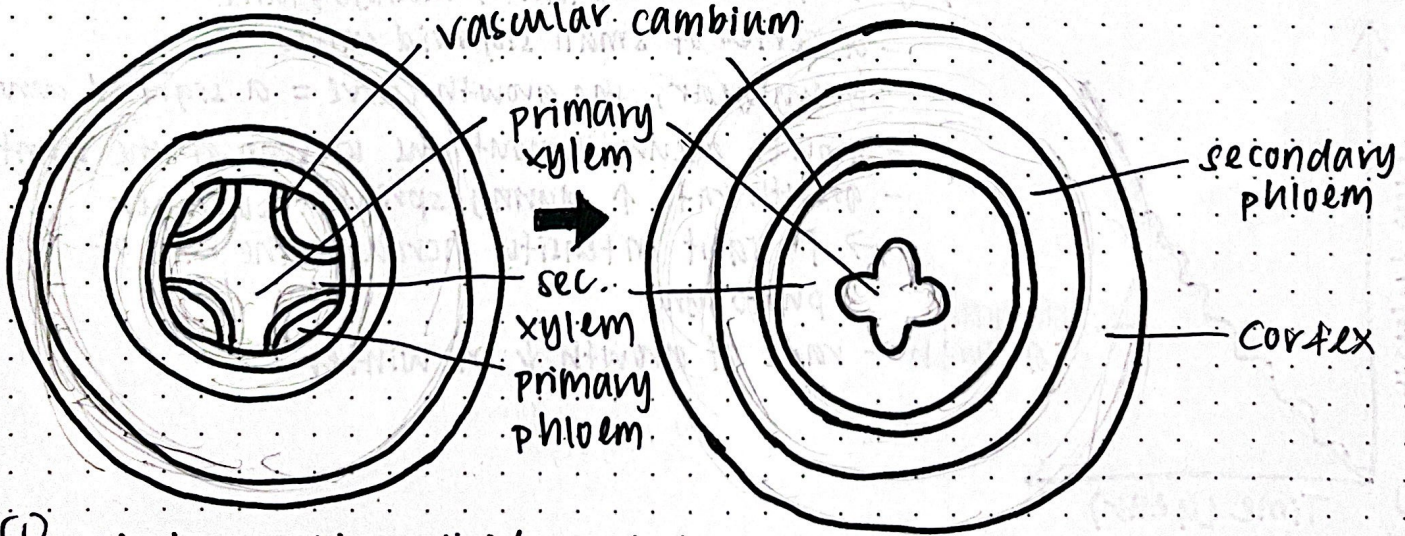
② cells in cambium ring divides inwards → form new xylem
+ outwards → form new phloem
- new xylem : secondary xylem
- new phloem : secondary phloem
- compressed xy. = addition to the circumference of the stem
↳ epidermis stretch + crack
- cork cambium divides actively to form cork cells @ outer side + cortex @ inner side
- cork layer : protects stem from insect + pathogen attack when epi. is cracked



- prim. x. is pushed towards the pith
- prim p. is pushed towards the epidermis
- prim x : compressed to form a stronger wood layer
↳ wall of x. is lignified
⇒ provide mech. sup. to plants



Secondary Growth at the Root



① vascular cambium divides actively thru mitosis
- combine + form a complete ring

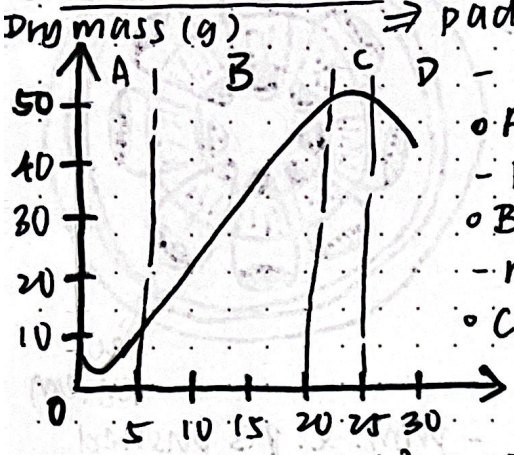
② cells in cambium ring divide inwards
- form sec. xylem
+ outwards - form ~~prim.~~ sec. phloem

③ root becomes thicker due to vasc. cam. actvt

④ cork cambium @ under epid. divides actively ⇒ form cork cells
→ provide protection to root tissues

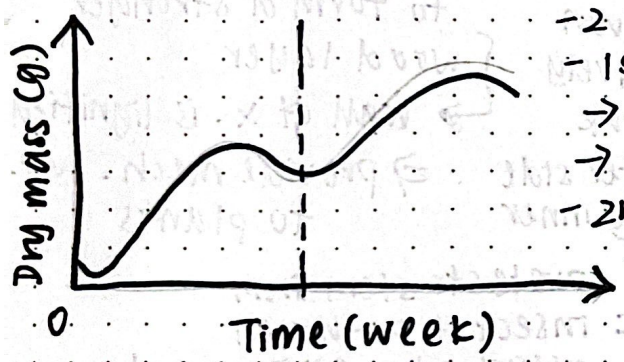
Growth Curves

① Annual plants → ny only one life cycle for a season / year
⇒ paddy, pumpkin, watermelon



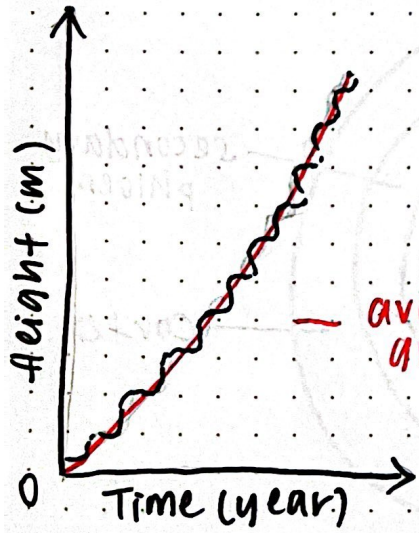
- a sigmoid curve
- A: Decreasing dry mass
  - Food stored in cotyledon is used for germination
- B: Increasing dry mass
  - rate of growth ↑↑ rapidly - Plant carries out photosyn.
- C: constant dry mass
  - rate of growth = 0 - Plant = matured
- D: Decreasing dry mass
  - happens slowly bc of aging, ↓ rate of photosyn., shedding of leaves + flowers + seed dispersal

② Biennial plants → take 2 years w/ 2 seasons of growth to complete life cycle ⇒ cabbage, carrot, silver cock's comb
→ 1st growth: vegetative growth → 2nd growth: reproduction



- 2 combined sigmoid curve
- 1st growth season:
  - → produce leaves, photosyn. takes place
  - → food is stored in tubers
- 2nd growth season:
  - → food is stored used to produce flowers + seeds

③ Perennial plants → live more than 2 years
⇒ grass, hibiscus plant, mango plant



- a series of small sigmoid curves
- Every year, the growth curve = a sigmoid curve
- Growth occurs throughout the lifespan of the plant
- growth rate ↑ during spring + summer
  - → ↑ light intensity increases the rate of photosyn.
- rate of growth ↓ in winter