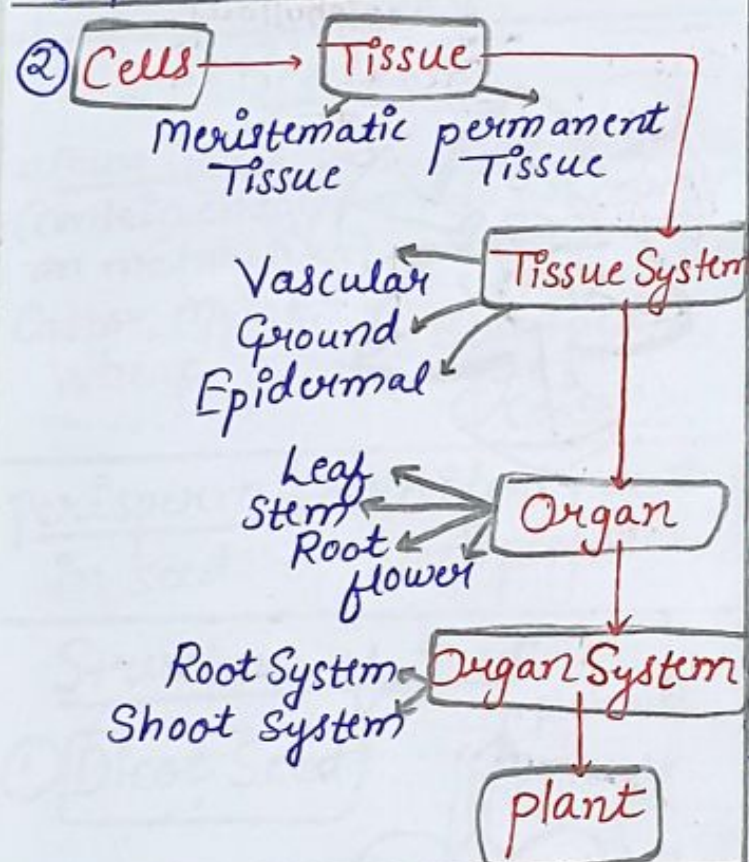


ANATOMY OF FLOWERING PLANTS...

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① Study of Internal structure of plants is called Anatomy.



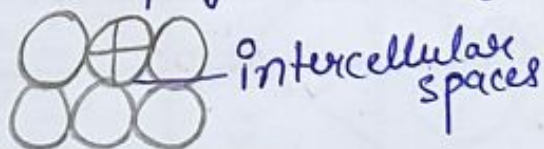
- Increase Girth
- Cork Cambium
- Vascular Cambium

④ Permanent Tissue in most plant body

simple	Complex
only one type of cells	Many types of cells
parenchyma	xylem unidirectional
collenchyma	phloem bidirectional
sclerenchyma	

⑤ Parenchyma

- Isodiametric
- spherical, Oval, round, polygonal or elongated
- Thin cell wall (primary cell wall made of cellulose)
- Living tissue
- photosynthesis, storage, secretion
- Majority of plant
- mesophyll cells - leaf



③ Plant Tissue →

Meristematic Tissue

(mitosis, plant growth)

① primary meristem → present from beginning. Increase in length.

- Shoot and root apical meristem
- Axillary Bud

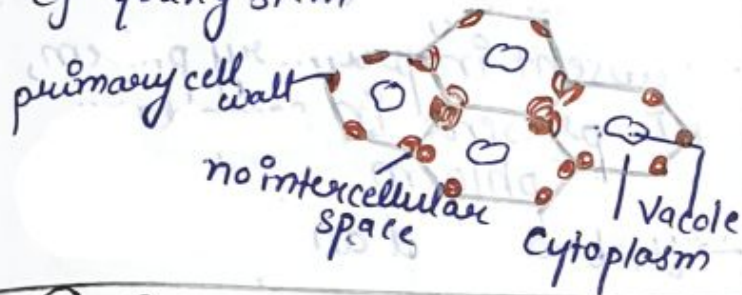
→ Intercalary meristem. Growth of grasses ★★

② Secondary meristem → formed later from permanent tissue.

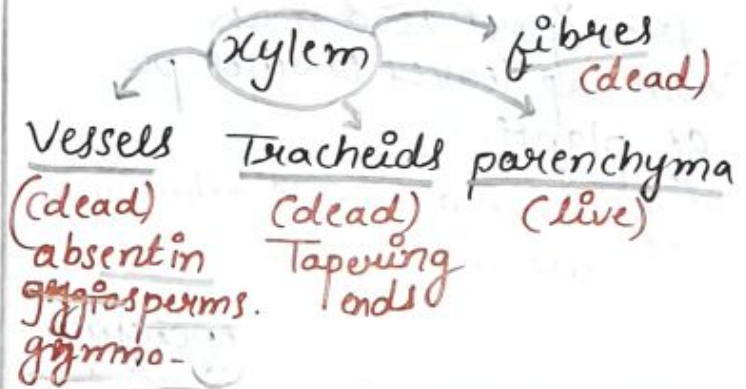
⑥ Collenchyma →

- mechanical strength.
- Living tissue
- Corners are thickened due to deposition of cellulose, hemicellulose, and pectin.

- Oval, spherical, polygonal.
- They can do photosynthesis when they contain chloroplast.
- provide mechanical support to growing parts of plants.
eg- Young stem

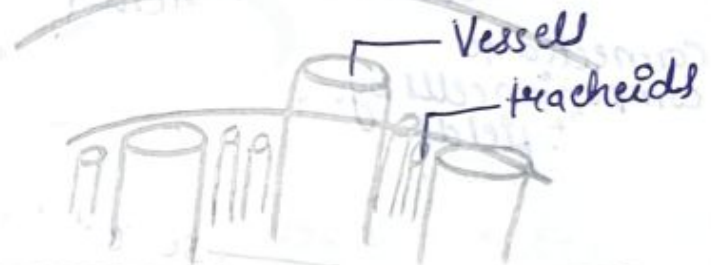
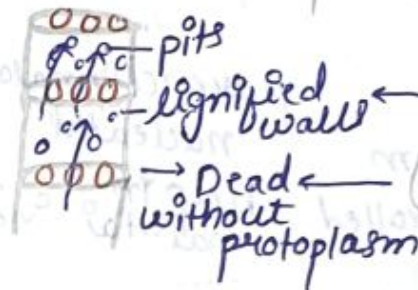


- Conducting tissue for water and minerals from root to stem and leaves



→ Vessels
Broad lumen
multicellular

→ Tracheids



parenchyma
living.
thin walls of cellulose
store fat, starch, tannins.
Radial conduction of water

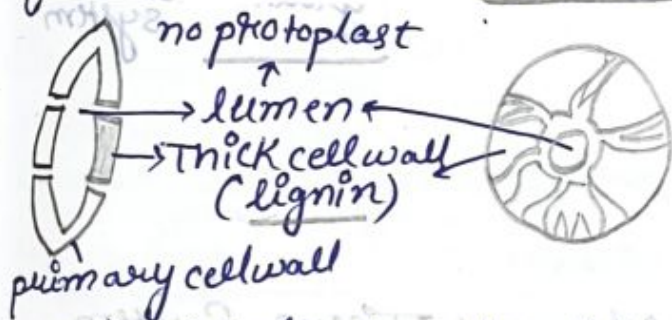
fibres
Highly thickened
Septate/aseptate
Obliterated central lumen

① Sclerenchyma

- Dead tissue without protoplast.
- provides mechanical strength

Sclerenchyma cells

fibres Sclereid



- Lignified cell walls with few or numerous pits (sec. cell walls)
- found in fruit walls of nuts, pulp of fruits like guava, pear, Sapota.
- seed coat of legumes
- Leaves of Tea

⑧ Complex permanent Tissue

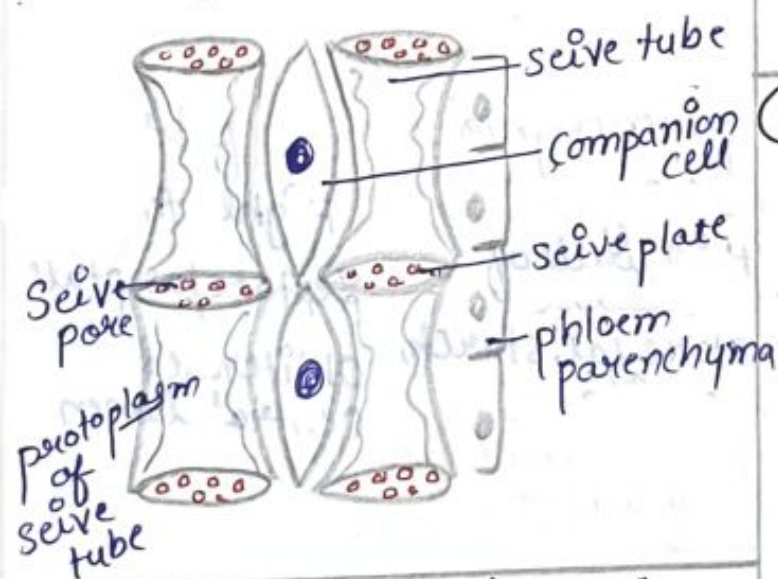
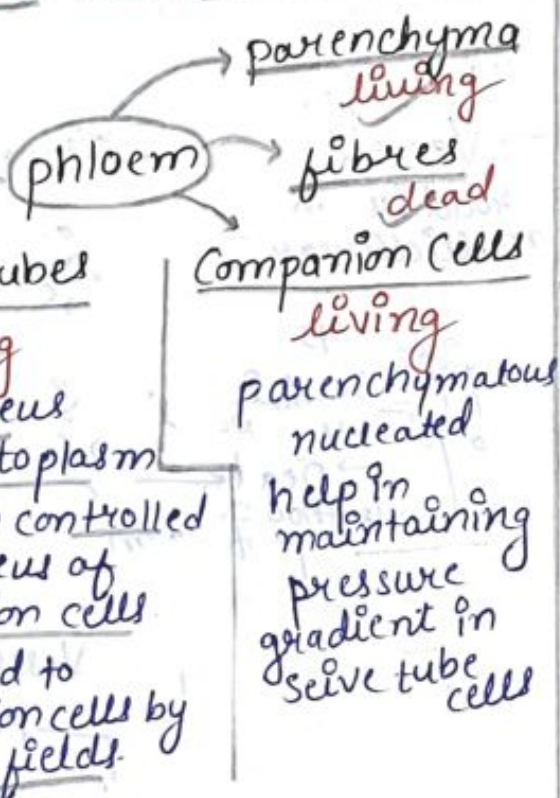
Xylem (mostly dead)

- Mechanical strength to part plants

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⑨ phloem

- mostly living.
- transport food materials from sap leaves to other parts of plants
- gymnosperms have albuminous cells and seive cells (*)



- phloem parenchyma: elongated, tapering, cylindrical cells. Dense cytoplasm

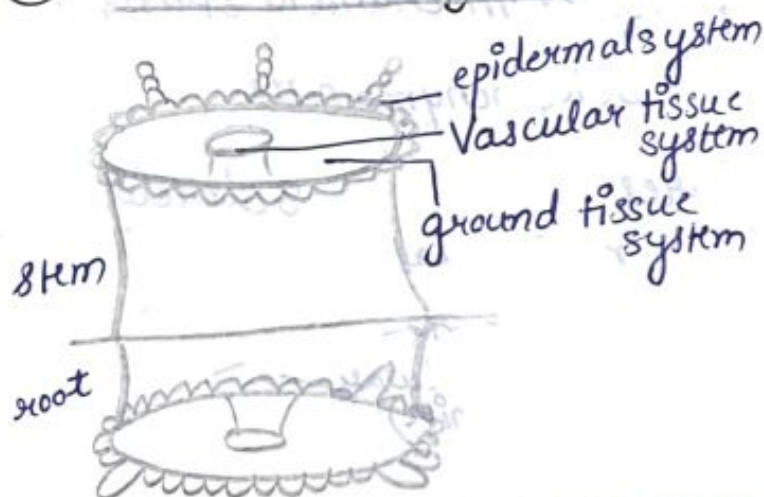
Cellulosic cell wall with pits stores food material, resins, latex; mucilage.

absent in most monocots

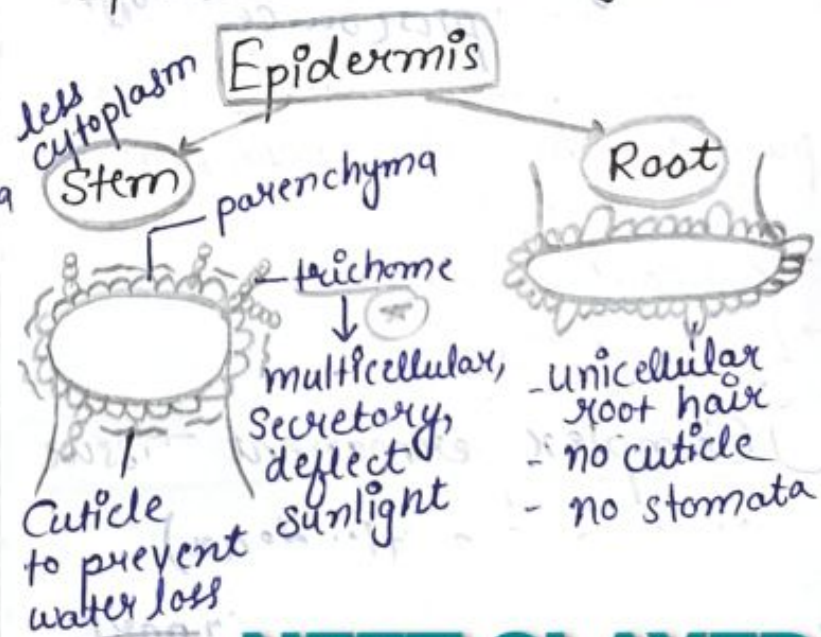
phloem fibres (Bast fibres)

- sclerenchymatous.
- absent in primary phloem, but present in secondary phloem
- Unbranched and pointed
- fibres of jute, flax, hemp.

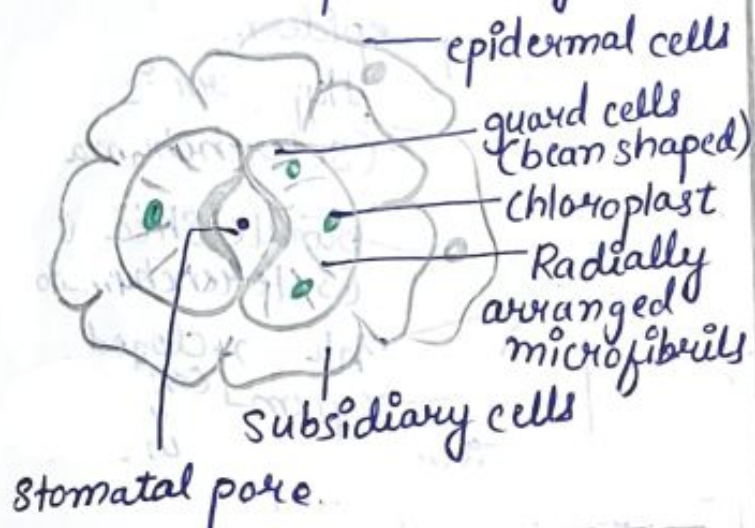
⑩ The Tissue System



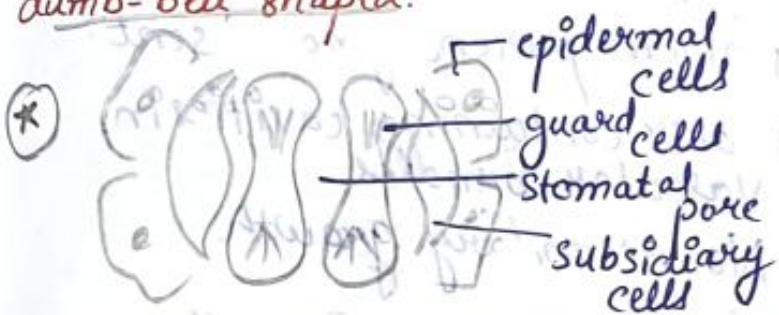
⑪ Epidermal Tissue System



(12) Stomata (as part of epidermal system)

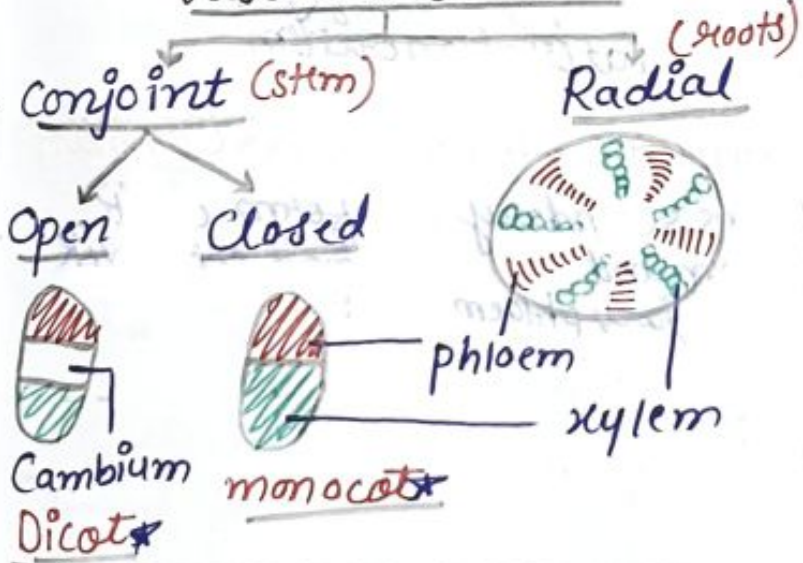


→ In grasses, guard cells are dumb-bell shaped.



(13) The Vascular Tissues

Vascular Bundles



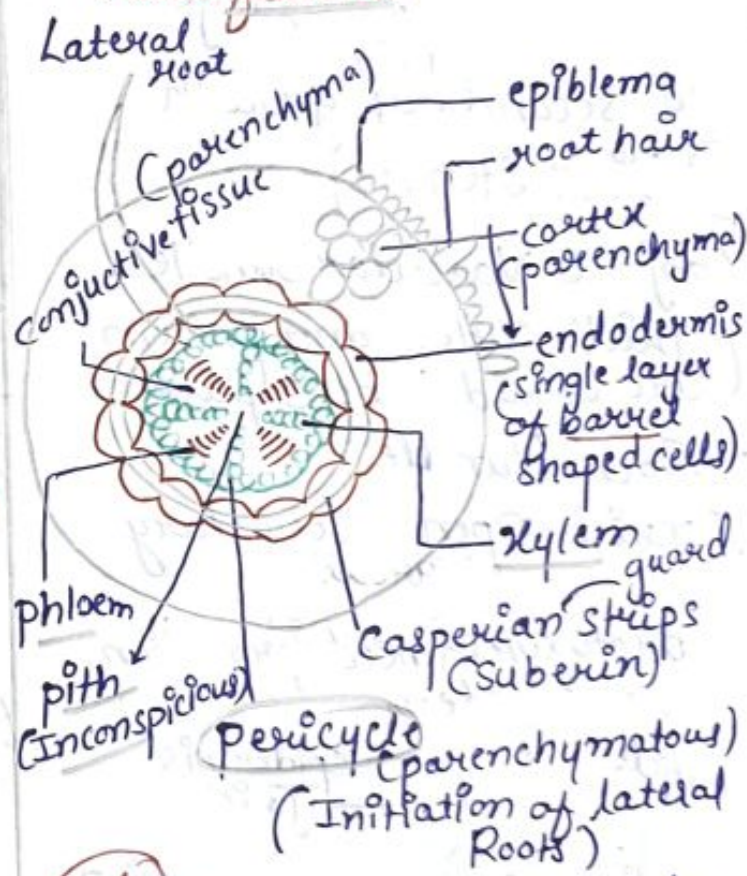
Thick → stem - fear - conjoint
→ root - fearless - Radial

(14) Anatomy of stem and roots



(14) Anatomy of Dicot Root

Thick - fearless

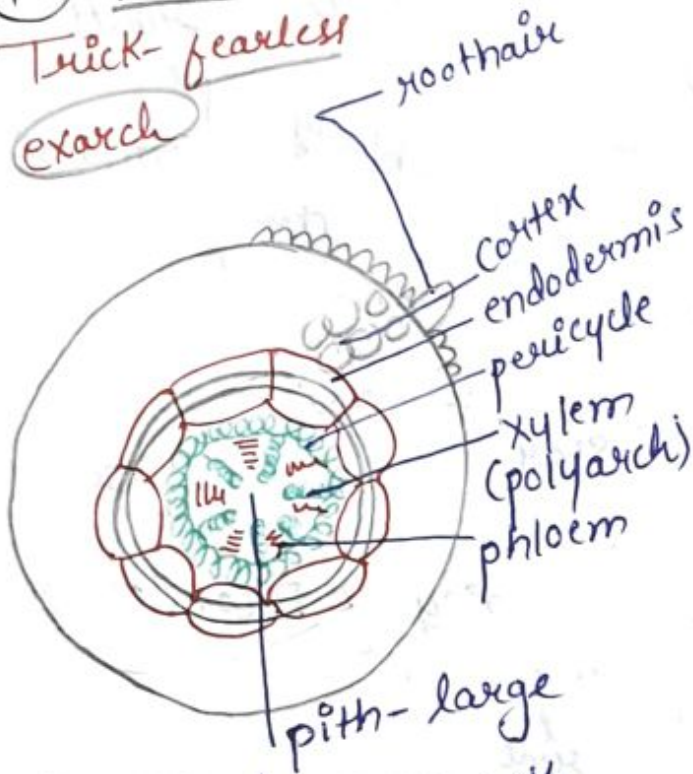


Stele all tissues inside endodermis
Undergoes secondary development

Thick
In Roots, protoxylem don't need protection, so outside (exarch) also radial vascular bundles, because xylem phloem fearless

⑮ Monocot Root

Thick - fearless
exarch



no secondary growth

⑯ Dicot Stem (Thick - fear)

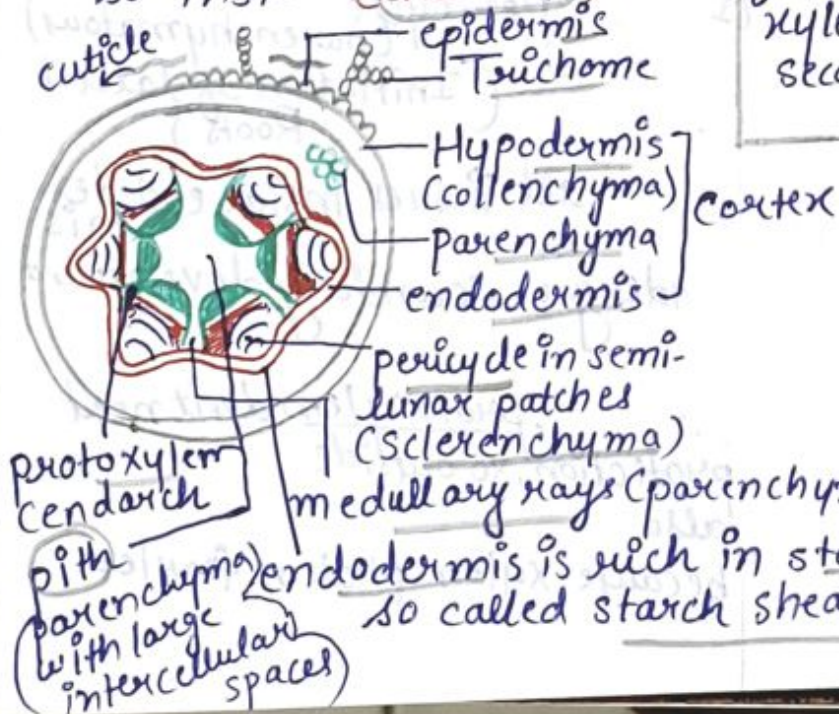
Conjoint Vascular bundles
(Thick - xylem and phloem are afraid to be separate)

→ Open Bundle

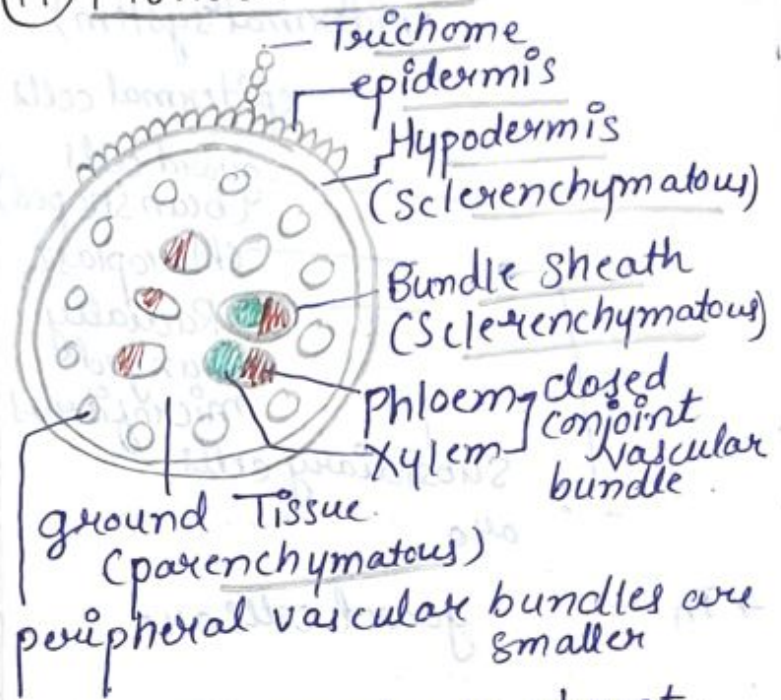
(Thick - Open to secondary growth)

→ protoxylem needs protection, so inside (endarch)

cuticle



⑰ Monocot Stem



peripheral vascular bundles are smaller

phloem parenchyma absent.

Water containing cavities in vascular bundles.

No secondary growth

⑱ Secondary Growth

Increase in girth of Dicot system and root is secondary growth

lateral meristem

Vascular Cambium

forms secondary xylem and secondary phloem

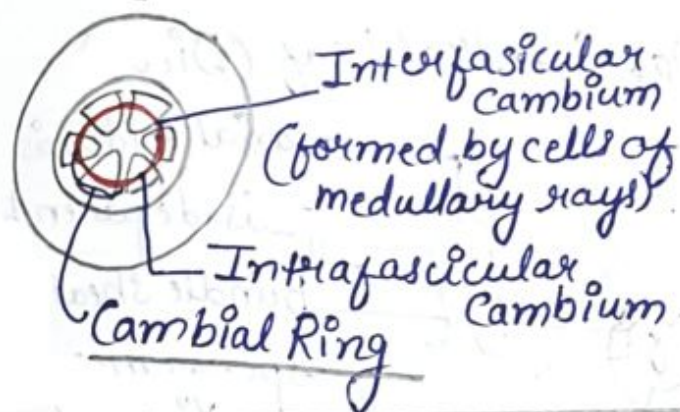
Cork Cambium

form cork and sec. cork

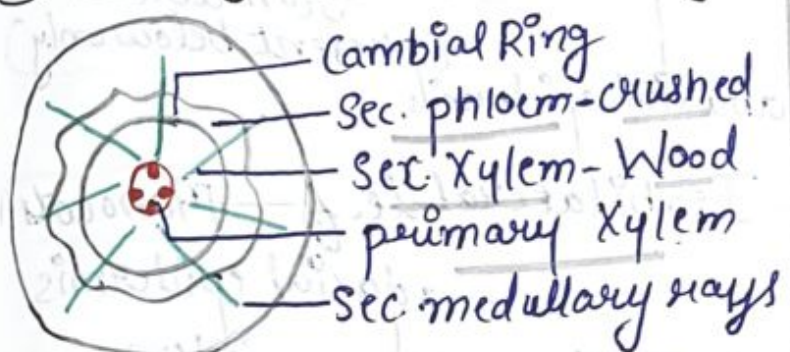
OK



19) Formation of Cambial Ring - (Dicot Stem) →



20) Activity of Cambial Ring



Sec. Xylem (Wood) is formed more than Sec. phloem.

Sec. phloem, primary phloem and other tissues are crushed.

Everything outside Vascular Cambium is Bark.

21) Spring and Autumn Wood.

① In temperate regions.

— autumn wood and spring wood form the annual ring *

used to estimate age of plant.

wood - sec Xylem



22) Heart Wood and Sap Wood

Heart Wood →

Inner Secondary Xylem.

Dark Brown due to deposition of tannins, resins, oils, gums etc.

Hard, durable, resistant to insect attacks.

Doesn't Conduct water, gives mechanical strength.

— Sapwood.

peripheral region of sec. Xylem
Lighter in Colour.

Conduction of Water.

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(23) Cork Cambium

Cork cambium (phellogen) develops in Cortex region.

Few layers thick.

→ forms cork (phellem) on the outside (impervious to water due to suberin deposits) dead cells

→ forms secondary cortex (phelloderm) on the inside (parenchymatous)

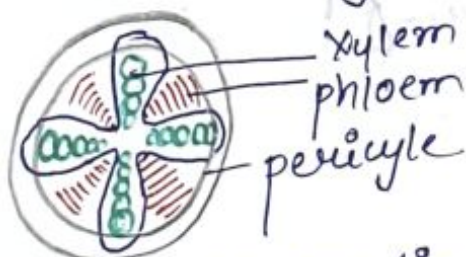
phellogen + phellem + phelloderm
= periderm

Bark → Early / Soft bark (formed early in the season)

↓
Late / Hard Bark (formed at the end of season)

(24) Secondary growth in Dicot Root →

Vascular cambium is totally secondary in Origin.

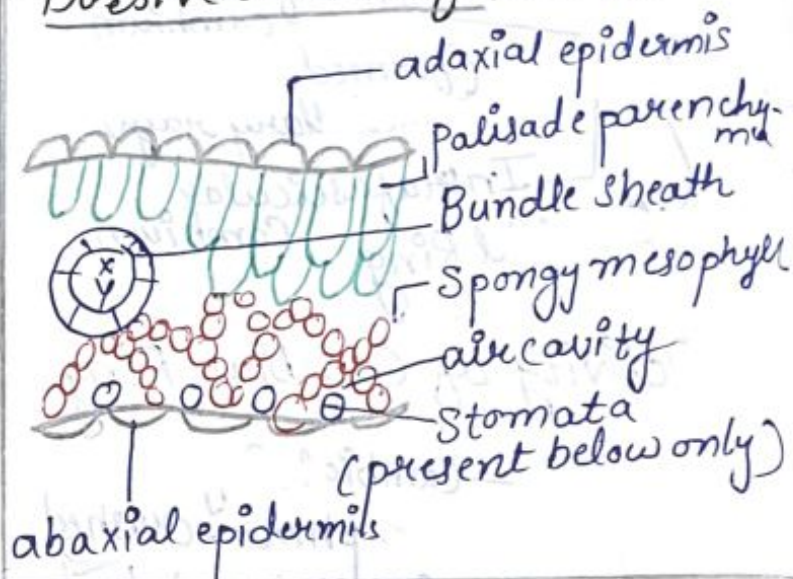


Originates from tissue, just below phloem and portion

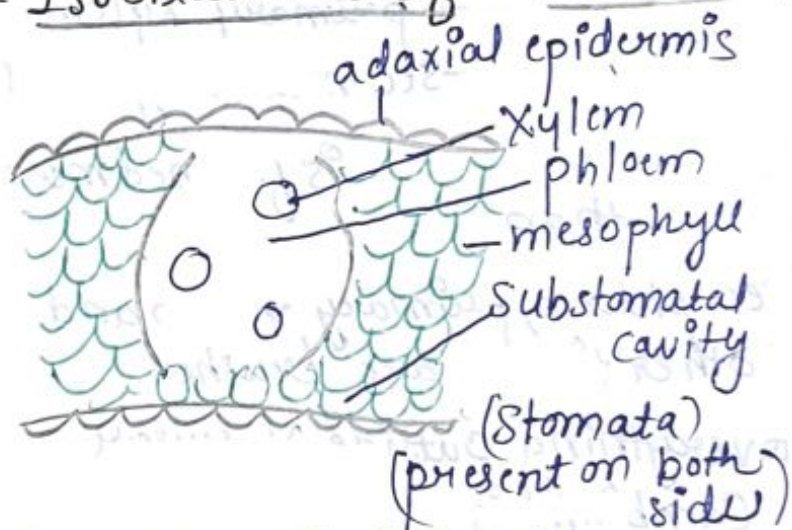
of pericycle above protoxylem.

(25) Leaf →

- Dorsiventral Leaf (Dicots)



- Isobilateral leaf — Monocots



Certain adaxial epidermal cells modify in grasses to form bulliform cells.

↓
minimise water loss

Lenticels Gaseous exchange.

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