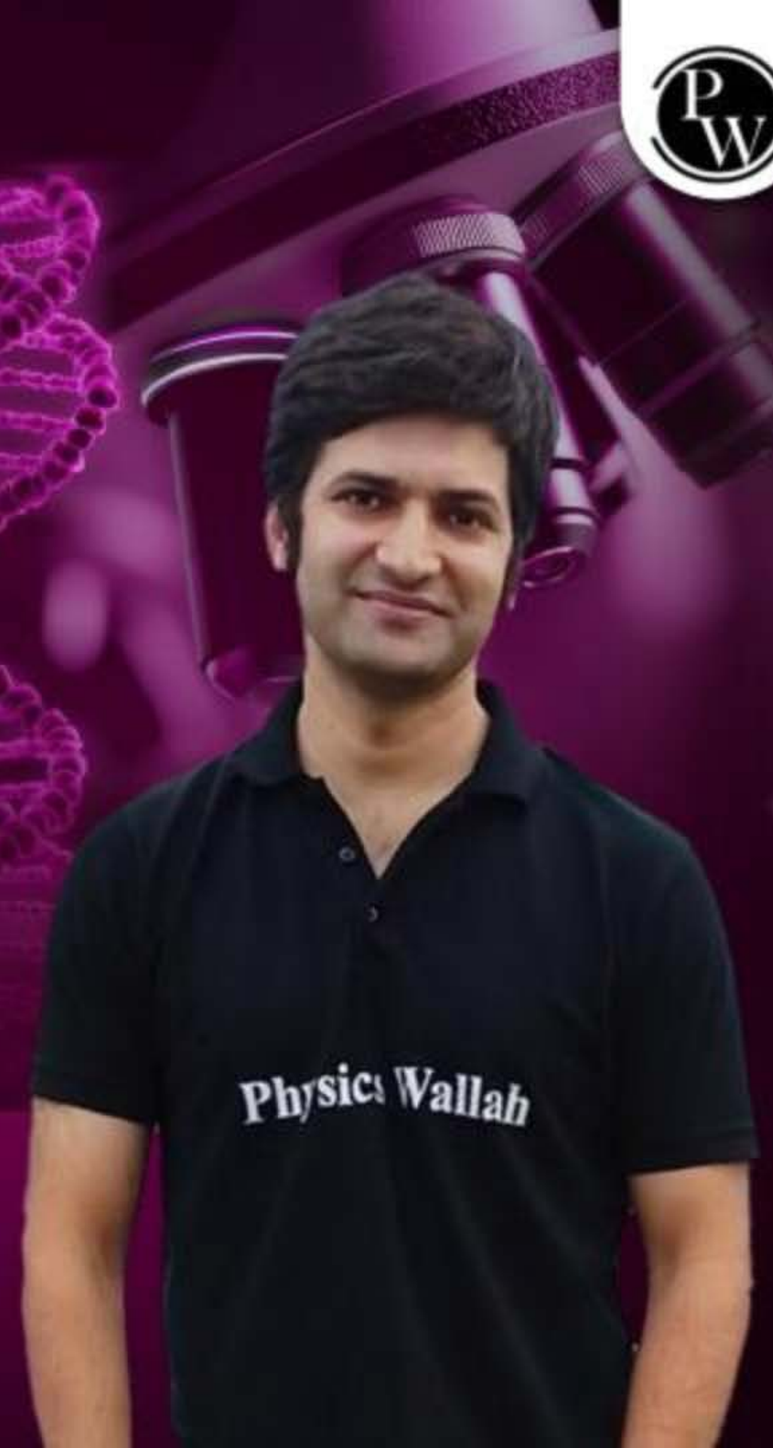
PRACHAND NEET

ONE SHOT

Botany

Anatomy of Flowering Plants



Rupesh Chaudhary Sir

TISSUE

* GROUP OF CELL : COMMON ORIGIN, & FUNCTION.

TYPES

① MERISTEMATIC TISSUE

* Cells : actively dividing
* Cell wall : PRIMARY WALL
* Immature cell

② PERMANENT TISSUE

* Cells usually do not Divide
* mature cell

NOTE : TERMINOLOGY

Meristematic Cell / TISSUE (DIVIDING)

DIFFERENTIATION.

(DIFFERENTIATION)

Cells stop DIVISION

PERMANENT TISSUE

DEDIFFERENTIATION

NEET 2024

Cells Regain Capacity of DIVISION

MERISTEMATIC CELL / TISSUE

Cell stop division

REDIFFERENTIATION

PERMANENT TISSUE

PRIMARY MERISTEM

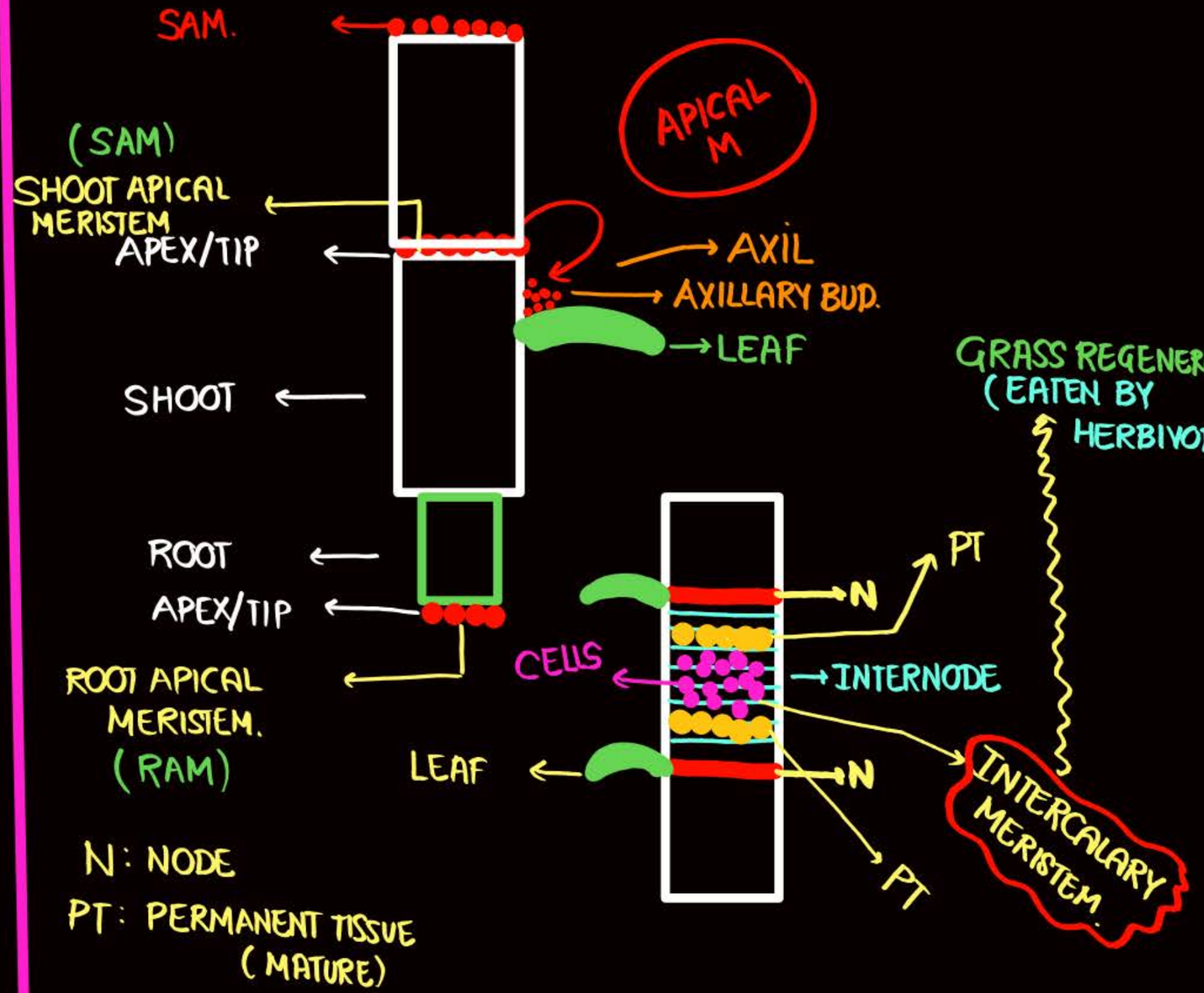
PRIMARY PERM. TISSUE

SECONDARY MERISTEM.

SECONDARY PERMAN. TISSUE

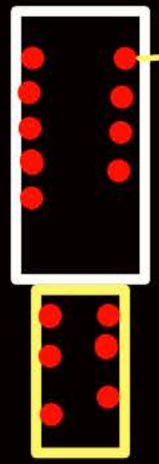
	PM	SM
FORMED:	EARLY	LATER.
FUNCTION:	LENGTH (ROOT, STEM) INCREASE	GIRTH/THICKNESS/ DIAMETER INCREASE
	PRIMARY GROWTH (EARLY)	SECONDARY GROWTH (LATER)
	PRIMARY XYLEM & PRIMARY PHLOEM FORMED (PRIMARY TISSUE)	SECONDARY XYLEM, SECONDARY PHLOEM (SECONDARY TISSUE)
	eg: APICAL M. → SAM, RAM INTERCALARY M.	eg LATERAL MERISTEM

SOME CELLS SEPERATED FROM SAM AND COLLECTED IN AXIL REGION CALLED AXILLARY BUD → FORM → BRANCH, FLOWER.



N: NODE

PT: PERMANENT TISSUE (MATURE)



STEM

ROOT

→ LATERAL SIDE

↓

MERIST. CELL

(LATERAL M.)

↓

SECONDARY GROWTH

(LATER)

eg ★ INTRAFASCICULAR CAMBIUM / FASCICULAR CAMBIUM → EARLY FORMED (ORIGIN) → PRIMARY MERISTEM (EXCEPTION) → GIRTH INCREASE (FUNCTION) (LATER) → SECONDARY GROWTH.

★ INTERFASCICULAR CAMBIUM

★ CORK CAMBIUM

→ LATER FORMED → SEC. GROWTH

SECONDARY MERISTEM.

★ All LATERAL M ARE SECONDARY M.
(FALSE)

★ ALL SECON. MERISTEM ARE LATERAL MERISTEM.
(TRUE)

PERMANENT TISSUE (P.T)

SIMPLE P.T

NEET 2024.

⇒ ONE TYPE OF CELL: PERFORM COMMON FUNCTION.

PARENCHYMA, COLLENCHYMA → CELLS DO NOT LOSE PROTOPLASM → LIVING

SCLERENCHYMA → CELLS LOSE PROTOPLASM → DEAD

PARENCHYMA

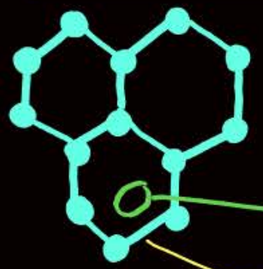
EITHER CLOSELY PACKED OR LITTLE INTERCELLULAR SPACE

CELL WALL: THIN, CELLULOSE

CHLOROPLAST → PHOTOSYNTHESIS, FOOD STORAGE, SECRETE OIL, RESIN, TANIN, MUCILAGE, LATEX.

* Cells isodiametric

COLLENCHYMA



INTERCELLULAR SPACE ABSENT.

CHLOROPLAST (PHOTOSYNTHESIS)

CELL WALL (CELLULOSE, HEMICELLULOSE, PECTIN)

deposition more at CORNERS → THICK

⇒ YOUNG STEM, PETIOLE OF LEAF. (MECHANICAL STRENGTH).

⇒ most of dicot stem. (BELOW EPIDERMIS)

→ epidermis

→ HYPODERMIS (COLLENCHYMA)

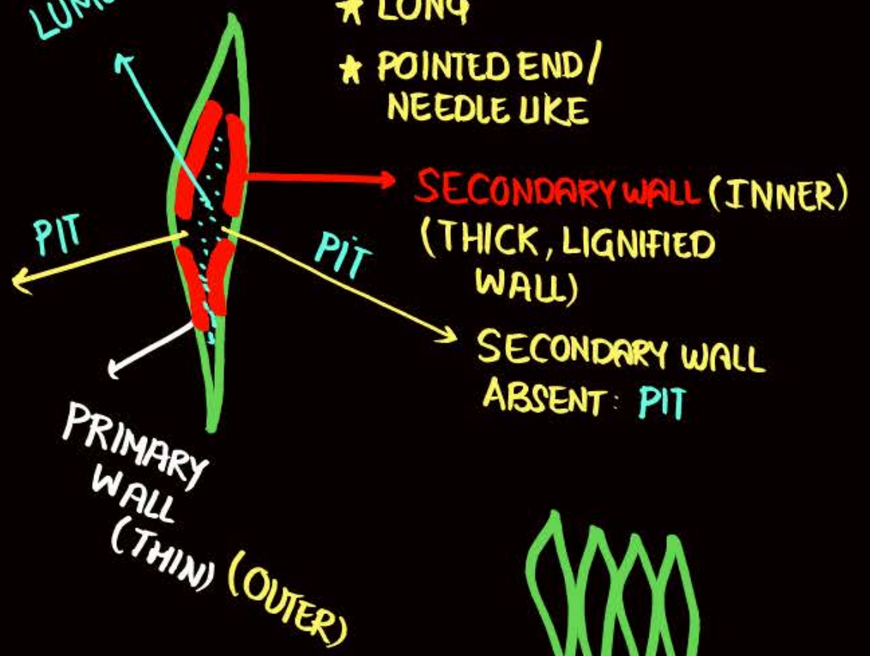
MONOCOT STEM: HYPODERMIS (SCLERENCHYMA).

ROOT: HYPODERMIS ABSENT.

SCLERENCHYMA

FIBRE (DEAD).

- ★ LONG
- ★ POINTED END / NEEDLE LIKE



PW + SW → CELL WALL

USULALLY FOUND IN BUNDLES.

SCEREIDS (DEAD).

- ★ SPHERICAL, OVAL, POLYGONAL.
- ★ SINGLE / GROUP.
- ★ FRUIT WALL OF NUTS.
- ★ SAPOTA, PEAR, GUAVA (PULP/SOFT PART)
- ★ SEED COAT OF LEGUMES.
- ★ LEAVES OF TEA.
- ★ LIGNIFIED CELL WALL.
- ★ NARROW LUMEN.

COMPLEX PER. TISSUE (NEET 2024)

* MORE THAN ONE TYPE OF CELL.

① XYLEM :

* water & minerals conduction.
* PROVIDE MECHANICAL STRENGTH.

* TRACHEID
* VESSEL
* XYLEM FIBRE

→ LOOSE PROTOPLASM (DEAD)

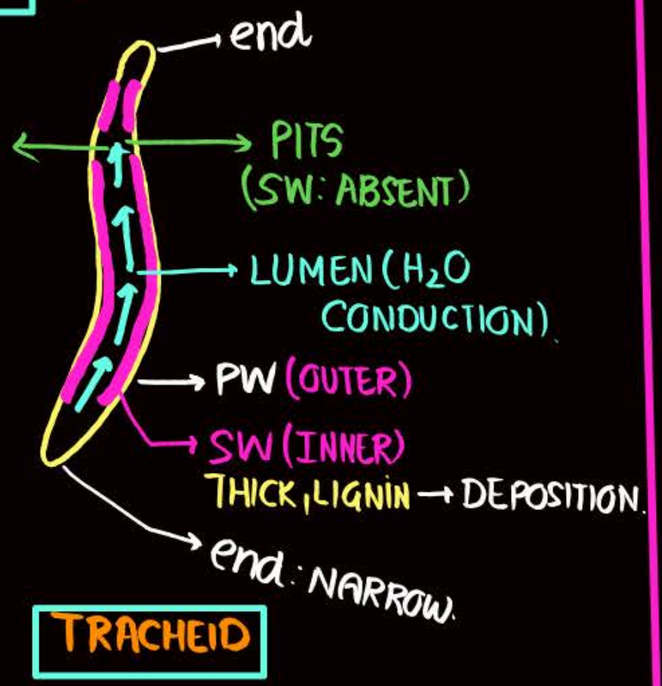
* XYLEM PARENCHYMA → LIVING

TRACHEID → elongated, TUBE LIKE CELL.

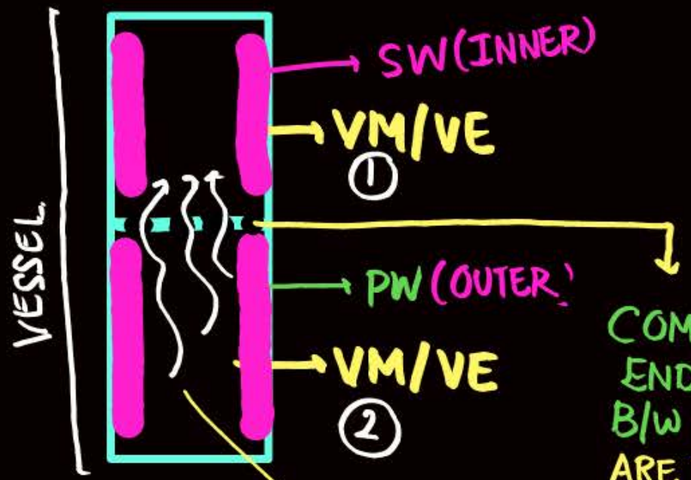
PTERIDO, GYMNO, ANGIOSPERM

VESSEL

ANGIOSPERM → FLOWERING PLANT.



TRACHEID



* LONG, CYLINDRICAL TUBE LIKE CELL

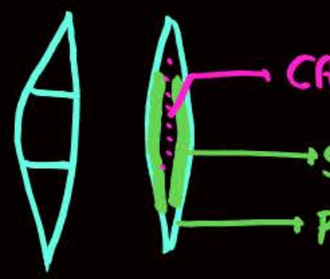
VESSELS

VM: VESSEL MEMBER

VE: VESSEL ELEMENT

* VESSEL MADE UP OF MANY CELL & EACH CELL: VM/VE

XYLEM FIBRE



THICK, LIGNIFIED CELL WALL, DEAD

XYLEM PARENCHYMA.

- LIVING, THIN WALL, CELLULOSE.
- FOOD: STORE: STARCH / FAT
- STORE: TANIN
- RADIAL COND^{N} OF H_2O: RAY PARENCHYMA.

WAIT ?

ENDARCH (STEM)

EXARCH. (ROOT)

TYPES OF XYLEM

PRIMARY X.

- EARLY FORMED DURING PRIMARY GROWTH

PROTOXYLEM

- ⇒ FIRST FORMED
- ⇒ NARROW / SMALL VESSELS

METAXYLEM.

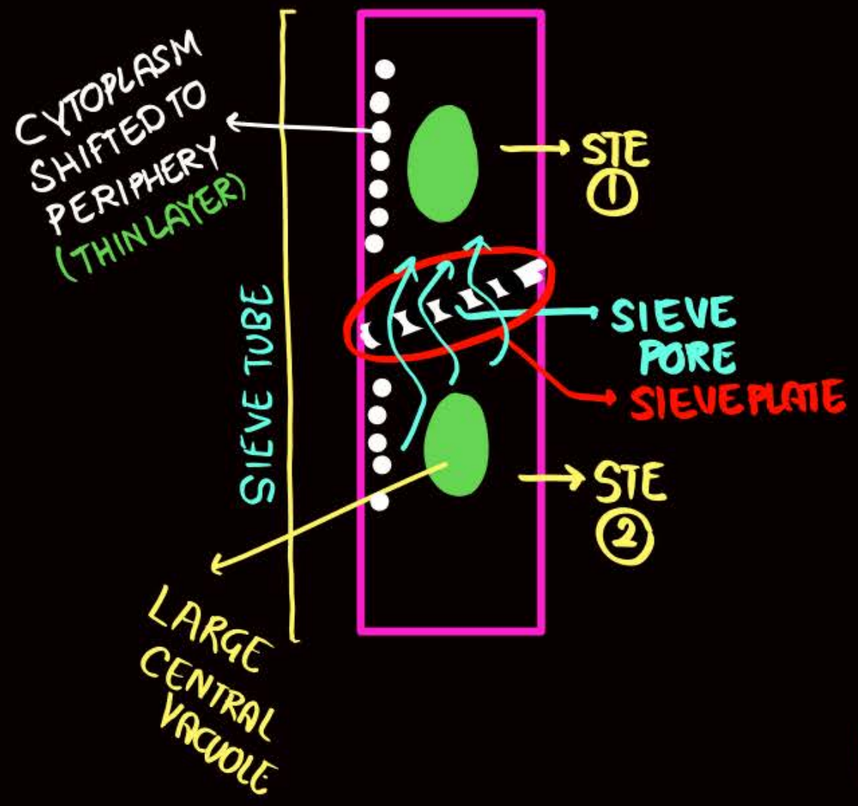
- ⇒ LATER.
- ⇒ BROAD / LARG VESSELS.

SEC. XYLEM.

- LATER
- DURING SEC. GROWTH.

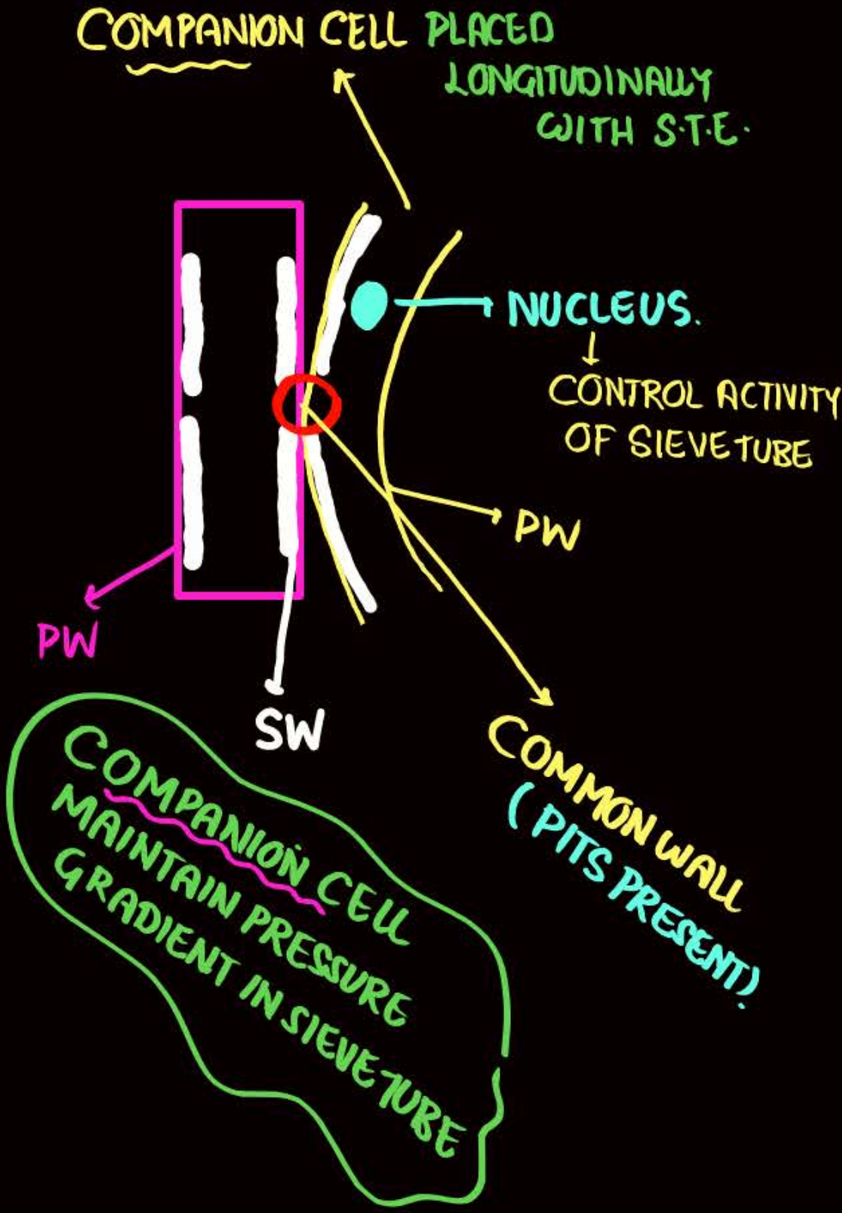
PHLOEM

- FOOD CONDN.
  - ANGIOSPERM.
    - SIEVE TUBE
    - COMPANION CELL.
    - PHLOEM PARENCHYMA.
    - → LIVING
    - PHLOEM FIBRE → DEAD.
  - GYMNOSPERM.
    - SIEVE CELL
    - ALBUMINOUS CELL.



SIEVE TUBE

- MADE UP OF STE (SIEVE TUBE ELEMENT).
- CELL WALL : CELLULOSE
- NUCLEUS ABSENT.
- FOOD CONN FROM ONE STE TO ANOTHER THROUGH SIEVE PORE

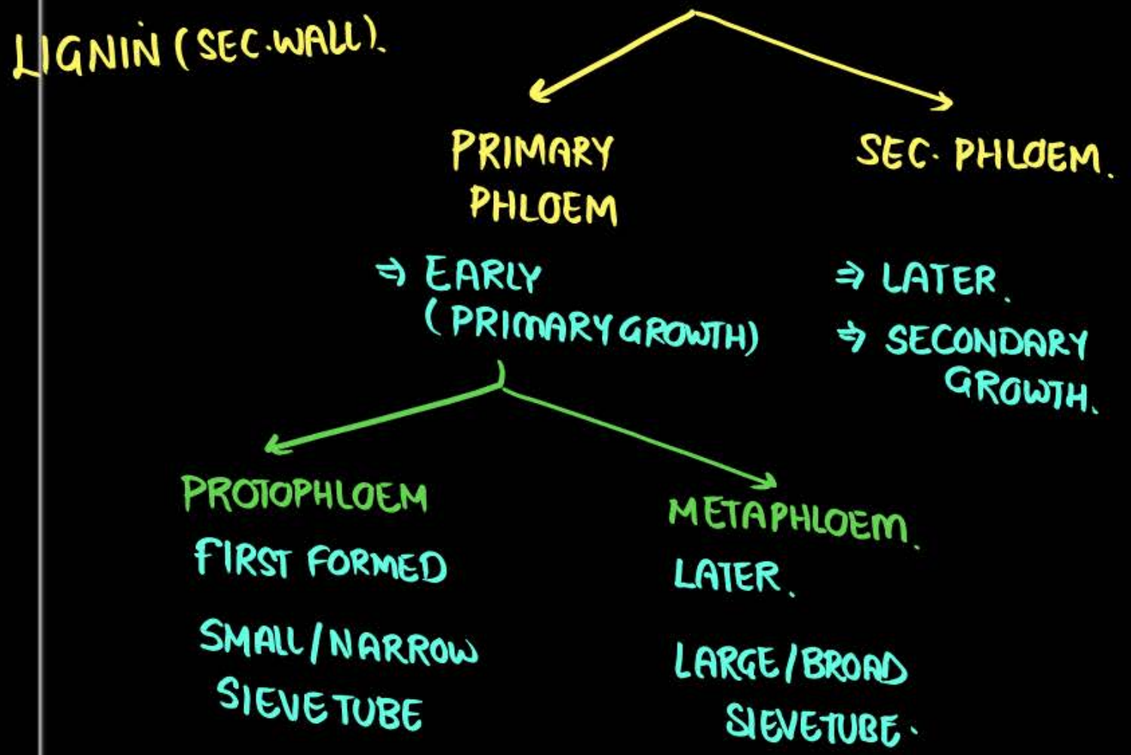


Phloem fibres (bast fibres) are made up of sclerenchymatous cells. These are generally absent in the primary phloem but are found in the secondary phloem. These are much elongated, unbranched and have pointed, needle like apices. The cell wall of phloem fibres is quite thick. At maturity, these fibres lose their protoplasm and become dead. Phloem fibres of jute, flax and hemp are used commercially. The first formed primary phloem consists of narrow sieve tubes and is referred to as **protophloem** and the later formed phloem has bigger sieve tubes and is referred to as **metaphloem**.

Explanation

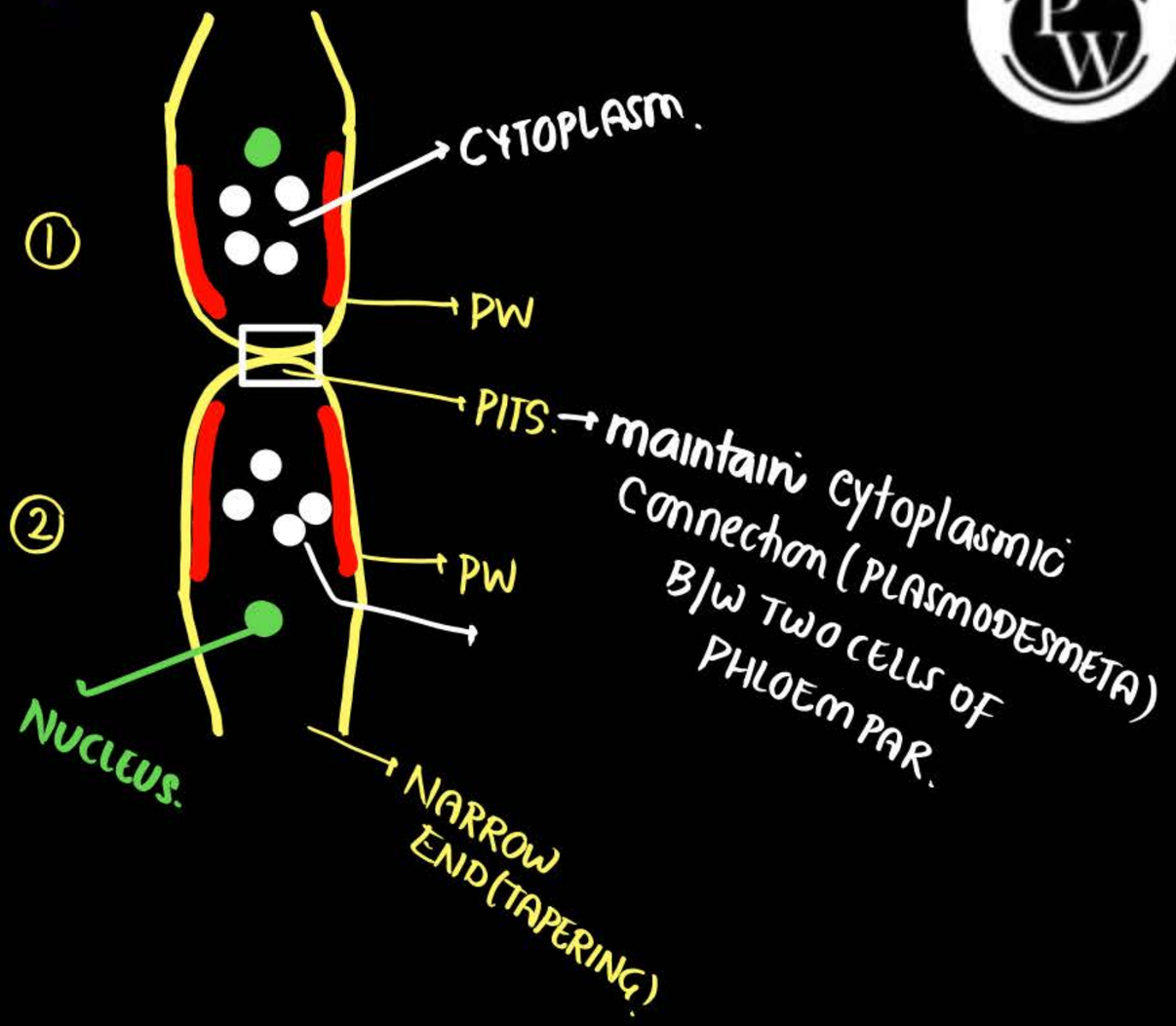
EARLY (PRIMARY GROWTH)

LIGNIN (SEC. WALL).



Phloem parenchyma is made up of elongated, tapering cylindrical cells which have dense cytoplasm and nucleus. The cell wall is composed of cellulose and has pits through which plasmodesmatal connections exist between the cells. The phloem parenchyma stores food material and other substances like resins, latex and mucilage. Phloem parenchyma is absent in most of the monocotyledons. Stem.

Explanation



TISSUE SYSTEM.

EPIDERMAL TISSUE SYSTEM.

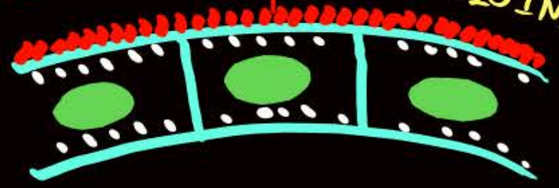
- → EPIDERMIS
- → STOMATA
- → EPIDERMAL APPENDAGES.

a) EPIDERMIS

→ STEM
→ LEAF

ROOT ABSENT.

CUTICLE (CUTIN) H_2O IMPERMEABLE (minimise H_2O loss/ TRANSPIRATION)



⇒ CELLS : ELONGATED, COMPACTLY ARRANGE

⇒ GENERALLY SINGLE LAYER.

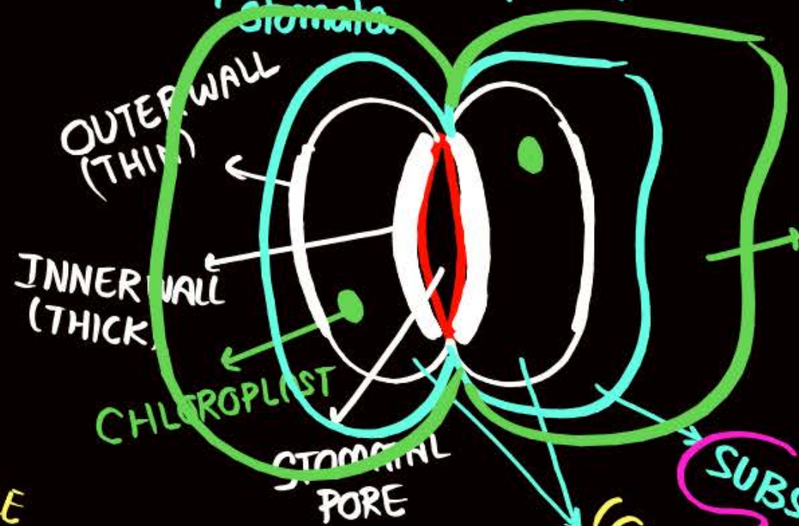
⇒ CONTINUOUS.

⇒ CENTRE : LARGE VACUOLE.

⇒ Cytoplasm : periphery : THIN LAYER.

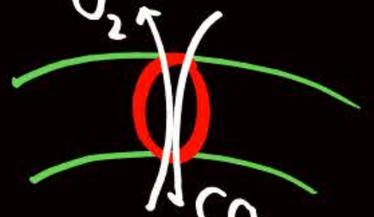
b) STOMATA

⇒ epidermis interrupted By Stomata.



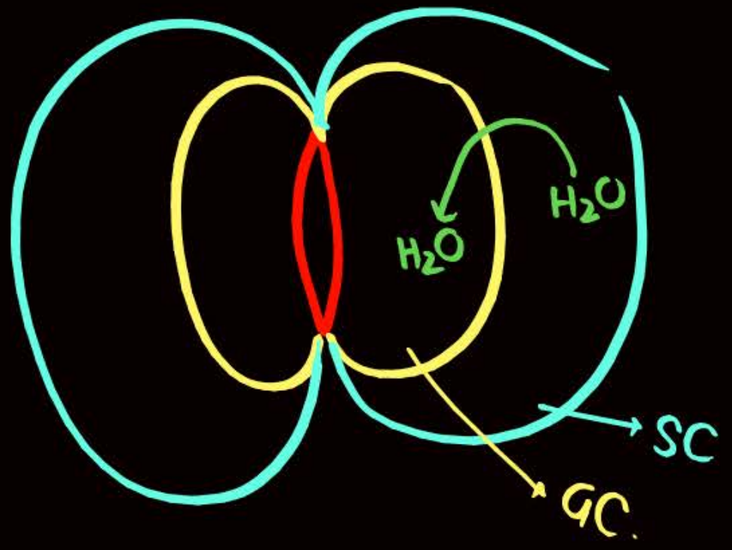
1. STOM. PORE
2. GUARD CELL
3. SUBSIDIARY CELL

STOMATAL APPARATUS.



* gaseous exchange
* TRANSPIRATION

monocot (grass) dumbell shape (guard cell).



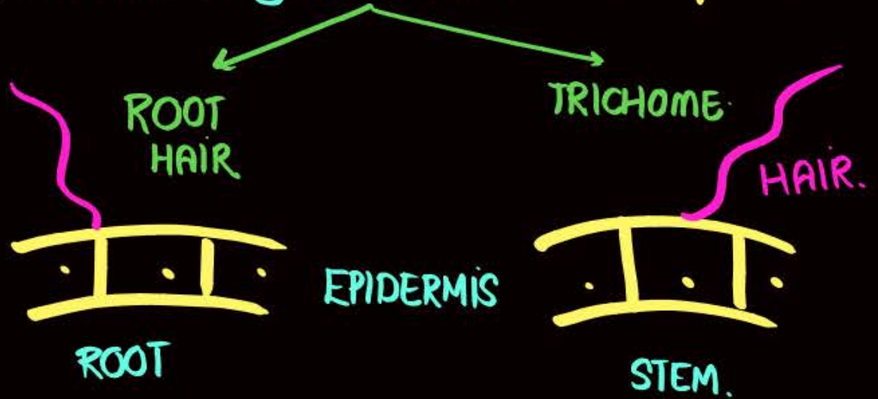
SC $\xrightarrow{H_2O}$ GC → SWELL/TURGID → STOMATA PORE OPEN.

GC $\xrightarrow{H_2O}$ SC

→ SHRINK/FLACCID → STOMATA CLOSED.

EPIDERMAL APPENDAGES

⇒ some outgrowth/structure arise from epidermis



- UNICELLULAR.
- absorption of H_2O/ mineral.

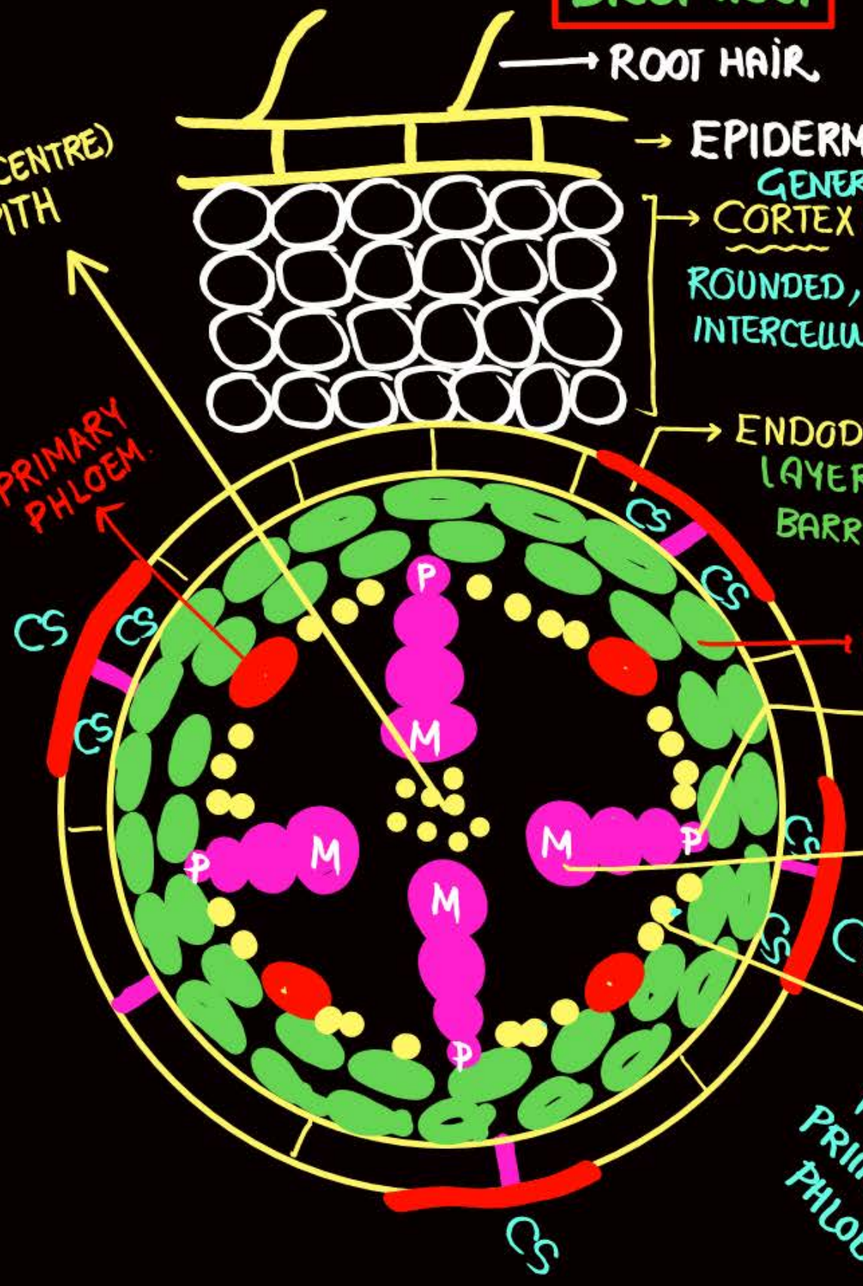
- MULTICELLULAR (MOSTLY) OR UNICELLULAR.
- SOFT / STIFF
- BRANCHED / UNBRANCHED.
- SECRETE OIL
- TRANSPIRATION / H_2O LOSS PREVENT

VASCULAR TISSUE SYSTEM.

→ RADIAL VASCULAR BUNDLE & EXARCH (DICOT, MONOCOT ROOT)

→ CONJOINT VASCULAR BUNDLE & ENDARCH. (DICOT, MONOCOT STEM).

DICOT ROOT



- RADIAL & TANGENTIAL CWALL: WATER IMPERMEABLE SUBSTANCE (SUBERIN) PRESENT: CASPARIAN STRIPS (CS).
- CORTEX → GENERAL CORTEX. (OUTER LAYER)
  → ENDODERMIS (INNER LAYER)
- PERICYCLE (THICK WALLED PARENCHYMA) (PERMANENT TISSUE) —dedifferentiation→ meristematic cell. OR SECONDARY MERISTEM. (VASCULAR CAMBIUM) ↓ INCREASE THICKNESS OF ROOT.
  → FORM LATERAL ROOT (SECONDARY & TERTIARY ROOT)
- PITH/CENTRE: PARENCHYMA. IS NOT WELL DEVELOPED
- PITH INCONSPICUOUS, SMALL.
- EXARCH.
- PROTOXYLEM + METAXYLEM → PRIMARY XYLEM
- METAXYLEM TOWARDS: PITH/CENTRE
  PROTOXYLEM TOWARDS: PERIPHERY/OUTER
- PRIMARY XYLEM & PRIMARY PHLOEM: DIFFERENT LINE/RADIUS, ALTERNATE
  RADIAL VASCULAR BUNDLE

STELE

PITH → XYLEM, PHLOEM → PERICYCLE
(VASCULAR TISSUE)

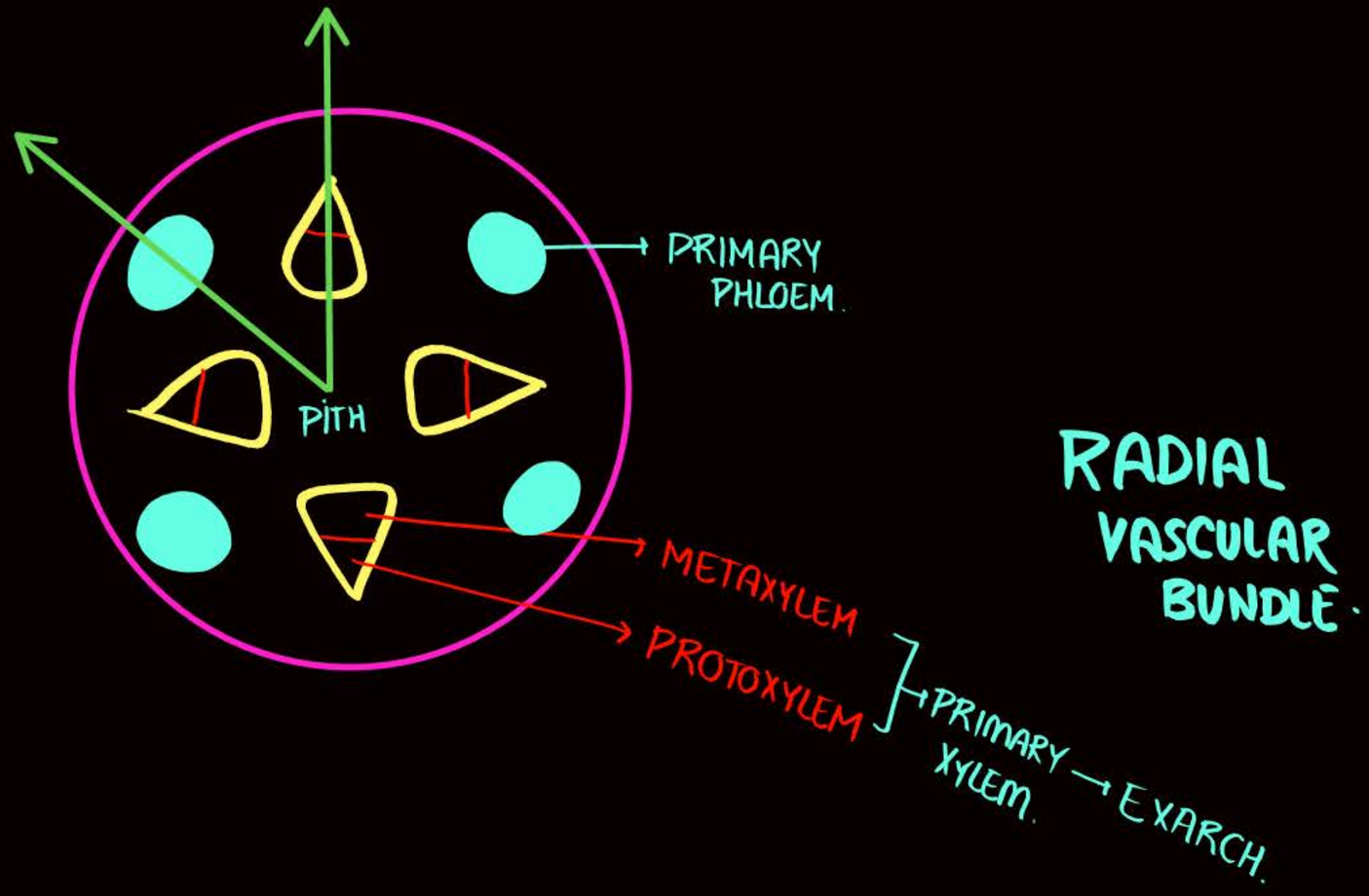
★ 4: XYLEM , 4: PHLOEM.
(TETRACH ROOT).

★
- 2 → X, P
- 3 → X, P
- 4 → X, P

→ most common → DIARCH TO TETRACH.

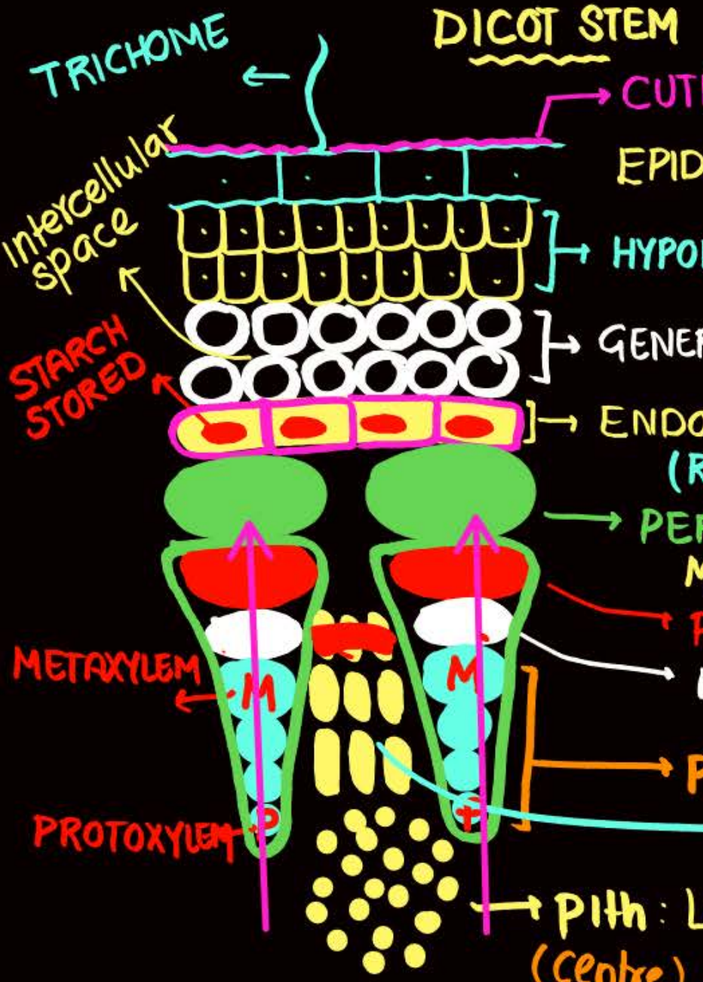
- 5 → X, P → PENTARCH
- 6 → X, P → HEXARCH.

	DICOT ROOT	MONOCOT ROOT
PERICYCLE	VASCULAR CAMBIUM → ABSENT LATERAL ROOT → PRESENT	
SECONDARY GROWTH (THICKNESS)	✓	×
SECONDARY XYLEM	✓	×
PITH	small, inconspicuous. (NOT WELL DEVELOPED)	LARGE, CONSPICUOUS (WELL DEVELOPED)
VASCULAR BUNDLE	2 TO 4 FEWER EXARCH, RADIAL	MORE THAN SIX (POLYARCH) MORE EXARCH, RADIAL



RADIAL VASCULAR BUNDLE.

DICOT STEM



(PRIMARY MERISTEM)
menst cell (Intrafascicular Cambium)

MEDULLARY RAYS (PARENCHYMA) PERMANENT TISSUE. —dedifferentiation→ merist cell / secondary meristem / interfascicular cambium

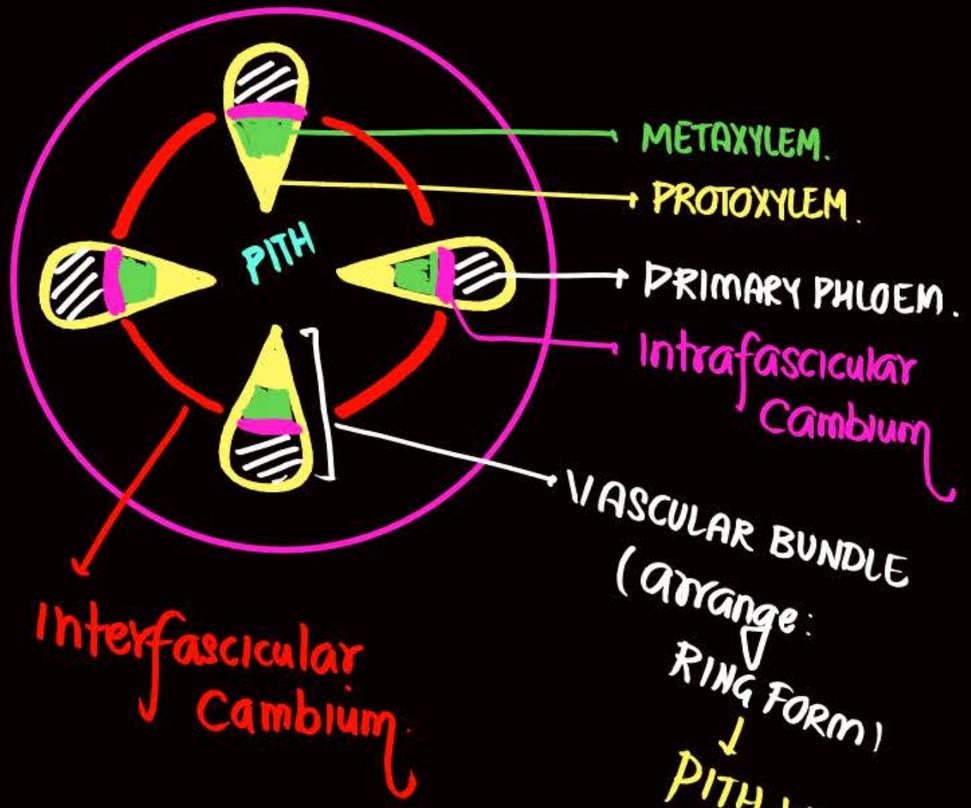
INTRAFASCICULAR CAMBIUM (PRIMARY MERISTEM) FORMED EARLY + interfas. cambium (SECON. MERISTEM) LATER FORMED → VASCULAR CAMBIUM.

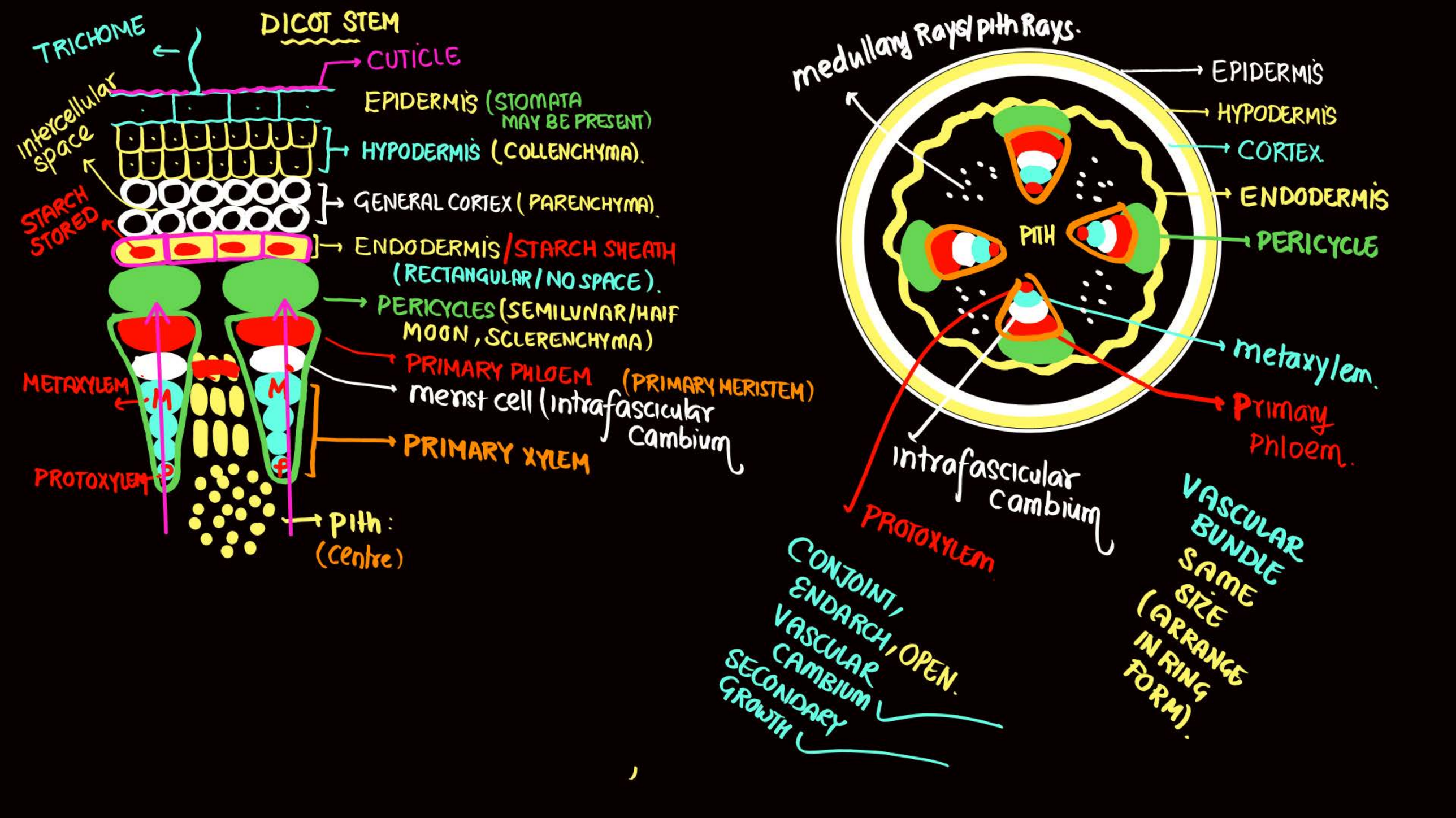
VASCULAR CAMBIUM ↓

SECONDARY GROWTH. (FORMATION OF SECONDARY XYLEM & SECON. PHLOEM)

PROTOXYLEM: TOWARDS PITH
METAXYLEM: PERIPHERY/OUTER.
ENDARCH.

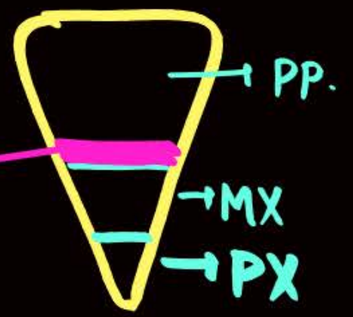
PRIMARY XYLEM & PRIMARY PHLOEM: SAME LINE / PRIMARY XYLEM COVERED BY PRIMARY PHLOEM:
CONJOINT VASCULAR BUNDLE


METAXYLEM.
PROTOXYLEM.
PITH
PRIMARY PHLOEM.
Intrafascicular Cambium
VASCULAR BUNDLE (arrange: RING FORM)
PITH WELL DEVELOPED.
Interfascicular Cambium.


DICOT STEM
TRICHOME
CUTICLE
Intercellular space
EPIDERMIS (STOMATA MAY BE PRESENT)
HYPODERMIS (COLLENCHYMA).
STARCH STORED
GENERAL CORTEX (PARENCHYMA).
ENDODERMIS/STARCH SHEATH (RECTANGULAR/NO SPACE).
PERICYCLES (SEMILUNAR/HAIF MOON, SCLERENCHYMA)
PRIMARY PHLOEM
(PRIMARY MERISTEM)
menst cell (Intrafascicular Cambium
METAXYLEM
PRIMARY XYLEM
PROTOXYLEM
Pith: (Centre)
medullary Rays/pith Rays.
EPIDERMIS
HYPODERMIS
CORTEX
ENDODERMIS
PERICYCLE
PITH
metaxylem.
Primary Phloem.
intrafascicular cambium
PROTOXYLEM
CONJOINT, ENDARCH, OPEN.
VASCULAR CAMBIUM
SECONDARY GROWTH
VASCULAR BUNDLE
SAME SIZE
(ARRANGE IN RING FORM).

CONJOINT (STEM)

OPEN
↓
DICOT STEM

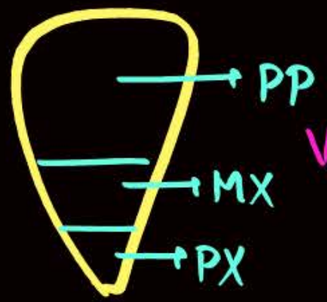


VASCULAR CAMBIUM PRESENT

SEC. GROWTH ✓

SEC XYLEM ✓

CLOSED.
↓
MONOCOT STEM



VASCULAR CAMBIUM ABSENT

SEC. GROWTH ✗

SEC XYLEM ✗

2. The Ground Tissue System

All tissues except epidermis and vascular bundles constitute the **ground tissue**. It consists of simple tissues such as parenchyma, collenchyma and sclerenchyma. Parenchymatous cells are usually present in cortex, pericycle, pith and medullary rays, in the primary stems and roots. In leaves, the ground tissue consists of thin-walled chloroplast containing cells and is called **mesophyll**.

Explanation

EPIDERMIS ⟶ EPIDERMAL TISSUE SYSTEM.

XYLEM, PHLOEM ⟶ VASCULAR TISSUE SYSTEM.

HYPOD, CORTEX, ENDODE, PERICYCLE, PITH, PITH RAYS : GROUND TISSUE SYST.

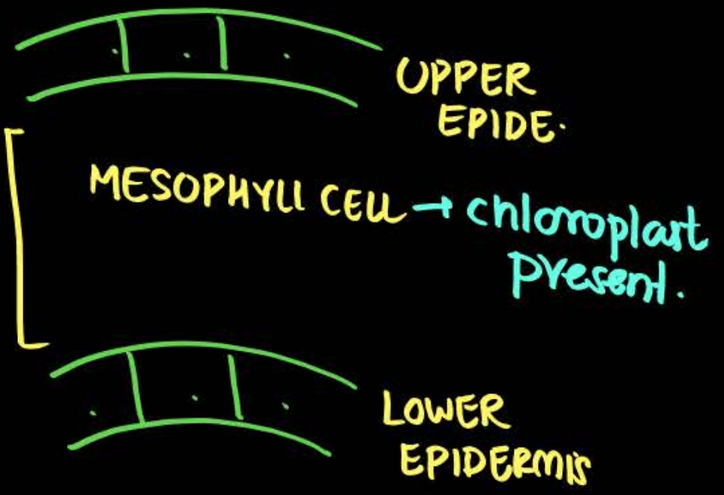
P P P P P

Collen chyma (DICOT STEM)

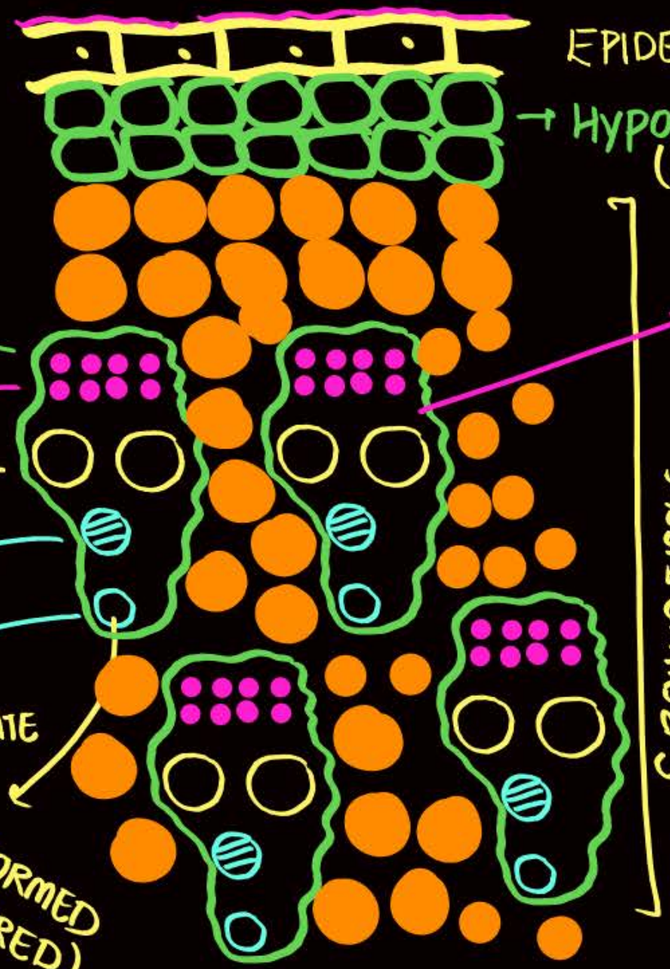
SCLERENCHYMA (MONOCOT STEM)

P: PARENCHYMA.

LEAF



MONOCOT STEM



EPIDERMIS

→ Hypodermis (sclerenchyma.

(SCLERENCHYMA) BUNDLE SHEATH

PHLOEM.

METAXYLEM ←

VESSELS PRESENT ← PROTOXYLEM. ←

PROTOXYLEM (VESSELS DEGENERATE

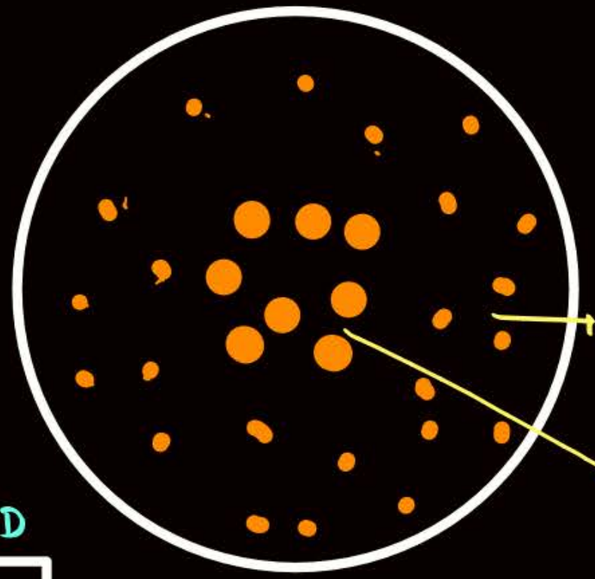
CAVITY FORMED (H_2O STORED) WATER CONTAINING CAVITY.

→ VASCULAR BUNDLE SCATTERED.

GROUND TISSUE → NOT DIFFERENTIATED INTO

CORTEX, ENDODERMIS, PERICYCLE, PITH, PITH RAYS. → ABSENT

PHLOEM PARENCHYMA ABSENT



→ PERIPHERY: SMALL

→ Centre: LARGE

UNEQUAL.

CONJOINT, CLOSED, ENDARCH, VASCULAR CAMBIUM ABSENT SEC. GROWTH ABSENT.

HORIZONTAL

DICOT LEAF / DORSIVENTRAL LEAF

BSE

C — less stomata/ absent

UPPER/ADAXIAL EPIDERMIS

(PARENCHYMA) BUNDLE SHEATH

CHLOROPLAST MESOPHYLL

PALISADE PARENCHYMA → ELONGATED CELL, ONE ABOVE OTHER VERTICALLY PLACED, INTERCELLULAR SPACE ABSENT

PROTOXYLEM

METAXYLEM → PRIMARY XYLEM

PRIMARY PHLOEM

Intercellular space/air cavity present

SPONGY PARENCHYMA → ROUNDED/OVAL

LOWER/ABAXIAL EPIDERMIS

C — more stomata

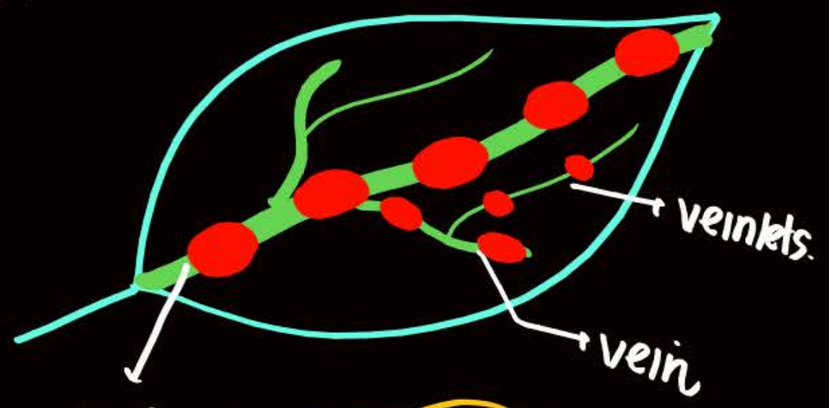
C : CUTICLE

BUNDLE SHEATH EXTENSION (BSE)

SUB-STOMATAL CAVITY

CONJOINT, ENDARCH CLOSED

RETICULATE VENATION

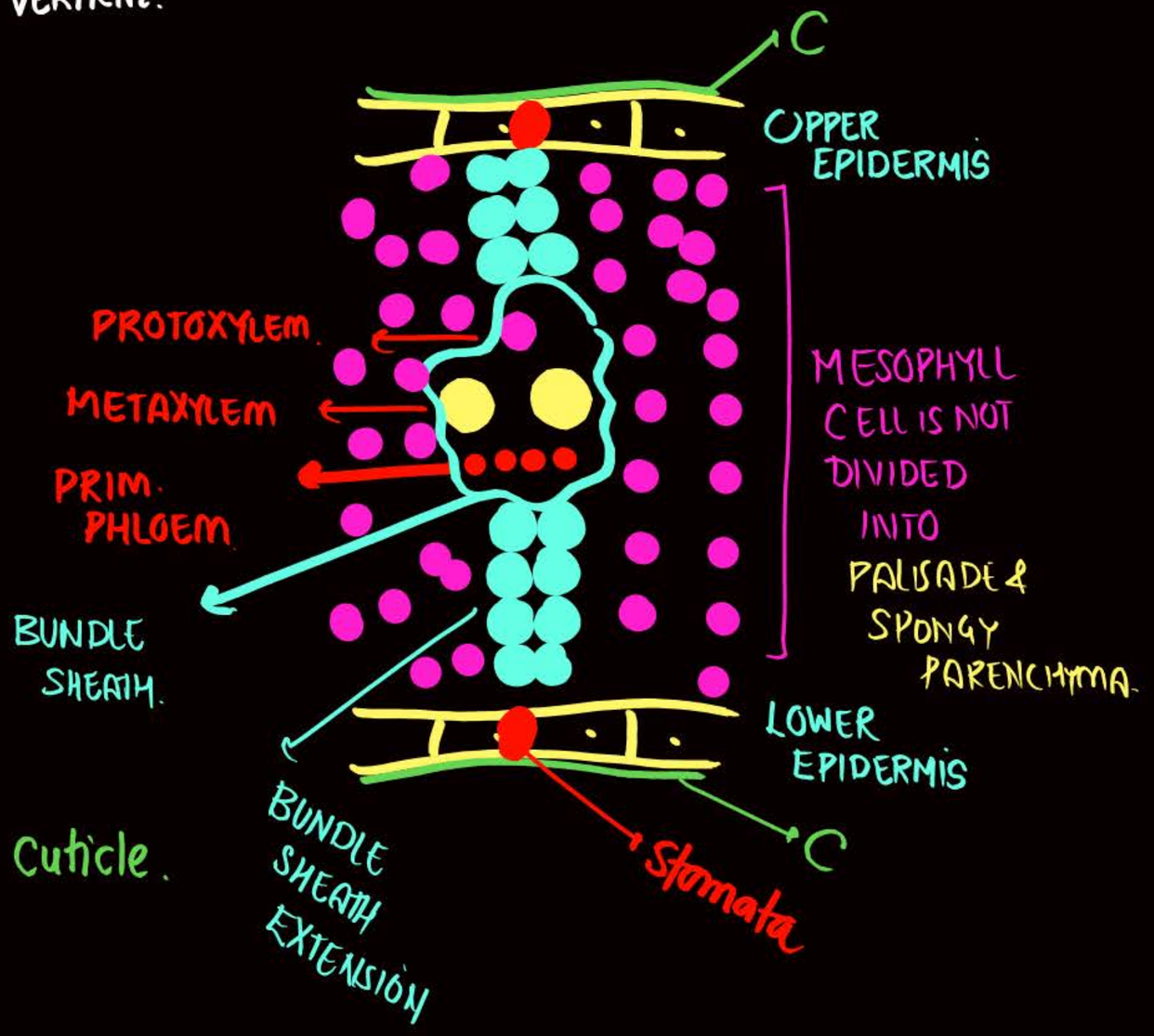


Size of vascular bundle ∝ Thickness of vein

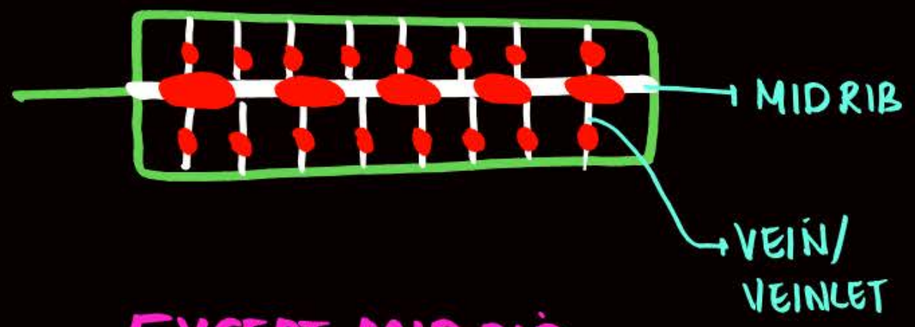
UNEQUAL SIZE

MONOCOT LEAF / ISOBILATERAL.

VERTICAL.



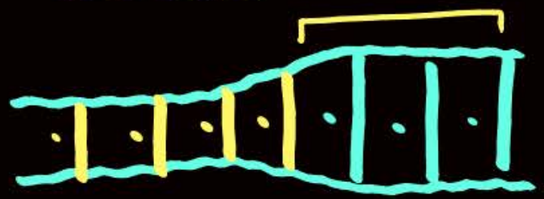
C : Cuticle.



EXCEPT MIDRIB

SIZE OF VASCULAR BUNDLE : EQUAL.

BULLIFORM CELL (B.C).



⇒ monocot leaf

UPPER EPIDERMIS.
LARGE CELL, GROUP,
COLOURLESS.,
EMPTY

B.C

	BC	BC	LEAF			
H_2O available →	WATER ✓	SWELL (TURGID)	EXPOSED.			
H_2O NOT AVALLABLE	✗	Shrink (FLACCID)	CURL INWARD	→ SURFACE AREA DECREASE	→ TRANSPIRATION DECREASE	

QUESTION

Bulliform cells are responsible for (2024)

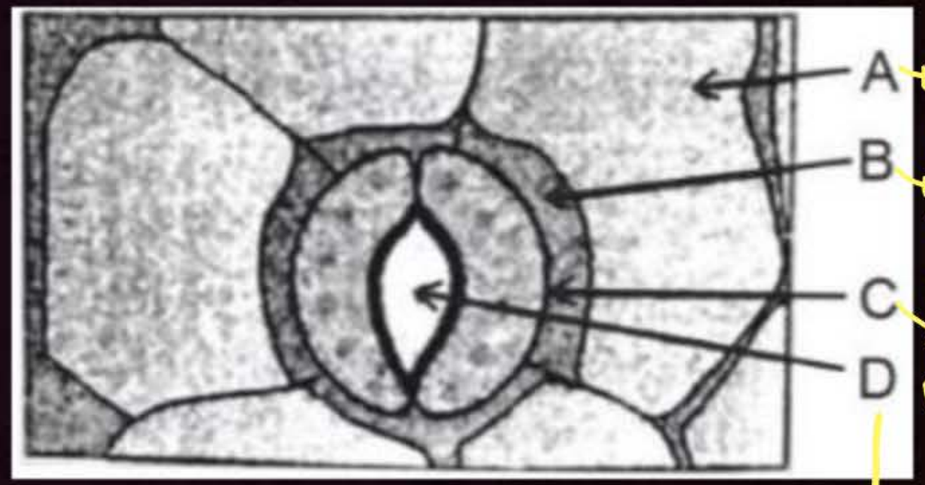
1. Inward curling of leaves in monocots.
2. Protecting the plant from salt stress.
3. Increased photosynthesis in monocots.
4. Providing large spaces for storage of sugars.

QUESTION

GUARDCELL.

In the given figure, which component has thin outer walls and highly thickened inner walls?

(2024)



1. C
2. D
3. A
4. B

QUESTION

Formation of interfascicular cambium from fully developed parenchyma cells is an example for (2024)

sec. meristem.

MEDULLARY RAYS.

1. Differentiation
2. Redifferentiation
3. Dedifferentiation
4. Maturation

QUESTION

Statement I: Parenchyma is living but collenchyma is dead tissue.

Statement II: Gymnosperms lack xylem vessels but presence of xylem vessels is the characteristic of angiosperms.

In the light of the above statements, choose the correct answer from the options given below: (2024)

1. Both Statement I and Statement II are true
2. Both Statement I and Statement II are false
3. Statement I is true but Statement II is false
4. Statement I is false but Statement II is true

QUESTION

Give below are two statements: (2023)

Statement I: Endarch and exarch are the terms often used for describing the position of secondary xylem in the plant body.

Statement II: Exarch condition is the most common feature of the root system.

In the light of the above statements, choose the correct answer from the options given below:

1. Statement I is incorrect but Statement II is true.
2. Both Statement I and Statement II are true.
3. Both Statement I and Statement II are false.
4. Statement I is correct but Statement II is false.

QUESTION

The transverse section of plant part showed polyarch, radial and exarch xylem, with endodermis and pericycle. The plant is identified as: (2023)

more than six

ROOT

1. Monocot root
2. Dicot root
3. Dicot stem
4. Monocot stem

QUESTION

Which of the following is NOT a character of collenchyma tissue? (2022)

1. They provide mechanical support to the growing part of the plant
2. They occur in layers below epidermis in dicotyledonous plants
3. They consist of cells with thick corners due to cellulose deposition
4. They are usually ~~dead~~ LIVING and ~~without~~ protoplasts

QUESTION

Initiation of lateral roots and vascular cambium during secondary growth takes place in cells of: (2022)

1. Epiblema
2. Cortex
3. Endodermis
4. Pericycle

QUESTION

The type of tissue commonly found in the fruit wall of nuts is: (2022)

1. Parenchyma
2. Collenchyma
3. Sclerenchyma
4. Sclereid

QUESTION

Select the correct pair. (2021)

1	In dicot leaves, vascular bundles are surrounded by large thick-walled cells	Conjunctive tissue B.S.
2	Cells of medullary rays that form part of cambial rings	Interfascicular cambium
3	Loose parenchyma cells rupturing the epidermis and forming a lens-shaped opening in bark (OUT OF NCERT)	Spongy parenchyma LENTICEL.
4	Large colorless empty cells in the epidermis of grass leaves	Subsidiary cells B.C.

QUESTION

The transverse section of a plant shows following anatomical features: (2020)

A. Large number of scattered vascular bundles surrounded by bundle sheath.

B. Large conspicuous parenchymatous ground tissue.

C. Vascular bundles conjoint and closed.

D. Phloem parenchyma absent.

Identify the category of plant and its part:

1. Monocotyledonous root
2. Dicotyledonous stem
3. Dicotyledonous root
4. Monocotyledonous stem

QUESTION

Large, empty colourless cells of the adaxial epidermis along the veins of grass leaves are

(2020 Covid)

1. Guard cells
2. Bundle sheath cells
3. Bulliform cells
4. Lenticels

QUESTION

Which of the following statements about cork cambium is incorrect? (2020 Covid)

1. It forms a part of periderm
2. It is responsible for the formation of lenticels
3. It is a couple of layers thick
4. It forms secondary cortex on its outer side

QUESTION

Grass leaves curl inwards during very dry weather. Select the most appropriate reason from the following (2019)

1. Closure of stomata
2. Flaccidity of bulliform cells
3. Shrinkage of air spaces in spongy mesophyll
4. Tyloses in vessels

QUESTION

Phloem in gymnosperms lacks (2019)

1. Albuminous cells and sieve cells
2. Sieve tubes only
3. Companion cells only
4. Both sieve tubes and companion cells

QUESTION

Secondary xylem and phloem in dicot stem are produced by (2018)

1. Apical meristem
2. Vascular cambium (Intra + Inter)
3. Phellogen
4. Axillary meristems

QUESTION

Casparian strips occur in (2018)

1. Epidermis
2. Pericycle
3. Cortex
4. Endodermis

QUESTION

Plants having little or no secondary growth are (2018)

absent monocot

1. Grasses / monocot.
2. Deciduous angiosperms
3. Conifers → gymnosperm
4. Cycads

QUESTION

Stomata in grass leaf are: (monocotl. (2018)

1. Dumb-bell shaped
2. Kidney shaped
3. Rectangular
4. Barrel shaped

QUESTION

Which of the following statements is true for phloem in plants? (2017-Gujarat)

1. Phloem fibres are made up of collenchymatous cells
2. Sieve tube elements are multicellular with wide lumen and rich cytoplasm
3. Companion cells help in maintaining the pressure gradient in sieve tubes
4. Phloem parenchyma is a abundantly present in monocots

QUESTION

Specialised epidermal cells surrounding the guard cells are called (2016-I)

1. Complementary cells
2. Subsidiary cells
3. Bulliform cells
4. Lenticels

QUESTION

Vascular bundles in monocotyledons are considered closed because: (2015)

1. There are no vessels with perforations
2. Xylem is surrounded all around by phloem
3. A bundle sheath surrounds each bundle
4. Cambium is absent

QUESTION

Interfascicular cambium develops from the cells of: (2013)

1. Pericycle
2. Medullary rays / pith Rays ✓
3. Xylem parenchyma
4. Endodermis


THANK YOU