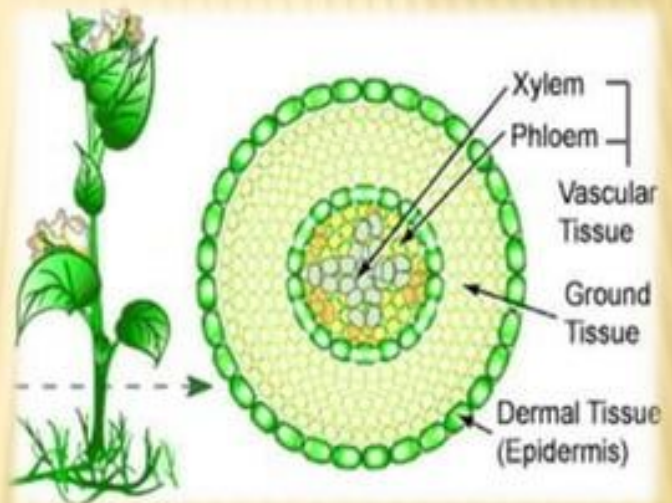


# PLANT TISSUES



By,  
K. Sharath Deepika



Cells



Tissues



Organ



Organ System



Organism



Cells



Tissues



Organ



Organ System

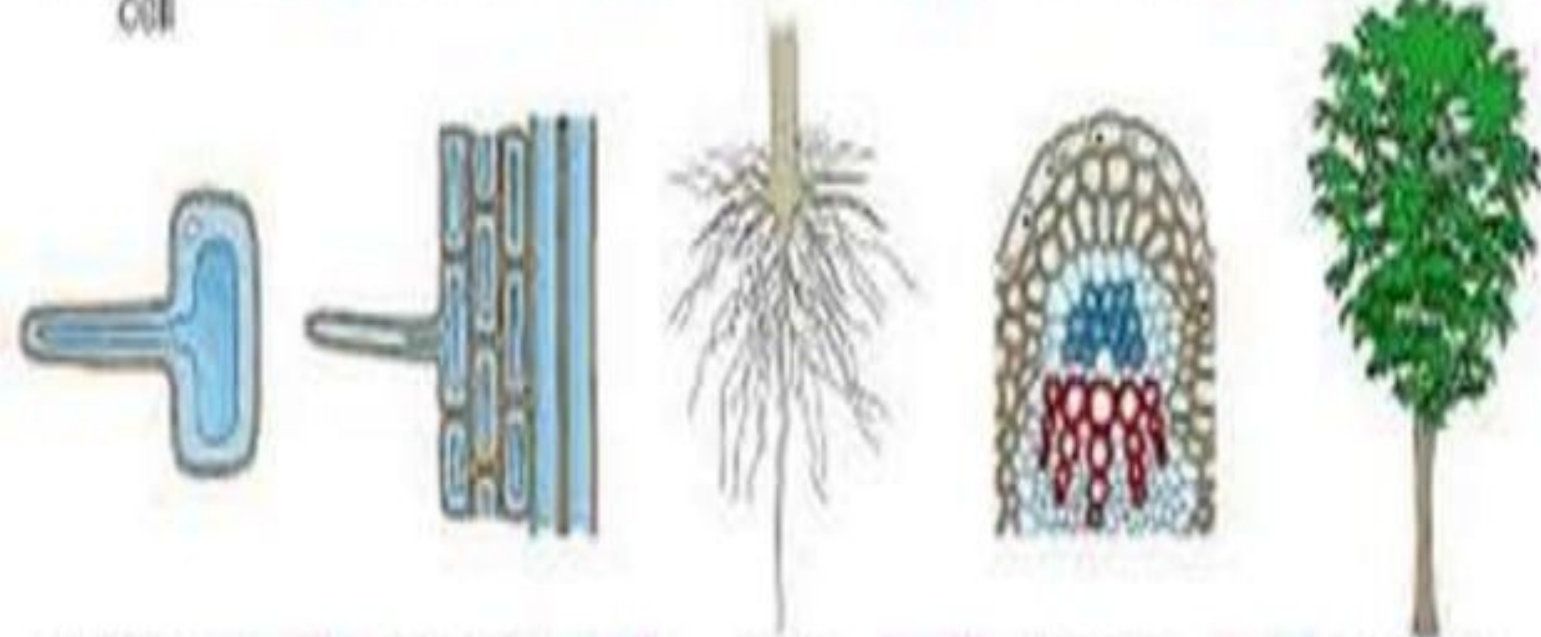


Organism

## WHAT IS A TISSUE?

- A tissue is an ensemble of similar cells and from the same origin, that together carry out a specific function.
- These are called tissues because of their identical functioning.
- Tissue systems are then formed by the functional grouping together of multiple tissues.

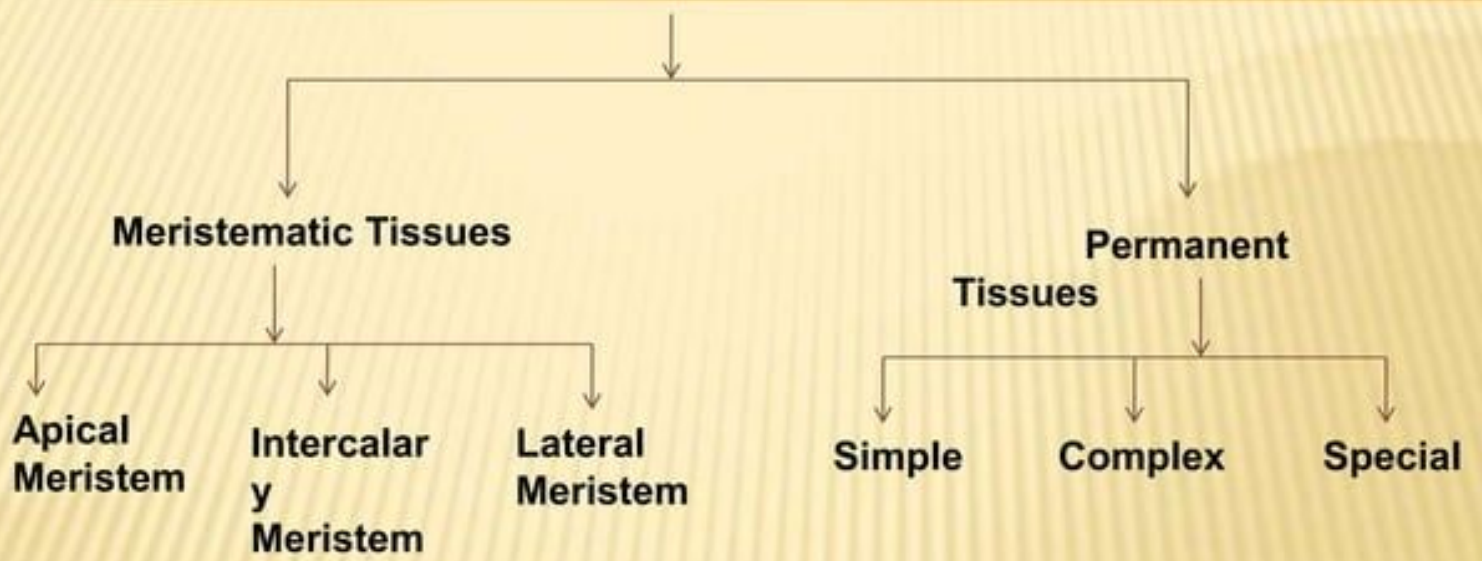
specialised cell → tissue → organ → system → organism



root hair cell → root tissue → root → vascular bundles make up transport system → transport system makes up part of a plant

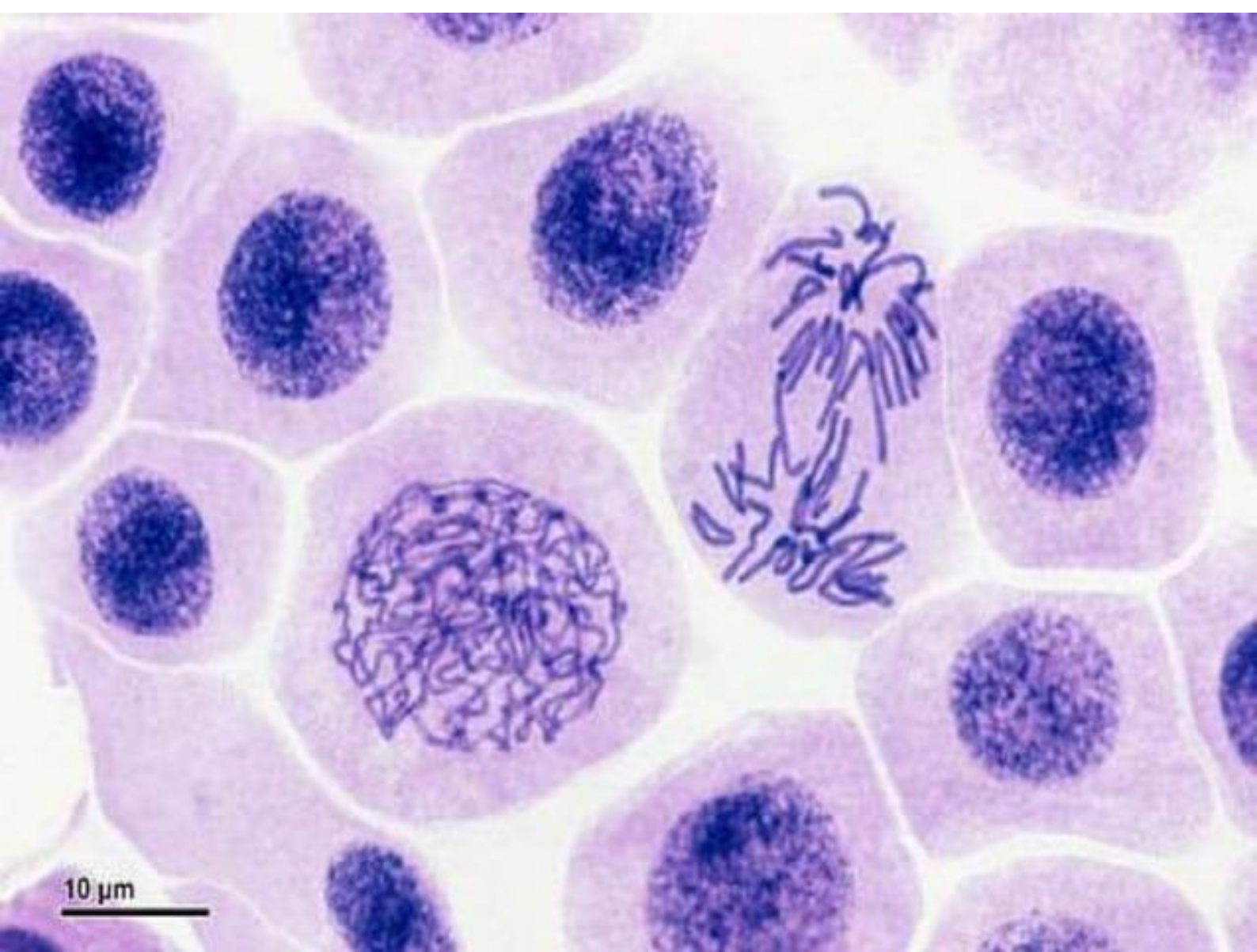


# **Tissues**



## MERISTEMATIC TISSUE

- Meristematic tissue is the composition of the meristematic cells.
- The Meristematic cells are usually thin walled living cells with dense cytoplasm and a large nucleus.
- **Meristems** are called the group of young cells that have capacity to divide into new cells.





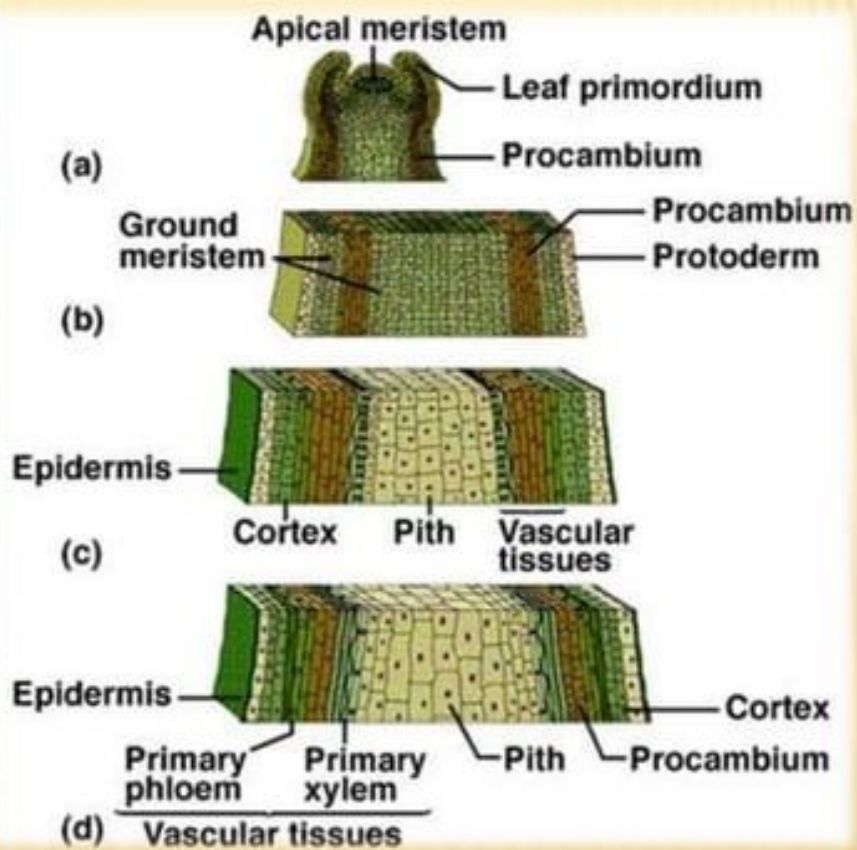
# KINDS OF MERISTEMS

## Kinds of meristems:

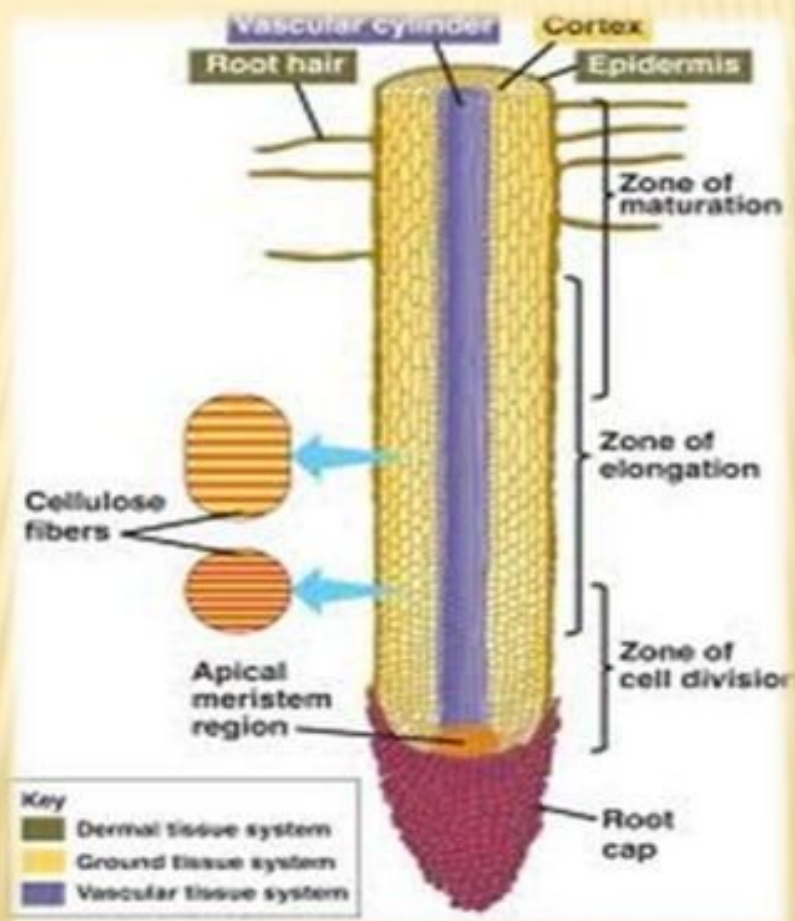
- **Apical meristems** – found at the tip of stems & roots
  - types: 1. Shoot Apex, 2. Root Apex.
- **Lateral meristems** – cambium
  - found along the sides of roots & stems
  - increase width or diameter of stems & roots
  - types: 1. vascular cambium    2. cork cambium
- **Intercalary meristems** – found at the bases of young leaves & internodes
  - responsible for further lengthening of stems & leaves



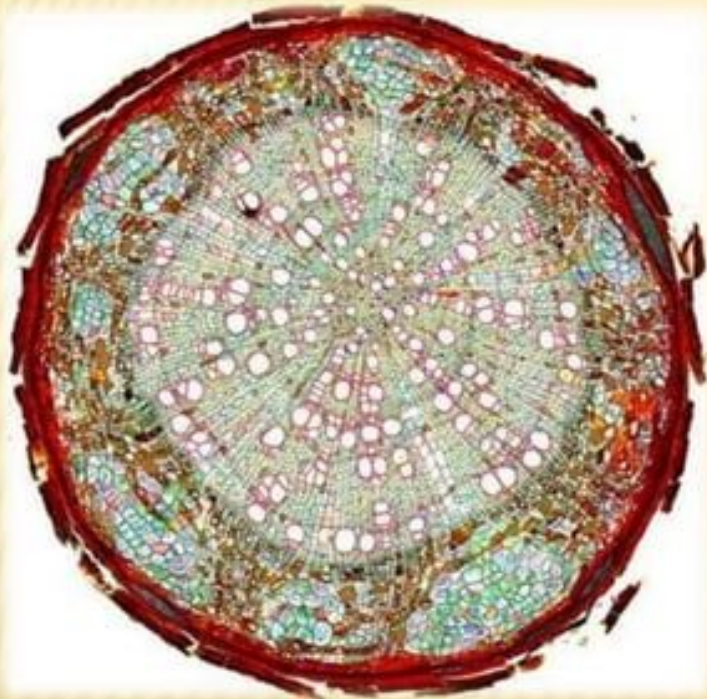
# SHOOT APICAL MERISTEM



# ROOT APICAL MERISTEM



# LATERAL MERISTEM



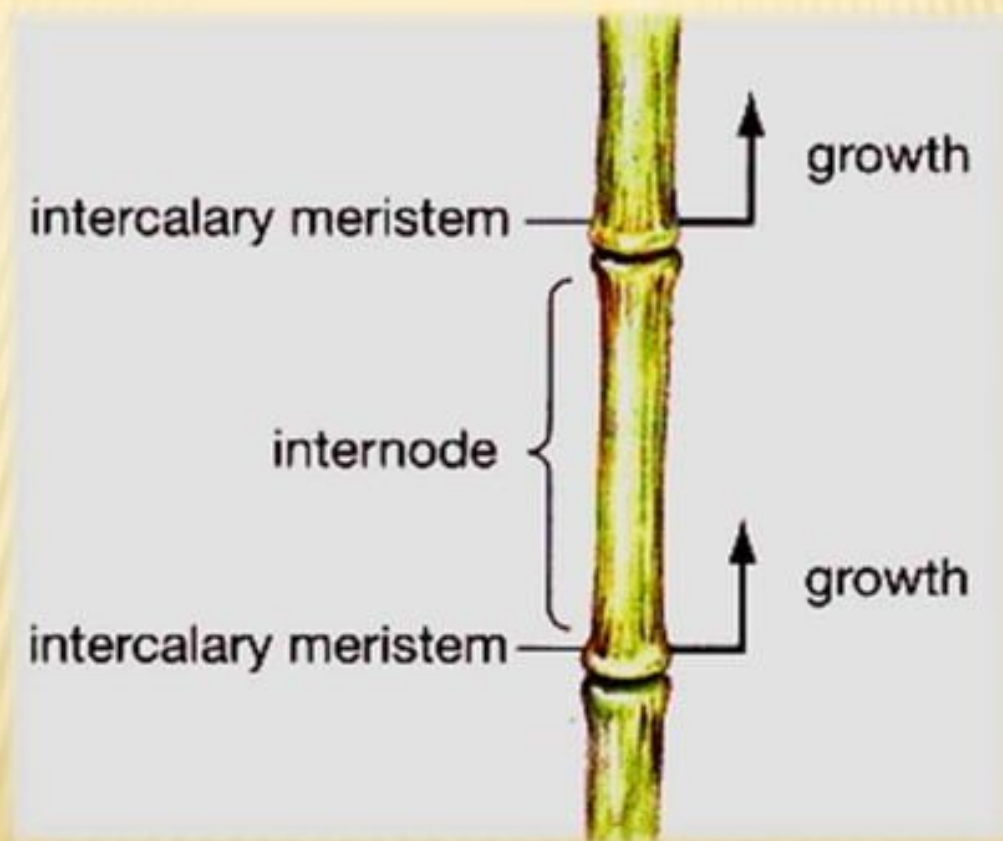
Basswood Root – Cross  
Section



Stem in cross section  
1,3 year old stems



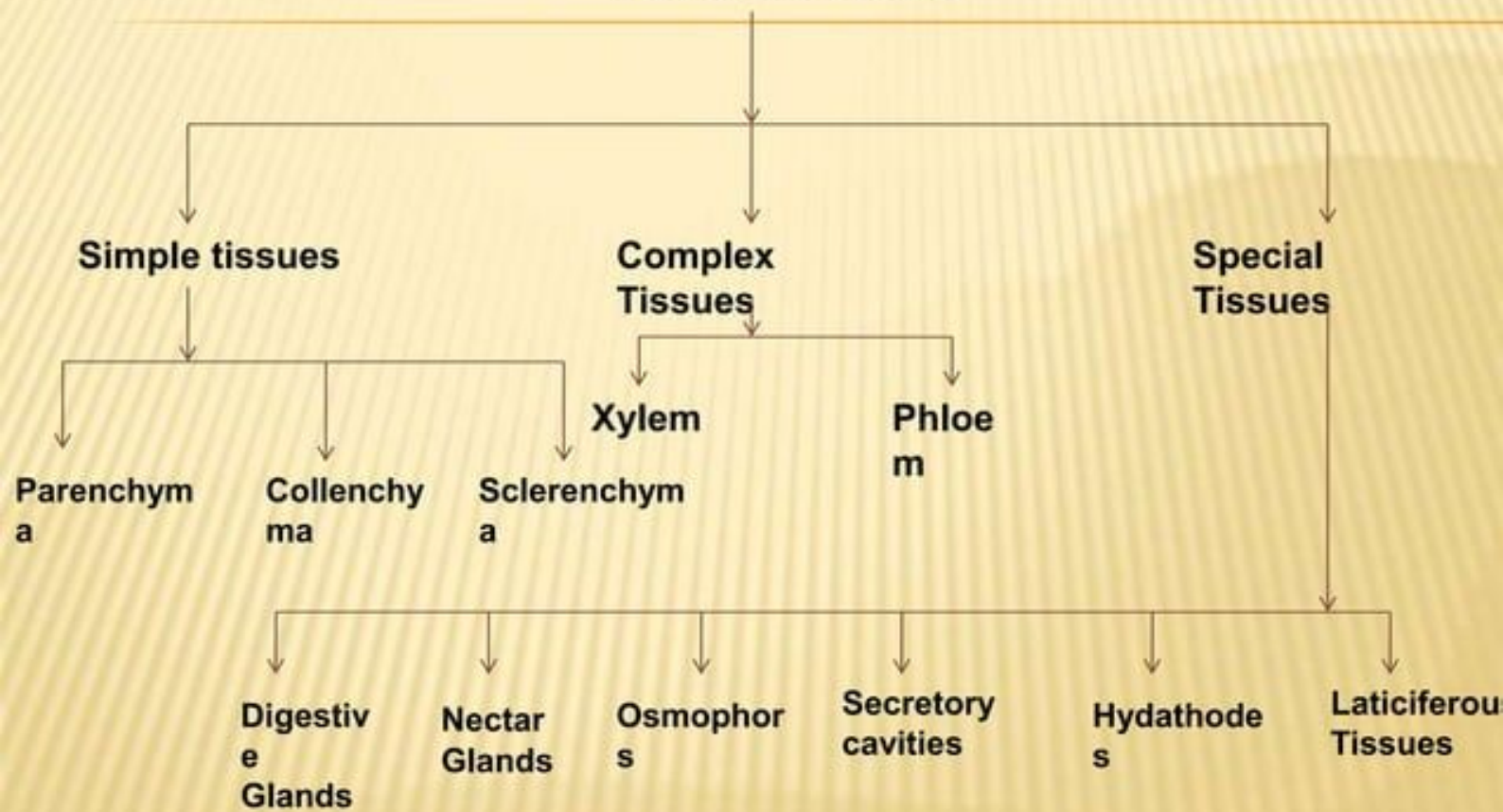
# INTERCALARY MERISTEM



## PERMANENT TISSUES

- A Permanent Tissue is formed by the division and differentiation of meristematic cells.
- The cells of these tissues have lost the power of division permanently.
- Permanent Tissues can be classified into three types – (i) Simple, (ii) Complex, (iii) Special Tissues.

## Permanent Tissues

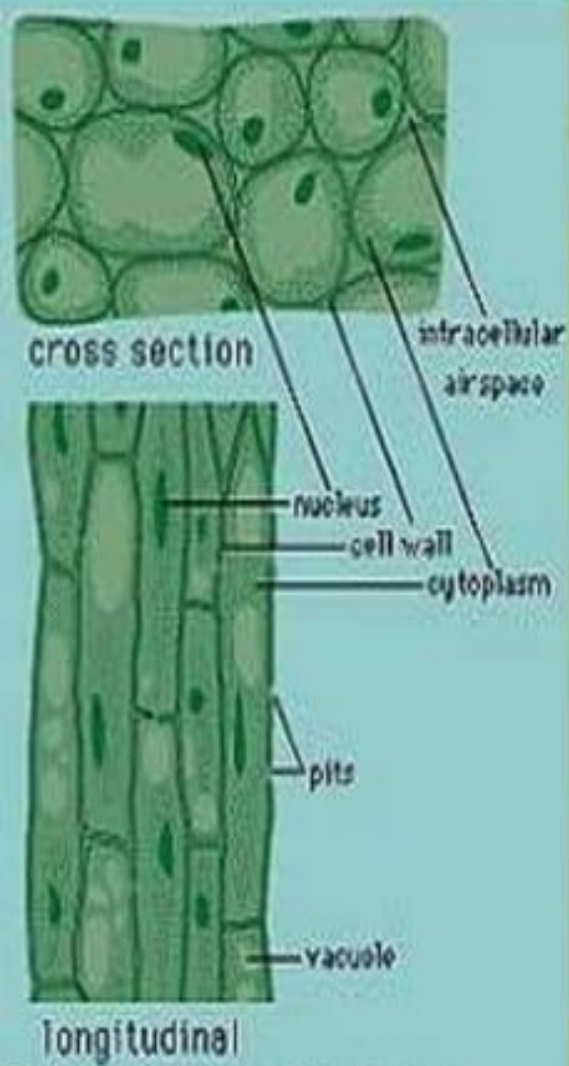




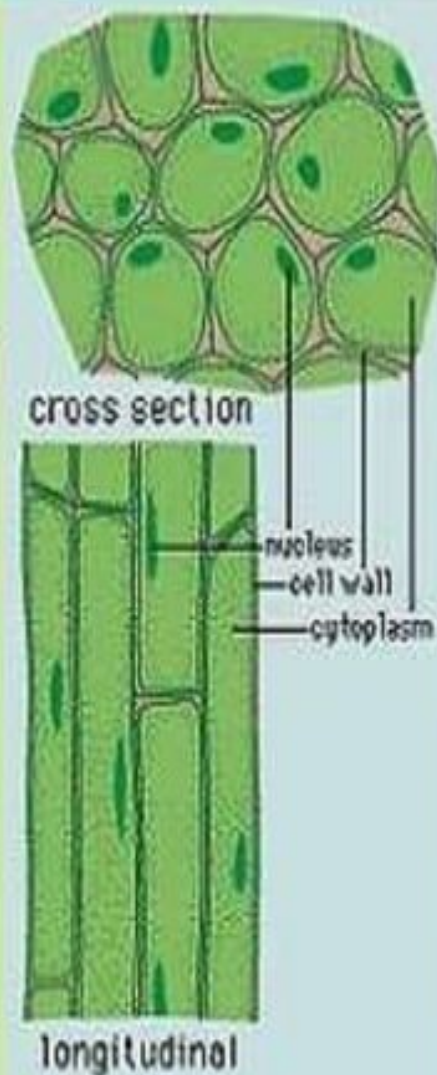
## SIMPLE TISSUES

- A group of similar cells that perform a common function is called a Simple Tissue.
- It is of three different types, they are
  - Parenchyma
  - Collenchyma
  - Sclerenchyma

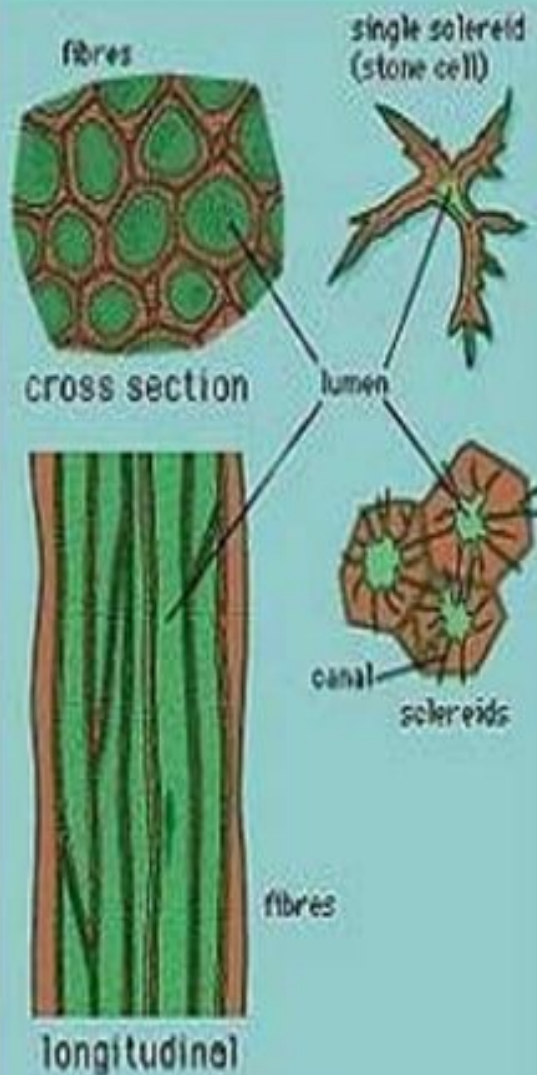
### parenchyma tissue



### collenchyma tissue



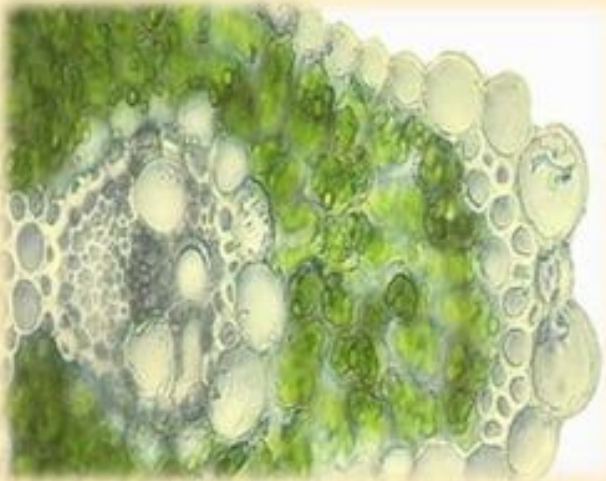
### sclerenchyma tissue



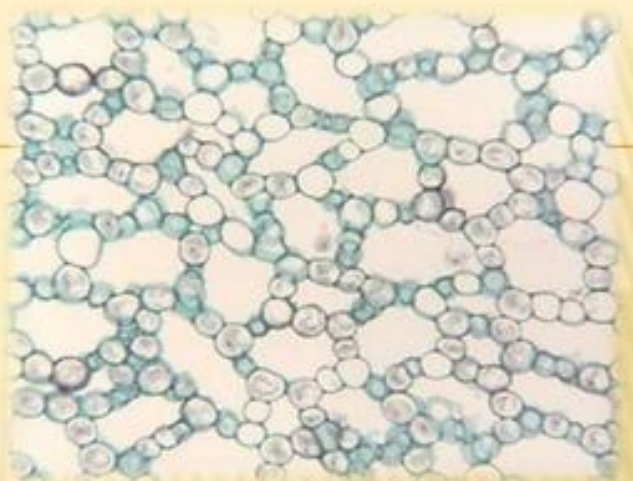
# PARENCHYMA

- Parenchyma is the most basic type of cells.
- The cells are usually isodiametric.
- Parenchyma is seen in the complex tissues like Xylem and Phloem.
- There are five types of parenchyma.
  - Aerenchyma – large intercellular spaces
  - Chlorenchyma –presence of chlorophyll.
  - Prosenchyma –elongated cell that give mechanical support
  - Storage Parenchyma –stores food material
  - Water storage Tissue –stores water (Succulents)

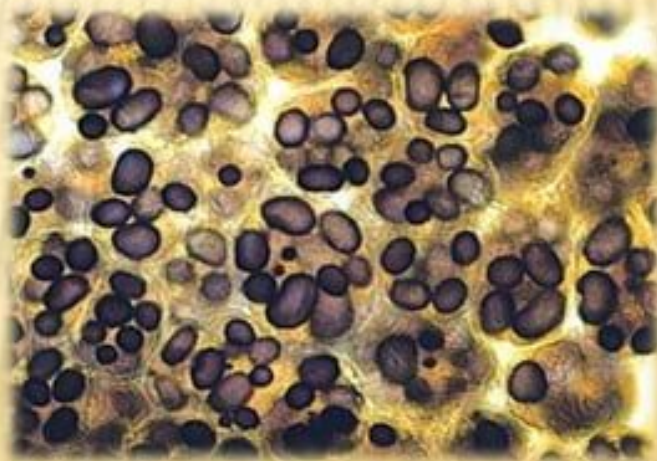




Chlorenchyma



Aerenchyma

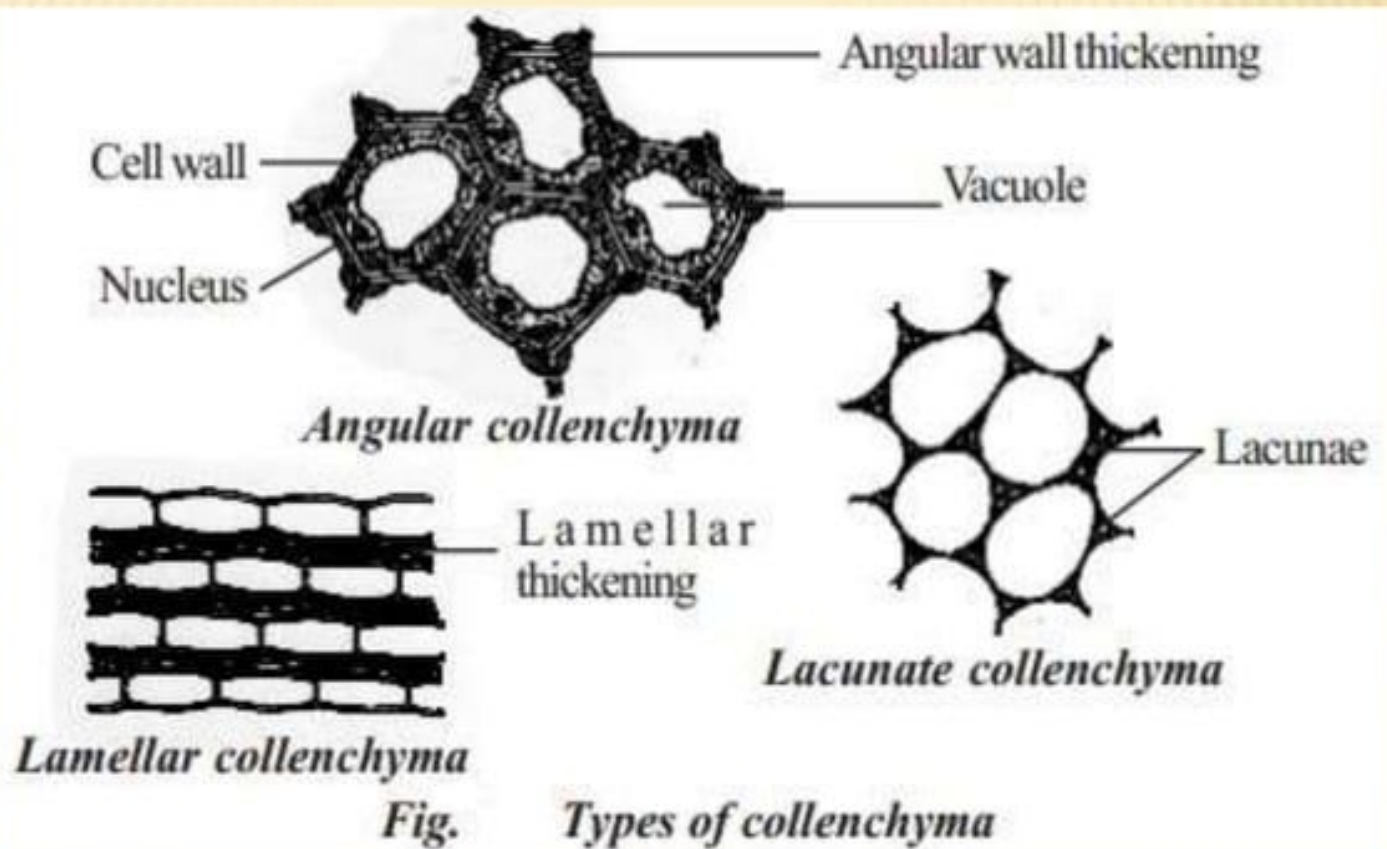


Storage Parenchyma in Bean

# COLLENCHYMA

- Collenchyma is the living Tissue which gives tensile strength.
- It is commonly found below the epidermis.
- The cell walls are thick and lignified.
- There are three types of collenchyma
  - Lamellar collenchyma –cell arrangement is in tangential rows
  - Lacunar Collenchyma –Cells have large intercellular spaces called 'Lacuna'.
  - Angular Collenchyma –wall deposition is at corners of the cells.

# COLLENCHYMA





# SCLERENCHYMA

- Sclerenchyma is a dead tissue that gives mechanical support.
- The cell wall is made of cellulose and lignin.
- They are of two types:
  - Fibres –elongated cell with tapering ends.
    - (i) Xylary fibres – present in xylem
    - (ii) Extra xylary fibres –present other than xylem
  - Sclereids –short and are irregular in shapes.  
Ex: astro sclerieds, osteo sclereids etc.

# SCLERENCHYMA

## SIMPLE TISSUE: **SCLERENCHYMA**



A fibre

No Protoplasm  
Lumen  
Thick  
cell wall  
(Due to Lignin)



A sclereid

No Protoplasm  
Lumen  
Pith  
Thick (Due to Lignin)  
cell wall

## **FUNCTIONS OF SIMPLE TISSUES**

- Parenchyma plays a vital role in Photosynthesis, Respiration, Storage and Secretion.
- Parenchyma gives turgidity to the young plants.
- Collenchyma gives flexibility and elasticity to the plant.
- Sclerenchyma protects the plant from stretching, bending, weight, pressure.



## COMPLEX TISSUES

- Tissues with different kinds of cells perform similar function.
- They are mainly helpful in conduction.
- There are two main types:
  - Xylem
  - Phloem

# XYLEM

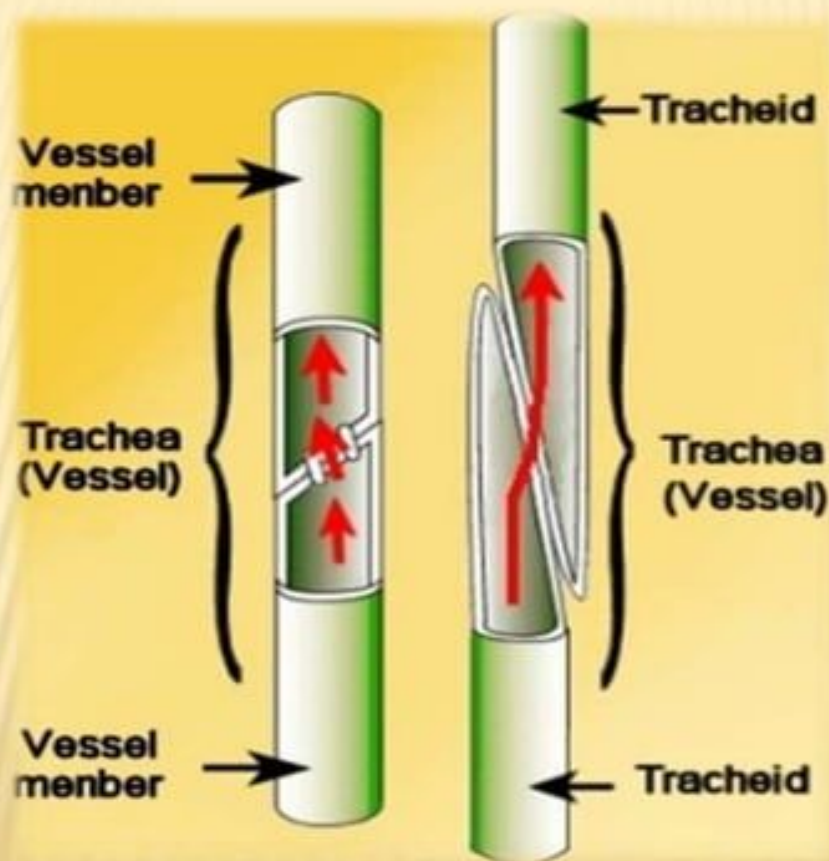
- Xylem is the water conducting tissue and also provides mechanical support.
- It originates from two sources like procambium and the vascular cambium.
- The first formed cells are called protoxylem and the latter are called metaxylem elements.

# STRUCTURE OF XYLEM

- It is composed of three types of cells.
  - Tracheary elements –There are dead cells, conduct water.
    - (i) Tracheids: elongated with tapering ends.
    - (ii) Vessel elements: wide and cylindrical structures.
  - Vessel Elements –They are wide and cylindrical.
  - Xylem Fibres –They are dead with thick lignified walls.
  - Xylem Parenchyma –normal parenchyma cells.
    - (i) Axial Parenchyma – develops from fusiform cells
    - (ii) Ray Parenchyma –develops from ray initials.



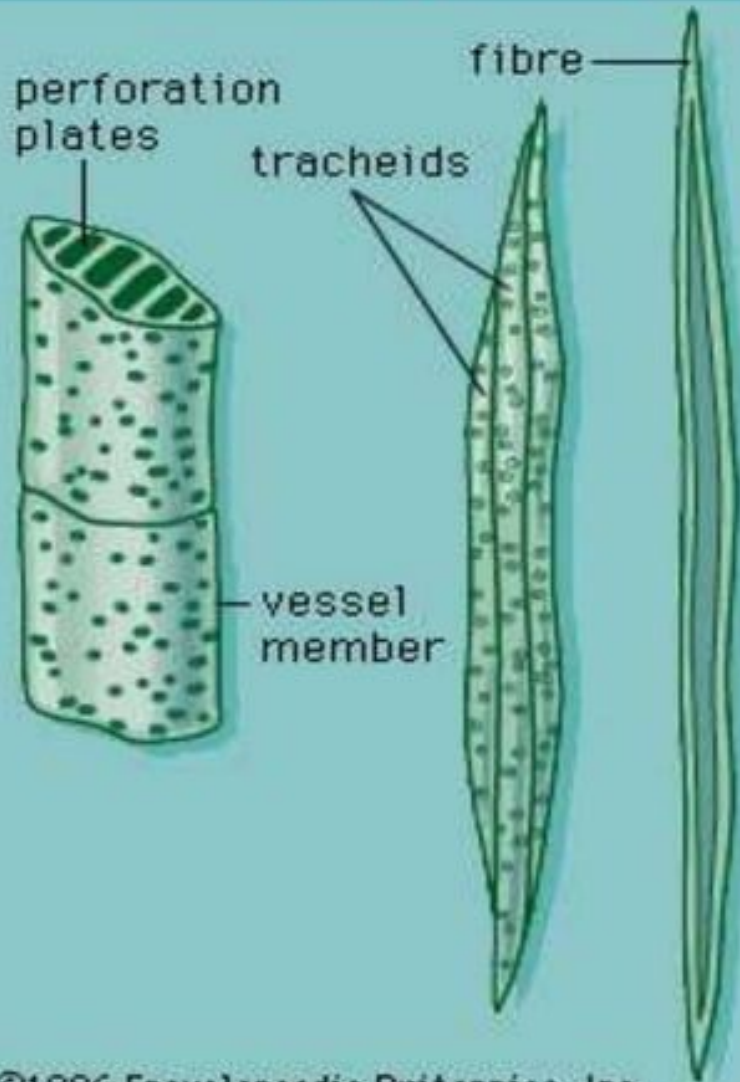
# XYLEM ELEMENTS



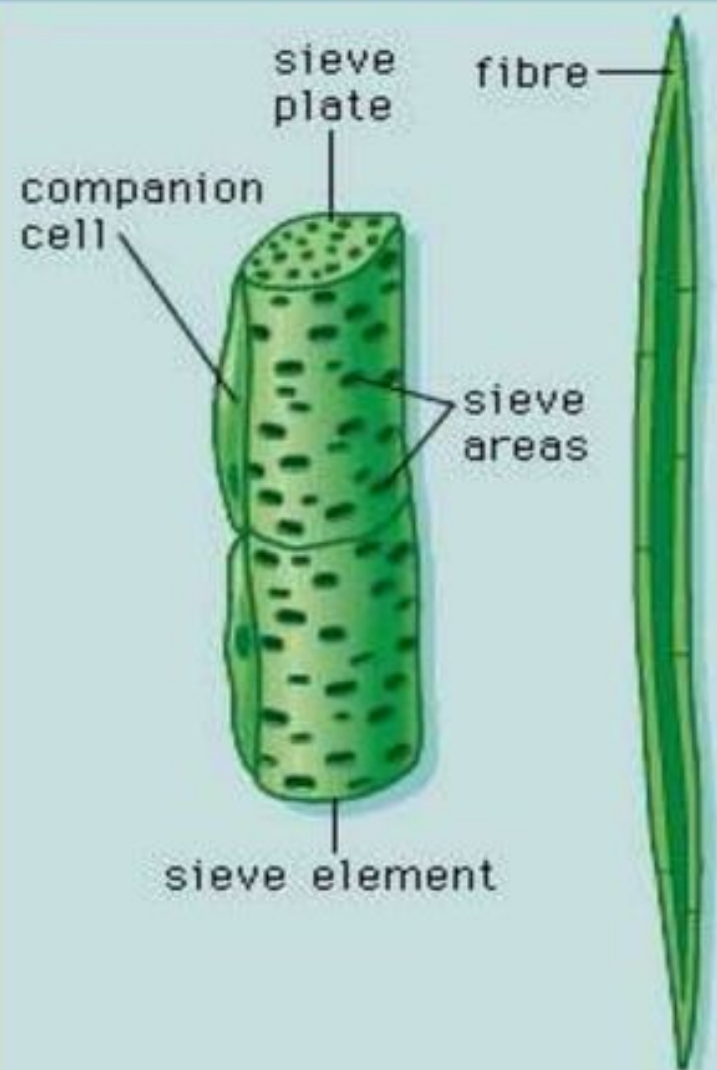
# PHLOEM

- Phloem conducts water, minerals and gives mechanical support.
- It originates from two sources like procambium and vascular cambium.
- The first formed cells are called protophloem and latter are metaphloem.

## XYLEM



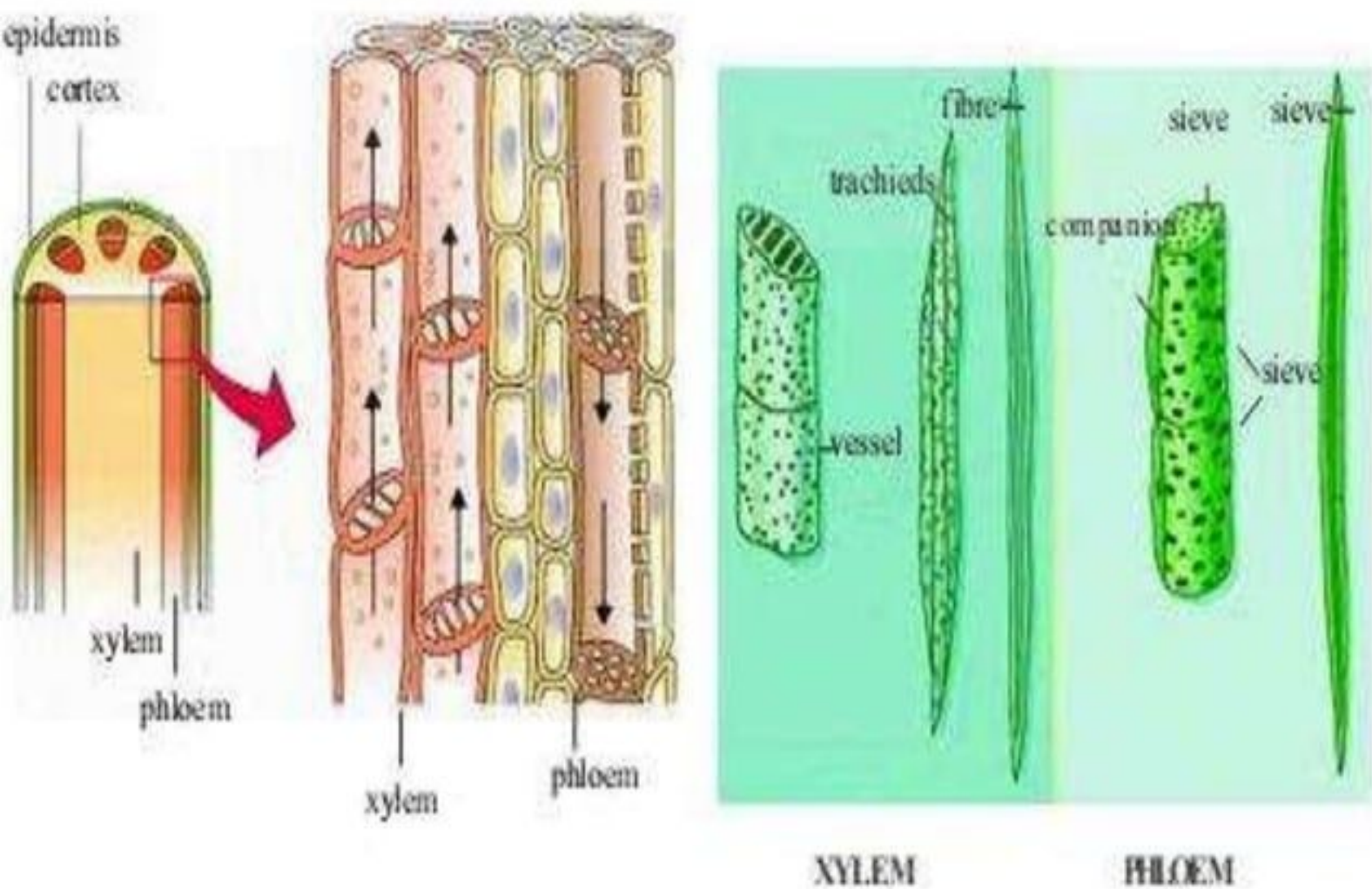
## PHLOEM





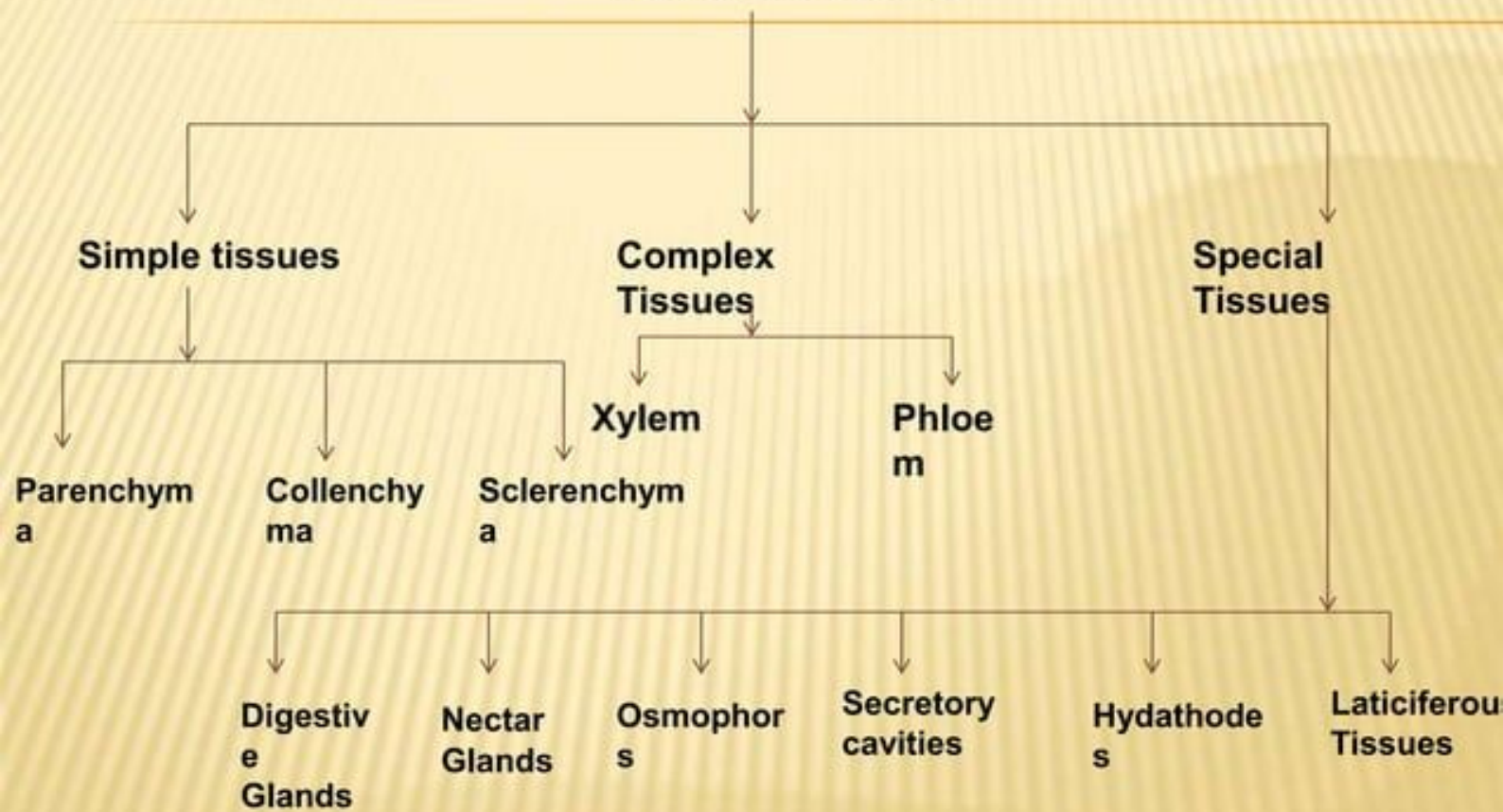
## STRUCTURE OF PHLOEM

- It is composed of four types of cells.
  - Sieve Elements – they are living with sieve areas.
    - (i) Sieve cells – With unspecialized sieve areas.
    - (ii) Sieve tube –With Specialized Sieve areas.
  - Companion cells –elongated cells which support sieve tubes.
  - Phloem Fibres –dead cells with tapering ends.
  - Phloem Parenchyma –Living and thin walled cells similar to parenchyma
    - (i) Axial Parenchyma – develops from fusiform cells
    - (ii) Ray Parenchyma –develops from ray initials.



Different cells of xylem and phloem

## Permanent Tissues





## SECRETORY (OR) SPECIAL TISSUES

- The cells or tissues that are concerned with secretion or excretion from the plant body.
- They are located in different parts of the plant body and are widely distributed.
- Many plant secretions are of high considerable economic importance.
- They include rubber, gums, oils, resins and mucilage.

# TYPES OF SPECIAL TISSUES

## 1. Digestive glands:-

- They are found in insectivore plants and secrete proteolytic enzymes.

Ex:- Nepenthes – digestive glands are spherical, multicellular.



Glandular hairs in



Pitcher in Nepenthes

## 2. Nectar Glands:-

- They are called as nectaries.
  - They secrete sugary substance called nectar which attracts insects and promote pollination.
- (i) Floral Nectaries – In floral regions
- (ii) Extra floral Nectaries –Other than floral regions.

Ex:- Dianthus



Nectar  
glands  
in  
Dianthus



### 3. Osmophors:-

- They are special glands which produce volatile essential oils and impart fragrance to flowers.
- The osmophors vary in structure for different species i.e. flaps, cilia, brush etc.
- They promote Cross Pollination.

Ex:- Orchids

Flap like osmophors in  
*Caryanthes macranthes*



## 4. Secretory Cavities:-

- The secretions released are stored in the spaces within the gland.
- These are formed by the breakdown of secretory cells.
  - (i) Lysigenous cavities –formed by the death of the secretory cells.
  - (ii) Schizogenous cavities –formed by the enlargement of intercellular space between secretory cells.

Ex:- Eucalyptus.

Oil glands in Eucalyptus  
leaf section

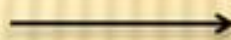


## 5. Hydathodes:-

- Hydathodes are also called as water stomata.
- They become active when root pressure increases due to reduced transpiration.
- Water is forced out of tracheids in the form of drops through water pores.
- This process is called guttation.

Ex:- *Lycopersicon*

Guttation in  
*Lycopersicon esculentum*





## 6.Laticiferous Tissues:-

- Laticifers are specialize parenchyma cell which secrete a viscous fluid, known as latex.
- Latex is mostly white in colour but sometimes variously colored.
  - (i) Laticiferous cells:- They are isolated, elongated, slender.
  - (ii) Laticiferous Vessels:- They are formed by series of cells whose wall break an form canals.

Ex:-Preparation of rubber from  
(*Ficus elastica*)

Collection of latex from  
*Ficus elastica* to prapare  
Rubber



## REFERENCE

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I thank  
you!

