For B.Sc. Part II (Sub.) Group B (Anatomy and Embryology)

# MERISTEM

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**Lecture No. 43**

## Meristem ????

- Meristem consist of group of immature cells that has capacity of division and redivision.
- The term meristem was coined by Nageli (1858).
- In plants meristem are found in apex of leaf primordia, stem, root, vascular cambium, cork cambium, etc.

## Characteristics of meristem

- ✓ Meristem tissue have ability to grow and divide.
- ✓ They are composed of immature cells.
- ✓Cells are oval, rounded or polygonal in shape.
- ✓Cells are living and thin walled.
- ✓Absence of intercellular spaces.
- ✓Vacuoles absent or very small.
- ✓There is large scale synthetic activity.
- ✓There is little reserve food, and limited amount of endoplasmic reticulum.
- ✓Plastid in the proplastid stage.

# Classification of Meristem

**Classification based on position in the plant body**

1. Apical meristem
2. Lateral meristem
3. Intercalary meristem

**1. Apical meristem:**

✓ It is the meristem present at the tip of the root and stem, commonly called as root apex and shoot apex respectively.

✓ Apical meristem produce growth in length.

✓ Such meristems constitute the actively growing regions in the plant body.

✓Number of apical cell varies in different plant group.

✓Lower plants usually have single apical cell.

✓ Gymnosperms and angiosperms have group of cells.

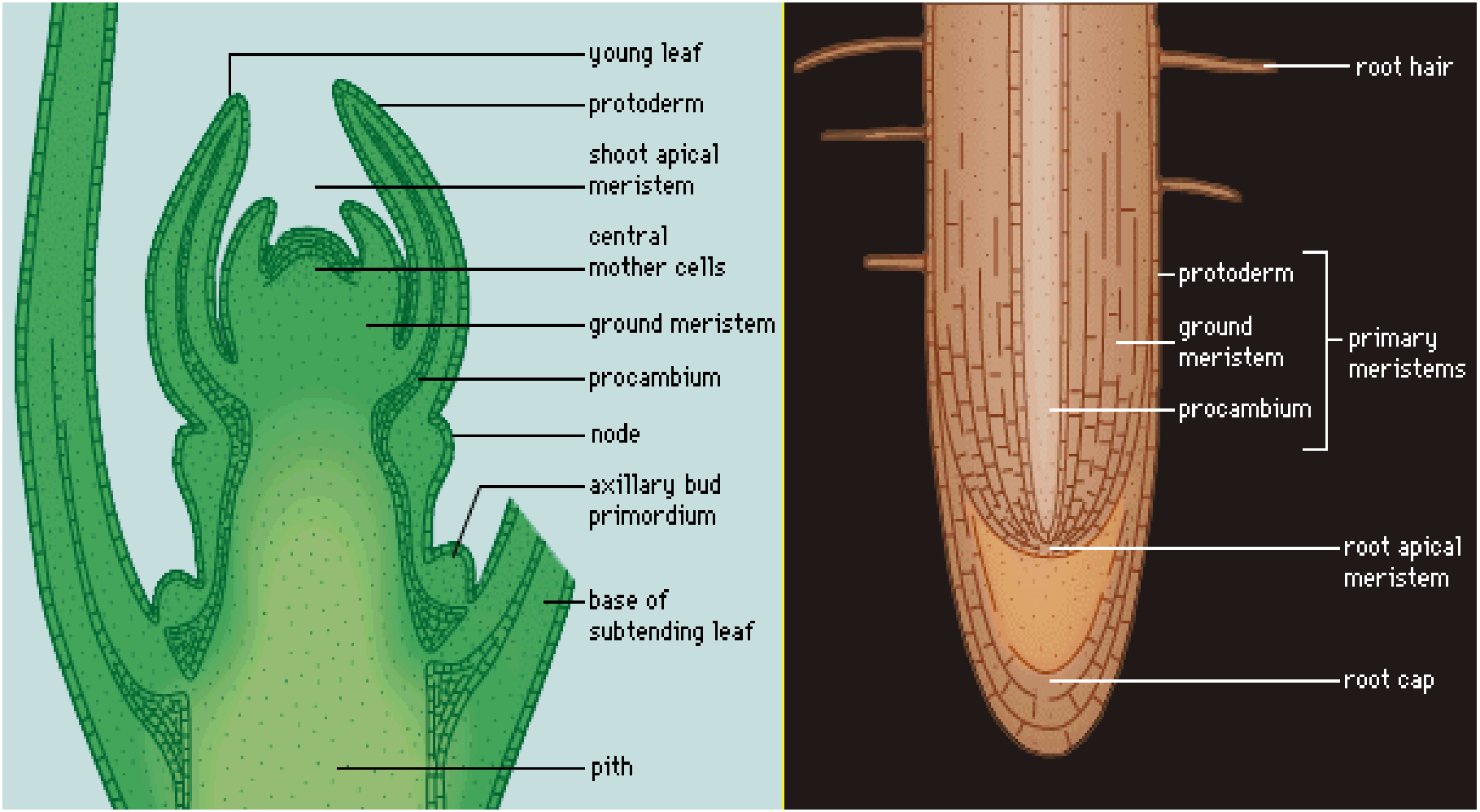
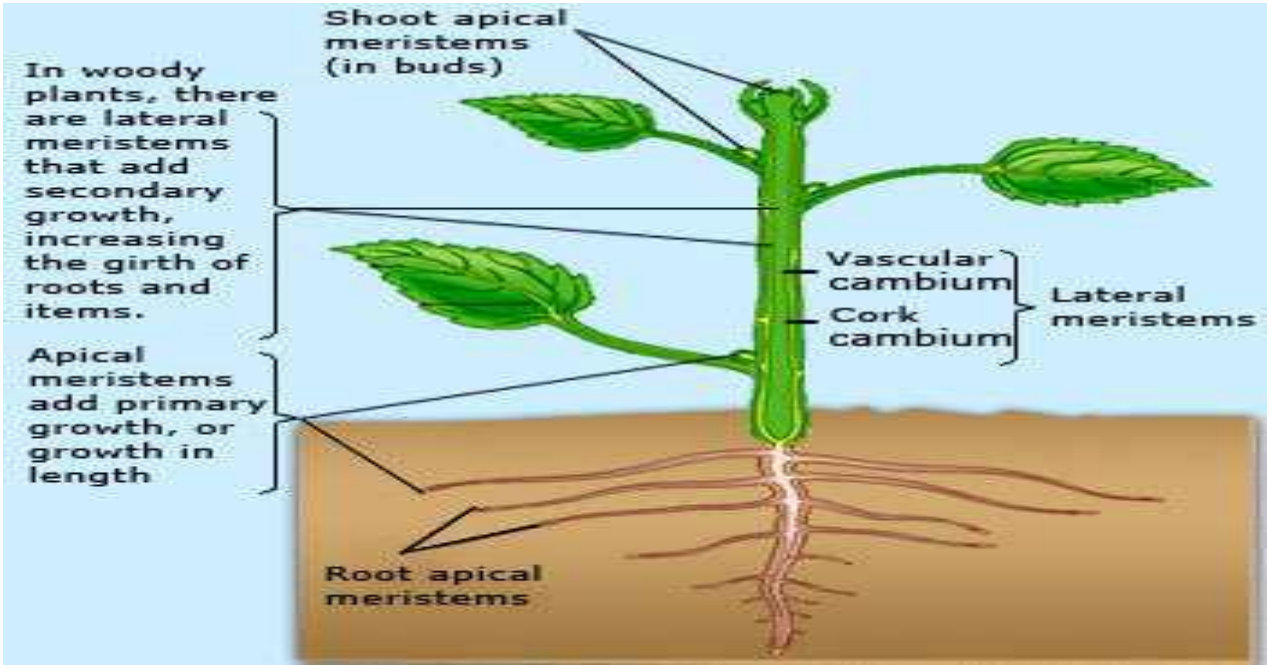
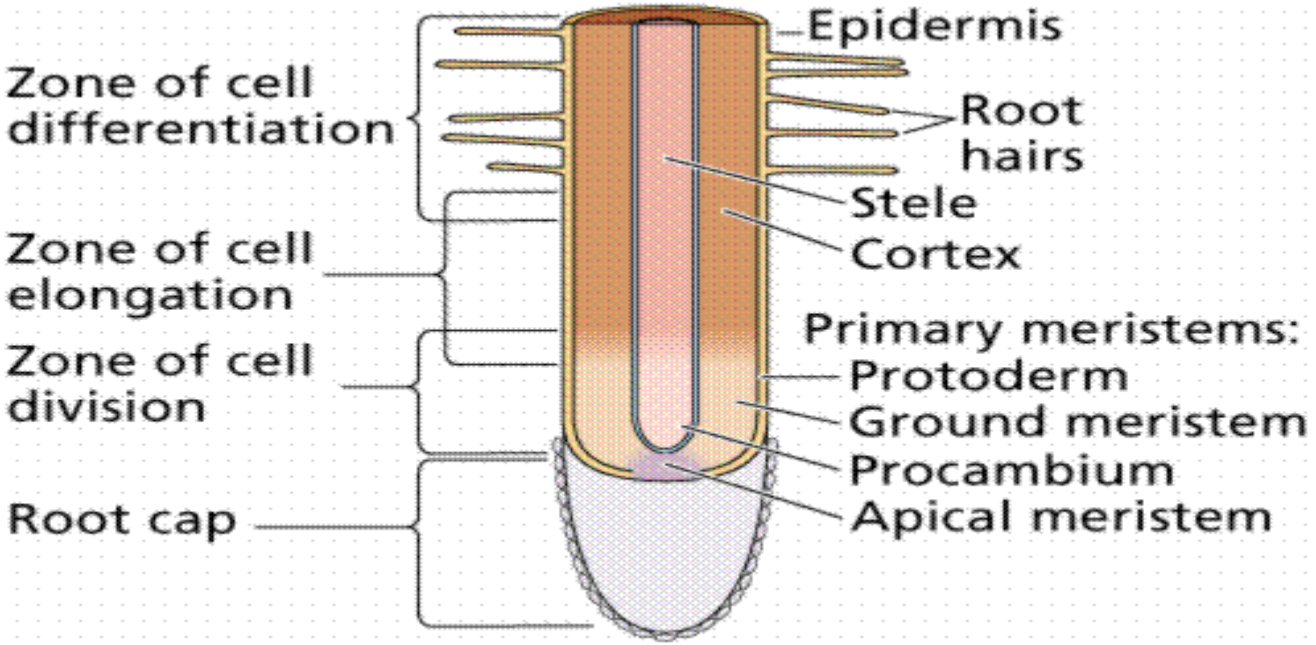



**Figure: Apical meristem (shoot and root)**


Shoot apical meristems (in buds)
In woody plants, there are lateral meristems that add secondary growth, increasing the girth of roots and items.
Apical meristems add primary growth, or growth in length
Vascular cambium
Cork cambium
Lateral meristems
Root apical meristems


Epidermis
Zone of cell differentiation
Root hairs
Stele
Cortex
Zone of cell elongation
Primary meristems:
Zone of cell division
Protoderm
Ground meristem
Procambium
Root cap
Apical meristem

## 2. Lateral meristem

- ✓ Lateral meristem occurs on the sides (parallel to the organ in which they occur) and takes part in **increasing girth of the plant**.
- ✓ Only one type of primary lateral meristem is found in plants.
- ✓ They divide only in one plane.
- ✓ The dividing plane is periclinal plane.
- ✓ The cambium lies in vascular bundles of dicot and gymnosperm stems in between phloem and xylem

Example: Cambium and cork cambium.

## 3. Intercalary meristem

✓Intercalary meristem occurs between permanent tissues

✓Intercalary meristems are commonly found at the bases of leaves, above the nodes (e.g., grasses) or below the nodes (e.g., mint).

✓ The intercalary meristem present at the base of Pinus leaf (basal meristem) lives almost throughout the life of the leaf. Usually the intercalary meristems differ from other meristems in that they ultimately get fully used up in the formation of permanent tissues.

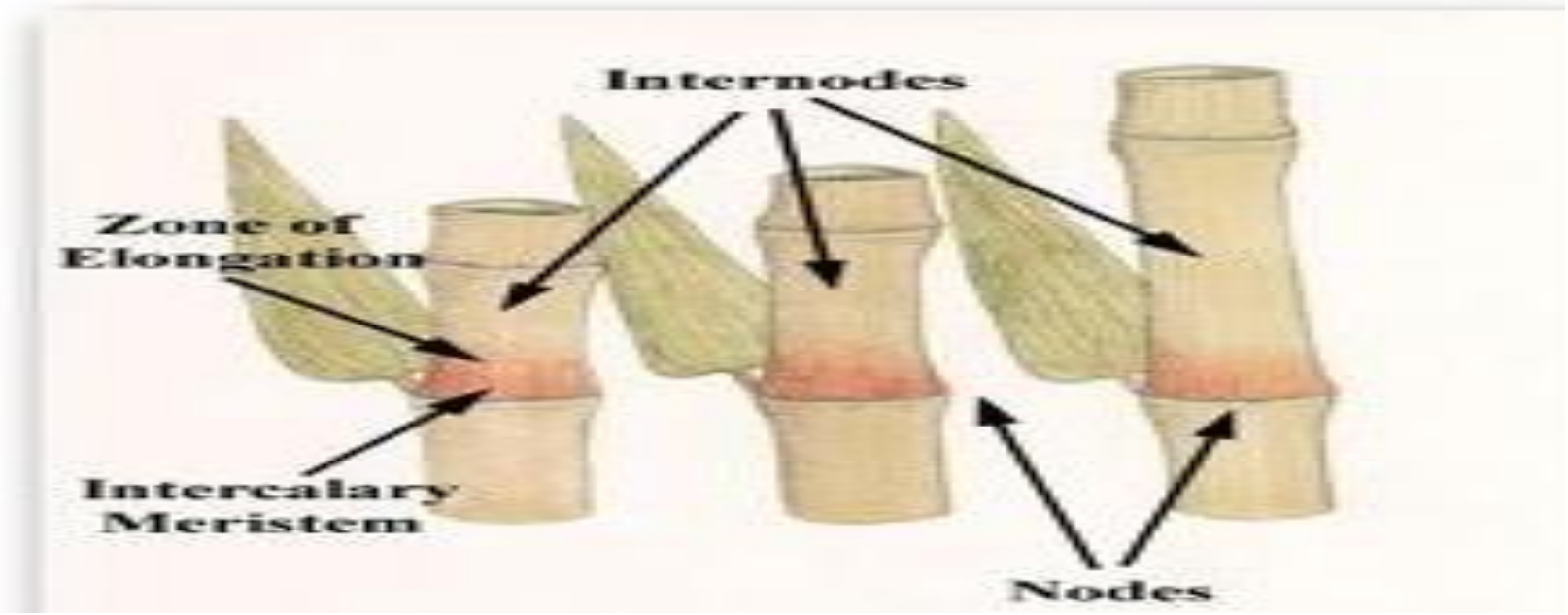



**Figure: Intercalary meristem**

## Classification of meristem based on nature of cell giving the meristem

**1. Primary meristem:**

✓In primary meristem meristematic tissues are derived directly from the meristems of the embryo.

✓Primary meristem continuously involved in cell division and growth.

✓ Apical meristem is the best example of primary meristem.

**2. Secondary meristem:**

✓The secondary meristems appears later at a stage of development of an organ of a plant body.

✓ The seconary meristems always arise in permanent tissue and they are always found lying lateral along the of stem and root.

✓Sometimes some of the primary permanent tissues actually the power of division and become meristematic.

✓ The secondary meristems are so called because they arise as new meristems in tissue which is not meristematic.

Example: cork cambium

# Shoot apical meristem

✓ The shoot apical meristem is the terminal meristem of the shoot which is the continuing embryonic region of the plant.

✓ It continuously gives rise to new cells and tissues from which new organs are formed.

✓ It is self determining and autonomous organizing centre of the plant.

✓Several theories have been put forward from time to time to explain and interpret the mode of growth of the shoot apical meristem. Some important one are discussed below

**Apical cell theory**

✓ Presence of a single tetrahedral apical cell in the shoot apex of most vascular Cryptogams prompted (Nageli 1878) to postulate the apical cell theory.

✓According to this theory a single apical cell is the structural and functional unit of apical meristem and it governs the whole process of growth.

✓ Such a single apical cell occurs in algae and majority of bryophytes and pteridophytes.

✓A single apical cell was also believed to be present in seed plants**.**

**Histogen theory :**

✓Histogen theory proposed by Hanstein, 1868.

✓Three distinct meristematic zones (layers) can be recognized in the shoot apex of angiosperms . These layers , each of which has its separate set of initials were termed as histogen.

✓The outermost histogen was designated as dermatogen – outermost . The middle one as periblem and the inner most as plerome.

✓Definite function were assigned to each histogens.

✓ The dermatogen give rise to epidermis, the periblem to the cortex and plerome to central cylinder.

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- Other theories are tunica corpus theory, Histogenic layer btheories, etc.

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# Thank You!!!