

BOT 102

GENERAL BOTANY

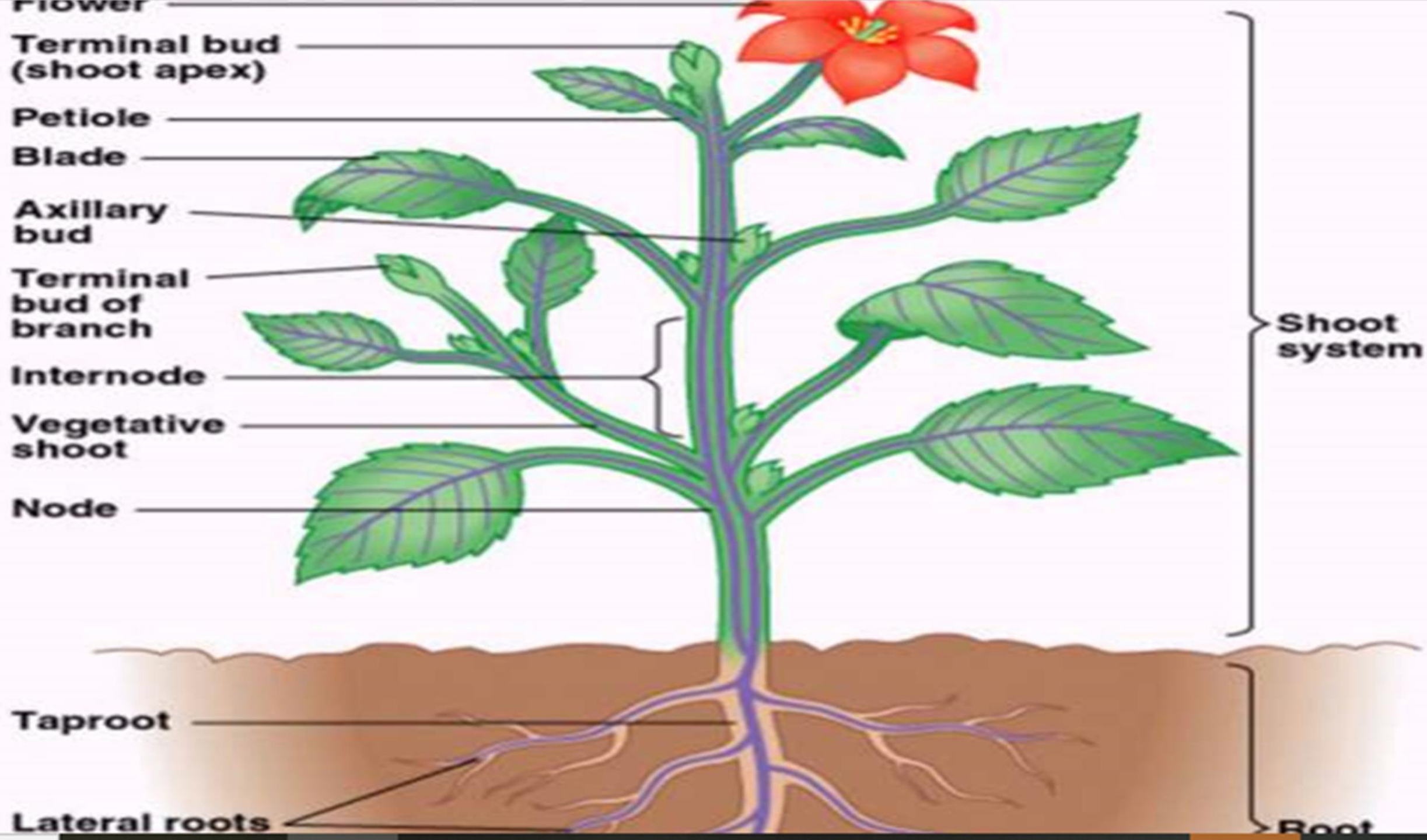
3 COMPULSORY COURSE UNIT

Plants generally are divided into two main system

- 1 Root system
- 2 Shoot system

The **shoot system** consists of two portions: the vegetative (non-reproductive) parts of the plant, such as the leaves and the stems, and the reproductive parts of the plant, which include flowers and fruits. The shoot system generally grows above ground, where it absorbs the light needed for photosynthesis.

The **root system**, which supports the plants and absorbs water and minerals, is usually underground



DIFFERENCES BETWEEN MONOCOTYLEDON AND DICOTYLEDON

• MONOCOTYLEDON

- 1 The embryo bears only one cotyledon
- 2 It possess fibrous root system
- 3 Venation is parallel
- 4 The flower has trimerous symmetry
- 5 The vascular bundles in the stem are arranged in a ring or circular form

• DICOTYLEDON

- 1 The embryo bears two cotyledon
- 2 It has tap root system
- 3 Venation is reticulate
- 4 The flower usually has a pentamerous symmetry, sometimes tetramerous
- 5 The vascular bundles in the stem are scattered in the ground is

In trimerous symmetry, there is an arrangement in flower parts such as petals, sepals, and stamens, in sets of three

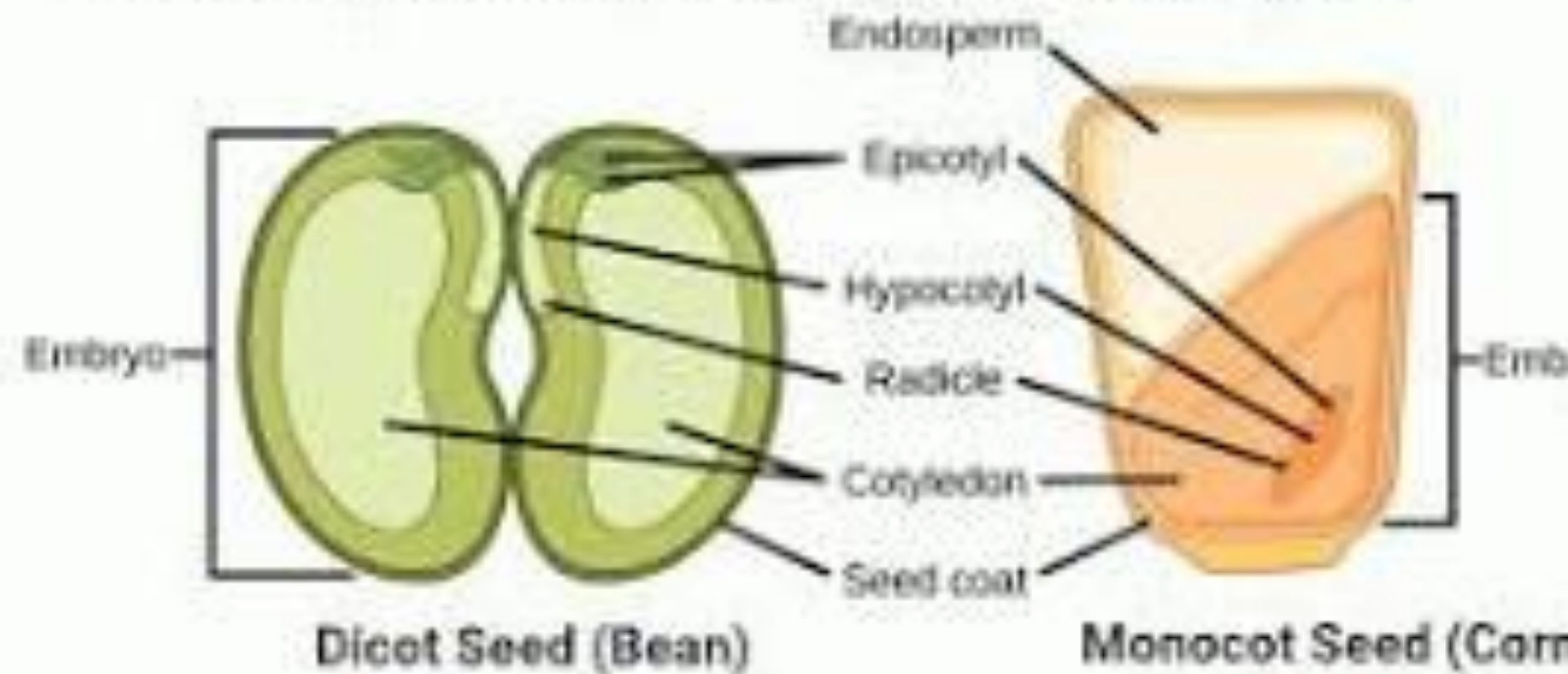


In pentamerous symmetry, there is an arrangement in flower parts such as petals, sepals, and stamens, in sets of five



Monocot and Dicot Seed

Definition, Structure, 10 Differences, Examples



Types of roots

- In flowering plants, there are three main types of roots, which include:
 1. Tap roots
 2. Fibrous roots
 3. Adventitious roots

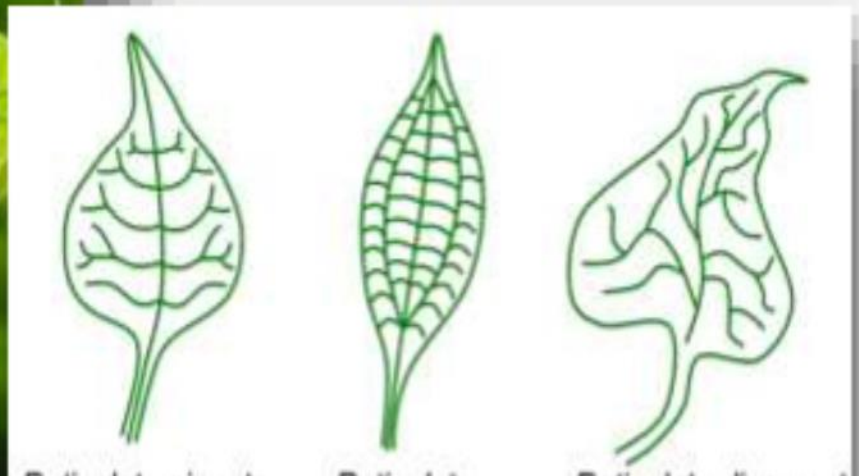
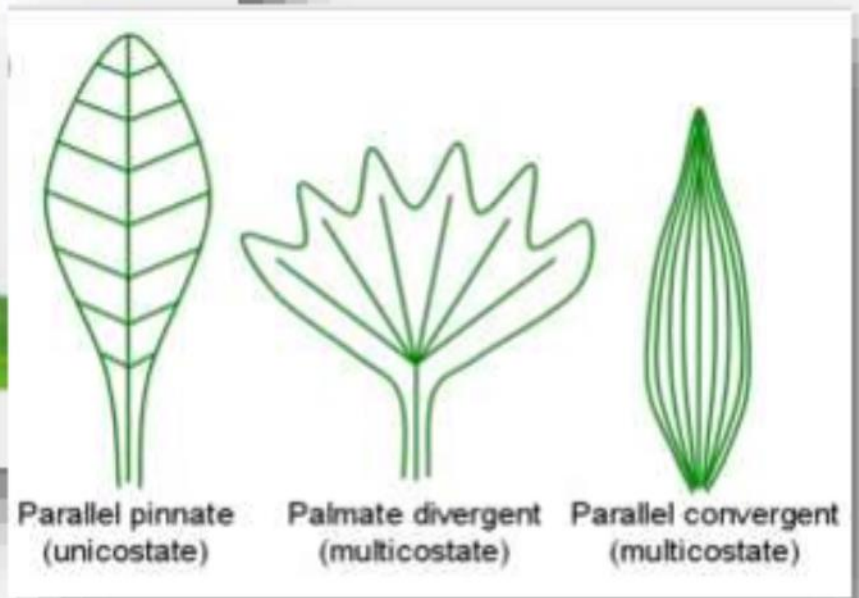


Venation in flowering plants

- **The pattern of veins on a leaf**
- There are two main types:
 1. **Parallel venation**
 2. **Reticulate venation**

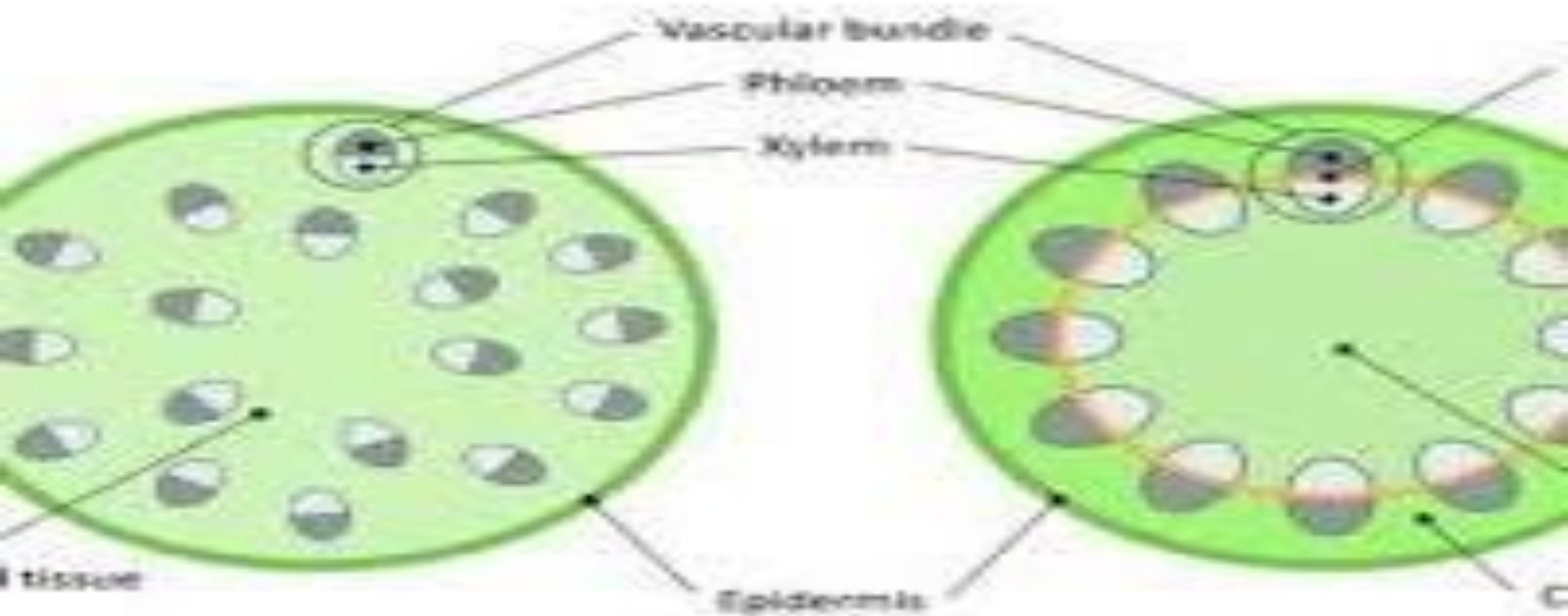


Parallel venation



Monocot stem

Dicot stem



Plants that have vascular tissues

- Seed plants are **gymnosperms** or open seeded plants (like conifers and cycads) and **angiosperms** closed seeded plants (flowering plants)
- A **pteridophyte** is a vascular plant that reproduces by means of spores. Because pteridophytes produce neither flowers nor seeds, they are sometimes referred to as "cryptogams". For example ferns, horsetails, clubmoss

Features of vascular bundles

- Vascular plants can also be referred to as **tracheophyte**. They are those varieties of plants that have special vascular tissue in them. The vascular tissue in plants is arranged in long, discrete strands called vascular bundles. The vascular tissue involves
 - 1 Xylem
 - 2 Phloem
- Vascular plants typically have stems, leaves, roots, flowers, or seeds
- Trees, shrubs, grasses, flowering plants, and ferns are all vascular plants

FUNCTIONS

Xylem: It transport water and dissolved minerals from the roots to other parts of the plant, such as the leaves and stems.

It also provides structural support for the plant.

Phloem: It transport food mainly sugars (like sucrose), which has been produced during photosynthesis in the leaves to other parts of the plant, including roots, flowers, and fruits

Vascular tissues in Pteridophytes

- The vascular bundles are seen in pteridophytes with variable arrangements in the position of xylem and phloem at the central part of stem.
- The central vascular cylinder found in the roots, stems and leaves are called **stele**.

Feature [1, 4, 5, 6, 7, 9]	Pteridophytes	Gymnosperms
Growth Type	Primarily herbaceous	Woody (secondary growth)
Vascular Cambium	Absent	Present (allows widening of stems)
Xylem Cells	Tracheids only	Mostly tracheids
Phloem Cells	Sieve cells only	Sieve cells and albuminous cells
Bundle Arrangement	Concentric/Stele-like	Ring arrangement (Eustele)

| Feature | Pteridophytes | Gymnosperms | Angiosperms

- | Xylem Composition | Tracheids only | Tracheids only | Tracheids and Vessel elements |
- | Phloem Composition | Sieve cells, no companion cells | Sieve cells, albuminous cells | Sieve tubes, companion cells |
- | Cambium | Absent | Present (Open bundles) | Present in Dicots, Absent in Monocots |
- | Stem Arrangement | Central stele | Arranged in a ring | Ring (Dicots) or Scattered (Monocots) |

Types of stele found in pteridophytes

Protostele

It is the simplest and most primitive type of stele, consisting of a solid core of xylem surrounded by phloem , **lacking** a central pith or any leaf gaps.

Subtypes:

Haplostele

Actinostele

Siphonostele

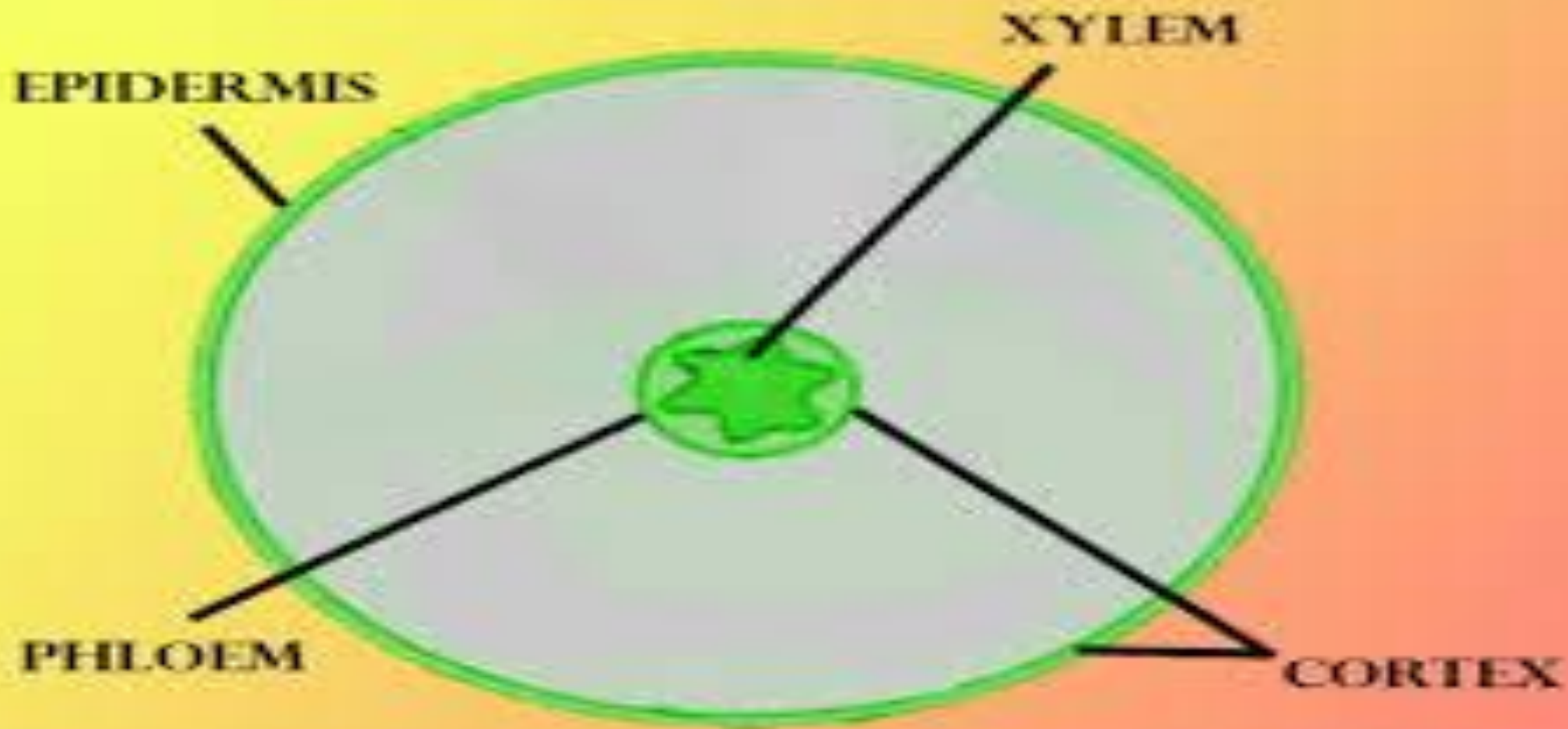
It is the type of stele with central pith surrounded by a ring of vascular tissue. It is more advanced than the protostele comprises of leaf gaps..

Subtypes:

Ectophloic Siphonostele:

Soleno-stele:

PROTOSTELE



Types of Siphonostele



solenostele



dictyostele



eustele

Types of stele found in pteridophytes

- **Dictyostele**

It is a type of **siphonostele** where the vascular cylinder is dissected by leaf gaps, resulting in a network (or net-like appearance) of vascular strands.

It is found in most **advanced ferns**, such as the maidenhair fern (*Adiantum*). The gaps are formed where leaves (fronds) are attached, This allow flexibility and efficient nutrient transport

Eustele

It is characterized by discrete vascular bundles arranged in a ring around the pith.

Vascular tissues in Angiosperms

- **In stems**, the vascular tissue is organized into many discrete vascular bundles.
- **In the roots**, the vascular tissue is organized within a single central vascular cylinder.
- There is presence of **vessels** in the xylem, well-developed sieve tubes and **companion cells** in phloem.
- The four main types of vascular bundles: Collateral bundle, Bicollateral bundle, Concentric bundle, Radial bundle

Vascular tissues in Gymnosperms

- The xylem primarily consists of tracheids, which are elongated, dead cells with thick walls that conduct water.
- The phloem in gymnosperms contains sieve tubes, which are specialized cells that conduct sugars and other organic compounds,
- They have no companion cells in their phloem.
- They have no vessels in their xylem but only have tracheids.