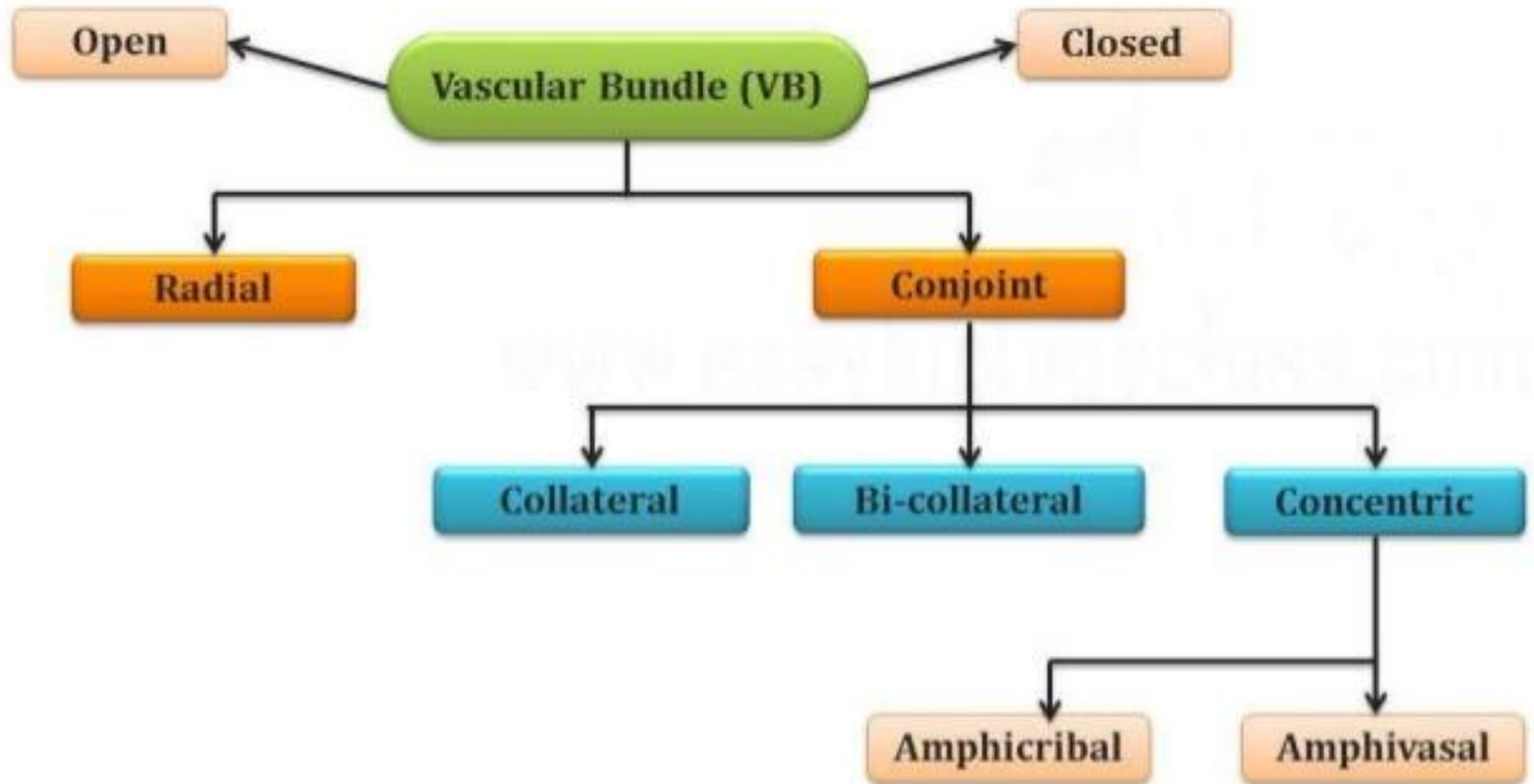


**PLANT ANATOMY**  
**Life Science III sem**

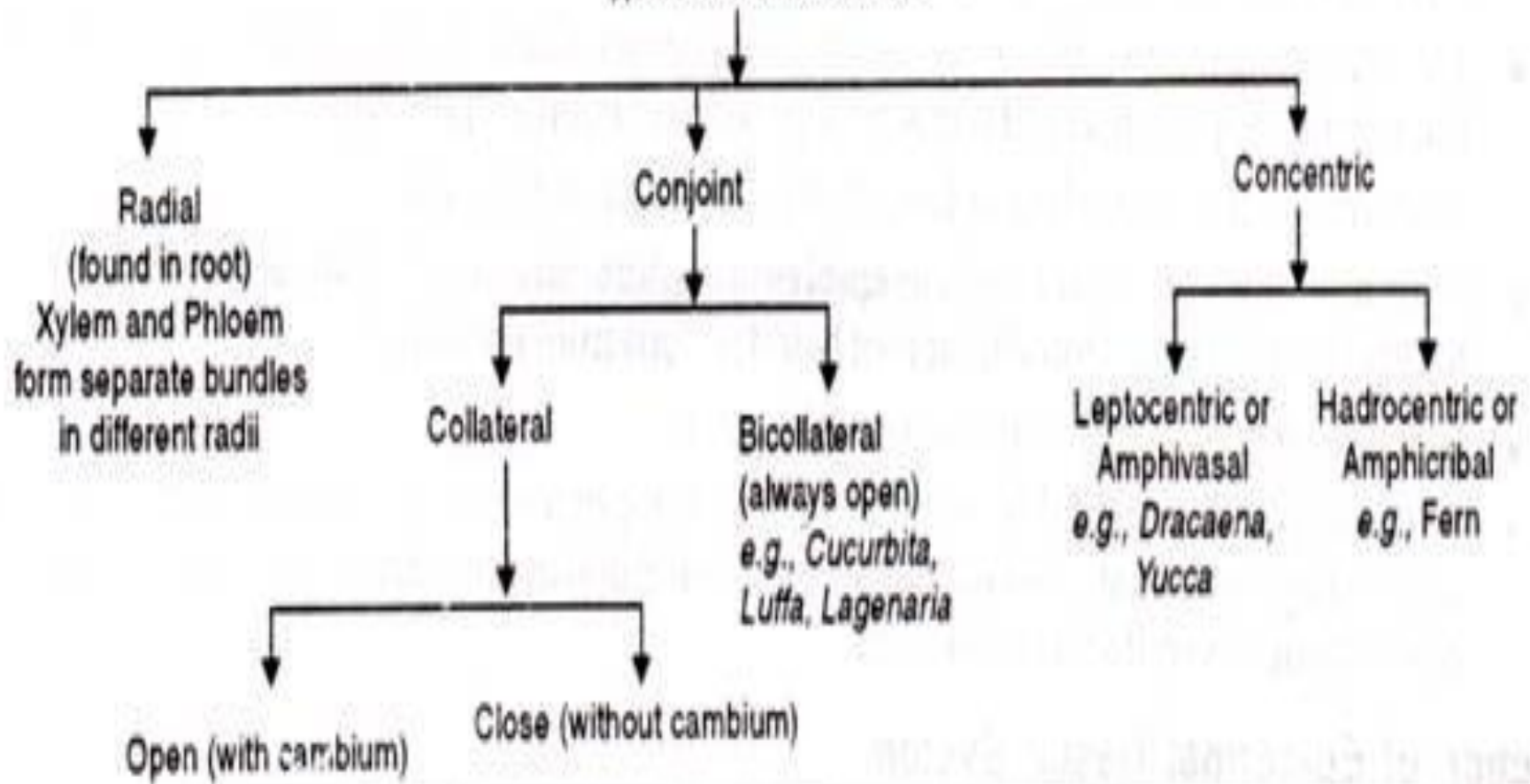
# VASCULAR BUNDLES

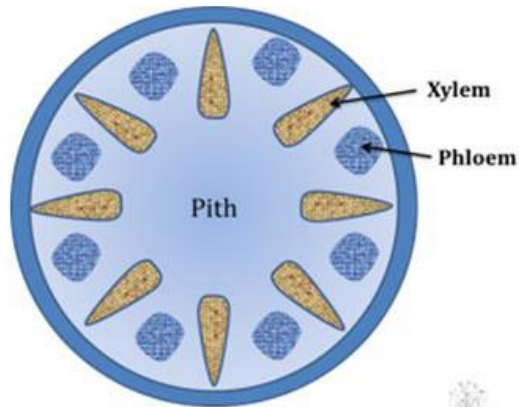


## Different Types of Vascular Bundles

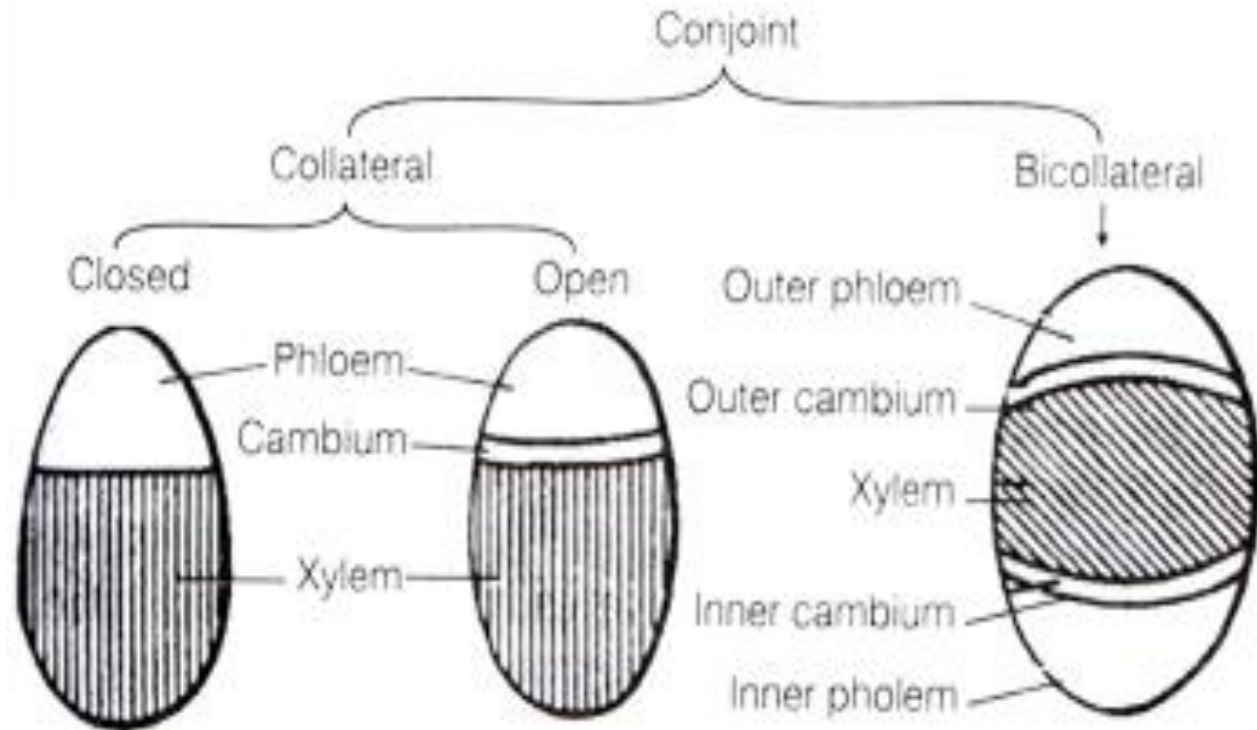


## Types of Vascular bundle





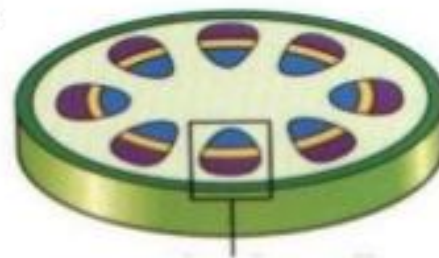
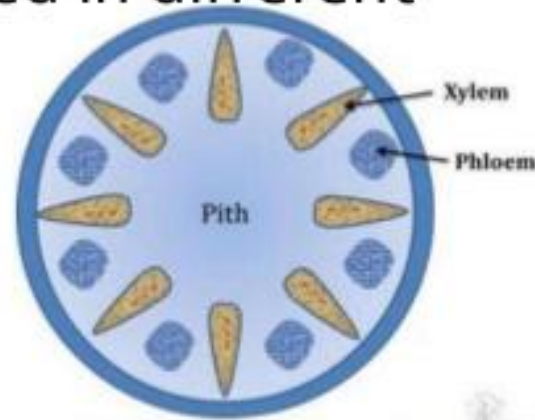
**Radial Vascular Bundles**

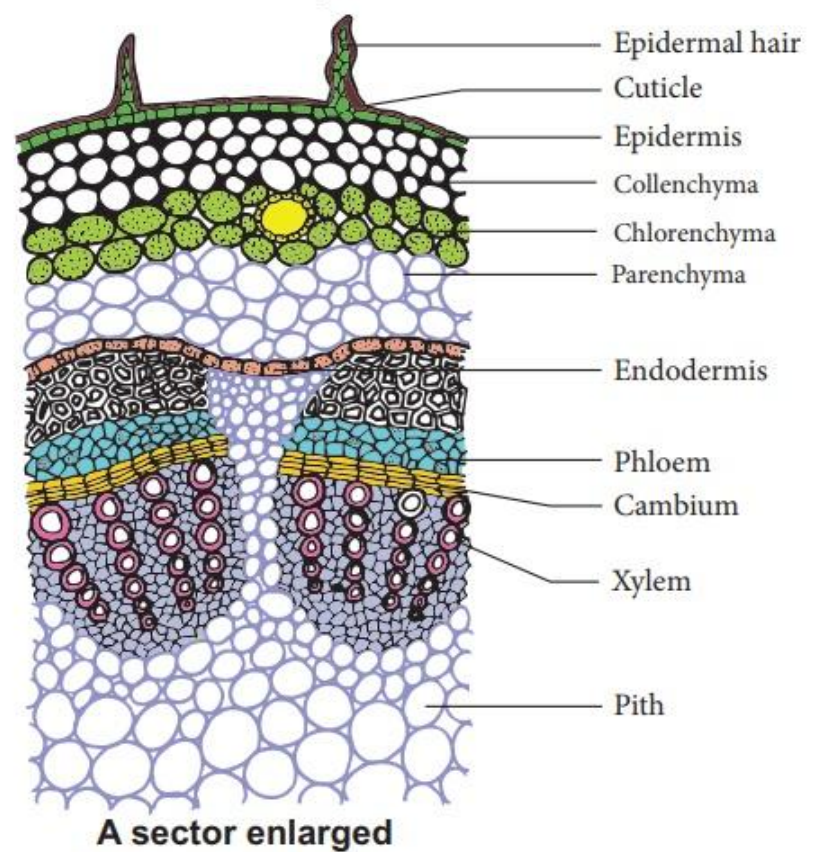
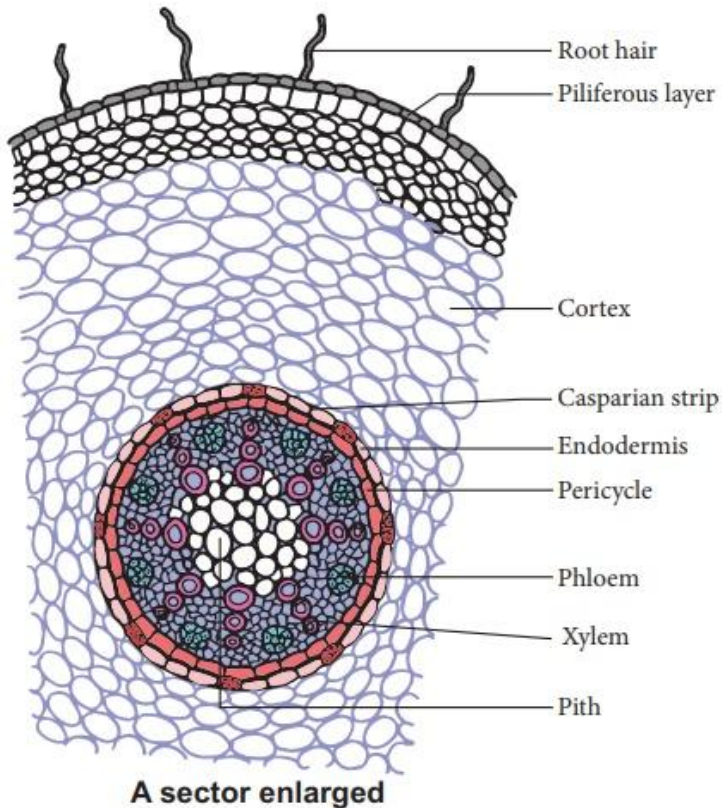
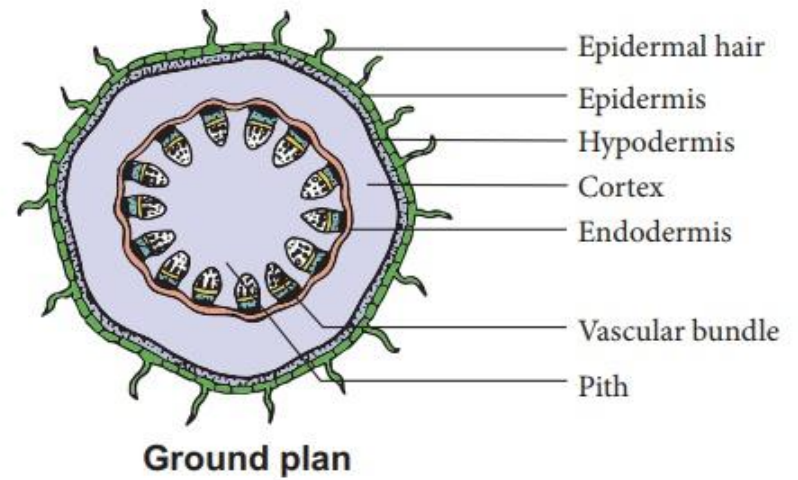
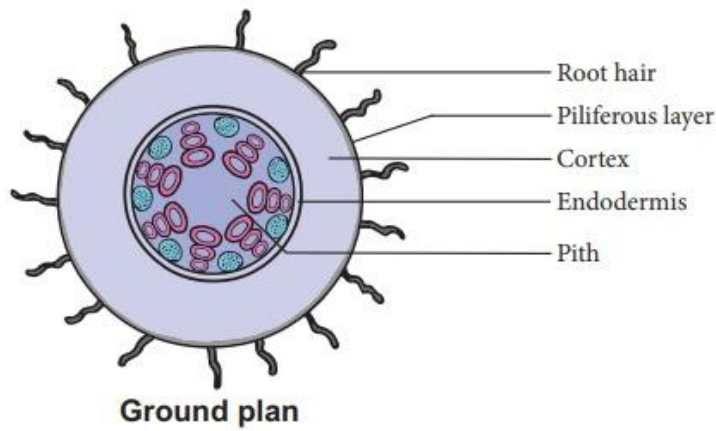


**Fig. 23.10** Types of conjoint vascular bundles

# Radial & conjoint vascular bundles

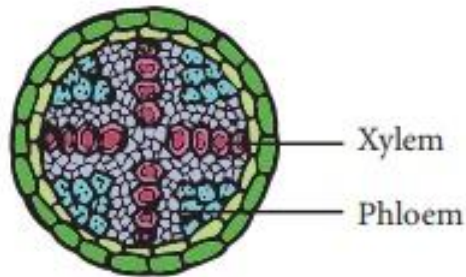
- Radial vascular bundles
  - xylem & phloem are arranged in different radii
  - Seen in roots
- conjoint vascular bundles
  - xylem & phloem are arranged in same radii
  - Seen in leaves and stems



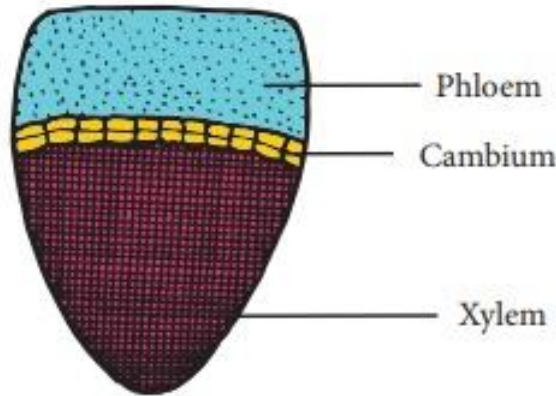


**Figure 12.3** Transverse section of Monocot root

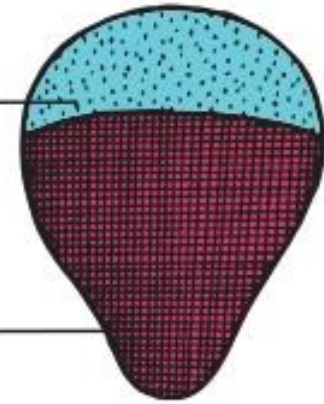
**Figure 12.4** Transverse section of Dicot stem



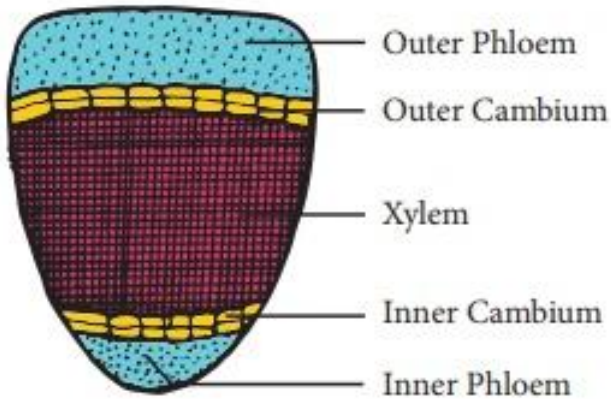
**Radial**



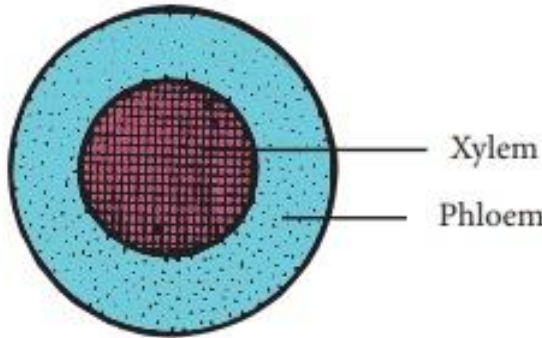
**Conjoint, collateral and open**



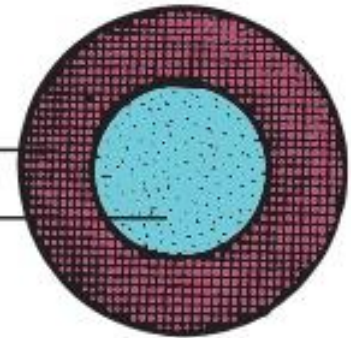
**Conjoint, collateral and closed**



**Conjoint, Bicollateral**



**Concentric and Amphicribal**



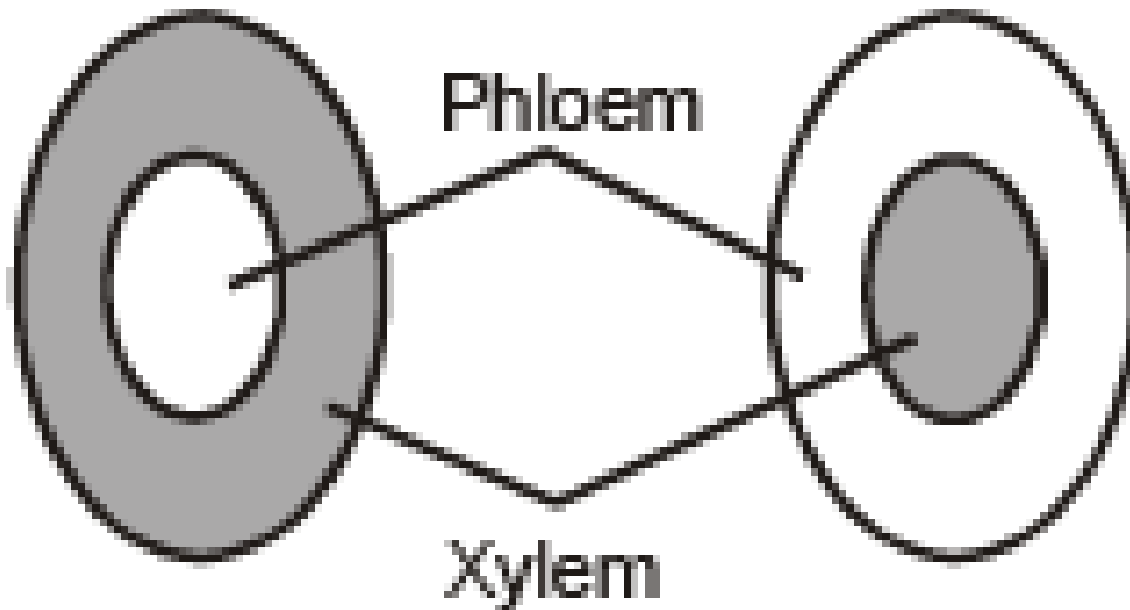
**Concentric and Amphivasal**

**Figure 12.1** Types of vascular bundle

# Concentric

Amphivasal

Amphicribral





# Vascular Bundles

## Radial bundles

(Xylem and phloem occur on different radii)

### Collateral bundles

(Xylem present inwards  
Phloem present outwards on the same radius)

#### Open

(with cambium in between xylem & phloem)

Ex. Sunflower, Tridax

#### Closed

(without cambium in between xylem and phloem)

Ex. Monocot stem

## Conjoint bundles

(Xylem and phloem are situated at the same radius of vascular bundle)

### Bicolateral bundles

(Xylem in the centre.  
Tissue sequence is outer phloem, outer cambium, xylem, inner cambium and inner phloem.)

Ex. Family cucurbitaceae members

### Concentric bundles

(Xylem and phloem are arranged as separate concentric rings)

Amphicribal  
or  
Hadrocentric  
(xylem central)

Ex. Ferns

Amphivasal or  
Leptocentric  
(Phloem central)

Ex. Dracaena, Yucca

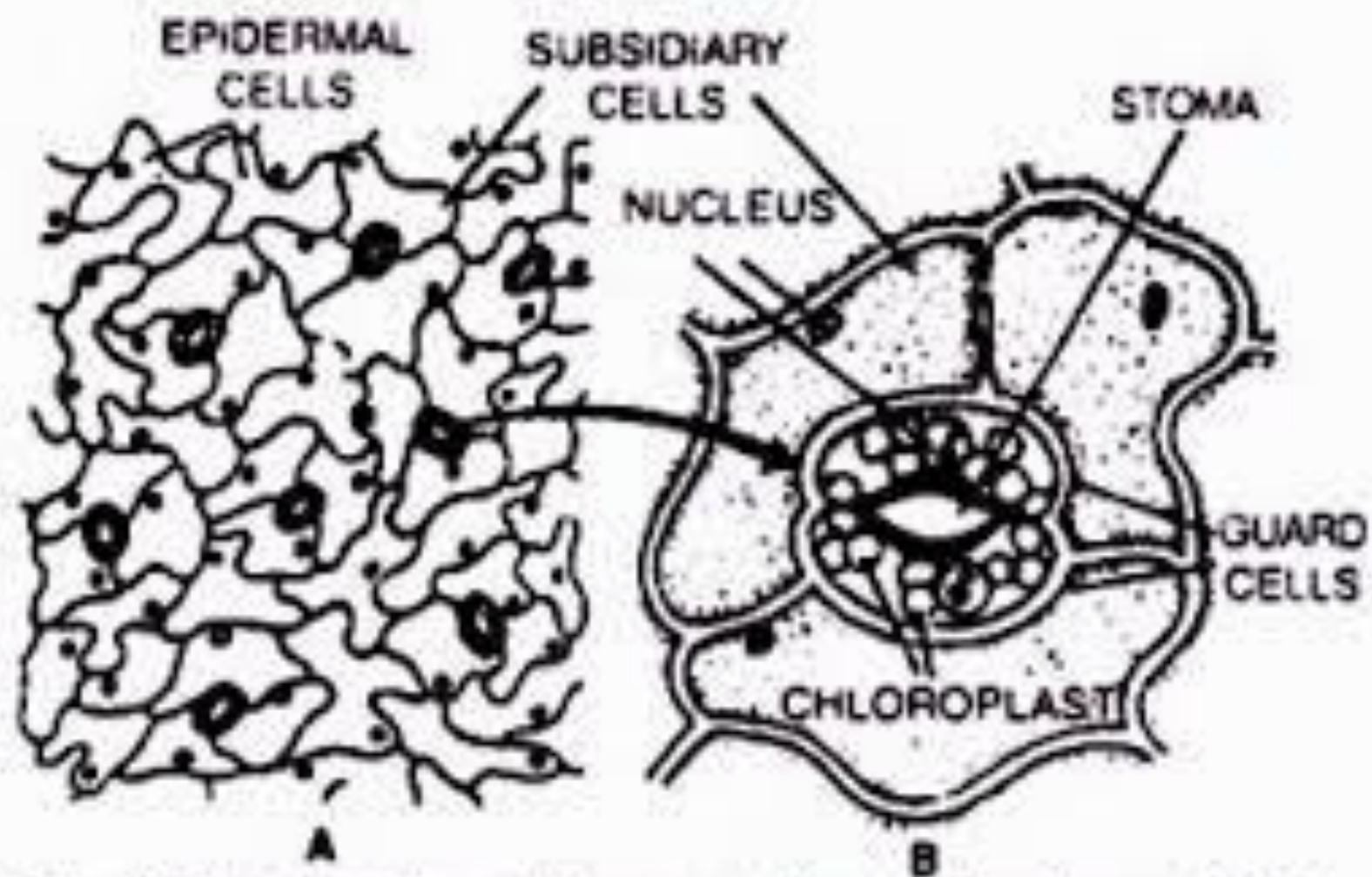
	<b>Exarch xylem</b>	<b>Endarch xylem</b>
(i)	Protoxylem is towards the outer side of the organ.	Protoxylem is towards the centre of the organ.
(ii)	Exarch condition of xylem is found in roots.	Endarch condition of xylem is found in stems.

# Anticlinal vs Periclinal Division

More Information Online [WWW.DIFFERENCEBETWEEN.COM](http://WWW.DIFFERENCEBETWEEN.COM)

	Anticlinal Division	Periclinal Division
DEFINITION	Anticlinal division is the method of cell division that takes place at a right angle to the plane of cell division	Periclinal division is the method of cell division that takes place parallel to the plane of cell division
PLANE OF DIVISION	Division takes place at a perpendicular angle to the plane of division	Division takes place parallel to the plane of division
OUTCOME OF CELL DIVISION	Increase in thickness and circumference of the plant	Increase in length of the plant

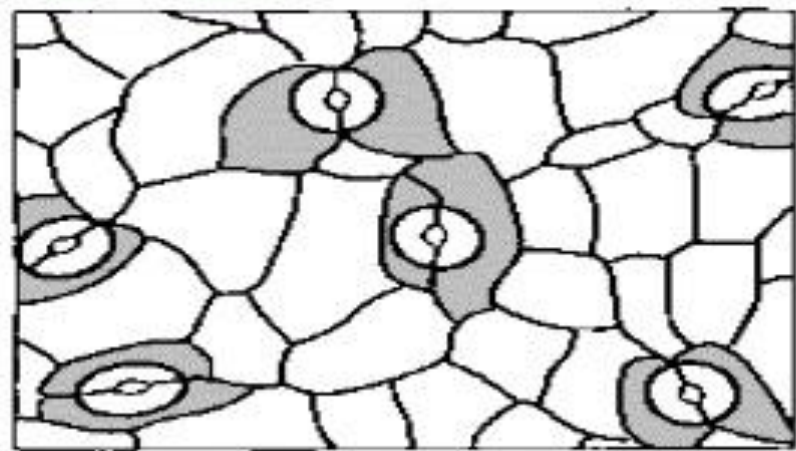
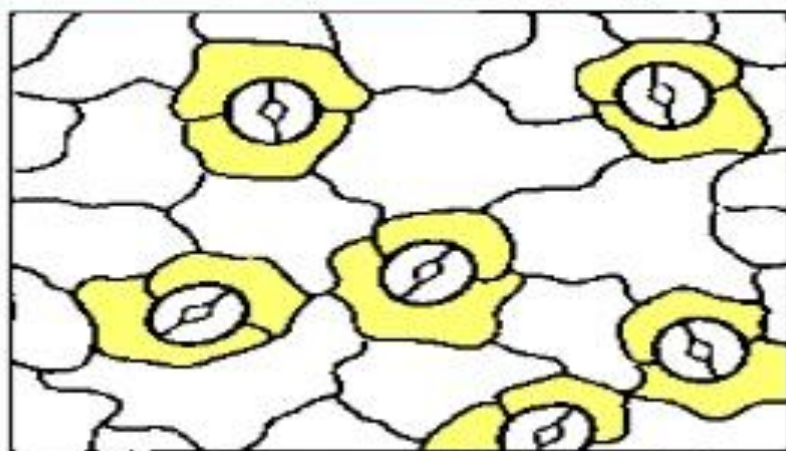
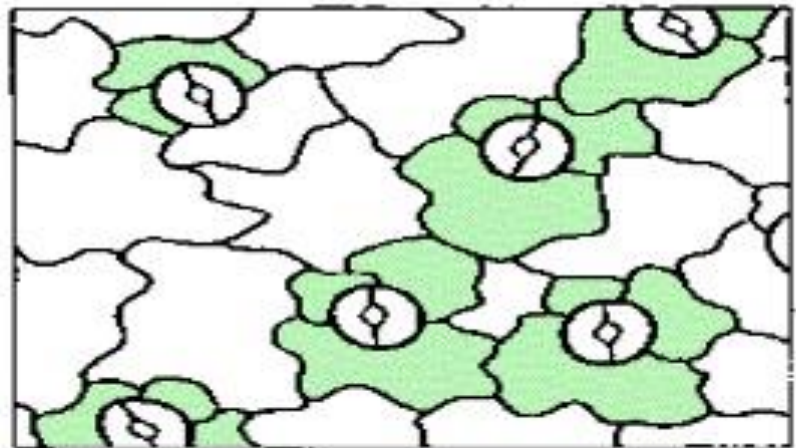
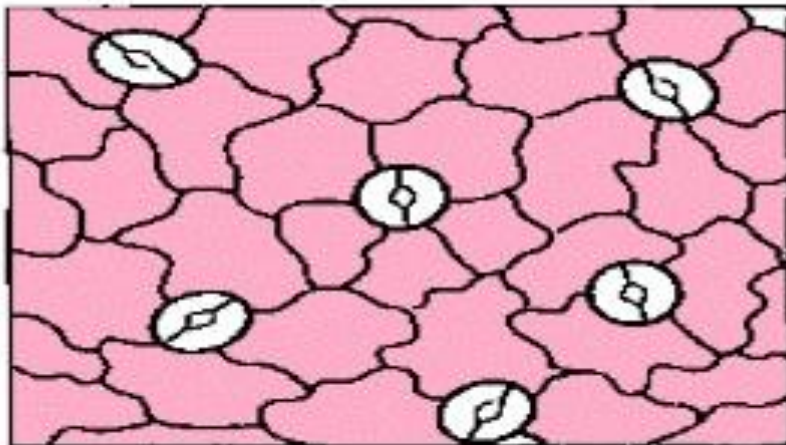
# **DIFFERENT TYPES OF STOMATA**



**Fig. 4.3 (A).** A portion of lower epidermis of leaf magnified to show stomata : **(B).** A stoma magnified.

# Metacalfe & Chalk :-

Describe 4 Type Of Dicot Stomata



# Types of stomata

- ▶ There are 4 basic types of stomata among the dicotyledons, these types are distinguished on the basis of the subsidiary cells surrounding the stomata & their arrangements,
- ▶ The four types are as the following
  - A) Anomocytic type, Ranunculaceae
  - B) Anisocytic type, Curciferaceae
  - C) Paracytic type, Rubiceae
  - D) Diacytic type, Caryophyllaceae

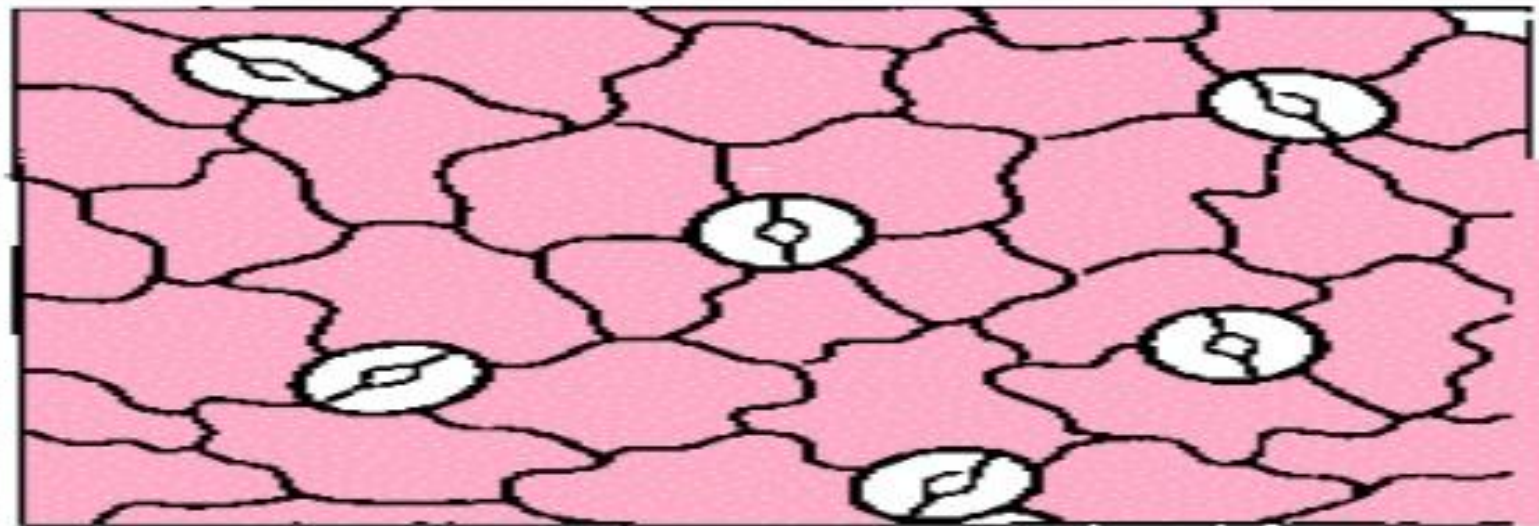
# Types of stomata and Example of drugs

- Paracytic or Rubiaceae or parallel-celled stomata: Cocca leaf, senna leaf
- Diacytic or Caryophyllaceae or cross-celled stomata : Peppermint, Vasaka
- Anisocytic or Cruciferae or Unequal celled stomata: Belladonna, Datura
- Anomocytic or Ranunculaceae or irregular celled stomata: Digitalis, Lobelia



## Anomocytic Type :-

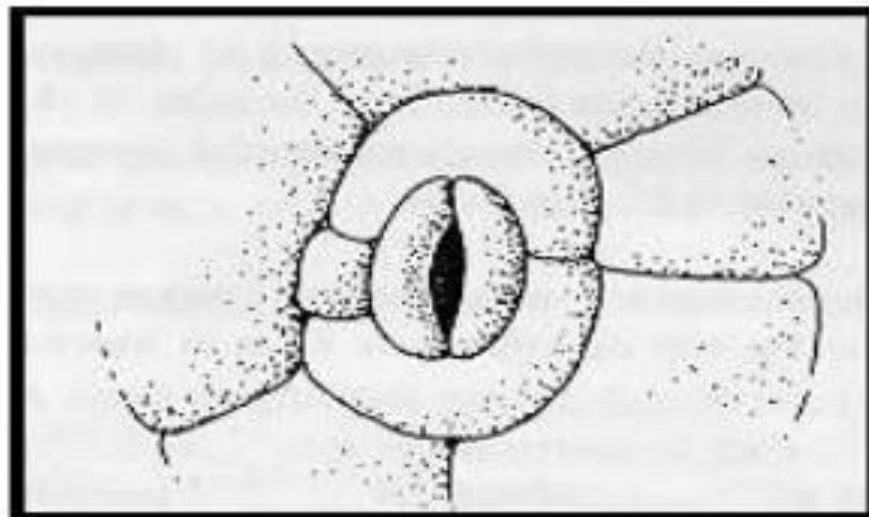
Here , Stomata Surround With Limited Number Of Cell , Which Cannot be Differentiated From Other Cell



Anomocytic Type

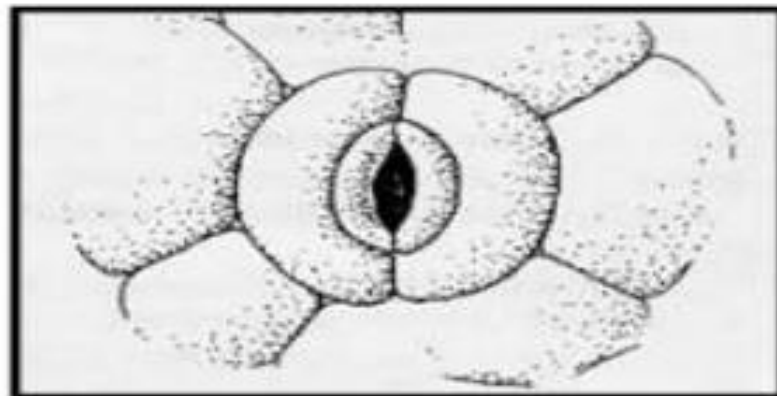
## B) Anisocytic type or Cruciferae

- ▶ The stomata is surrounded by 3 or more subsidiary cells, one of them is distinctly smaller than the others like in *Hyoscyamus niger*, check the following picture.



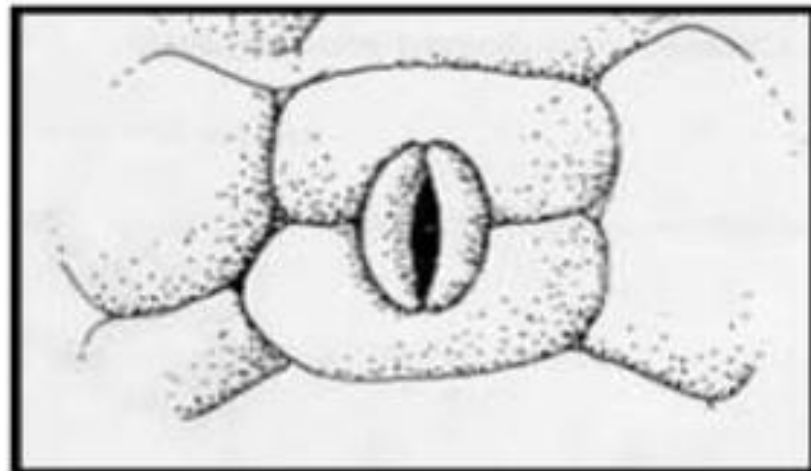
## *C) Paracytic type or Rubiaceae*

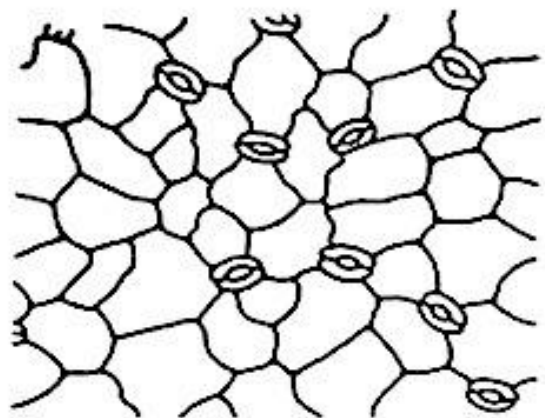
- ▶ Each stoma is surrounded by 2 or more subsidiary cells, 2 of them have their long axes parallel to the pore, which means that the axes of the subsidiary cells are parallel to the axes of the pore like the one in senna leaves, check the following picture.



## D) Diacytic type, Caryophyllaceae

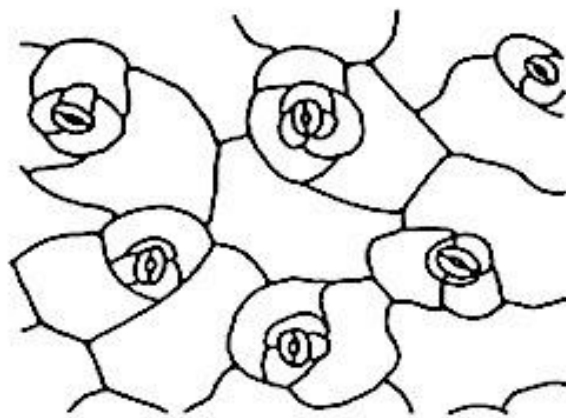
- ▶ Each stomata is surrounded by 2 subsidiary cells having their long axes perpendicular to the pore like in peppermint, *Mentha piper*, check the following picture





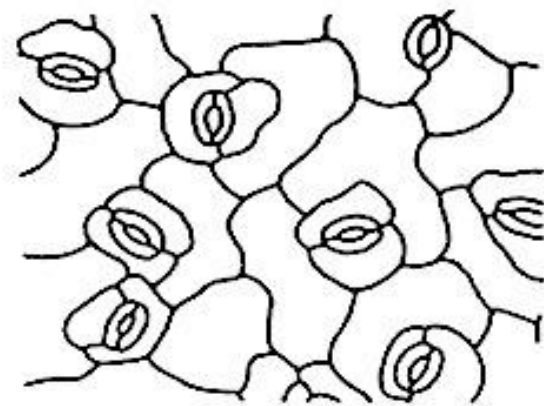
*Citrullus* – anomocytic

**A**



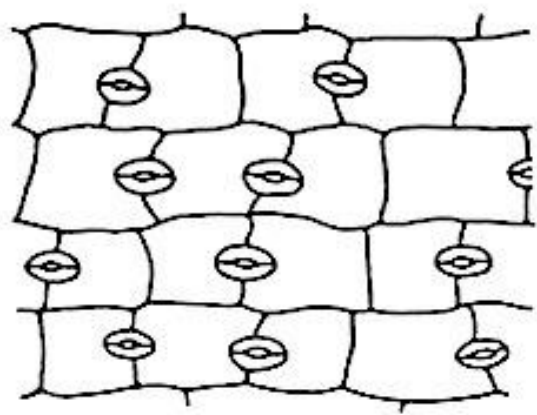
*Sedum* – anisocytic

**B**



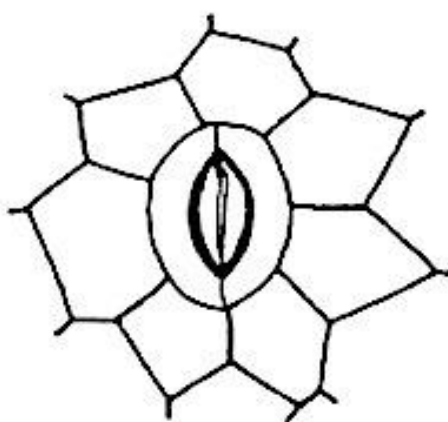
*Vigna* – paracytic

**C**



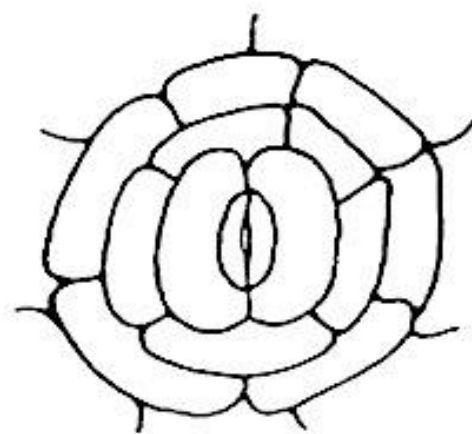
*Dianthus* – diacytic

**D**



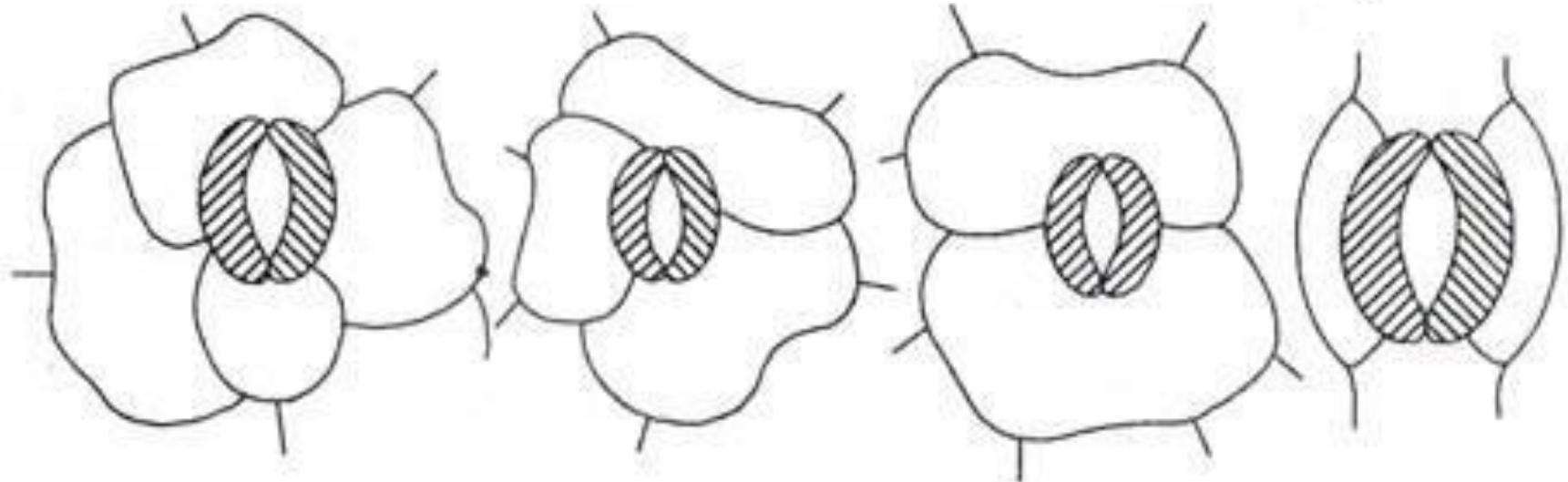
*Lansea* – actinocytic

**E**



*Schinopsis* – cyclocytic

**F**

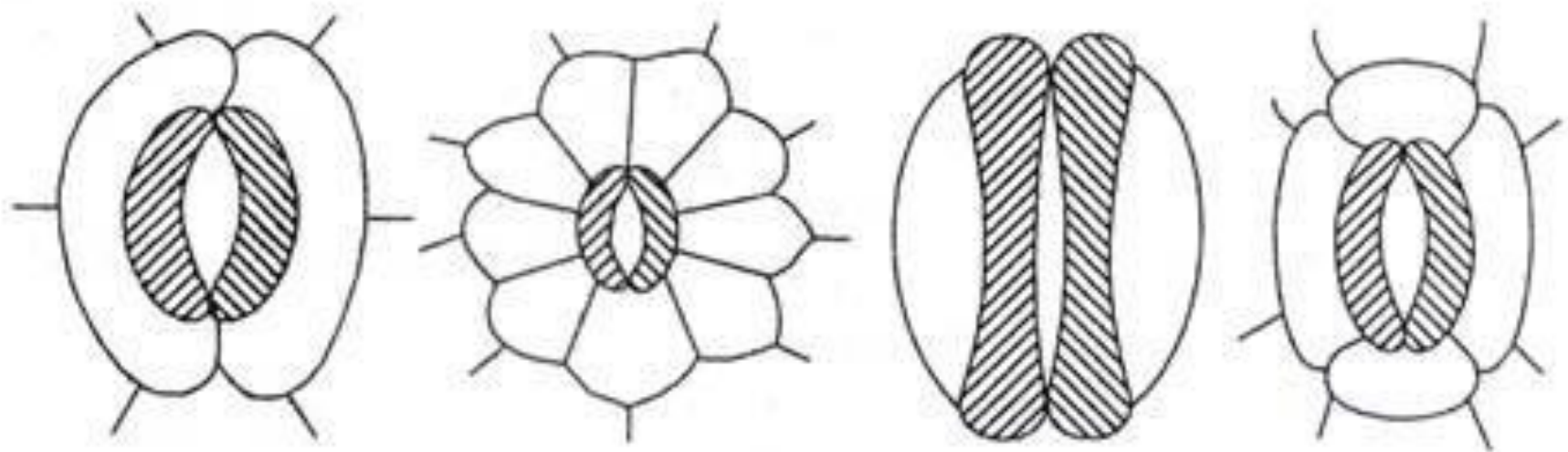


Anomocytic

Anisocytic

Diacytic

Paracytic



Paracytic

Actinocytic

Gramineous

Tetracytic

Figure 12.9