FREE NOTES · NCERT + NEET LEVEL

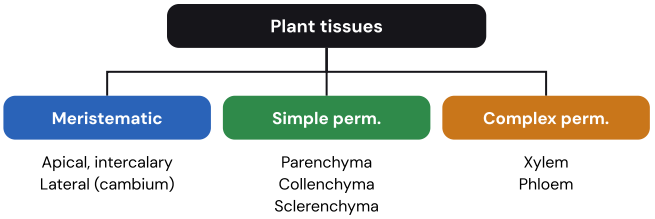
Anatomy of Flowering Plants

Meristems, simple aur complex permanent tissues, teen tissue systems, dicot aur monocot root, stem, leaf ki andar ki banawat, aur secondary growth.

01 Meristematic tissues
02 Permanent tissues
03 Tissue systems
04 Dicot vs monocot: root aur stem
05 Leaf anatomy
06 Secondary growth
07 Extra + tricks
08 Important Q&A
09 Common mistakes
10 Practice (NEET style)
11 Quick revision

01 Meristematic tissues

- **Apical**: root aur shoot ki nok pe, lambai badhate (primary growth).
- **Intercalary**: mature tissues ke beech (ghaas), charne ke baad phir ugti.
- **Lateral** (secondary): vascular cambium, cork cambium; motai badhate.
- Axillary buds shoot apical meristem ke bache cells se.



Plant tissues ka classification

02 Permanent tissues

Tissue	Structure	Function
Parenchyma	Patli cellulose walls, zinda, isodiametric	Photosynthesis, storage, secretion
Collenchyma	Konon pe cellulose, hemicellulose, pectin; zinda; dicots me epidermis ke neeche	Badhte parts ko support
Sclerenchyma	Lignified moti walls, mrit; fibres aur sclereids (nut shells, amrood, nashpati, chai patti)	Mechanical support
Xylem	Tracheids, vessels (mrit, lignified), xylem fibres, xylem parenchyma (sirf ye zinda)	Paani, minerals
Phloem	Sieve tubes (nucleus nahi, sieve plates), companion cells, phloem parenchyma, phloem fibres (bast, sirf ye mrit)	Khana transport

Protoxylem pehle, metaxylem baad me. **Endarch** (protoxylem centre ki taraf: stems), **exarch** (bahar ki taraf: roots). Gymnosperms me vessels nahi; companion cells ki jagah albuminous cells.

03 Tissue systems

- **Epidermal**: epidermis, cuticle (roots me nahi), stomata (guard cells: dicots me sem jaise, ghaas me dumbbell; subsidiary cells ke saath), trichomes (shoot, multicellular) aur root hairs (unicellular).
- **Ground**: epidermis aur vascular bundles ke alawa sab: cortex, pericycle, pith, medullary rays; leaves me mesophyll.
- **Vascular**: xylem + phloem. **Radial** (alag radii pe: roots), **conjoint** (ek radius pe: stems, leaves). Open (cambium hai: dicot stem) vs closed (cambium nahi: monocots).

04 Dicot vs monocot: root aur stem

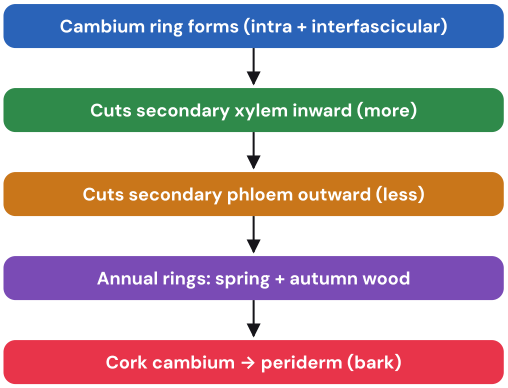
Feature	Dicot root	Monocot root	Dicot stem	Monocot stem
Vascular bundles	2–4 xylem/phloem (radial)	>6 (polyarch)	Ring, conjoint, open	Scattered, conjoint, closed
Pith	Small/absent	Large	Present	Not distinct
Special	Endodermis with Casparian strips; pericycle gives lateral roots	Same, no secondary growth	Hypodermis collenchyma; starch sheath	Sclerenchymatous bundle sheath; water cavities

05 Leaf anatomy

- **Dorsiventral** (dicot) leaf: mesophyll **palisade** (upar, lambe) aur **spongy** (neeche, khaali jagah) me banta; neeche ki epidermis pe zyada stomata.
- **Isobilateral** (monocot) leaf: dono taraf stomata, mesophyll alag nahi.
- **Bulliform cells** (ghaas): upar ki epidermis pe bade khaali cells; paani kam hone pe patti mud jaati, paani kam udta.
- Veins ke chaaron taraf bundle sheath.

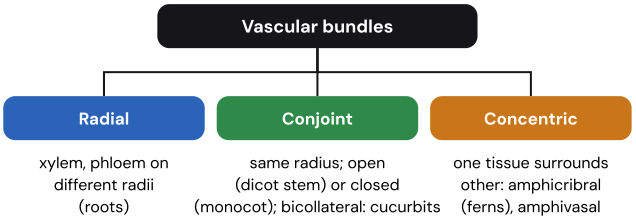
06 Secondary growth

- Dicots aur gymnosperms me. Intrafascicular + interfascicular cambium poori ring banate.
- **Spring wood** (early wood): cambium zyada active, chaude vessels, halka. **Autumn wood** (late wood): patle vessels, gehra, ghana. Dono milke **annual ring** (ped ki umar).
- **Heartwood**: gehra, paani nahi le jaata, tannins aur resins, tikau. **Sapwood**: halka, paani le jaata.
- **Phellogen** (cork cambium) bahar phellem (cork), andar phelloderm (secondary cortex): milke periderm. **Lenticels** se gas exchange. Bark = vascular cambium ke bahar ke saare tissues.



Dicot stem me secondary growth

07 Extra + tricks



Vascular bundles ke types

- Simple tissue trick: **P-C-S** → Parenchyma (zinda, patli), Collenchyma (zinda, kone mote), Sclerenchyma (mrit, lignified).
- Angiosperm phloem: sieve tube + companion cell **pit fields** se jude; gymnosperms me sieve tubes aur companion cells nahi (sieve cells aur albuminous cells).
- Root vs stem: root me root hairs aur exarch xylem; stem me trichomes aur endarch xylem; root me pericycle se lateral roots.
- Bark (aam bhasha) = vascular cambium ke bahar ke saare tissues; early (naram) aur late (sakht) bark.
- Spring wood (halka, chaude vessels) vs autumn wood (gehra, patle): tropical pedon me mausam na badle to annual rings saaf nahi.

08 Important Q&A

Q1. Zyada tar monocots me phloem parenchyma kyun nahi?

Ye anatomy ka fact hai: monocot phloem me phloem parenchyma nahi hota (dicots me hota).

Q2. Ped ki umar kaise pata karein?

Annual rings gino (ek halka spring + ek gehra autumn band = ek saal). Ise dendrochronology kehte.

Q3. Sookhe mausam me ghaas ki patti kyun mudti?

Bulliform cells ka paani kam hota, dheele padte, patti andar mudti aur transpiration kam hota.

09 Common mistakes

- Xylem parenchyma ko mrit kehna (xylem me sirf yahi zinda).
- Endarch (stem) aur exarch (root) mix karna.
- Monocot bundles ko open kehna (closed hain, cambium nahi).
- Sochna ki heartwood paani le jaata.

10 Practice (NEET style)

1. Casparian strips kis cheez ke?
2. Phloem ka sirf mrit part?
3. Ghaas dobara ugne ka meristem?
4. Cork cambium ka doosra naam?
5. Dono surface pe stomata wali leaf?

ANSWERS

1) Suberin · 2) Phloem fibres · 3) Intercalary · 4) Phellogen · 5) Isobilateral (monocot)

11 Quick revision: exam se 5 minute pehle

TISSUES

- Collenchyma: kone mote
- Sclerenchyma: mrit, lignified
- Xylem parenchyma zinda

BUNDLES

- Root: radial, exarch
- Dicot stem: ring, open
- Monocot: scattered, closed

LEAF

- Dicot: palisade + spongy
- Monocot: isobilateral
- Bulliform: mudna

SECONDARY

- Spring halka, autumn gehra
- Heartwood paani nahi
- Periderm = phellem+phellogen+phelloderm

Koi doubt? padhaiadda.netlify.app pe AI Doubt Solver se poocho, ya is chapter ka mock test do.