FREE NOTES · NCERT + NEET LEVEL

Morphology of Flowering Plants

Root, stem and leaf with their modifications, inflorescence, flower parts and floral formula, fruit and seed, and the description of families Fabaceae, Solanaceae and Liliaceae.

01 Root and its modifications
02 Stem and leaf
03 Inflorescence and the flower
04 Aestivation, stamens, placentation
05 Fruit and seed
06 Semi-technical description & floral formula
07 Extra: more families (NEET syllabus) + tricks
08 Important Q&A
09 Common mistakes
10 Practice (NEET style)
11 Quick revision

01 Root and its modifications

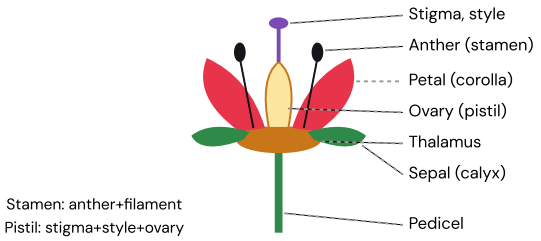
- **Tap root** (dicots, from radicle; mustard) · **fibrous** (monocots; wheat) · **adventitious** (from parts other than radicle; *Monstera*, banyan, grass).
- Regions: root cap → meristematic zone → elongation → maturation (root hairs).
- **Storage**: carrot, turnip (tap), sweet potato (adventitious). **Prop roots**: banyan. **Stilt roots**: maize, sugarcane. **Pneumatophores** (breathing, grow up): *Rhizophora* (mangroves).

02 Stem and leaf

- Stem: nodes, internodes, buds; develops from plumule. **Storage**: potato (tuber), ginger, turmeric (rhizome), *Colocasia* (corm), onion (bulb). **Tendrils** (axillary bud): cucumber, grapes. **Thorns**: *Citrus*, *Bougainvillea*. **Phylloclade** (flat green stem): *Opuntia*, *Euphorbia*. Runner (grass), stolon (mint, jasmine), offset (*Pistia*, *Eichhornia*), sucker (banana, pineapple, *Chrysanthemum*).
- Leaf: leaf base, petiole, lamina; **pulvinus** in legumes. Venation: reticulate (dicots), parallel (monocots). Simple vs compound (pinnate: neem; palmate: silk cotton).
- Phyllotaxy: alternate (china rose), opposite (*Calotropis*, guava), whorled (*Alstonia*).
- Leaf modifications: tendrils (peas), spines (cactus), storage (onion, garlic), phyllode (Australian *Acacia*), insectivorous (pitcher plant, Venus fly trap).

03 Inflorescence and the flower

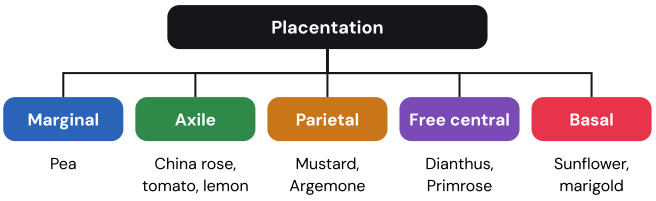
- **Racemose**: main axis keeps growing, flowers acropetal (older at base).
- **Cymose**: main axis ends in a flower, basipetal.
- Flower: modified shoot; 4 whorls: calyx, corolla, androecium, gynoecium on thalamus.
- Symmetry: actinomorphic (mustard, datura, chilli), zygomorphic (pea, gulmohur, bean, *Cassia*), asymmetric (canna).
- Ovary position: hypogynous (superior: mustard, china rose, brinjal), perigynous (half-inferior: plum, rose, peach), epigynous (inferior: guava, cucumber, sunflower ray florets).



Parts of a flower

04 Aestivation, stamens, placentation

- Aestivation: **valvate** (*Calotropis*), **twisted** (china rose, lady's finger, cotton), **imbricate** (*Cassia*, gulmohur), **vexillary**/papilionaceous (pea, bean: standard, 2 wings, 2 keel).
- Stamens: epipetalous (brinjal), epiphyllous (lily); monoadelphous (china rose), diadelphous (pea), polyadelphous (citrus).
- Gynoecium: apocarpous (free carpels: lotus, rose), syncarpous (fused: mustard, tomato).



Types of placentation

05 Fruit and seed

- Fruit = mature ovary after fertilisation; **parthenocarpic** fruit forms without fertilisation. Pericarp: epicarp, mesocarp, endocarp.
- **Drupe** (one-seeded, stony endocarp): mango, coconut (fibrous mesocarp).
- Dicot seed (pea, bean): seed coat (testa + tegmen), hilum, micropyle, embryo (axis + 2 cotyledons), non-endospermic (food in cotyledons; castor is endospermic).
- Monocot seed (maize): endospermic; aleurone layer; scutellum (single cotyledon); coleoptile covers plumule, coleorhiza covers radicle.

06 Semi-technical description & floral formula

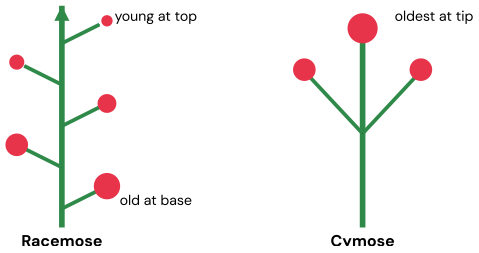
Symbols: Br bracteate, ⊕ actinomorphic, % zygomorphic, ⚥ bisexual, K calyx, C corolla, P perianth, A androecium, G gynoecium; G with line below = superior, line above = inferior; brackets = fused; C with A joined by arc = epipetalous.

Family	Floral formula	Features	Examples / use
Fabaceae (pea)	% ⚥ $K_{(5)}$ $C_{1+2+(2)}$ $A_{(9)+1}$ $\underline{G}_{1}$	Root nodules, pulvinus, vexillary aestivation, diadelphous stamens, marginal placentation, legume pod	Gram, arhar, soybean, groundnut; indigo, sunn hemp, *Sesbania*, lupin
Solanaceae (potato)	⊕ ⚥ $K_{(5)}$ $C_{(5)}$ A_5 $\underline{G}_{(2)}$	Epipetalous stamens, swollen axile placenta, ovary obliquely placed, berry/capsule	Tomato, brinjal, potato; belladonna, ashwagandha; tobacco; petunia
Liliaceae (lily)	⊕ ⚥ $P_{(3+3)}$ A_{3+3} $\underline{G}_{(3)}$	Monocot, tepals, epitepalous stamens, axile placentation, capsule/berry	Tulip, *Gloriosa*; aloe, asparagus, colchicine (*Colchicum*)

07 Extra: more families (NEET syllabus) + tricks

Family	Floral formula	Key points	Examples
Malvaceae (china rose)	Epk ⊕ ⚥ $K_{(5)}$ C_5 $A_{(\infty)}$ $\underline{G}_{(5)}$	Epicalyx; twisted aestivation; monadelphous stamens (staminal tube); axile placentation	Cotton, lady's finger, china rose
Brassicaceae / Cruciferae (mustard)	⊕ ⚥ K_{2+2} C_4 A_{2+4} $\underline{G}_{(2)}$	Cruciform corolla; **tetradynamous** stamens (4 long + 2 short); parietal placenta with replum; fruit siliqua	Mustard, radish, cabbage
Asteraceae / Compositae (sunflower)	Disc floret: ⊕ ⚥ K_{pappus} $C_{(5)}$ $A_{(5)}$ $\underline{G}_{(2)}$ inferior	Head (capitulum) inflorescence; **syngenesious** stamens (anthers fused); basal placenta; fruit cypsela	Sunflower, marigold, *Parthenium*
Poaceae / Gramineae (grass)	$P_{2\ lodicules}$ A_3 $\underline{G}_{1}$	Spikelets; versatile anthers; fruit **caryopsis** (pericarp fused with seed coat)	Wheat, rice, maize, bamboo

- Root shapes (storage): **fusiform** (radish), **conical** (carrot), **napiform** (turnip, beetroot), **fasciculated** (*Dahlia*, *Asparagus*).
- Climbing roots: money plant (*Pothos*); epiphytic roots with velamen: orchids.
- Ovary trick: **HPE** → Hypogynous (superior), Perigynous (half), Epigynous (inferior).



Racemose vs cymose

08 Important Q&A

Q1. Why is a potato a stem and sweet potato a root?

Potato has nodes with buds (eyes) and develops from stem; sweet potato is a swollen adventitious root with no nodes or buds.

Q2. What is the function of pneumatophores?

They grow vertically up out of swampy soil to get oxygen for respiration (e.g. *Rhizophora*).

Q3. Distinguish racemose and cymose inflorescence.

Racemose: axis grows indefinitely, flowers acropetal. Cymose: axis ends in a flower, basipetal.

09 Common mistakes

- Calling ginger a root (it is a rhizome = stem).
- Mixing axile (tomato) with parietal (mustard) placentation.
- Writing Solanaceae ovary as inferior (it is superior).
- Forgetting coconut is a drupe.

10 Practice (NEET style)

1. Pea flower aestivation?
2. Placentation in sunflower?
3. Phylloclade example?
4. Edible part of coconut?
5. Stamens in Fabaceae?

ANSWERS

1) Vexillary · 2) Basal · 3) *Opuntia* · 4) Endosperm · 5) Diadelphous (9)+1

11 Quick revision: 5 minutes before the exam

ROOT/STEM

- Prop: banyan; stilt: maize
- Pneumatophore: Rhizophora
- Potato tuber, ginger rhizome

FLOWER

- Hypogynous = superior ovary
- Twisted: china rose
- Vexillary: pea

PLACENTATION

- Marginal pea · axile tomato
- Parietal mustard · basal sunflower
- Free central Dianthus

FAMILIES

- Fabaceae: diadelphous, pod
- Solanaceae: epipetalous
- Liliaceae: P(3+3)

Have a doubt? Ask the AI Doubt Solver at padhaiadda.netlify.app, or take the mock test on this chapter.