



ChapterNotes

chapternotes.in · free NEET & JEE prep

CHAPTER NOTES

Morphology of Flowering Plants

Class 11 Notes | CBSE Biology

Chapter 5

- ✓ Chapter-wise notes & important questions
- ✓ Free gamified practice app — streaks, levels, revision
- ✓ Free mock & prediction papers with answer keys

Source: <https://chapternotes.in/cbse/class-11-biology/morphology-of-flowering-plants-class-11-notes/>



Scan to practice this
chapter free in the app

Morphology of Flowering Plants Class 11 Notes | CBSE Biology Chapter 5

Morphology of Flowering Plants is Chapter 5 of CBSE Class 11 Biology — the chapter that teaches you the visual language of botany. It is all about the *external structure* of angiosperms: how a root, stem, leaf, flower, fruit, and seed look, what their modifications mean, and how to describe a plant the way a botanist does. Get this chapter right and the rest of plant biology — anatomy, physiology, even taxonomy — suddenly has a vocabulary you already speak.

By the end of these notes you will be able to identify root and stem modifications on sight, name venation and phyllotaxy types, decode aestivation and placentation, write a floral formula, draw a floral diagram, and describe the three NEET-favourite families — Fabaceae, Solanaceae, and Liliaceae. This is a high-yield, fact-heavy chapter carrying roughly 6–8 marks in boards and a guaranteed 2–4 questions in NEET, so every diagram and term here is worth memorising.

Table of Contents

- Key Concepts — Root, stem, leaf, inflorescence, flower, fruit, seed, families
 - Weightage in Board & Entrance Exams
 - Important Definitions
 - Solved Examples
 - Important Questions for Board Exams
 - Quick Revision Points
-

Key Concepts

1. The Root — Regions and Types

The **root** is the underground, non-green, positively geotropic part of the plant that anchors it and absorbs water and minerals. It bears no nodes, internodes, leaves, or buds.

Types of Root System

- **Tap root system:** one main root growing from the radicle, with lateral branches (most dicots — e.g., mustard, mango).
- **Fibrous root system:** many slender roots arising from the base of the stem (most monocots — e.g., wheat, grass).
- **Adventitious roots:** roots arising from parts other than the radicle, such as the stem or leaves (e.g., grass, banyan, *Monstera*).

Regions of the Root

[DIAGRAM: A young root tip showing — from base to apex — region of maturation (with root hairs), region of elongation, region of meristematic activity, and the root cap at the very tip.]

- **Root cap:** thimble-like cover that protects the tender apex as it pushes through soil.
- **Region of meristematic activity:** small thin-walled cells that divide repeatedly.
- **Region of elongation:** cells enlarge and elongate, increasing root length.
- **Region of maturation:** cells differentiate and mature; bears **root hairs** that absorb water and minerals.

2. Modifications of the Root

Roots change shape and function for storage, support, or respiration.

Function	Modification	Example
Storage of food (tap root)	Fusiform, conical, napiform, tuberous	Radish, carrot, turnip, sweet potato
Support (prop roots)	Hanging roots that become pillar-like	Banyan
Support (stilt roots)	Roots from lower nodes for support	Maize, sugarcane
Respiration	Pneumatophores (grow upward for gaseous exchange)	Rhizophora (mangroves)

NEET tip: Sweet potato = modified *root* (tuberous root); potato = modified *stem* (stem tuber). This pairing is a classic trap.

3. The Stem — Features and Modifications

The **stem** is the ascending, usually aerial part developing from the plumule. It bears **nodes and internodes**, leaves, buds, branches, flowers, and fruits, and is generally green when young.

Modifications of the Stem

Function	Modification	Example
Storage (underground)	Rhizome, tuber, bulb, corm	Ginger, potato, onion, colocasia
Support (climbing)	Stem tendrils	Gourd, grapevine
Protection	Thorns (axillary buds)	Citrus, Bougainvillea
Vegetative propagation	Runner, stolon, offset, sucker	Grass, mint, Pistia, Chrysanthemum
Photosynthesis (flattened green stems)	Phylloclade / cladode	Opuntia, Asparagus

How to tell a stem modification from a root one: stems have nodes, internodes, scale leaves, and buds — roots do not. The “eyes” on a potato are buds, proving it is a stem.

4. The Leaf — Venation, Types, Phyllotaxy

The **leaf** is a lateral, flattened, green outgrowth borne on the node of a stem; it is the chief organ of photosynthesis and transpiration. A typical leaf has three parts: **leaf base, petiole, and lamina (leaf blade)**.

Venation — Arrangement of Veins

- **Reticulate venation:** veins form a network (most dicots — e.g., mango, china rose).
- **Parallel venation:** veins run parallel (most monocots — e.g., grass, banana).

Types of Leaf

- **Simple leaf:** lamina is entire or incised, but incisions do not reach the midrib (e.g., guava).
- **Compound leaf:** lamina is divided into leaflets; a bud lies in the axil of the whole leaf, not the leaflets.
 - **Pinnately compound:** leaflets on a common axis or rachis (e.g., neem).
 - **Palmately compound:** leaflets attached at a common point (e.g., silk cotton).

Phyllotaxy — Arrangement of Leaves on the Stem

- **Alternate:** a single leaf at each node, alternately (e.g., china rose, mustard, sunflower).
- **Opposite:** a pair of leaves at each node (e.g., Calotropis, guava).
- **Whorled:** more than two leaves at a node forming a whorl (e.g., Alstonia).

Modifications of the Leaf

Leaves modify into **tendrils** (peas — for climbing), **spines** (cactus — to reduce water loss and protect), **fleshy storage leaves** (onion, garlic), **pitchers** (*Nepenthes* — for trapping insects), and **phyllodes** (*Australian acacia*).

5. The Inflorescence

An **inflorescence** is the arrangement of flowers on the floral axis. Its type depends on whether the main axis keeps growing or ends in a flower.

- **Racemose:** the main axis continues to grow and bears flowers *laterally* in **acropetal** succession (older flowers at the base, younger at the top). Example: radish, mustard.
- **Cymose:** the main axis ends in a flower, so growth is limited; flowers are borne in **basipetal** order (older flower at the top/centre). Example: *Solanum* (nightshade), Jasmine.

NEET tip: Acropetal = racemose; basipetal = cymose. Mug this single line — it answers many one-mark questions.

6. The Flower — The Reproductive Unit

The **flower** is a modified shoot meant for sexual reproduction. A typical flower has four **whorls** arranged on the swollen end of the stalk called the **thalamus**: calyx, corolla, androecium, and gynoecium.

- **Calyx (sepals)**: outermost whorl, usually green and protective.
- **Corolla (petals)**: brightly coloured to attract pollinators.
- **Androecium (stamens)**: male whorl; each stamen has anther + filament. The anther produces pollen.
- **Gynoecium (carpels/pistil)**: female whorl; each carpel has stigma, style, and ovary. The ovary contains ovules.

Symmetry of the Flower

- **Actinomorphic (radial)**: can be divided into two equal halves by any vertical plane (e.g., mustard, datura, chilli).
- **Zygomorphic (bilateral)**: divides into two equal halves in only one plane (e.g., pea, bean, Cassia).

Position of Floral Parts (with respect to ovary)

- **Hypogynous**: ovary *superior*, other parts below it (e.g., mustard, china rose, brinjal).
- **Perigynous**: ovary half-inferior, parts at the same level (e.g., rose, plum).
- **Epigynous**: ovary *inferior*, other parts above it (e.g., guava, cucumber, sunflower ray florets).

Aestivation — Arrangement of Sepals/Petals in the Bud

Type	Arrangement	Example
Valvate	Margins just touch, no overlap	Calotropis
Twisted	One margin overlaps the next regularly	China rose, cotton, lady's finger
Imbricate	Overlapping but irregular	Cassia, Gulmohar
Vexillary (papilionaceous)	Largest petal (standard) covers two wings, which cover two keel petals	Pea, bean (Fabaceae)

Placentation — Arrangement of Ovules in the Ovary

Type	Description	Example
Marginal	Ovules on the ventral suture in one row (monocarpellary)	Pea
Axile	Placenta axial, ovules attached to central axis (multilocular)	China rose, tomato, lemon
Parietal	Ovules on the inner ovary wall; one-chambered, false septum	Mustard, Argemone
Free central	Ovules on a central axis, no septa	Dianthus, Primrose
Basal	A single ovule at the base	Sunflower, marigold

7. The Fruit and The Seed

The **fruit** is a mature or ripened ovary, developed after fertilisation. It has a wall (**pericarp**) and seeds. A fruit formed without fertilisation is **parthenocarpic** (e.g., banana). A **true fruit** develops only from the ovary; a **false fruit** involves the thalamus too (e.g., apple).

A drupe like mango/coconut has a pericarp differentiated into **epicarp** (outer skin), **mesocarp** (fleshy/fibrous middle), and **endocarp** (hard stony layer protecting the seed).

The Seed — Dicot vs Monocot

The **seed** is a fertilised ovule. It has a seed coat (testa + tegmen) and an embryo (radicle, plumule, and one or two cotyledons).

Feature	Dicot Seed (bean/gram)	Monocot Seed (maize)
Cotyledons	Two, often fleshy with stored food	One (scutellum)
Endosperm	Usually non-endospermic (food in cotyledons)	Endospermic (large endosperm)
Special structures	Hilum, micropyle on seed coat	Coleoptile (covers plumule), coleorhiza (covers radicle), aleurone layer

8. Semi-Technical Description of a Typical Flowering Plant

To describe a plant scientifically, you record its features in a fixed order: **habit and vegetative characters** (root, stem, leaves), followed by **floral characters** in the order inflorescence → flower → calyx → corolla → androecium → gynoecium.

This description is then summarised in two compact tools — the **floral diagram** and the **floral formula** — so that anyone can reconstruct the flower without seeing it.

9. Floral Formula and Floral Diagram

The **floral formula** represents a flower using symbols. Each whorl is given a letter and the number of its parts; fusion and ovary position are shown with brackets and lines.

Symbol	Meaning
Br	Bracteate
⊕	Actinomorphic (radial symmetry)
%	Zygomorphic (bilateral symmetry)
♂ / ♂ / ♀	Male / bisexual / female flower
K	Calyx (number of sepals)
C	Corolla (number of petals)
P	Perianth (when calyx and corolla are not distinct)
A	Androecium (number of stamens)
G / $\bar{G}$	Gynoecium; bar above = inferior ovary, bar below = superior ovary
()	Brackets show fusion (e.g., gamopetalous)

The **floral diagram** is the ground plan: a series of concentric circles representing the whorls, drawn with the mother axis at the top, showing the number, fusion, and position of parts.

[DIAGRAM: Floral diagram of mustard — four sepals (alternating), four petals in a cross, six stamens (tetradynamous: 4 long + 2 short), and a bicarpellary syncarpous gynoecium in the centre.]

10. Important Families

(a) Fabaceae (Papilionoideae — the pea/legume family)

- **Vegetative:** tap root with root nodules (nitrogen-fixing *Rhizobium*); leaves alternate, pinnately compound, with pulvinus leaf base.
- **Flower:** bisexual, zygomorphic; **vexillary aestivation**; corolla papilionaceous (1 standard, 2 wings, 2 keel petals).
- **Androecium:** ten stamens, **diadelphous** (9 fused + 1 free).
- **Gynoecium:** monocarpellary, superior ovary, **marginal placentation**; fruit a legume (pod).
- **Floral formula:** Br ♂ % K(5) C1+2+(2) A(9)+1 G1
- **Uses:** pulses (gram, pea), edible oil (soybean), dyes (indigo), fodder.

(b) Solanaceae (the potato/nightshade family)

- **Vegetative:** mostly herbs/shrubs; leaves alternate, simple; stem often hairy.
- **Flower:** bisexual, actinomorphic; calyx of 5 fused sepals (persistent); corolla 5 fused petals, valvate aestivation.
- **Androecium:** five stamens, epipetalous (attached to corolla).
- **Gynoecium:** bicarpellary, syncarpous, superior ovary, **axile placentation**, swollen placenta; fruit a berry or capsule.
- **Floral formula:** $\text{Br} \oplus \text{K}(5) \text{C}(5) \text{A}_5 \text{G}(2)$
- **Uses:** food (potato, tomato, brinjal), spice (chilli), medicine (Atropa), tobacco (Nicotiana).

(c) Liliaceae (the lily family — monocots)

- **Vegetative:** usually perennial herbs with bulbs/corms/rhizomes; leaves mostly basal, parallel venation.
- **Flower:** bisexual, actinomorphic; **perianth** of six tepals (3+3), often petaloid, fused.
- **Androecium:** six stamens, in two whorls of three.
- **Gynoecium:** tricarpeal, syncarpous, superior ovary, axile placentation; fruit a capsule or berry.
- **Floral formula:** $\text{Br} \oplus \text{P}(3+3) \text{A}_{3+3} \text{G}(3)$
- **Uses:** ornamentals (tulip, Gloriosa), vegetables (onion, garlic), medicine (Aloe), colchicine (Colchicum).

Weightage in Board & Entrance Exams

Exam	Typical Weightage	Most-Tested Areas
CBSE Board (Class 11)	6–8 marks	Root/stem modifications, floral formula, families, placentation
NEET	2–4 questions	Aestivation, placentation, inflorescence, floral formulae of families
State CETs	2–3 questions	Modifications, venation, dicot vs monocot seed, examples

[TABLE: Question-type split — VSA (1 mark): examples & definitions (e.g., aestivation in pea); SA (2–3 marks): differences (tap vs fibrous, racemose vs cymose); LA (5 marks): family description with floral formula + floral diagram.]

Important Definitions

Term	Definition
Morphology	The study of the external form and structure of plants and their parts
Adventitious root	Root arising from any part of the plant other than the radicle
Pneumatophore	Negatively geotropic root that grows upward for gaseous exchange (mangroves)
Phylloclade	Green, flattened or cylindrical stem modified for photosynthesis (Opuntia)
Phyllotaxy	The pattern of arrangement of leaves on the stem (alternate, opposite, whorled)
Venation	The arrangement of veins in the lamina (reticulate or parallel)
Aestivation	Mode of arrangement of sepals or petals in a floral bud
Placentation	The arrangement of ovules within the ovary on the placenta
Floral formula	A symbolic representation of the structure of a flower
Parthenocarpic fruit	A fruit that develops from the ovary without fertilisation (e.g., banana)

Solved Examples

Example 1

Name the root modification in carrot, sweet potato, and banyan respectively.

Answer: Carrot = **conical tap root** (storage); sweet potato = **tuberous adventitious root** (storage); banyan = **prop root** (support).

Example 2

Potato and ginger are both underground — why are they called stem modifications and not roots?

Answer: They bear **nodes, internodes, scale leaves, and buds** ("eyes" in potato), which are stem features. Roots lack these, so both are modified stems (tuber and rhizome respectively).

Example 3

Distinguish racemose from cymose inflorescence in one line each.

Answer: In **racemose**, the main axis keeps growing and flowers open in acropetal succession (mustard). In **cymose**, the main axis ends in a flower and flowers open in basipetal order (jasmine).

Example 4

Write the floral formula of a Solanaceae flower (e.g., Datura/brinjal).

Answer: $\text{Br } \oplus \text{ } \overline{\sigma} \text{ K}(5) \text{ C}(5) \text{ A}_5 \text{ G}(2) - \text{actinomorphic, bisexual, gamosepalous, gamopetalous, epipetalous stamens, bicarpellary syncarpous superior ovary with axile placentation.}$

Example 5

Identify the placentation: (a) tomato, (b) pea, (c) mustard.

Answer: (a) tomato = **axile**; (b) pea = **marginal**; (c) mustard = **parietal**.

Example 6

Give two structural differences between a dicot seed (bean) and a monocot seed (maize).

Answer: (1) Bean has **two cotyledons** storing food and is non-endospermic; maize has **one cotyledon (scutellum)** and is endospermic. (2) Maize seed has a **coleoptile and coleorhiza**; bean does not.

Important Questions for Board Exams

1-Mark Questions (VSA)

1. What type of aestivation is found in the pea flower?
2. Name the root modification seen in mangroves for respiration.
3. Give one example each of marginal and axile placentation.
4. Which whorl of the flower is the reproductive male whorl?
5. Define phyllotaxy.

2–3-Mark Questions (SA)

1. Differentiate between a tap root system and a fibrous root system with examples.
2. Distinguish racemose and cymose inflorescence on the basis of axis growth and flower succession.
3. Explain, with examples, the difference between a simple leaf and a compound leaf.
4. Describe the three positions of the ovary on the thalamus (hypogynous, perigynous, epigynous) with one example each.

5-Mark Questions (LA)

1. Describe the family Fabaceae giving its vegetative and floral characters, floral formula, and economic importance.

2. Write the semi-technical description of a typical flowering plant and explain how a floral formula and floral diagram summarise it.
 3. Describe the five types of placentation with a labelled example for each, and explain how the fruit and seed develop from the ovary and ovule.
-

Quick Revision Points

- Root: positively geotropic, no nodes/buds; tap (dicot) vs fibrous (monocot) vs adventitious
 - Root mods: storage (carrot/radish), prop (banyan), stilt (maize), pneumatophore (Rhizophora)
 - Stem mods: rhizome/tuber/bulb/corm (storage), tendril (climb), thorn (protect), phylloclade (photosynthesis)
 - Venation: reticulate (dicot) vs parallel (monocot); phyllotaxy: alternate, opposite, whorled
 - Inflorescence: racemose = acropetal (axis grows); cymose = basipetal (axis ends in flower)
 - Flower whorls: calyx, corolla, androecium, gynoecium on the thalamus
 - Symmetry: actinomorphic (mustard) vs zygomorphic (pea); ovary: hypo/peri/epigynous
 - Aestivation: valvate, twisted, imbricate, vexillary (pea)
 - Placentation: marginal, axile, parietal, free central, basal
 - Fruit = ripened ovary (pericarp + seed); seed = fertilised ovule
 - Dicot seed: 2 cotyledons, non-endospermic; monocot seed: 1 cotyledon, coleoptile/coleorhiza
 - Families — Fabaceae: K(5) C1+2+(2) A(9)+1 G1; Solanaceae: K(5) C(5) A5 G(2); Liliaceae: P(3+3) A3+3 G(3)
-

Next Chapter: Chapter 6 — Anatomy of Flowering Plants



Got this PDF from a friend?

Everything here is free at **chapternotes.in** — 134 chapters of notes, a gamified practice app, and full NEET mock & prediction papers.



Scan to practice this chapter free in the app