

CLASS 11

BIOLOGY

NCERT SOLUTIONS

NCERT Solutions for Class 11 Biology Chapter 5: Morphology of Flowering Plants – Free PDF Download

Chapter 5 of Class 11 Biology, Morphology of Flowering Plants, deals with the external structure of the root, stem, leaf, inflorescence, flower, fruit and seed in angiosperms, and introduces the precise scientific vocabulary used to describe a flower — aestivation, placentation, symmetry, and the position of flora...

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Class 11 Biology Chapter 5 – Notes and Extra Questions

Chapter 5 of Class 11 Biology, **Morphology of Flowering Plants**, deals with the external structure of the root, stem, leaf, inflorescence, flower, fruit and seed in angiosperms, and introduces the precise scientific vocabulary used to describe a flower — aestivation, placentation, symmetry, and the position of floral parts on the thalamus. After the 2023 NCERT rationalisation, the exercise for this chapter concentrates on core vegetative and floral morphology rather than the detailed semi-technical family descriptions found in older editions. These Class 11 Biology Chapter 5 solutions are also useful as quick revision notes before exams.

Exercises

Q1. How is a pinnately compound leaf different from a palmately compound leaf?

A compound leaf is one in which the lamina is divided into several separate leaflets. In a **pinnately compound leaf**, a number of leaflets are arranged along a common axis called the **rachis**, which is essentially a continuation of the petiole — for example, the leaf of *neem*. In a **palmately compound leaf**, the leaflets radiate outward from a single common point at the tip of the petiole, like the fingers of a hand — for example, the leaf of *silk cotton* (*Bombax*). Thus, the key difference lies in whether the leaflets are attached along an elongated axis (pinnate) or at one central point (palmate).

Q2. Explain with suitable examples the different types of phyllotaxy.

Phyllotaxy is the pattern of arrangement of leaves on a stem or branch. It is mainly of three types:

Alternate: A single leaf arises at each node, and successive leaves alternate on either side of the stem, as in *China rose*, *mustard* and *sunflower*.

Opposite: A pair of leaves arises at each node and the two leaves lie directly opposite each other, as in *Calotropis* and *guava*.

Whorled: More than two leaves arise at a node and form a whorl around the stem, as in *Alstonia*.

Q3. Define the following terms: (a) aestivation (b) placentation (c) actinomorphic (d) zygomorphic (e) superior ovary (f) perigynous flower (g) epipetalous stamen.

(a) Aestivation is the arrangement of sepals or petals in a floral bud relative to the other members of the same whorl. It is of four main types — valvate (margins just touch, as in *Calotropis*), twisted (one margin overlaps the next, as in *China rose*), imbricate (margins overlap without a fixed direction, as in *gulmohar*) and vexillary (the largest petal overlaps two lateral petals, which in turn overlap two smaller anterior petals, as in the pea flower).

(b) Placentation is the arrangement of ovules within the ovary, describing how the placenta is distributed inside it (e.g., marginal, axile, parietal, basal, free central).

(c) Actinomorphic describes a flower that can be divided into two equal radial halves by any vertical plane passing through the centre, i.e., it shows radial symmetry — for example, *mustard* and *Datura*.

(d) Zygomorphic describes a flower that can be divided into two equal halves in only one particular vertical plane, i.e., it shows bilateral symmetry — for example, *pea* and *gulmohar*.

(e) Superior ovary refers to the condition in a hypogynous flower where the gynoecium occupies the highest position on the thalamus while the other whorls lie below it — for example, *mustard* and *brinjal*.

(f) Perigynous flower is one in which the gynoecium sits in the centre and the other floral parts arise from

the rim of a cup-like thalamus at roughly the same level, so the ovary is described as half-inferior — for example, *plum*, *rose* and *peach*.

(g) Epipetalous stamen refers to a stamen that is attached to (borne on) the petal rather than being directly inserted on the thalamus — for example, the stamens of *brinjal*.

Q4. Differentiate between (a) racemose and cymose inflorescence, (b) apocarpous and syncarpous ovary.

(a) Racemose vs cymose inflorescence: In a **racemose** inflorescence, the main floral axis keeps growing and does not end in a flower; flowers are borne laterally in acropetal succession, meaning the youngest flowers are near the apex and the oldest (older, more mature) flowers are towards the base. In a **cymose** inflorescence, the main axis terminates in a flower and therefore has limited growth; flowers are borne in a basipetal order, so the oldest flower is at the tip and younger flowers arise below it.

(b) Apocarpous vs syncarpous ovary: When a flower has more than one carpel and these carpels are free (not fused to one another), the condition is called **apocarpous**, as seen in *lotus* and *rose*. When two or more carpels are fused together into a single compound ovary, the condition is called **syncarpous**, as seen in *mustard* and *tomato*.

Q5. Draw the labelled diagram of the following: (i) gram seed (ii) V.S. of maize seed.

(i) Gram seed (a typical dicot, non-endospermic seed): It is enclosed by a tough **seed coat** made of an outer testa and inner tegmen. On the seed coat, a small pore called the **micropyle** lies near the **hilum** (the scar marking the point of attachment to the fruit wall). Inside, the embryo consists of two large, fleshy **cotyledons** that store food, joined to a short **embryonal axis** bearing the **plumule** (young shoot) at one end and the **radicle** (young root) at the other. Since the endosperm is consumed during seed development, the mature gram seed is exalbuminous (non-endospermic).

(ii) V.S. of maize seed (a typical monocot, endospermic seed): A vertical section shows the **pericarp** fused with the seed coat forming a single protective layer around the seed. Beneath it lies the bulky, starchy **endosperm**, with its outermost layer differentiated as the **aleurone layer**. The embryo lies embedded in a groove on one side of the endosperm and is differentiated into a large shield-shaped **scutellum** (the single cotyledon), a **plumule** enclosed in a protective sheath called the **coleoptile**, and a **radicle** enclosed in a protective sheath called the **coleorhiza**.

Q6. Describe the various types of placentation found in flowering plants.

Placentation is the arrangement of ovules within the ovary. The main types are:

Marginal: The placenta forms a ridge along the ventral suture of a single-chambered ovary, with ovules borne on the ridge in two rows — for example, *pea*.

Axile: The placenta is axial (at the centre) and the ovules are attached to it in a multilocular (many-chambered) ovary — for example, *China rose*, *tomato* and *lemon*.

Parietal: Ovules develop on the inner wall of the ovary; the ovary is one-chambered but often appears two-chambered because of a false septum — for example, *mustard* and *Argemone*.

Free central: Ovules are borne on a central axis that is not connected to the ovary wall by septa — for example, *Dianthus* and *primrose*.

Basal: The placenta develops at the base of the ovary and bears a single ovule — for example, *sunflower* and *marigold*.

Q7. What is a flower? Describe the parts of a typical angiosperm flower.

A **flower** is the reproductive unit of an angiosperm; it is essentially a modified shoot in which the shoot apical meristem transforms into a floral meristem and produces floral appendages instead of leaves at closely-spaced nodes. A typical flower bears four whorls arranged successively on the swollen tip of the pedicel, called the **thalamus** or receptacle: the **calyx** (composed of sepals, usually green, that protect the flower in bud), the **corolla** (composed of petals, often brightly coloured to attract pollinators), the **androecium** (the male whorl, made up of stamens, each with a filament and a bilobed, four-chambered anther that produces pollen), and the **gynoecium** (the female whorl, made up of one or more carpels, each differentiated into stigma, style and ovary, with ovules attached to the placenta inside the ovary). When the calyx and corolla are not clearly distinguishable, they are together called the **perianth**.

Q8. Define the term inflorescence. Explain the basis for the different types of inflorescence in flowering plants.

The arrangement of flowers on the floral axis is called **inflorescence**. The basis for classifying inflorescences is whether the apex of the floral axis is converted into a flower or continues to grow indefinitely. In a **racemose** inflorescence, the main axis continues to elongate and produces flowers laterally in acropetal succession (younger flowers near the tip, older ones towards the base). In a **cymose** inflorescence, the main axis terminates in a flower and its growth is therefore limited, with flowers produced in a basipetal order (older flower at the tip, younger ones arising below).

Q9. Describe the arrangement of floral members in relation to their insertion on the thalamus.

Based on the position of the calyx, corolla and androecium relative to the ovary on the thalamus, flowers are classified as hypogynous, perigynous or epigynous.

In a **hypogynous** flower, the gynoecium occupies the highest position on the thalamus while the other whorls are attached below it; the ovary is said to be **superior** — for example, *mustard*, *China rose* and *brinjal*.

In a **perigynous** flower, the gynoecium sits in the centre while the other parts arise from the rim of a cup-shaped thalamus at roughly the same level; the ovary is **half-inferior** — for example, plum, rose and peach.

In an **epigynous** flower, the margin of the thalamus grows upward, encloses the ovary and fuses with it, so the other floral parts appear to arise from above the ovary; the ovary is **inferior** — for example, guava, cucumber and the ray florets of sunflower.

Class 11 Biology Chapter 5 – Notes and Extra Questions

In its current, rationalised form, Chapter 5 carries **9 exercise questions** at the end of the chapter — a reduction from the 15 questions found in pre-2023 editions. The questions that dealt with root modifications (prop roots, fleshy tap roots, pneumatophores), the justification of underground stems and the flower as a modified shoot, stem modifications, leaf modifications, and the semi-technical description of Fabaceae and Solanaceae together have been removed from the exercise, along with the standalone floral-formula question. Correspondingly, the detailed subsections on root, stem and leaf modifications and the family descriptions of Fabaceae and Liliaceae have been trimmed from the chapter text, leaving Solanaceae as the sole family retained for illustrating a semi-technical description. For revision, focus on the terminology

that still carries full weight in the current exercise — aestivation (valvate, twisted, imbricate, vexillary), the five types of placentation with one example each, the distinction between racemose and cymose inflorescence, hypogynous/perigynous/epigynous insertion, and the structural difference between a dicot seed (like gram) and a monocot seed (like maize). These terms remain heavily tested in CBSE board papers as well as in NEET and CUET, even though the family-description portion has been de-emphasised at the school level.

What are the four whorls of a typical flower called?

A typical flower has four whorls arranged on the thalamus, from outermost to innermost: the calyx (sepals), the corolla (petals), the androecium (stamens, the male reproductive whorl) and the gynoecium (carpels, the female reproductive whorl). The calyx and corolla are accessory whorls, while the androecium and gynoecium are the reproductive whorls.

What is the difference between a hypogynous and an epigynous flower?

The difference depends on the position of the ovary relative to the other floral parts on the thalamus. In a hypogynous flower, the gynoecium sits above the other whorls, so the ovary is superior (e.g., mustard, brinjal). In an epigynous flower, the thalamus grows up and around the ovary and fuses with it, so the other parts appear to arise above the ovary, making it inferior (e.g., guava, cucumber).

Why was the detailed description of plant families removed from the current NCERT syllabus?

As part of the 2023 curriculum rationalisation aimed at reducing content load, NCERT trimmed the “Description of some important families” section so that only Solanaceae remains as a worked example of a semi-technical family description; the earlier treatment of Fabaceae and Liliaceae, along with the exercise question that asked students to describe a Fabaceae and a Solanaceae flower together, was dropped from the school-level textbook. Students preparing for NEET or other competitive exams may still need to study these families from supplementary material.

How do you read a floral formula?

A floral formula is a shorthand code that summarises a flower’s structure using letters and symbols: K for calyx (sepals), C for corolla (petals), P for perianth (when calyx and corolla are not distinct), A for androecium (stamens) and G for gynoecium (carpels), each followed by a number showing how many members are present. Symbols such as $\oplus$ for actinomorphic and $\%$ for zygomorphic indicate symmetry, a line over the number of carpels shows a superior ovary while a line under it shows an inferior ovary, and a bracket around a number indicates that the members of that whorl are fused (e.g., gamosepalous or gamopetalous).