Ratna Sagar

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Education, Our Mission

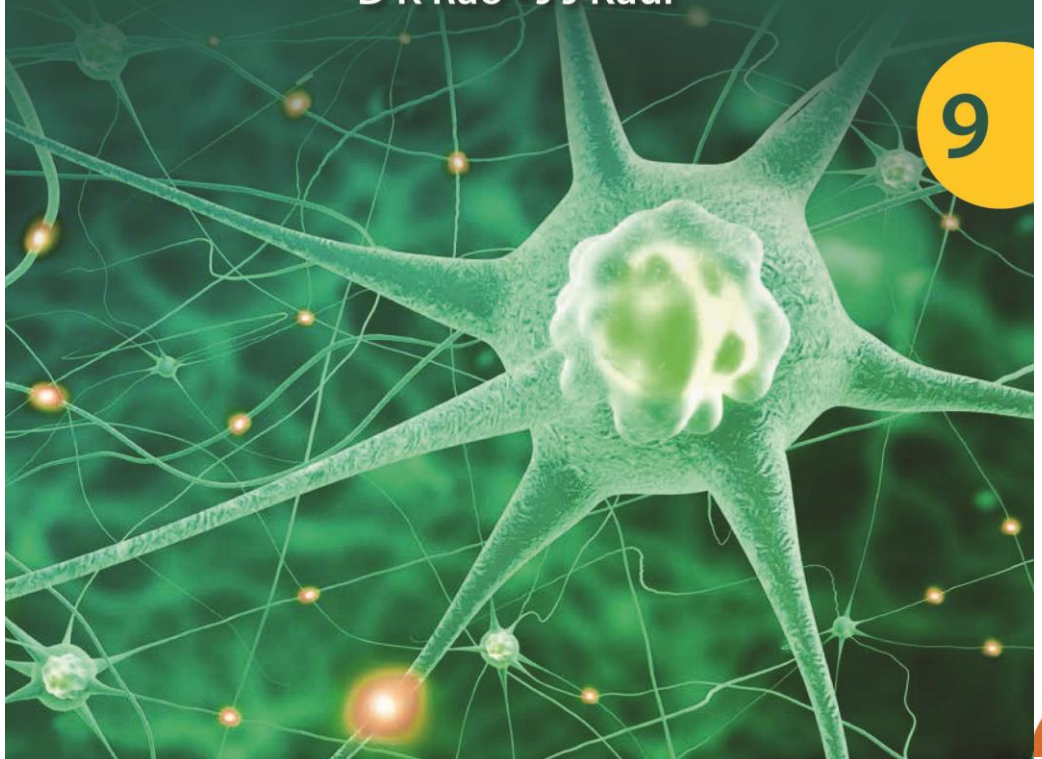
As per the latest ICSE syllabus

Rama Sagar
Education, Our Mission!

Revised and Updated

LIVING SCIENCE BIOLOGY

D K Rao • J J Kaur



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ICSE
Living Science
Biology

Class 9

Chapter 3 The Flower – Structure and Functions

LEARNING OBJECTIVES

Typical structure of a bisexual flower

- **Pedicel (Stalk)**
- **Receptacle (Thalamus)**
- **Floral whorls**
- **Nectaries**

Complete and incomplete flowers

Essential and non-essential parts of a flower

Parts of a flower

- **Calyx**
- **Corolla**
- **Androecium**
- **Gynoecium**

Placentation – the attachment of ovules in the ovary

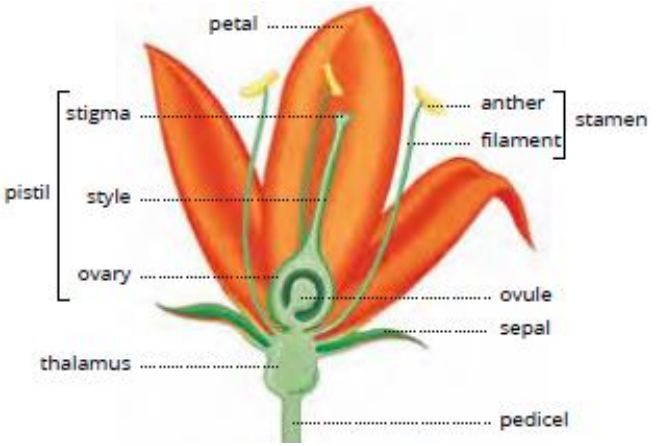
Inflorescence – arrangement of flowers on floral stem

What are angiosperms and gymnosperms?

Trees which have flowers are called the **flowering plants** or a**ngiosperms**. There are many other trees such as pine, firs, redwoods, etc., which do not have flowers and they are called **naked-seeded** plants or **gymnosperms**.

Typical structure of a bisexual flower

Flowers have many different shapes, sizes, colour, number of flower parts and the arrangements of these parts. However, all of them have certain features in common.



Pedicel (Stalk)

Flowers grow as a specialized branch at the tip of a **stalk** known as **pedicel** or **peduncle**.

Receptacle (Thalamus)

The pedicel swells at its tip into a small cup-shaped pad known as **receptacle** or **thalamus**. Thalamus can be flat, conical, concave, or dome-shaped in different species. **All the floral whorls arise from the receptacle.**

Floral whorls

Generally, a flower consists of **four whorls**,

- **calyx** (green coloured sepals) on the outside (**first whorl**),
- **corolla** (coloured petals) lying inside the calyx (**second whorl**),
- **androecium** (male reproductive parts) enclosed by the corolla (**third whorl**),
- **gynoecium** (female reproductive parts) at the centre of the flower (**fourth whorl**).

Nectaries

Nectar is a sweet fragrant liquid secreted by most of the flowers. These flowers have nectar secreting cells,called **nectaries**. Nectaries are found near the base of the pistil or on the base of petals.

Nasturtium flower

Complete and incomplete flowers

❖ **Complete flower:** A flower which has all the four types of floral whorls namely, calyx, corolla, androecium and gynoecium is called **complete flower**.

❖ **Incomplete flower:** A flower in which any one or more of the four floral parts are missing is called **incomplete flower**.

Essential and non-essential parts of a flower

❖ **Essential (reproductive) parts of a flower:** Those parts of a flower which are **directly concerned with reproduction** are known as essential parts of a flower. For example, stamens (male parts) and the carpels (female parts) are the essential parts of a flower.

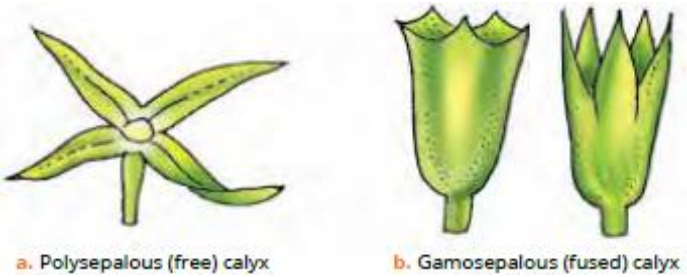
❖ **Non-essential (non-reproductive) parts of a flower:** Those parts of a flower which **do not directly take part in reproduction** are called non-essential parts of a flower.

They simply help in either **protecting** the reproductive parts or to make the flower **attractive for pollination**. For example, sepals and petals are non-essential parts of a flower.

Parts of a flower

Calyx

The calyx is the outermost whorl of the flower. It consists of three to five s**epals**, which are generally green in colour and look like small leaves that cover an unopened floral bud.



Types of calyx

Functions

- ❖ The calyx encloses and protects the inner whorls of the flower in the bud stage.
- ❖ Since the sepals contain chlorophyll, they can also **synthesize food**
- ❖ Together with petals, they also attract the birds and insects for pollination.

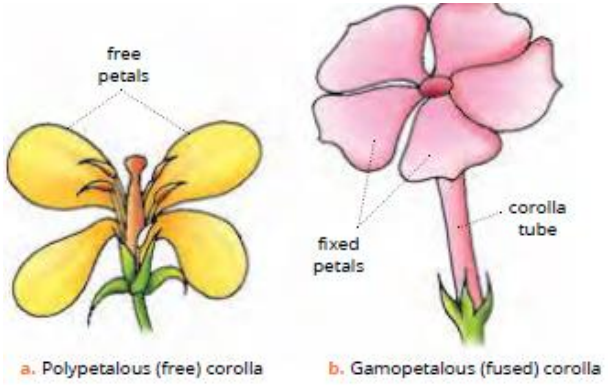
Corolla

The corolla is the most conspicuous part in the flower because it is usually white or brightly coloured. The corolla forms the second whorl from outside, inner to the calyx. This whorl is made-up of **petals**, which are much larger than sepals. The number of petals varies from plant to plant.

Functions

❖ The brightly-coloured corolla **attracts agents of pollination such as insects and birds**.

❖ Some petals are scented with a **nectary** which **produces sugary nectar**. The insects and birds come to collect this nectar and while doing so **transfer pollen** from one flower to another.

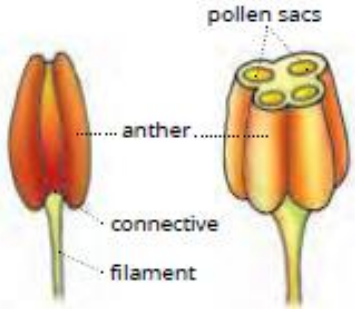


Types of corolla

❖ The corolla **encloses and protects the stamens and the pistil**.

Androecium

The androecium (*andros* meaning male) forms the third whorl on the inside of the corolla. Androecium consists of stamens. These are the **male reproductive organs**.



Anther showing pollen sacs

Each stamen is made-up of a slender flexible stalk known as the **filament**, which supports the anther at its end. Anther is attached to the filament with the help of a structure known as the **connective**. Each anther is two lobed. Each lobe has two **pollen sacs**.

Functions

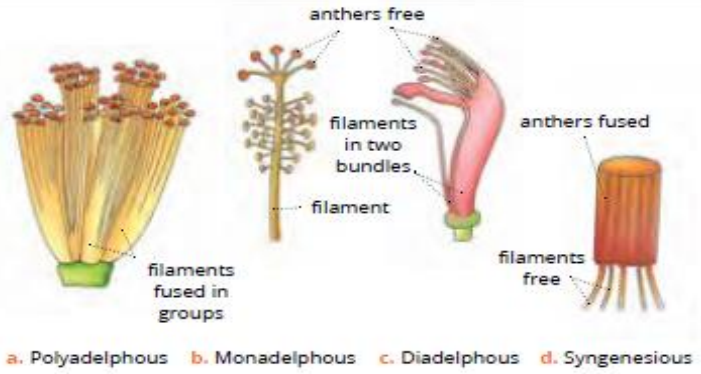
❖ The **anther produces pollen grains** which contain the male reproductive cells, i.e. the gametes.

❖ The **filament bears and supports the anther** in the most suitable position for the transfer of pollen to take place.

Variations in the androecium

1. Number of stamens: The number of stamens may differ greatly in flowers of plants from different families.

A rose has many stamens clustered at the centre of the flower



Types of androeciums

2. Positions of stamens within a flower: The stamens may originate near the base of the pistil or they may be fused at their base with the petals and appear to originate out of the petal.

Gynoecium

The gynoecium is the fourth and the innermost whorl of a flower. The gynoecium consists of the ovule-bearing basic units called **pistils** or **carpels**. Collectively, **the carpels form the gynoecium**, which is referred to as the female part of the flower because the **carpels produce the female gametes**.

A flower may have one or more pistils, which consist of:

❖ **Ovary:** The basal portion is called the **ovary** which contains the **ovules** or embryo seeds. The female gametes develop in the ovules.

❖ **Stigma:** Area where the pollen is received is called the **stigma**. The stigma is the terminal part of a carpel which receives the pollen grains.

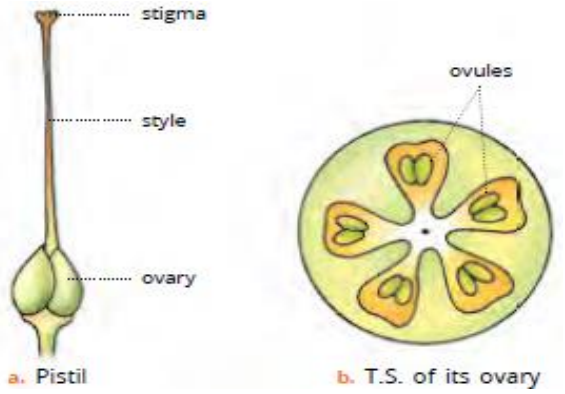
❖ **Style:** Often the stigma may be borne on a slender stalk-like structure called the style. **Style** connects stigma to the ovary

Functions

❖ The ovary is a hollow cavity which **contains the ovules**. Each ovule **contains an egg cell** for reproduction.

❖ The style bears the stigma in the most suitable position for receiving pollen during pollination.

❖ The stigma is structurally adapted to receive or trap pollen grains.



A pistil and T.S. of its ovary

Variations in the gynoecium

1. Number of carpels: Peas and beans have only a single carpel, which forms a single pistil. Such gynoecium is known as **monocarpellary**. It may be **bicarpellary**, as in mustard flower where two carpels are present. There may be more than two carpels as in *Magnolia* and lady's finger, known as **polycarpellary**.

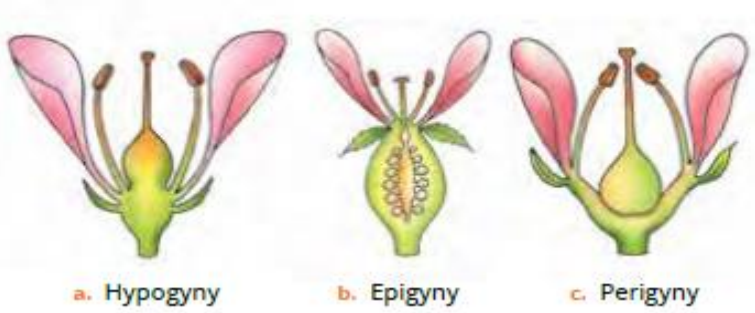
The central portion of a *Magnolia* flower showing the central cluster of pistils surrounded by stamens

2. Position of the ovary in a flower

a. *Hypogyny:* If the **ovary is attached above the attachment of the other three whorls**, i.e. the corolla, calyx and androecium, the ovary is said to be **superior ovary** and the condition is known as **hypogyny**. Such flowers are called **hypogynous flowers**. Examples: China rose, mustard, citrus, etc.

b. *Epigyny:* If **ovary is below the level of attachment of the three whorls**, and the receptacle completely grows around the ovary, it is called **inferior ovary** and the condition is known as **epigyny**. Such flowers are called **epigynous flowers**. Examples: Sunflower, cucumber, etc.

c. *Perigyny*: If the ovary is surrounded by a receptacle which grows to form a cupshaped structure up to the midway of the ovary and the other three whorls sprout from the receptacle rim, the ovary is said to be **halfinferior** or **intermediate**.



The central portion of a *Magnolia* flower showing

Such condition is known as **perigyny** and the flowers are called **perigynous flowers**. Examples: Pea, bean, etc.

Placentation – the attachment of ovules in the ovary

The ovary may consist of one or more chambers or locules, which contain one or more undeveloped seeds,the ovules. The area of the ovary wall where the ovules are attached is called the **placenta**. The arrangement of the placenta within the ovary is called **placentation**. Placentation varies in different species.

Inflorescence – arrangement of flowers on floral stem

An **inflorescence** is a group or cluster of flowers on a branch of a plant. Inflorescence refers to the way individual flowers are arranged on the axis or floral stem. Depending upon the arrangement of flowers on the axis, the axis or peduncle may be branched or unbranched. The inflorescence is of two types – **racemose** and **cymose**.

SUMMARY...

- Flower is the reproductive part of the plant, responsible for gamete formation and fertilization.
- Flowers grow as a specialized branch at the tip of pedicel or peduncle. There are some flowers that lack a stalk and they are called sessile flowers.
- Stamens and carpels are the essential parts while calyx and corolla are the non-essential parts of a flower.
- Calyx is the outermost whorl of the flower. It consists of sepals which protect the bud.
- Corolla is found inside the calyx. It consists of petals, usually brightly coloured. Petals attract the insects and birds for pollination.
- Androecium forms the third whorl on the inside of corolla. It consists of stamens. Stamens produce pollen grains (the male gametes).
- Gynoecium is the innermost whorl of the flower. It contains carpels, that produce female gametes.
- The arrangement of ovules in the ovary is called placentation.
- The inflorescence is the arrangement of flowers on the floral stem. It can be cymose or racemose.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