CHAPTER

5

MORPHOLOGY OF FLOWERING PLANTS

CLASS 11TH

NCERT EXERCISE AND SOLUTIONS - BIOLOGY

Q. 1. **How is a pinnately compound leaf different from a palmately compound leaf?**

ANSWER:-

Pinnately Compound Leaf	Palmately Compound Leaf
1. Multiple leaflets are arranged along a common axis.	1. Several leaflets are attached at a single point.
2. Leaflets are connected to a central axis known as the rachis.	2. Leaflets are connected to a single point on the petiole.
3. The axis bearing leaflets is an extension of the petiole.	3. The axis bearing leaflets is short.
4. **Example:** Neem leaves	4. **Example:** Cotton leaves

Q. 2. **Explain with suitable examples the different types of phyllotaxy.**

ANSWER:-

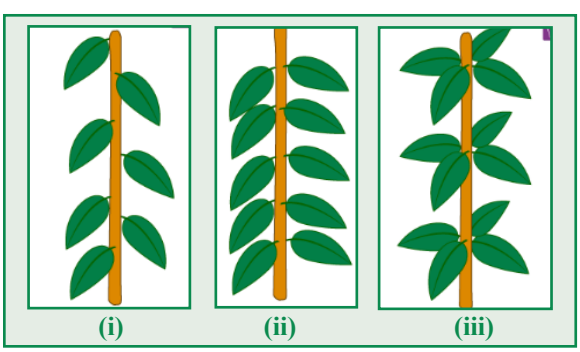
The arrangement of leaves on a stem or branch is referred to as phyllotaxy. For example, in plants like China rose, mustard, and sunflower, a single leaf grows at each node in an alternate fashion.

Phyllotaxy is classified into three types:

(i) **Alternate phyllotaxy:** A single leaf grows at each node in an alternate manner along the stem or branch. Example: Sunflower, Mustard.

(ii) **Opposite phyllotaxy:** Two leaves grow opposite each other at the same node. Example: Guava, *Calotropis*.

(iii) **Whorled phyllotaxy:** More than two leaves grow in a whorl (circle) at a single node. Example: *Alstonia*.



Q. 3. Define the following terms:

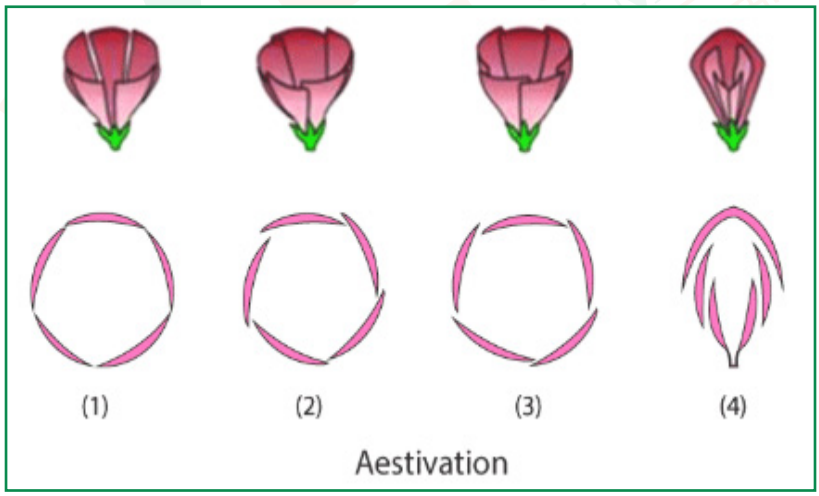
(a) aestivation
(b) placentation
(c) actinomorphic
(d) zygomorphic
(e) superior ovary
(f) perigynous flower
(g) epipetalous stamen

ANSWER:-

(a) aestivation

a. The arrangement of sepals or petals in a floral bud relative to other members of the same whorl is termed aestivation. The different types of aestivations are as follows:

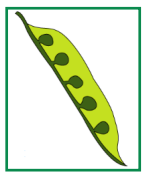
- **Twisted:** When one margin of an appendage overlaps the adjacent one, either in a clockwise or anticlockwise direction. *Example*: Cotton.
- **Valvate:** When the petals or sepals in a whorl just touch each other at the margins without overlapping.*Example*: *Calotropis*.
- **Imbricate:** When the petals or sepals overlap one another, but not in any specific direction. *Example*: Gulmohar.
- **Vexillary:** The largest petal (standard) overlaps the two lateral petals (wings), which in turn overlap the two smallest anterior petals (keel). *Example*: Bean flower.



(b) placentation

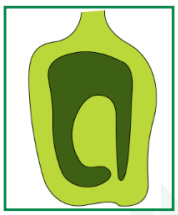
The arrangement of ovules within the ovary is referred to as **placentation**. The different types of placentation are as follows:

- **Marginal**: The placenta forms a ridge along the ventral suture of the ovary, and ovules are arranged in two rows on this ridge. *Example*: Pea.
- **Axile**: The ovules are attached to a central axis in a multilocular ovary. *Example*: Tomato, lemon.

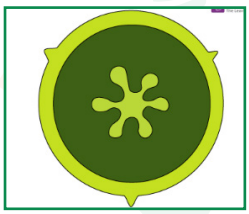


- **Parietal**: The ovules develop on the inner wall of the ovary or on peripheral parts. The ovary is unilocular but becomes bilocular due to the formation of a false septum. *Example*: Mustard, cucumber.

- **Basal**: The placenta is located at the base of a unilocular ovary, and a single ovule is attached to it. *Example*: Sunflower, marigold.



- **Free central**: The ovules are attached to a central axis in a unilocular ovary, without any septa dividing the ovary. *Example*: Dianthus, primrose.



(c) actinomorphic

Flowers that can be divided into two equal halves through any vertical plane are called actinomorphic flowers.*Example*: Chilli.

(d) zygomorphic

Flowers with bilateral symmetry, which can be divided into two equal halves only along one plane, are called **zygomorphic flowers**. *Example*: Gulmohar.

(e) superior ovary

In a hypogynous flower, the gynoecium occupies the highest position, while other floral parts are positioned below it. The ovary in such flowers is termed a superior ovary. *Example*: Brinjal.

(f) perigynous flower

A perigynous flower has the gynoecium in the center, with other floral parts arranged on the rim of the thalamus. The ovary in such flowers is half inferior. *Example*: Rose.

(g) epipetalous stamen

Epipetalous stamens are stamens that are attached to the petals instead of being directly inserted onto the thalamus. *Example*: Brinjal.

Q. 4. Differentiate between

(a) Racemose and cymose inflorescence

(b) Apocarpous and syncarpous ovary

ANSWER:-

(a) Racemose and cymose inflorescence

Racemose Inflorescence	Cymose Inflorescence
The young flowers are located at the tip, while the older flowers are arranged at the base.	The older flowers are positioned at the tip, and the younger flowers are arranged at the base.
The main axis continues to grow and produces flowers laterally.	The main axis has limited growth and terminates in a flower.

(b) Apocarpous and syncarpous ovary

Apocarpous Ovary	Syncarpous Ovary
In an apocarpous ovary, two or more carpels are separate and not fused.	In a syncarpous ovary, two or more carpels are united or fused together.
Example: Lotus	**Example:** Mustard

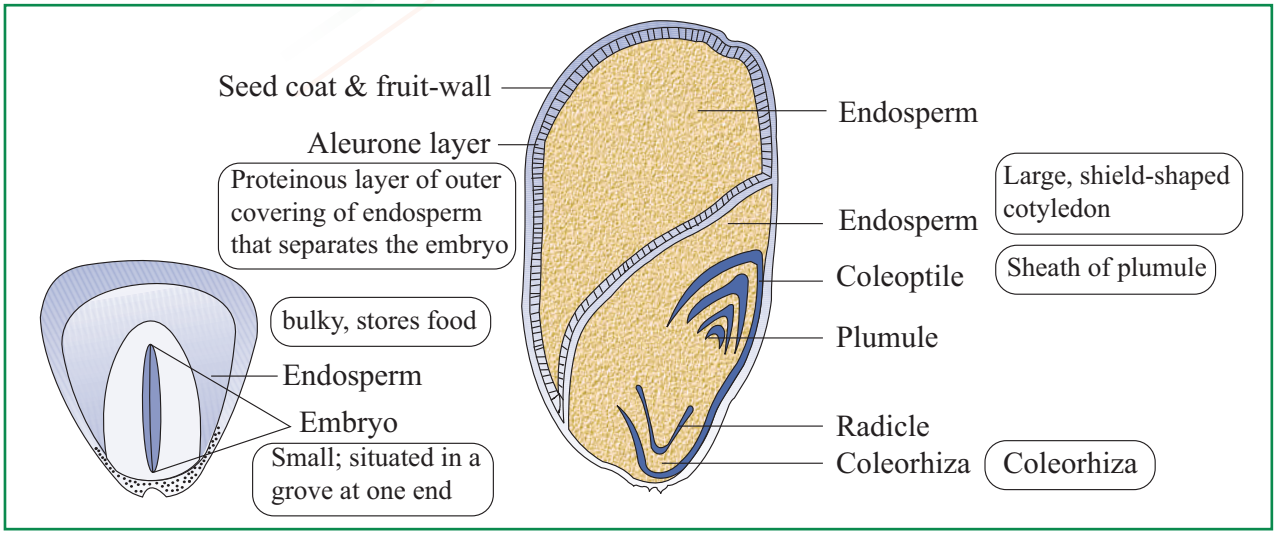
Q. 5. Draw the labelled diagram of the following:

(i) gram seed

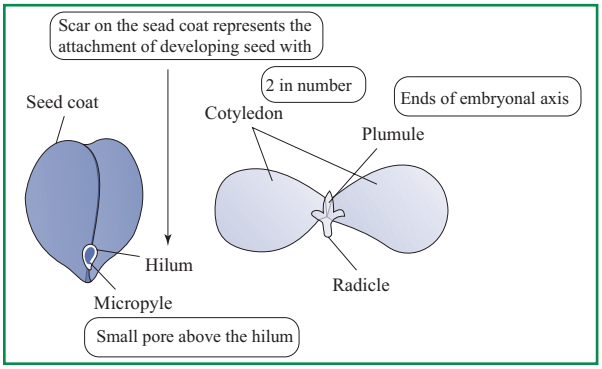
(ii) V.S. of maize seed

ANSWER:-

(i) gram seed



(ii) V.S. of maize seed



Q. 6. Take one flower of the family Solanaceae and write its semi-technical description. Also draw their floral diagram.

ANSWER:-

Characteristics of Solanaceae

- **Common Name:** Known as the potato family.
- **Habit:** Predominantly herbs and shrubs; rarely small trees.
- **Stem:** Herbaceous, occasionally woody, aerial, erect, cylindrical, and branched. The stem can be solid or hollow, hairy or smooth, with underground stems in plants like potatoes.
- **Leaves:** Alternate, simple, or rarely pinnately compound; exstipulate with reticulate venation.

Floral Characteristics

- **Inflorescence:** Solitary, axillary, or cymose, as observed in *Solanum*.
- **Flower:** Bisexual and actinomorphic.
- **Calyx:** Five sepals, united, persistent, with valvate aestivation.
- **Corolla:** Five petals, united, exhibiting valvate aestivation.
- **Androecium:** Five stamens, epipetalous.
- **Gynoecium:** Bicarpellary, syncarpous, ovary superior, bilocular with swollen placenta bearing numerous ovules; axile placentation.
- **Fruit:** Either a berry or a capsule.
- **Seeds:** Numerous, with endosperm.

Economic Importance

Plants from the Solanaceae family serve various purposes:

- **Food:** Potato (*Solanum tuberosum*), tomato (*Solanum lycopersicum*), and brinjal (*Solanum melongena*).
- **Spices:** Chili (*Capsicum annuum*).
- **Medicines:** Belladonna (*Atropa belladonna*) and ashwagandha (*Withania somnifera*).
- **Ornamentals:** Petunia (*Petunia hybrida*).

Floral Diagram

The floral diagram typically represents the arrangement of floral parts, their fusion, and symmetry

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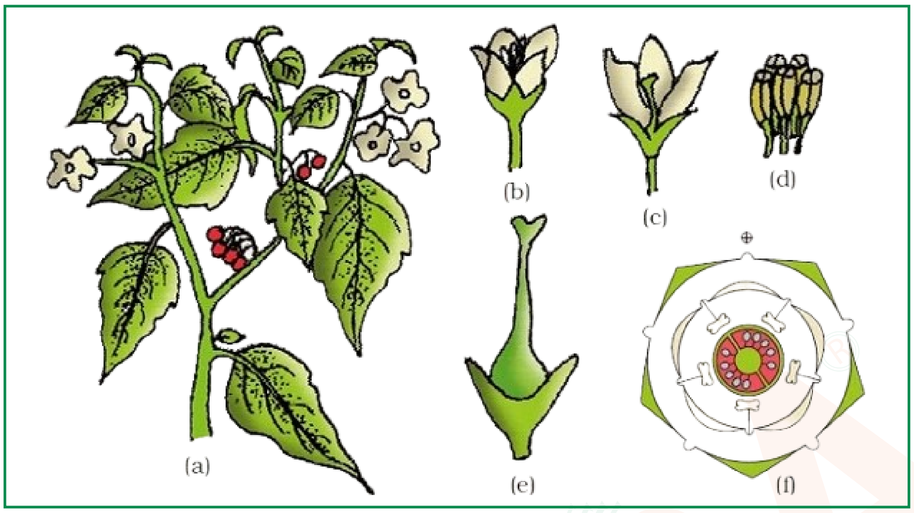
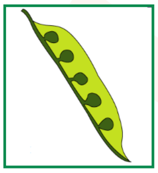


Q. 7. **Describe the various types of placentation found in flowering plants.**

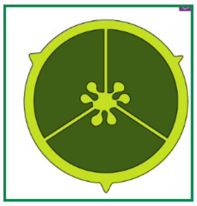
ANSWER:-

The arrangement of ovules within the ovary is referred to as **placentation**. The different types of placentation are as follows:

- **Marginal:** The placenta forms a ridge along the ventral suture of the ovary, and ovules are arranged in two rows on this ridge. *Example*: Pea.

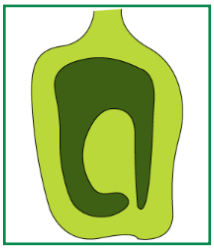


- **Axile**: The ovules are attached to a central axis in a multilocular ovary. *Example*: Tomato, lemon.

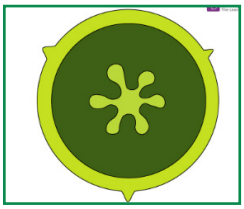


- **Parietal**: The ovules develop on the inner wall of the ovary or on peripheral parts. The ovary is unilocular but becomes bilocular due to the formation of a false septum. *Example*: Mustard,

- **Basal**: The placenta is located at the base of a unilocular ovary, and a single ovule is attached to it. *Example*: Sunflower, marigold.



- **Free central**: The ovules are attached to a central axis in a unilocular ovary, without any septa dividing the ovary. *Example*: *Dianthus*, *primrose*.



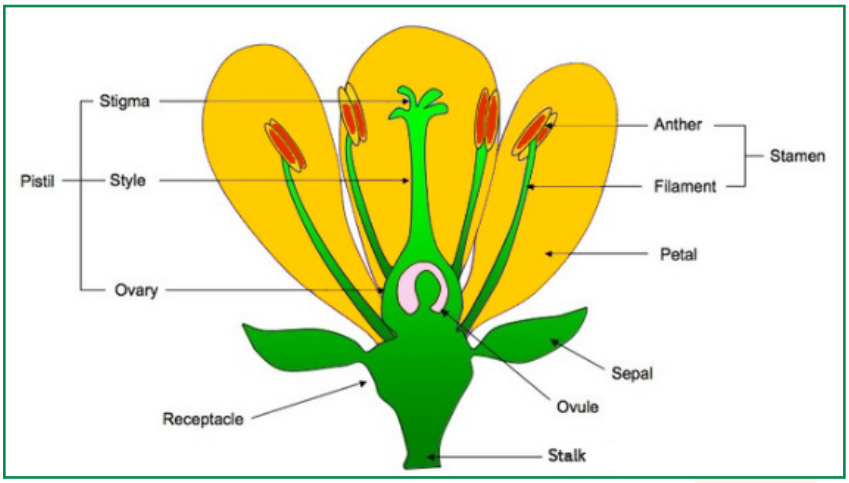
Q. 8. What is a flower? Describe the parts of a typical angiosperm flower.

Ans. The flower, the reproductive structure of angiosperms, is a modified shoot where the shoot apical meristem transforms into a floral meristem. A typical flower consists of four distinct whorls, arranged in sequence on the swollen end of the pedicel or stalk, called the receptacle or thalamus. These whorls are categorized into accessory organs and reproductive organs. When the calyx and corolla are indistinguishable, they are collectively referred to as the perianth.

Flower Parts

1. **Calyx:**
   - The outermost and lowermost whorl of the flower, consisting of sepals.
   - Functions to support and protect the inner floral structures.
2. **Corolla:**
   - Composed of brightly coloured petals, located inside the sepals and outside the stamens.
   - Attracts pollinators such as insects for pollination.
3. **Androecium:**
   - Represents the male reproductive organ and consists of stamens, each comprising a stalk (filament) and an anther.
   - Anther: Bilobed, with each lobe containing two pollen sacs where pollen grains develop.
   - Stamens may be attached to other floral parts like petals or may fuse with one another.
4. **Gynoecium:**
   - Represents the female reproductive organ, consisting of one or more carpels. Each carpel has three parts:
     - **Stigma:** The pollen-receiving tip.
     - **Style:** An elongated tube connecting the stigma to the ovary.
     - **Ovary:** Located at the base, it contains one or more ovules attached to the placenta.

These well-coordinated parts work together to facilitate the process of reproduction in angiosperms.



Q. 9. Define the term inflorescence. Explain the basis for the different types of inflorescences in flowering plants.

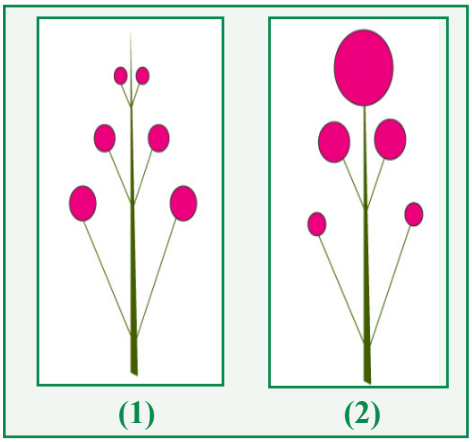
ANSWER:-

Inflorescence refers to the arrangement of flowers on the floral axis.

Based on whether the floral axis continues to grow or ends in a flower, inflorescence is categorized into two major types:

1. **Racemose:**
- In this type, the main axis continues to grow indefinitely.
- Flowers are arranged laterally in acropetal succession, meaning newer flowers are located near the apex, while older flowers are positioned at the base.

2. **Cymose:**
- Here, the main axis terminates in a flower, restricting further growth.
- Flowers develop in basipetal succession, where younger flowers are found near the base, and older flowers are located at the apex.



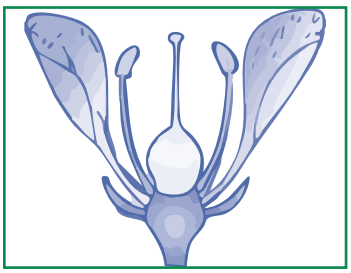
Q. 10. Describe the arrangement of floral members in relation to their insertion on thalamus.

ANSWER:-

The arrangement of floral parts in relation to their attachment on the thalamus is classified into three types:

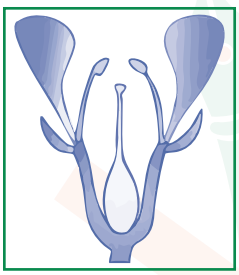
1. **Hypogynous flowers:**

- In these flowers, the gynoecium is positioned at the highest point, while the other floral parts are located below it. The ovary is termed superior.
- *Example:* Brinjal.



2. **Perigynous flowers:**

- In these flowers, the gynoecium is centrally located, and the other parts are arranged around the rim of the thalamus, almost at the same level. The ovary is considered half inferior.
- *Example:* Rose.



3. **Epigynous flowers:**

- In these flowers, the thalamus grows upward, surrounding the ovary. The ovary becomes fused with the thalamus, and the other floral parts emerge above it. Therefore, the ovary is termed inferior.
- *Example:* Guava.