

## Chapter: Morphology

### Exercise Questions

**Question 1. What is meant by modification of root? What type of modification of root is found in the**

- (a) **Banyan tree**
- (b) **Turnip**
- (c) **Mangrove trees**

**Answer:** The taproot system and the fibrous root system are the two types of root systems present in plants. The roots' primary role is to absorb water and minerals from the surrounding soil. Roots, on the other hand, are adjusted to fulfill a variety of additional activities. Some plants' roots serve as food storage places, while others support vast plant structures and absorb oxygen from the atmosphere.

Roots and their variations in different plants:

- (a) **Banyan tree-** Massive pillar-like adventitious roots emerge from the aerial section of the stem of the banyan tree (*Ficus benghalensis*). The tree is supported by these roots, which develop towards the ground. Prop roots are a type of root.
- (b) **Turnip-** Turnip (*Brassica rape*) roots are useful for food storage. Radishes, carrots, and sweet potatoes all have similar food-storing roots.
- (c) **Mangrove tree-** Because the soil is poorly aerated, the roots of mangrove plants shoot vertically upwards from the earth to get oxygen from the atmosphere. Pneumatophores are the name for these forms of roots.

**Question 2. Justify the following statements on the basis of external features**

- (i) **Underground parts of a plant are not always roots**
- (ii) **Flower is a modified shoot**

**Answer:**

i. Plant parts such as stems, leaves, and even fruits are transformed into underground structures that accomplish varied purposes. The stems of ginger and banana are buried and swollen from food storage. Rhizomes are what they're called. In *Colocasia* and *Zamin-Khand*, a corm is an underground stem. Due to the accumulation of food, the tips of the underground stem of the potato swell and form tuber. Tubers have eyes that are cared for by a leaf scar. Because of the accumulation of food, onions' basal leaves become fleshy. After fertilization, the flower in peanuts is pushed into the soil by the growth of a flower stalk. Fruit and seed development takes place within the soil.

ii. The floral meristem develops from the apical meristem during the flowering season. The stem's axis becomes condensed, while the internodes become closer together. Rather than leaves, the node sprouts a variety of floral appendages. As a result, the flower can be considered a modified shoot.

**Question 3. How is pinnately compound leaf different from palmately compound leaf?**

Answer:

Pinnately compound leaf	Palmately compound leaf
The leaflets are linked to the rachis, which is the common axis.	The leaflets are linked to the leaf stem at a similar place.
Neem and Cassia fistula are two examples ( also called golden shower plants)	Silk cotton (Bombax) and cannabis are two examples.

**Question 4. Explain with suitable examples the different types of phyllotaxy?**

Answer: The pattern or arrangement of leaves on a plant's stem or branch is referred to as phyllotaxy. Alternate, opposite, and whorled phyllotaxy are the three types. A single leaf emerges from the node of a branch in alternating phyllotaxy. Sunflower, mustard, and peepal all have this sort of phyllotaxy. Plants with opposite phyllotaxy have two leaves that grow in opposite directions from the node. Guava and Jamun plants contain it. Three or more leaves emerge from the node in plants with whorled phyllotaxy. Alstonia is where you'll find it.

**Question 5. Define the following terms:**

- (a) Aestivation
- (b) Placentation
- (c) Actinomorphic
- (d) Zygomorphic
- (e) Superior ovary
- (f) Perigynous flower
- (g) Epipetalous Stamen

Answer:

- (a) Aestivation

The mode in which sepals or petals are placed in a floral bud in relation to other floral members is referred to as 'aestivation.' Plants go through four stages of aestivation: valvate, twisted, imbricate, and vexillary.

- (b) Placentation

The arrangement of ovules within the ovary of a flower is referred to as 'placentation.' It comes in five different varieties: marginal, basal, parietal, axile, and free central.

- (c) Actinomorphic

Any radial line traveling through the center of an actinomorphic flower can divide it into two radial halves. Chilli and mustard are two examples of these flowers.

(d) Zygomorphic

Flowers that may be divided into two comparable halves by a single vertical plane are called zygomorphic flowers. Peas and beans are examples of these flowers.

(e) Superior ovary

Superior ovary flowers have the gynoecium at the top of the flower, while the rest of the floral components are positioned below it. Hypogynous refers to a flower with this configuration. Brinjal and mustard are two examples.

(f) Perigynous flower

The gynoecium is located in the center of perigynous flowers, and the rest of the floral elements are positioned at the same level around the thalamus rim. Plum and rose are two examples.

(g) Epipetalous Stamen

Stamens adhering to the petals are known as epipetalous stamens. Brinjal is where you'll find them.

**Question 6. Differentiate between**

**(a) Racemose and cymose inflorescence**

**(b) Fibrous roots and adventitious roots**

**(c) Apocarpous and syncarpous ovary**

**Answer:**

**a)**

<b>Racemose inflorescence</b>	<b>cymose inflorescence</b>
The younger blooms are at the tip of the inflorescence, while the older blossoms are near the base. Acropetal succession is the name for this type of arrangement.	At the base of the inflorescence, younger flowers are present, while older flowers are located at the top. Basipetal succession is the term for this type of configuration.
In a racemose inflorescence, the main axis continues to expand and generate flowers laterally.	The primary axis of a cymose inflorescence grows slowly and eventually finishes in a flower.

**b)**

<b>Fibrous roots</b>	<b>Adventitious roots</b>
In monocots, the primary root that emerges from the seed's radicle is short-lived and is replaced by a vast number of roots that emerge from the stem's base.	Other than the radicle of seeds, these roots can come from any portion of the plant.
Wheat and other cereals contain it.	Banyan, Monstera, and other plants contain it.

c)

Apocarpous ovary	syncarpous ovary
There are several carpels in flowers with an apocarpous ovary. These carpels are completely free.	Syncarpous ovary flowers have more than one carpel. These carpels, however, are united.
It can be found in rose and lotus blossoms.	It can be found in tomato and mustard blooms.

**Question 7. Draw the labeled diagram of the following:**

(i) Gram seed

(ii) V.S. of maize seed

Answer:

i)

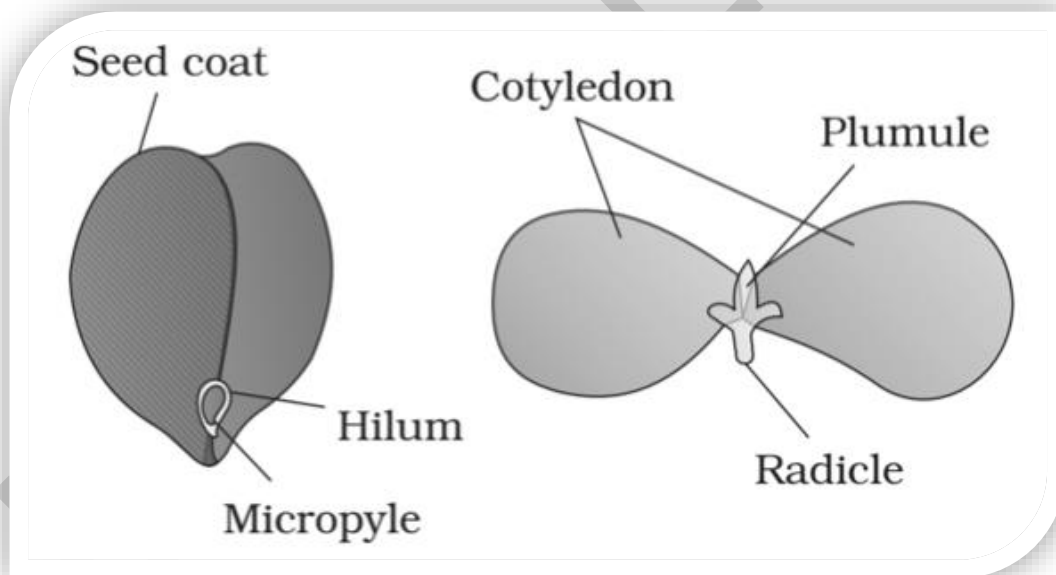
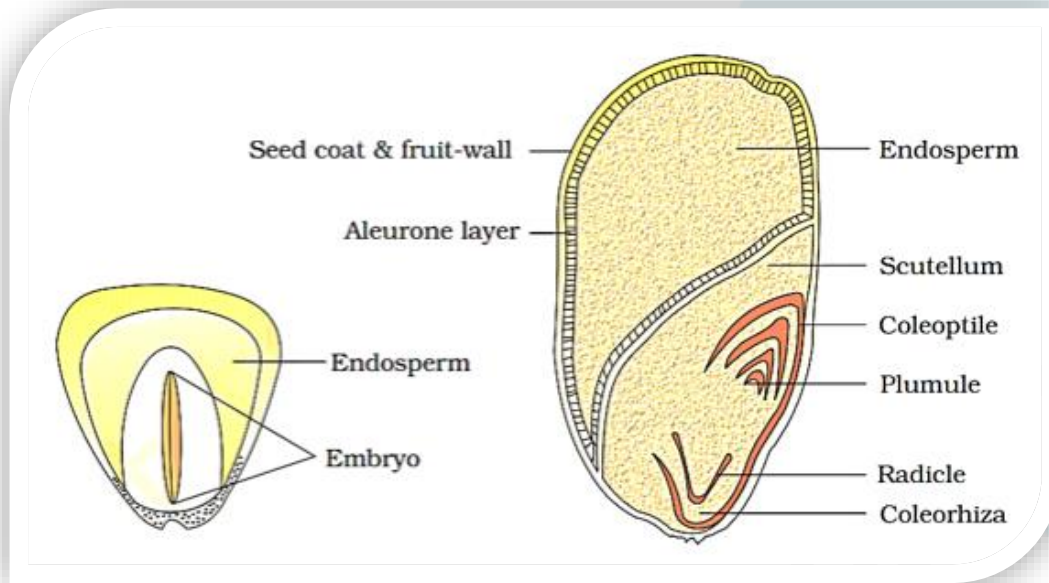


Fig. Structure of Gram seed

ii)



**Question 8. Describe modifications of the stem with suitable examples.**

**Answer:**

The stems of numerous plants have been modified to perform diverse roles.

- **Storage stems or underground stems:**

Examples: Tubers, corms, and rhizomes. The underground stem of ginger and banana is known as a rhizome. Corm refers to the underground stem of *Colocasia* (are). Rhizomes and corms are underground stems that have been adapted to store food. These stems also aid in the vegetative reproduction of the plants. The buildup of food causes the terminals of the subterranean stem of potato plants to swell. Potatoes are tubers that aid in food storage and have eyes on them. These eyes, which are protected by a leaf scar, produce buds that give rise to new plants.

- **Supportive stems**

Tendrils, for example, Some weak plants have thin, fragile, spirally-coiled tendrils on their stems that aid in the plant's attachment to neighboring structures for support. Cucumbers, melons, and other members of the Cucurbitaceae family have tendrils.

- **Protective stems**

Thorns are a good example of protective stems. Bougainvillea and citrus plants (such as lemon and orange) have sharp, pointed structures called thorns on their stems, which protect the plant against herbivores.

- **Photosynthetic stems**

*Opuntia* is a good example. The *Opuntia* has a green stem. In the absence of leaves, it completes the photosynthetic process.

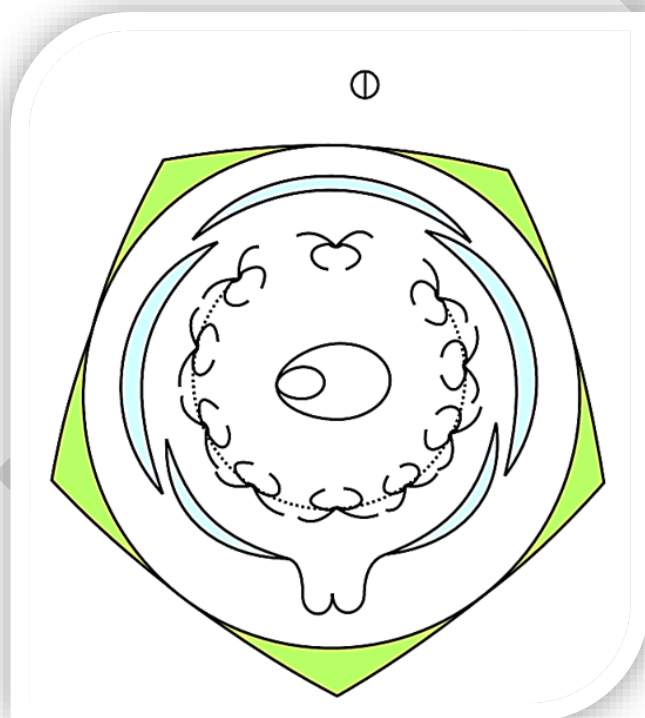
- **Other alterations to stems**

Underground stems of some plants, such as grasses, spread in the soil and aid in perennation. Runners are the name for these stems. Some aquatic plants (such as Eichhornia) have a short lateral stem called the offset that bears leaves and tufts of roots at the node and produces new plants.

**Question 9. Take one flower each of families Fabaceae and Solanaceae and write its semitechnical description. Also, draw their floral diagrams after studying them.**

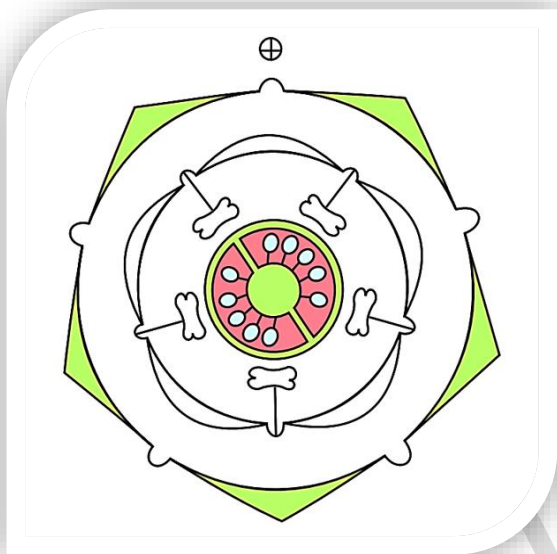
**Answer:**

1. **Family Fabaceae/Papilionaceae (pea plant)**- The Leguminosae family features a subfamily named Fabaceae/Papilionaceae, which includes pea plants.
  - Characteristics of the plant: The pulvinus grows near the base of the leaf, along foliaceous stipules, with alternately oriented leaf tendrils. Root nodules contain the taproot system.
  - Floral characteristics: Racemose blooms inflorescence, more axial than terminal. There are two types of flowers: zygomorphic and bisexual. Five gamosepalous sepals and imbricate aestivation make up the calyx. The corolla has five petals and is vexillary aestivation (polypetalous). The androecium is made up of ten diadelphous anthers and ditheous anthers.
  - Economic importance: Peas are important economically since they are utilised as vegetables in a variety of dishes.



2. Flowers of *Solanum nigrum*- Family Solanaceae
  - Characteristics of the plant: Herbaceous plant with upright stems. Leaves: Reticulate venation on simple and exstipulate leaves. A long, slender stem having a number of branches.

- **Floral characteristics:** Solitary and axillary inflorescences have bisexual and actinomorphic flowers. The calyx is made up of five interconnected and persistent sepals. Aestivation is a valvate condition. The corolla is made up of five petals that are joined together and has valvate aestivation. Five epipetalous stamens make up the androecium. A bi-carpellary syncarpous superior ovary with axile placentation makes up the gynoecium. A berry is a fruit of the genus *Vaccinium*. With a great quantity of seeds, endospermous.
- **Economic value:** It has a high economic value because it is widely used for therapeutic purposes.

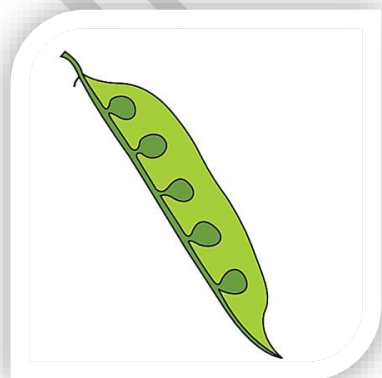


**Question 10. Describe the various types of placentations found in flowering plants.**

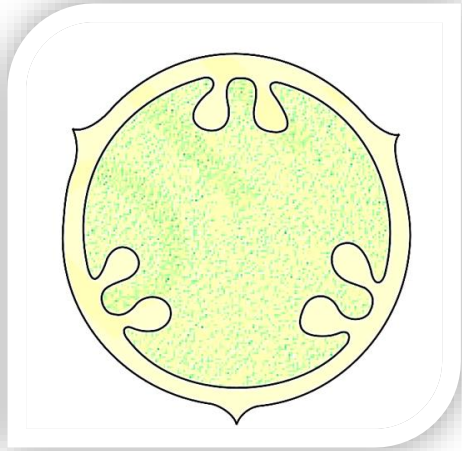
**Answer:**

Placentation refers to the positioning of ovules inside the ovary. It comes in five different varieties.

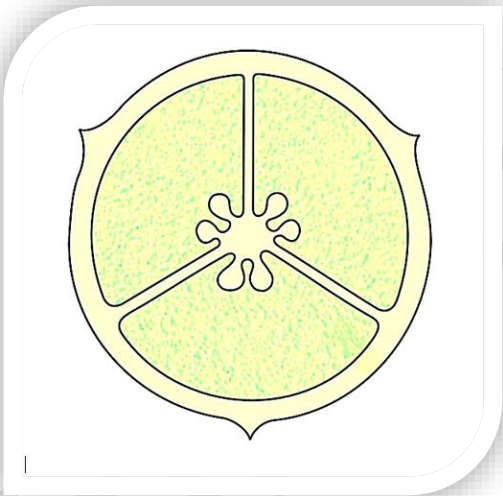
- **Marginal placentation** - A situation in which the placenta forms a ridge at the ovary's ventral part and the ovules develop in two rows is known as marginal placentation. For example: Pea



- (B) Parietal placentation - The ovary is considered to have parietal placentation when the ovules grow on the inner walls of the ovary.

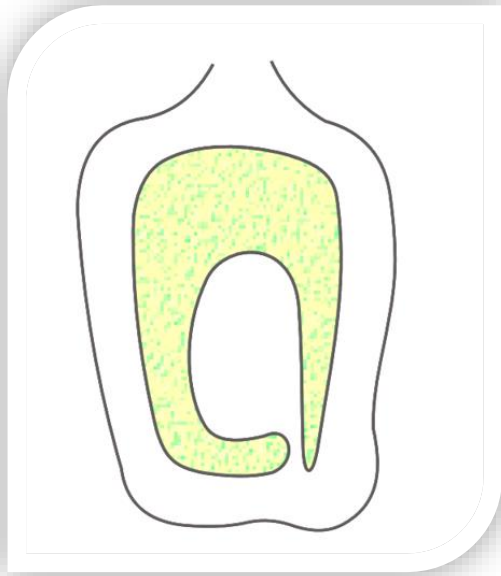


- (C) Axile placentation -The placenta is axial in axile placentation, and the ovules are linked to it. China rose, lemon, and tomato are just a few examples.

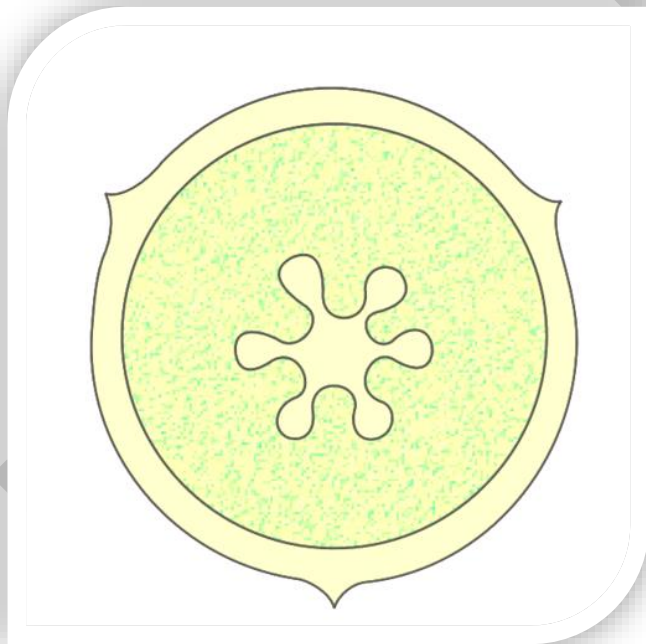


- (D) Basal placentation - The term "basal placentation" refers to an ovary with a placenta that emerges from the base with just one ovule visible. Marigolds and sunflowers contain it.





- (E) Free central placentation -The ovules form on the central axis and the septa are missing in free central placentation. Dianthus and Primrose have this sort of placentation.



**Question 11. What is a flower? Describe the parts of a typical angiosperm flower?**

**Answer:** Any flowering plant's reproductive unit is known as a flower (angiosperms). Flowers use angiosperms to reproduce sexually. A modified stem with a condensed axis is a characteristic flower. The calyx, corolla, androecium, and gynoecium are the four components of a flower. The male and female reproductive organs of a flower are represented by androecium and gynoecium (respectively).

Flowers that include both androecium and gynoecium are known as bisexual blooms, whereas unisexual flowers only contain gynoecium or androecium. The corolla and the calyx are usually separate, however, they can sometimes be mixed up (called perianth). The term "complete flower" refers to a flower that has all four floral parts.

Parts of flowers

- The calyx is the flower's outermost whorl, which contains sepals. During the bud stage, they are green, leaf-like structures that cover and protect the flowers. Polysepalous refers to flowers with free sepals, whereas gamosepalous refers to flowers with fused sepals.
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- The androecium, or stamen, is a flower's male reproductive component. The filament and the bilobed anther are the two elements. Meiosis and pollen grain generation take place in the bilobed anther.
- The female reproductive portion of a flower is represented by the genus Gynoecium. It is made up of an ovary. A lengthy tube (called the style) connects the ovary to the stigma. The ovary contains a large number of ovules that are connected to the placenta.

**Question 12. How do the various leaf modifications help plants?**

**Answer:** The leaves' primary job is to carry out the photosynthesis process. In a few plants, though, leaves have been modified to perform different tasks.

- (a) Tendrils: Tendrils are modified pea plant leaves that assist the plant in climbing.
- (b) Spines: Cactus leaves are changed into sharp spines that serve as defense organs.
- (c) Phyllode: Some Australian acacias have short-lived leaves that are quickly replaced by flattened, green structures called phyllodes that emerge from the petiole of the leaves. These plants' petioles manufacture nourishment.
- (d) Pitcher: The pitcher plant's leaves are transformed into pitcher-like structures that hold digestive juices and aid in the capture and digestion of insects.

**Question 13. Define the term inflorescence. Explain the basis for the different types of inflorescence in flowering plants.**

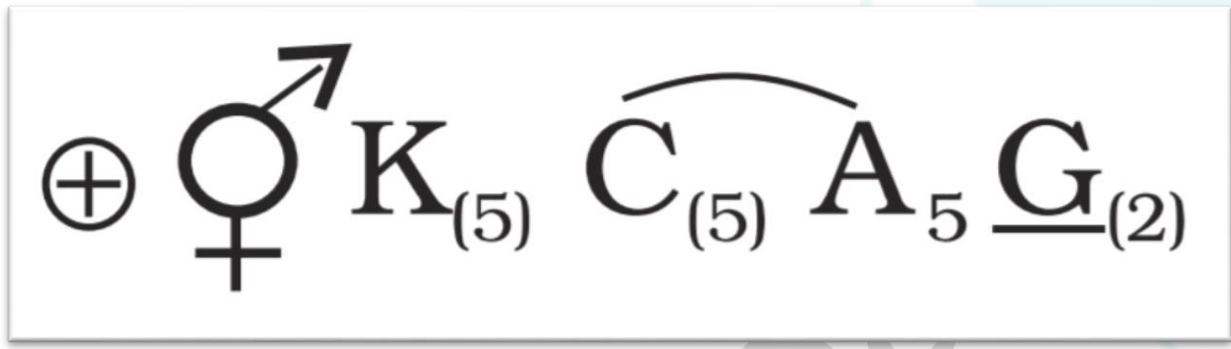
**Answer:**

The arrangement of flowers on the flowering axis is known as inflorescence. The vegetative apex of the stem is changed into a floral meristem during the flowering season. The inflorescence is an organ defined as racemose or cymose depending on whether the floral axis continues to expand or ends in a flower. The floral axis of a racemose inflorescence continues to expand and produces blooms laterally. The primary axis of a cymose inflorescence, on the other hand, finishes in a flower. As a result, its growth is restricted.

**Question 14. Write the floral formula of an actinomorphic bisexual, hypogynous flower with five united sepals, five free petals. Five free stamens and two united carpals with superior ovary and axile placentation.**

Answer:

The floral formula for the flower in question is as follows:



Actinomorphic flowers are represented by the symbol



A bisexual flower is indicated by



The calyx has five joined sepals, which are represented by the letter k5. The corolla is made up of five free petals and is designated by the letter C5. A5 represents the androecium, which is made up of five free stamens. A superior ovary with two joined carpels and axile placentations makes up the gynoecium, which can be represented as



**Question 15. Describe the arrangement of floral members in relation to their insertion on the thalamus?**

**Answer:** The flowers are classified as hypogynous, perigynous, or epigynous based on the position of the calyx, corolla, and androecium in relation to the ovary on the thalamus. The ovary is at the top of the thalamus in hypogynous flowers, whereas the rest of the floral components are below it. The ovary of such flowers, such as China roses and mustard, is superior. The ovary is at the center of perigynous flowers, while the other floral elements are positioned on the thalamus's rim. Here, the ovary is considered to be half inferior, as in plum, rose, and peach. The thalamus develops around the ovary in epigynous flowers, merging with its wall.