

## CHAPTER – 5

### MORPHOLOGY OF FLOWERING PLANTS

#### EXERCISES

#### 2 Mark Questions

**Q1: Which part of opuntia is modified to form spines?**

**Answer:**Leaves of opuntia are modified to form spines.

**Q2: Name one plant in which the leaf is pinnately compound.**

**Answer:**Neem is the plant where leaves are pinnately compound.

**Q3: In mangroves, Pneumatophores are the modified adventitious roots  
How are these roots helpful to plants?**

**Answer:**In mangroves, Pneumatophores are helpful in respiration.

**Q4:Which part of mango fruit is edible?**

**Answer:**Mesocarp of the mango fruit is edible.

**Q5:Why do the various plants have different types of phyllotaxy?**

**Answer:**Various plants have different types of phyllotaxy (arrangement of leaves on an axis or stem) for proper exposure of leaves to get sunlight.

**Q6:State the main function of leaf tendril.**

**Answer:**The main function of the leaf tendril is to help the plant for climbing.

#### 4 Mark Questions

**Q1: How is a pinnately compound leaf different from a palmately compound leaf?**

**Answer:**The compound leaves may be of two types, pinnately compound leaf and palmately compound leaf. In pinnately compound leaf, a number of leaflets are present on a common axis, the rachis, which represents the midrib of the leaf as in

neem. Pinnately compound leaf may be of different types as unipinnate, bipinnate, tripinnate and decompose. In palmately compound leaf, the leaflets are attached at a common point, i.e., at the tip of petiole, as in silk cotton. Palmately compound leaf may be of different types as unifoliate, bifoliate, trifoliate, quadrifoliate and multifoliate.

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

**Answer:** Phyllotaxy is the pattern of arrangement of leaves on the stem or branch. It is usually of three types – alternate, opposite and whorled. In alternate type of phyllotaxy, a single leaf arises at each node in alternate manner, as in china rose, mustard and sunflower plants. In opposite type, a pair of leaves arises at each node and lie opposite to each other as in Calotropis and guava plants.

If more than two leaves arise at a node and form a whorl it is called whorled phyllotaxy as in Alstonia.

**Q3: Define the term inflorescence. Explain the basis for the different types of inflorescence in flowering plants.**

**Answer:** The arrangement of flowers on the floral axis is termed as inflorescence. A flower is a modified shoot wherein internodes do not elongate and the axis gets condensed. The apex produces different kinds of floral appendages laterally at successive nodes instead of leaves. When a shoot tip transforms into a flower, it is always solitary. Depending on whether the apex gets converted into a flower or continues to grow, two major types of inflorescence are defined – racemose and cymose. In racemose type of inflorescence the main axis continues to grow, the flowers are borne laterally in acropetal succession. In cymose type of inflorescence the main axis terminates in a flower, hence is limited in growth. The flowers are borne in a basipetal order.

**Q4: Describe the arrangement of floral members in relation to their insertion on thalamus.**

**Answer:** In a typical flower, the floral members like calyx, corolla, androecium and gynoecium are arranged over the thalamus. Based on the position of calyx, corolla and androecium in respect to ovary on thalamus, the flowers are described as hypogynous, perigynous and epigynous ones. In the hypogynous flower the gynoecium occupies the highest position while the other parts are situated below it.

The ovary in such flowers is said to be superior, e.g., mustard, china rose and brinjal. If gynoecium is situated in the centre and other parts of the flower are located on the rim of the thalamus almost at the same level, it is called perigynous. The ovary here is said to be half inferior or sub superior, e.g., plum, rose, peach. In epigynous flowers, the margin of thalamus grows upward enclosing the ovary completely and gets fused with it; the other parts of flower arise above the ovary. Hence, the ovary is said to be inferior as in flowers of guava and cucumber, and the ray florets of sunflower.

## **7 Mark Questions**

**Q1: 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 of arrangement of accessory floral organs (sepals and petals) in relation to one another in floral bud is known as aestivation.

The main type of aestivation are valvate, twisted, imbricate, and vexillary.

(b) Placentation : The arrangement of ovules within the ovary is known as placentation. The placentation are of different types namely, marginal, axile, parietal, basal, and free central.

(c) Actinomorphic : When flower can be divided into equal radial halves in any radial plane passing through the centre, it is said to be actinomorphic, e.g., mustard, Datura etc.

(d) Zygomorphic : When a flower can be divided into two similar halves only in one particular vertical plane, it is said to be zygomorphic, e.g., pea, gulmohar, bean, Cassia.

(e) Superior ovary : In hypogynous flower, the gynoecium occupies the highest position while the other parts are situated below it. The ovary in such flowers is said to be superior, e.g., mustard, brinjal.

(f) Perigynous flower: If gynoecium is situated in the centre and other parts of the flower are located on the rim of the thalamus almost at the same level, it is called perigynous. Here ovary is half superior, e.g., peach, plum.

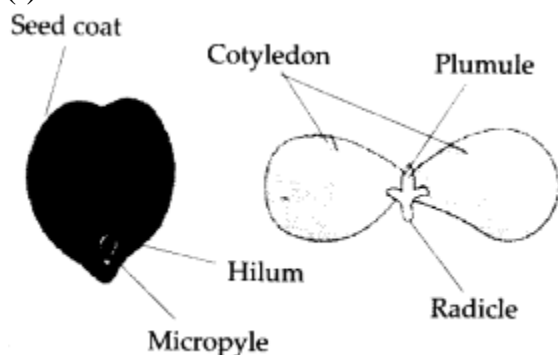
(g) Epipetalous stamen : When stamens are attached to the petals, they are called epipetalous stamens e.g., brinjal.

**Q2: Draw the labelled diagram of the following:**

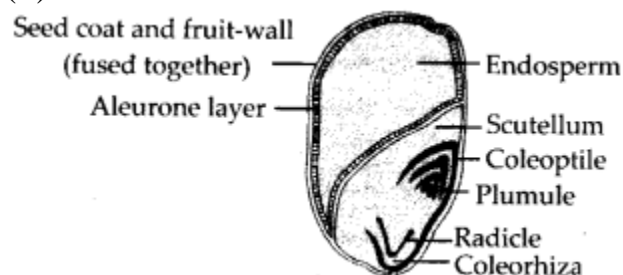
**(i) Gram seed (ii) V. S. of maize seed.**

**Answer:**

**(i) Gram seed.**



**(ii) V.S. of maize seed.**



**Q3: Take one flower each of the families Fabaceae and Solanaceae and write their semi-technical description. Also draw their floral diagram after studying them.**

**Answer:** Family Fabaceae (e.g., *Pisum sativum*) Systematic position:

Class – Dicotyledoneae

Subclass- Polypetalae

Series – Calyciflorae

Order – Rosales

Family – Fabaceae

Vegetative characters:

Habit: herb. Root: tap, branched, with root nodules.

Stem: herbaceous, climbing.

Leaves : pinnately compound, leaf base pulvinate, stipulate, venation reticulate.

Floral characters:

Inflorescence: racemose.

Flower : bisexual, zygomorphic, irregular, hermaphrodite, white or pink, complete, hypogynous to perigynous.

Calyx : sepals five, gamosepalous, ascending, imbricate aestivation, campanulate calyx tube.

Corolla : petals five, polypetalous, vexillary aestivation, papilionaceous, consisting of a posterior standard or vexillum two lateral wings or alae, two anterior ones forming a keel.

Androecium : 10 stamens in two bundles (diadelphous) of (9) + 1, anthers ditheous (bilobed), basifixed, introrse.

Gynoecium : ovary superior, monocarpellary, unilocular with many ovules, marginal placentation, style bent and long, stigma simple and-hairy.

Fruit : legume; seeds one to many, non- endospermic.

Floral formula :  $\frac{9}{5} \text{♂} K_{(5)} C_{1+2+(2)} A_{(9)+1} \underline{C}_1$



Floral diagram of *Pisum sativum*

Family Solanaceae (e.g., *Solanum nigrum*) Systematic position:

Class Subclass Series Order Family

Vegetative characters:

Habit: herbs Stem : herbaceous, aerial, erect, cylindrical, branched.

Leaves: alternate, simple, exstipulate, venation reticulate.

Floral characters:

Inflorescence: cymose.

Flower : ebracteate, ebracteolate, bisexual, actinomorphic, white, hypogynous.

Calyx : sepals five, gamosepalous, persistent, valvate aestivation.

Corolla : petals five, gamopetalous, valvate. aestivation.

Androecium : stamens five, epipetalous, polyandrous, anthers large, bitheous and

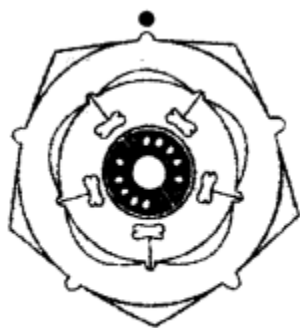
basifixed.

Gynoecium : bicarpellary, syncarpous,

ovary, obliquely placed carpels in the flower, bilocular, axile placentation, placenta swollen with many ovules.

Fruits : berry with persistent calyx.

Floral formula :  $\text{Ebr Ebrl } \oplus \text{ } \overset{\uparrow}{\text{K}}_{(5)} \overset{\curvearrowright}{\text{C}}_{(5)} \overset{\curvearrowright}{\text{A}}_{(5)} \text{ } \underline{\text{G}}_{(2)}$



Floral diagram of *Solanum nigrum*.

**Q4: Describe the various types of placentations found in flowering plants.**

**Answer:** Placenta is a parenchymatous cushion present inside the ovary where ovules are borne. The number, position, arrangement or distribution of placentae inside an ovary is called placentation. The placentation are of different types namely, marginal, axile, parietal, basal and free central.

(i) Marginal placentation : The placenta forms a ridge along the ventral suture of the ovary and the ovules are borne on this ridge forming two rows, e.g., pea.

(ii) Axile placentation : When the placenta is axial and the ovules are attached to it in a multilocular ovary, the placentation is said to be axile, e.g., china rose, tomato and lemon.

(iii) Parietal placentation : The ovules develop on the inner wall of the ovary or on peripheral part. Ovary is one-chambered but it becomes two-chambered due to the formation of the false septum, e.g., mustard and Argemone.

(iv) Free central placentation : When the ovules are borne on central axis and septa are absent, as in Dianthus and primrose the placentation is called free central.

(v) Basal placentation: The placenta develops at the base of ovary and a single ovule is attached to it, as in sunflower, marigold.

**Q5: What is a flower? Describe the parts of a typical angiosperm flower.**

**Answer:** Flower is the reproductive unit in the angiosperms. It is meant for sexual reproduction. A typical flower has four different kinds of whorls arranged successively on the swollen end of the stalk or pedicel, called thalamus or receptacle. These are calyx, corolla, androecium and gynoecium. Calyx and corolla are accessory organs, while androecium and gynoecium are

reproductive organs. In some flowers like lily, the calyx and corolla are not distinct and are termed as perianth. Some flowers have both androecium and gynoecium and are termed hermaphrodite flowers while some flowers have only one of these two whorls.

**Calyx :** The calyx is the outermost whorl of the flower and its units are called sepals. Generally, sepals are green, leaf like and protect the flower in the bud stage. The calyx may be gamosepalous (sepals united) or polysepalous (sepals free).

**Corolla :** Corolla is composed of petals. Petals • are usually brightly coloured to attract insects for pollination. Like calyx, corolla may also be free (polypetalous) or united (gamopetalous). The shape and colour of corolla vary greatly in plants.

Corolla may be tubular, bell-shaped, funnel-shaped or wheel-shaped.

**Androecium :** Androecium is the male reproductive part of the flower. It is composed of stamens. Each stamen which represents the male reproductive organ consists of a stalk or a filament and an anther. Each anther is usually bilobed and each lobe has two chambers, the pollen-sacs. The pollen grains are produced in pollen-sacs. A sterile stamen is called staminode.

**Gynoecium :** Gynoecium is the female reproductive part of the flower and is made up of one or more carpels. A carpel consists of three parts namely stigma, style and ovary. Ovary is the enlarged basal part, on which lies the elongated tube, the style. The style connects the ovary to the stigma. The stigma is usually at the tip of the style and is the receptive surface for pollen grains. Each ovary bears one or more ovules attached to a flattened, cushion-like placenta. When more than one carpel is present, they may be free (as in lotus and rose) and are called apocarpous. They are termed syncarpous when carpels are fused, as in mustard and tomato. After fertilisation, the ovules develop into seeds and the ovary matures into a fruit.

## **Multiple Choice Questions**

**1. The morphological nature of the edible part of a coconut is**

- a. Cotyledon
- b. Perisperm
- c. Pericarp
- d. Endosperm

**Answer:** Endosperm

**2. ————— are the non-essential parts of a flower**

- a. Androecium and gynoecium
- b. Sepals and carpels
- c. Sepals and petals
- d. Sepals and gynoecium

**Answer:** Sepals and petals

**3. Four long and two short stamens are found in**

- a. Asteraceae
- b. Brassicaceae
- c. Liliaceae
- d. Solanaceae

**Answer:** Brassicaceae

**4. A fruit developed from a condensed inflorescence is**

- a. Composite fruit
- b. Simple fruit
- c. Aggregate fruit
- d. Etaerio



**Answer:** Composite fruit

**5. Radial symmetry is found in the flowers of**

- a. Cassia
- b. Pisum
- c. Trifolium
- d. Brassica

**Answer:** Brassica

**6. The stem modified into flat, green organs performing the function of leaves**

- a. Phyllodes
- b. Cladodes
- c. Phylloclades
- d. Scales

**Answer:** Phylloclades

**7. Leaves become modified into spines in**

- a. Opuntia
- b. Onion
- c. Silk cotton
- d. Pea

**Answer:** Opuntia

**8. Geocarpic fruits are formed in**

- a. Onion
- b. Carrot
- c. Groundnut
- d. Watermelon

**Answer:** Groundnut

**9. Testa of seed develops from**

- a. Hilum
- b. Funicle
- c. Ovary wall
- d. Outer integument

**Answer:** Outer integument

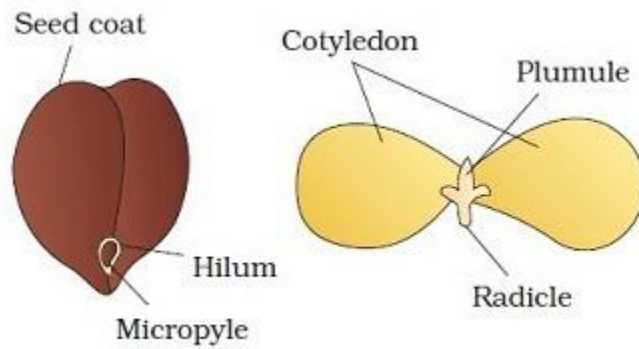
**10. Replum is found in the ovary of**

- a. Brassicaceae
- b. Malvaceae
- c. Liliaceae
- d. Asteraceae

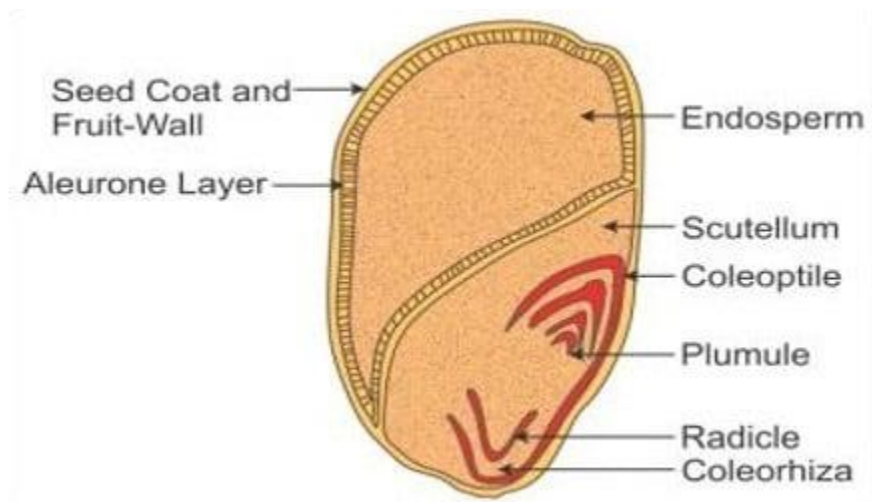
**Answer:** Brassicaceae

## DIAGRAMS

### Structure of dicotyledonous seed



### Structure of a monocotyledonous seed



## SUMMARY

Flowering plants exhibit enormous variation in shape, size, structure, mode of nutrition, life span, habit and habitat. They have well developed root and shoot systems. Root system is either tap root or fibrous. Generally, dicotyledonous plants have tap roots while monocotyledonous plants have fibrous roots. The roots in some plants get modified for storage of food, mechanical support and respiration. The shoot system is differentiated into stem, leaves, flowers and fruits. The morphological features of stems like the presence of nodes and internodes, multicellular hair and positively phototropic nature help to differentiate the stems from roots. Leaf is a lateral outgrowth of stem developed exogeneously at the node. These are green in colour to perform the function of photosynthesis. Leaves exhibit marked variations in their shape, size, margin, apex and extent of incisions of leaf blade (lamina). The flower is a modified shoot, meant for sexual reproduction. The flowers are arranged in different types of inflorescences. They exhibit enormous variation in structure, symmetry, position of ovary in relation to other parts, arrangement of petals, sepals, ovules etc. After fertilisation, the ovary is modified into fruits and ovules into seeds. Seeds either may be monocotyledonous or dicotyledonous. They vary in shape, size and period of viability. The floral characteristics form the basis of classification and identification of flowering plants. This can be illustrated through semitechnical descriptions of families. Hence, a flowering plant is described in a definite sequence by using scientific terms. The floral features are represented in the summarised form as floral diagrams and floral formula.