

EXERCISE QUESTIONS

CHAPTER -5 MORPHOLOGY OF FLOWERING PLANTS

5.1 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

Ans - Some plants' roots undergo structural and morphological change, and they are transformed to fulfil tasks other than absorbing and conducting water and minerals. It is known as root modification. For support, food storage, and respiration, among other things, roots are transformed.

(a) Root modification in banyan tree : The aerial portion of the stem of the banyan tree (*Ficus benghalensis*) sprouts enormous adventitious roots that resemble pillars. The tree is supported by these roots, which incline toward the ground. Prop roots are those types of roots.

(b) Root modification in turnip : The modification of root found in turnip is napiform for food storage. These fleshy roots have an inflated or swollen upper section that tapers inward towards the lower end.

(c) Mangrove tree root modification: Because the soil is inadequately aerated, the roots of mangrove plants grow vertically upward from the soil in order to absorb oxygen from the atmosphere. Pneumatophores are the name given to these kinds of roots.

5.2 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.

Ans - 1. While it is true that roots grow underground, there are certain exceptions. Potato is one of these. In this instance, the stem is changed to resemble a "tuber" for the purpose of storing reserve food supplies. These tubers grow and develop underground.

These facts demonstrate this:

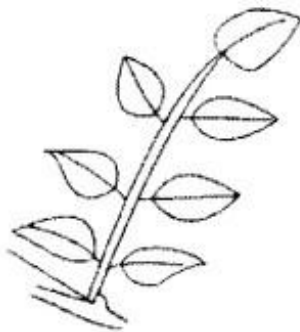
- A)The potato has scale leaves, which are only present in the stems.
- b)They also have buds in the areas known as the eyes.
- c) They include nodes. The aforementioned claims support the idea that
- d) a plant's subsurface components are not always its roots.

2. Because a flower's internodes are tightly packed together and its appendages, such as sepals, petals, stamens, and carpels, are typically numerous and large in size, the flower is thought to be a modified shoot (Goethe proposed this idea in 1760).

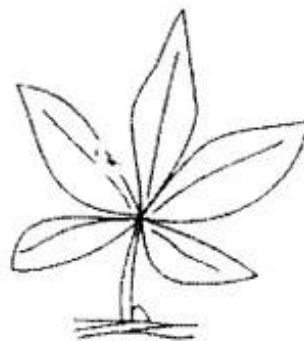
5.3 How is a pinnately compound leaf different from a palmately compound leaf?

Ans -

Pinnately compound leaf	Palmately compound leaf
The leaflets are attached to the common axis, called rachis.	The leaflets are attached at a common point on the leaf stalk.
Examples include neem and Cassia fistula(also called golden shower plant)	Examples include silk cotton (Bombax) and Cannabis.



Pinnately compound leaf



Palmately compound leaf

5.4 Explain with suitable examples the different types of phyllotaxy.

Ans - The arrangement of leaves on a stem or branch is referred to as phyllotaxy. The three main types are alternate, opposite, and whorled. As in the case of the china rose, mustard, and sunflower plants, an alternative type of phyllotaxy results in the alternate emergence of a single leaf at each node. In the opposite kind, which is found in Calotropis and guava plants, a pair of leaves grows from each node and is positioned opposite one another. Whorled phyllotaxy, as seen in Alstonia, is the term used when more than two leaves develop at a node and form a whorl.

5.5 Define the following terms:

(a) aestivation

(b) placentation

(c) actinomorphic

(d) zygomorphic

(e) superior ovary

(f) perigynous flower

(g) epipetalous stamen

Ans - (a) Aestivation: Aestivation is the method of positioning the sepals and petals, the auxiliary floral organs, in relation to one another in the floral bud. Valvate, twisted, imbricate, and vexillary are the four primary types of aestivation.

(b) Placentation: Placentation is the arrangement of ovules within the ovary. It comes in five main varieties: free central, basal, axile, parietal, and marginal.

(c) Actinomorphic: A flower is considered to be actinomorphic if it may be divided into equal radial halves in any radial plane that passes through the centre, such as in the case of mustard, datura, etc.

(d) Zygomorphic: A flower is considered to be zygomorphic if it can be divided into two identical halves by a single vertical plane, such as the pea, gulmohar, bean, or Cassia.

(e) Superior ovary: In a hypogynous flower, the gynoecium is located at the top, with the other organs below. Such flowers as mustard and brinjal are reported to have superior ovaries.

(f) The perigynous flower, which has the gynoecium in the centre and the remaining floral components placed along the thalamic rim at the same level. Consider plum and rose as examples.

(g) Epipetalous stamen: These stamens are known as epipetalous stamens when they are connected to the petals, such as in brinjal.

5.6 Differentiate between

(a) Racemose and cymose inflorescence

(b) Fibrous root and adventitious root

(c) Apocarpous and syncarpous ovary

Ans - (a)

<i>Racemose Inflorescence</i>	<i>Cymose Inflorescence</i>
<i>The main axis continues to grow</i>	<i>The main axis terminates in a flower.</i>
<i>Growth is not limited.</i>	<i>Growth is limited</i>
<i>The flowers are borne in an acropetal succession</i>	<i>Flowers are borne in a basipetal succession</i>
<i>The grouping of flowers is less common and arrangement of flowers in a group is centripetal</i>	<i>The grouping of flowers is more common and arrangement of flowers in a group is centrifugal</i>

The main difference between fibrous root and adventitious root are as following :

(b)	Fibrous root	Adventitious root
1.	These roots arise due to repeated branching or radicle.	1. These roots do not arise from radicle.
2.	They appear from base of stem.	2. They may appear from parts like stem or leaves.
3.	E.g., Wheat plant	3. E.g., Grass, Banyan

The main difference between apocarpous ovary and syncarpous ovary are as following :

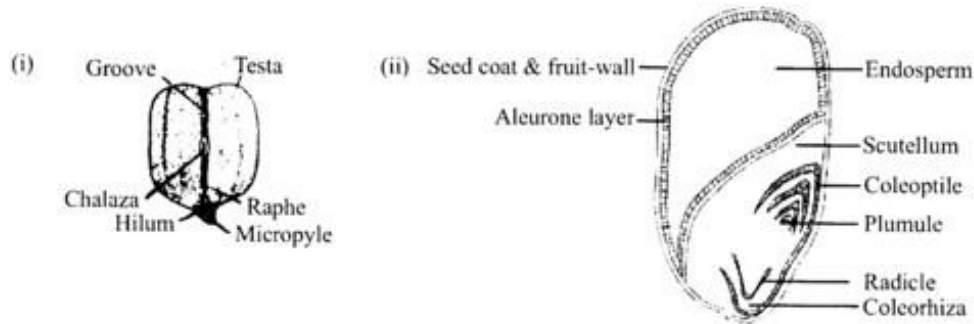
(c)	Apocarpous ovary	Syncarpous ovary
1.	There are two or more carpels in the gynoecium which are free from each other.	1. There are two or more carpels in the gynoecium which are fused to form a single compound ovary.
2.	E.g., Lotus and Rose.	2. E.g., Mustard and Tomato.

5.7 Draw the labelled diagram of the following:

(i) gram seed

(ii) V.S. of maize seed

Ans -



5.8 Describe modifications of stem with suitable examples.

Ans - The Stem changes with appropriate examples are as follows:

Food Storage: Stems are altered to serve a variety of purposes. Potato, ginger, turmeric, zaminkand, and colocasia underground stems have been adapted to hold food there. Additionally, they serve as perpetual organs to counteract unfavourable growth conditions.

Tendrils: Stem tendrils, like those on grapevines and gourds (cucumber, pumpkin, and watermelon), grow from axillary buds and are slender and spirally coiled.

Thorns: Axillary stem buds may develop into woody, erect, and pointed thorns. Many plants, including citrus and bougainvillea, have thorns. They defend plants against animals that browse. Some plants that live in dry climates change the shape of their stems into flattened (*Opuntia*) or fleshy cylindrical (*Euphorbia*) forms. They function and have chlorophyll in them.

Vegetative reproduction: When older sections of some plants, like grass and strawberries, etc., die, new plants are generated from their underground stems. A thin lateral branch develops from the base of the main axis in plants like mint and jasmine, and after growing aurally for a while, it bends downward to touch the ground. Aquatic plants like *Pistia* and *Eichhornia* have lateral branches with short internodes and each node containing a rosette of leaves and a tuft of roots. The lateral branches of the main stem of chrysanthemum, pineapple, and banana grow horizontally beneath the soil before emerging obliquely upward to give rise to leafy shoots.

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

Ans - Family Fabaceae (Pea)

The Leguminosae family includes the subfamily Fabaceae, formerly known as Papilionaceae.

• Vegetative features:

Habit: Pinnately compound, alternately arranged, and with the pulvinus present at the base of the leaf together with foliaceous stipules.

Root: Root nodules and the tap root system.

• Floral characteristics

Racemose, typically axial rather than terminal, inflorescence

Flower: There are zygomorphic and bisexual flowers.

Five gamosepalous sepals make up the calyx, which has an imbricate aestivation.

Corolla: Polypetalous with five petals and vexillary aestivation.

Its ten diadelphous and ditheous anthers make up the androecium.

Gynoecium: A superior unilocular monocarpellary ovary with marginal placentation.

Legume fruit with non-endospermic seeds.



Floral diagram of family Papilionaceae

Solanaceae:

Solanaceae: It is extensively dispersed in temperate, subtropical, and tropical regions. Datura, for instance

Solanum nigrum described in a semi-technical manner.

Vegetative figures:

Habit: Annual herb

Stem: Straight, hairy, slightly fistular, erect stem. Leaves: Simple, petiolate, ovate, alternate, with a reticulate venation.

Floral characters:

Solitary, axillary inflorescence

Ebracteate, actinomorphic, and hypogynous flowers

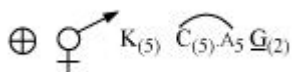
Calyx: Valvate aestivation, persistent, gamosepalous, 5, sepals.

Corolla: Valvate aestivation with five gamopetalous petals.

Gynoecium: Bicarpellary, syncarpous, ovary superior, bilocular, but four celled by creation of false septum, placenta swelling with many ovules.

Androecium: Stamen 5, epipetalous

Fruit: a spine-tipped capsule with a septifragal tear



Floral formula:



Floral diagram of family Solanaceae

5.10 Describe the various types of placentations found in flowering plants.

Ans - Placentation is the term for how the ovules are arranged inside the ovary. the various forms of placentation, including free central, basal, axile, parietal, and central. In marginal placentation, the placenta and the ovary's core structure form a ridge, and the ovules are carried on this ridge in two rows, much like in the pea. As in the case of the china-rose, tomato, and lemon, the placentation is referred to as being axile when the placenta is axial and the ovules are linked to it in a multilocular ovary.

Ovules grow on the ovary's inner wall or on its periphery during parietal placentation. The ovary has one chamber, but when the false septum forms, as in mustard and argemone, it divides into two chambers. Free central placentation occurs when the ovules are borne on the central axis and the septa are missing, as in Dianthus and Primrose. As with sunflowers and marigolds, basal placentation occurs when the placenta forms at the base of the ovary and is joined by a single ovule.

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

Ans - In angiosperms, the reproductive unit is the flower. For sexual reproduction only. The four distinct components of a flower are the calyx, corolla, androecium, and gynoecium. The male and female reproductive systems of a flower are represented by the terms androecium and gynoecium, respectively. Flower parts include:

→ The calyx: The calyx is the outermost whorl of the flower and the members are called sepals. Typically, sepals are green, resemble leaves, and guard the developing flower. A flower's sepals are referred to as polysepalous when they are free, and gamosepalous when they are fused.

Corolla: The petals that make up the corolla. Typically, flowers have colourful petals to entice pollinating insects. Gamopetalous refers to united petals, whereas polypetalous refers to petals that are free. Corolla might have a tubular, bell, funnel, wheel, or funnel shape.

The male reproductive component of a flower is called the androecium or stamen. The filament and the bilobed anther make up its two components. Meiosis and pollen grain production take place in the bilobed anther.

Gynoecium is a flower's female reproductive component. It is made up of an ovary. A lengthy tube (known as the style) connects the stigma to the ovary. The placenta is joined to the ovary, which contains several ovules.

5.12 How do the various leaf modifications help plants?

Ans - Tendrils: In some plants, such as pears, leaves are transformed into tendrils for climbing or into spines for defence.

Bulb: Onion and garlic's fleshy leaves serve as food storage. The leaves of some plants, like the Australian acacia, are small and transient.

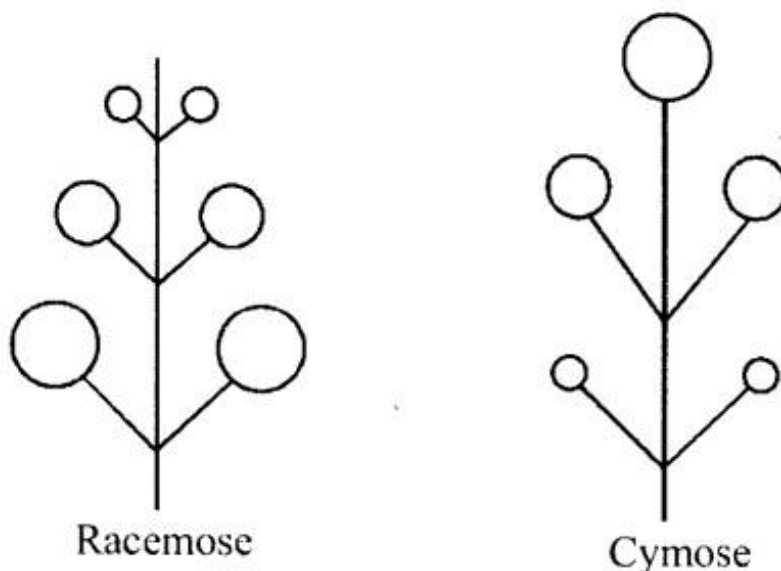
These plants' petioles grow, turn green, and produce food. Some plants that feed on insects, such as pitcher plants and Venus flytrap, also have altered leaves.

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

Ans - The arrangement of the flowers along the flowering axis is called an inflorescence. The vegetative apex of the stem transforms into a floral meristem throughout the flowering season. According to

Racemose and cymose are the two main forms of inflorescences, depending on whether the apex develops into a flower or keeps growing.

While the main floral axis in a cymose inflorescence terminates into a flower, the floral axis in a racemose inflorescence grows and produces flowers laterally. In turn, its growth is constrained.



5.14 Write the floral formula of a actinomorphic, bisexual, hypogynous flower with five united sepals, five free petals, five free stamens and two united carpels with superior ovary and axile placentation.

Ans -

Floral formula : $\oplus \overset{\text{♂}}{\text{♀}} K_{(5)} C_5 A_5 \underline{G}_{(2)}$

The calyx has five joined sepals that can be visualised as the letter K. (5). Five free petals make up the corolla, which is designated as C5. A5 stands for the androecium, which has five free stamens. The gynoecium, which can be represented as G2 by a superior ovary with two united carpels, and axile placentations.

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

Ans - The reproductive component of angioSperms is the flower. For sexual reproduction only.

There are four main types of whorls on a typical flower. sequentially placed on the thalamus or receptacle, the inflated end of the stalk or pedicel. These are the gynoecium, androecium, calyx, and corolla. While androecium and gynoecium are reproductive organs, calyx and corolla are auxiliary organs. The calyx and corolla of some flowers, such as lilies, are one and the same and are known as the perianth. A flower is considered bisexual if it has both androecium and gynoecium. Unisexual flowers are those that either have only stamens or only carpels.

The flower may have actinomorphic (radial) or zygomorphic symmetry (bilateral). Actinomorphic flowers, such as mustard, datura, and chilli, can be divided into two equal radial halves in any radial plane that passes through the centre. It is zygomorphic when it can be split into two comparable halves only in one specific vertical plane, such as the pea, Gulmohar, bean, and cassia. If a vertical plane cannot split a flower into two comparable halves, as in the case of a canna, then it is asymmetric (irregular).

If the number of floral appendages on a flower is three, four, or five times, it is said to be trimerous, tetramerous, or pentamerous. Flowers are classified as either bracteate or ebracteate depending on whether they include bracts, which are shortened leaves present at the base of the flower. The flowers are classified as hypogynous, perigynous, and epigynous based on the relationship between the ovary and thalamus and the positions of the calyx, corolla, and androecium. The gynoecium is located at the top of the hypogynous flower, with the other components below it. These flowers, including mustard, china rose, and brinjal, are thought to have better ovarian tissue.

Perigynous flowers have the gynoecium in the centre and other floral parts that are practically at the same level on the thalamic rim. According to this theory, the ovary is half inferior, like a plum, rose, or peach. In epigynous flowers, the thalamus edge extends upward, totally encircling the ovary and fusing with it before the other flower parts emerge above the ovary. As a result, the ovary is described as being "inferior" in the same way that cucumber, guava, and sunflower ray florets are.