

Morphology of Flowering Plants

CHAPTER 5

EXAM DRILL

ANSWERS

1. (a) : In some seeds the endosperm persists in the seed as food storage tissue. Such seeds are called endospermic or albuminous e.g., castor, maize, wheat, barley, rubber, coconut.

2. (b) : Composite fruit develops from entire inflorescence.

OR

(d) : The flowers of Family Papilionaceae have butterfly shaped corolla (papilionaceous corolla). Posterior or outermost petal is the largest and is called standard or vexillum, two lateral petals are similar and generally clawed called wings or alae and the two anterior petals called keel are fused enclosing stamens and carpels. This type of petal arrangement is found in bean, gram, pea, etc.

3. (d) : Sepals are usually green and protect the other floral parts in bud condition.

4. (b) : Polyadelphous condition represents cohesion of stamens. In this condition stamens of a flower are fused by their filaments only to form many groups, e.g., *Citrus*.

5. (d)

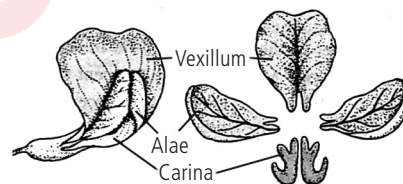
6. (b) : In alternate (or spiral) form of arrangement, one leaf is borne at a node and leaves are arranged alternately giving a spiral form, e.g., mango, mustard, tobacco, etc.

7. In alternate (or spiral) form of arrangement, one leaf is borne at a node and leaves are arranged alternately giving a spiral form, e.g., mango, mustard, tobacco etc. In opposite arrangement each node gives rise to two leaves, arranged opposite to each other. Opposite phyllotaxy are of two types – opposite superposed (each pair parallel to the next pair) and opposite decussate (one pair at right angle to the next pair).

8. Inflorescence is the arrangement of flowers on the floral axis. In banana flowers, spadix type of inflorescence is found. Spadix is a special type of spike which possesses a fleshy peduncle and large green or coloured bract called spathe. The peduncle bears an upper coloured and sterile appendix. The lower part of the peduncle possesses sessile unisexual flowers, upper male and lower female. The two types of flowers are separated by downwardly directed sterile hair or neuter flower. In a spadix the appendix of the peduncle and the spathe are coloured to attract insects for pollination. The spathe is tubular in the basal region to protect the flowers.

9. True fruit or eucarp is a ripened ovary which develops under the influence of ripening ovules and is meant for protecting them. It consists of a pericarp formed from the wall of ovary and seeds formed from ovules. A fruit in which other floral parts (e.g., thalamus, base of sepals, petals, etc.) fuse with the pericarp is called false fruit, accessory fruit or pseudocarp (e.g., apple, mulberry, strawberry). Banana is the fruit formed without fertilisation, i.e., a seedless fruit and is called parthenocarp.

10. Papilionaceous corolla is a type of polypetalous corolla having five unequal or irregular petals that are arranged like butterfly. The posterior large bilobed petal called standard or vexillum overlaps the two smaller lateral petals named wings or alae. The latter overlap the two anterior petals which are fused lightly by the upper anterior margins to form a boat shaped structure called keel or carina.



11. (c) : Any seed which contains endosperm or perisperm at maturity is called albuminous or endospermic seed i.e., food reserve of the seed is stored in endosperm or perisperm, e.g. rubber, coconut, castor bean, maize and other cereals. Seed that does not have endosperm at maturity and in which cotyledons absorb food reserve from endosperm during development and act as storage organs is called exalbuminous or non-endospermic seed, e.g., mustard, groundnut, bean, pea etc.

12. (a)

13. (b)

14. (d) : Monoadelphous stamens are found in *Althea*. Here anthers are free and fusion of filament produces a single group.

15. (i) (a)

(ii) (a) : In flower X (China rose), gynoecium occupies the highest position while the other parts are situated below it. The ovary in such flowers is said to be superior.

(iii) (a) : The flower Z (sunflower) shows the basal placentation. It can be observed in marigold also.

(iv) (c) : In flower X (China rose), gynoecium occupies the highest position because it is a hypogynous flower.

(v) (d) : The aestivation of corolla found in *Calotropis* is similar to flower Z, i.e. Sunflower.

16. (i) (d) : The tap root system (X) can be seen in mustard and turnip.

(ii) (b)

(iii) (b) : In root system Z (fibrous roots), primary root is short lived and is replaced by a large number of roots.

(iv) (c) : In X (tap root system), roots arise from the direct elongation of the radicle which will lead to the formation of primary roots.

(v) (a)

17. (a) Epipetalous condition is represented by C A and epitepalous condition is represented by P A respectively.

(b) Differences between monocot seed and dicot seed are as follows:

S.No.	Monocot seed	Dicot seed
(i)	The seed contains a single cotyledon.	The seed possesses two cotyledons.
(ii)	The food is commonly stored inside endosperm (exception-orchids).	The food may be stored inside endosperm or cotyledons.
(iii)	An aleurone layer of special protein-rich cells is found on the outside of endosperm.	Aleurone layer is absent.
(iv)	The embryo tips may bear special sheaths, coleoptile over plumule and coleorhiza over radicle.	Coleoptile and coleorhiza are absent.
(v)	Embryo occupies one side of the seed.	Embryo occupies the whole interior or only the central part of the seed.
(vi)	Plumule lies at one end near the cotyledon.	Plumule lies in between the two cotyledons.

18. Description of a typical angiospermic flower with diagram is as follows :

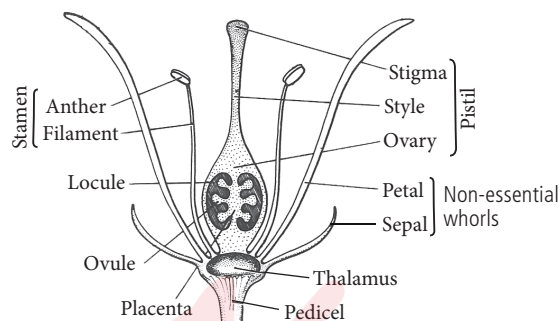
(i) Calyx : This is the outermost whorl of the flower and first whorl of the non-essential organs. Calyx consists of sepals. Sepals are usually small, green and protect the other floral parts in the bud condition.

(ii) Corolla : Corolla is the next whorl of non-essential organs. It is composed of petals. Petals are usually brightly coloured to attract insects for pollination.

(iii) Androecium : Androecium forms the third whorl of the

flower. Androecium consists of stamens which are the male reproductive organs. Stamen is morphologically equivalent to microsporophyll.

(iv) Gynoecium : The gynoecium or pistil is composed of one or more carpels. It is innermost whorl.

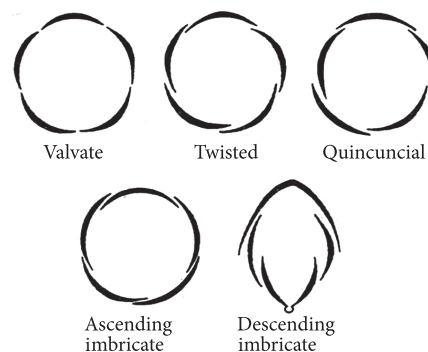


19. Aestivation is the arrangement of accessory floral organs (sepals or petals) in relation to one another in the floral bud. It is of four types.

(i) Open : Margins of the adjacent petals are sufficiently apart from each other.

(ii) Valvate : Margins of the adjacent petals touch each other but without overlapping e.g., corolla of *Brassica*.

(iii) Twisted or contorted : One margin of a petal overlaps regularly the margin of an adjacent petal; the other margin being overlapped by margin of another adjacent petal, e.g., corolla of China rose.



(iv) Imbricate : There is an irregular overlapping of petals by one another. It has 3 subtypes besides the imbricate proper: Quincuncial : Two petals external, two internal and fifth with one margin external while its other margin is internal.

Ascending imbricate : Posterior petal being overlapped by the two lateral ones while they are being overlapped by the two interior petals, e.g., *Cassia*.

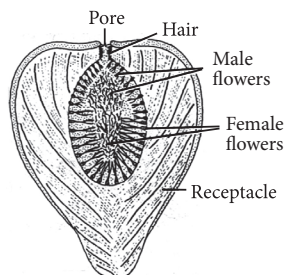
Descending imbricate or Vexillary : The posterior petal overlapping the two lateral petals, the latter overlapping the two anterior petals, e.g., pea. It is also called papilionaceous corolla.

OR

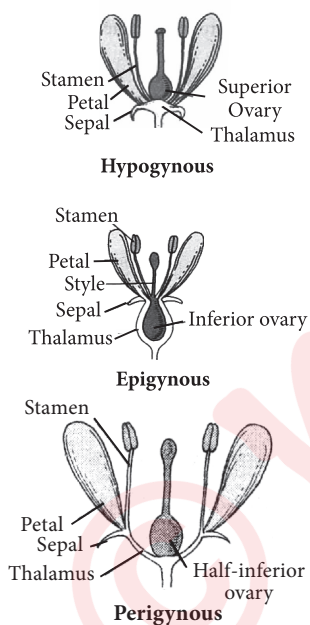
Description of a special inflorescence is as follows:

Hypanthodium : Hypanthodium has a flask-shaped fleshy receptacle which possesses a narrow canal lined by

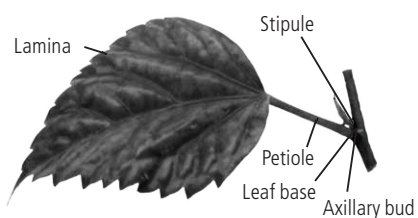
downwardly pointed hairs and a terminal pore surrounded by a few scales. Internally the receptacle bears male flowers towards the pore and female flowers towards the base. Sterile, neuter or gall flowers occur in between the two groups. The inflorescence is formed by the condensation of three types of flower bearing axes (cymose groups). e.g., Peepal (*Ficus religiosa*), Banyan (*Ficus benghalensis*), Fig (*Ficus carica*). The labelled diagram of hypanthodium is as follows:



20. The well labelled diagram of hypogynous, epigynous and perigynous flower are shown below:



21. The leaf is a flattened lateral outgrowth of the stem and bears a bud in its axil. It is green in colour due to the presence of chlorophyll and constitutes the main photosynthetic organ of the plants. They develop acropetally and exogenously. A typical angiospermic leaf consists of three parts, namely (i) a leaf base, (ii) a petiole and (iii) a lamina. Parts of a typical leaf is shown below:



22. A flower is termed as actinomorphic when its symmetry remains undisturbed if one cuts the flower into two halves

through any vertical plane passing through the axis, e.g., mustard and *Datura*. In zygomorphic flowers, symmetry remains intact when the flower is cut into two equal halves only through one particular vertical plane passing through the centre, e.g., pea, bean and *Cassia*. A flower, which cannot be divided into two equal parts by any vertical plane, it is known as asymmetric as in *Canna*.

23. Mango is a simple succulent fruit called drupe. It is derived from superior ovary hence considered as true fruit. The fruit wall or pericarp is differentiated into three layers - epicarp, mesocarp and endocarp (stony).

Apple is a false or accessory simple succulent fruit that develops from an inferior compound ovary.

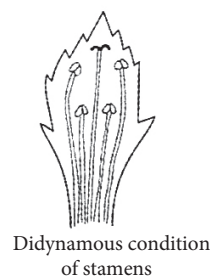
24. (i) The given figure represents cohesion of stamens. The union of members of same whorl is known as cohesion.

- (ii) A - Monoadelphous
B - Diadelphous
C - Polyadelphous
D - Syngenesious
E - Synandrous

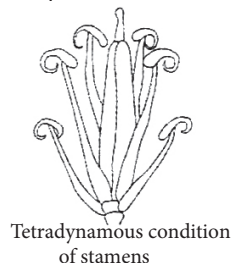
(iii) Syngenesious - In this condition, stamens are united by their anthers only. The filaments are free. The condition is charactersitic feature of Family Compositae (Asteraceae). E.g. sunflower.

OR

Didynamous : In this condition total stamens are four, out of which two are long and two are short. Thus the combination is termed as didynamous, as in *Ocimum*.



Tetradynamous: In this condition total stamens are six out of which two are short and inserted in the outer whorl whereas the rest four are longer and are inserted in the inner whorl. Therefore the combination is termed as tetradynamous, as in mustard (*Brassica campestris*).



25. (i) The given figure represents structure of a monocotyledonous seed maize.

- (ii) A - Endosperm
B - Scutellum
C - Aleurone layer
D - Coleoptile
E - Coleorhiza

(iii) C represents aleurone layer which is 1 – 3 celled thick. The cells have dense cytoplasm filled with aleurone (protein grains) and produce enzyme during the process of grain germination. D represents coleoptile in which the plumule is enclosed and E represents coleorhiza which encloses radicle.

26. (i) The given figure represents the floral diagram of a plant.

- A is calyx - Symbol K
B is corolla - Symbol C
C is androecium - Symbol A
D is gynoecium - Symbol G

(ii) According to the figure, B is corolla (petals) and has valvate aestivation.

In valvate aestivation, the margins of adjacent sepals/petals are close to each other without overlapping.

(iii) D represents gynoecium which is fourth whorl of floral diagram. Gynoecium has carpel which consists of three parts stigma, style and ovary. Ovary bears ovules. After fertilisation ovules develop into seeds and the ovary matures into fruits.

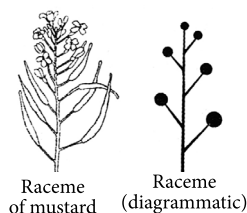
27. (a) The major functions of roots are as follows:

- (i) Fixation : Roots provide fixation to the plants with soil.
(ii) Absorption : Roots absorb water and minerals from the soil.
(iii) Storage : Roots of many plants store food for the use of other plant parts.
(iv) Aeration : Plants growing in waterlogged soil or marshy areas have special roots, i.e., pneumatophores for respiration.

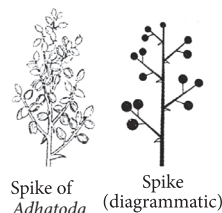
(b) Functions of stems are : It keeps leaves and flowers in such a position so as to provide maximum sunlight and to facilitate pollination respectively. It conducts water and minerals from roots to leaves, flowers, fruits, etc.

28. Simple racemose inflorescence is that indefinite inflorescence in which the peduncle is unbranched. It is of following types:

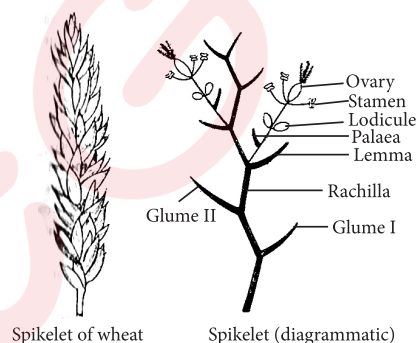
(i) Raceme : The main axis, which is elongated, bears stalked flowers, e.g., *Brassica* (mustard) and *Raphanus* (Radish).



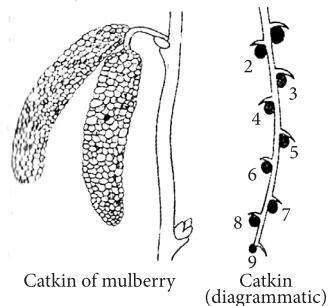
(ii) Spike : This is like raceme but the flowers are sessile or unstalked, e.g., *Adhatoda*, *Achyranthes*.



(iii) Spikelet : Very small spike with one or few flowers called florets. Each spikelet has two sterile glumes and one fertile glume-bearing flower called lemma. One bracteole is present just opposite to lemma called palea. Each flower of the spikelet is enclosed by the lemma and palea. Flowers and glumes are arranged in two opposite rows on the spikelet, e.g., *Oryza sativa* (paddy), *Triticum* (wheat), and grasses.

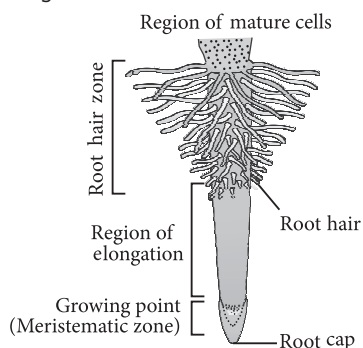


(iv) Catkin : This is like a spike but differs from latter in having a long and pendulous axis, usually bearing unisexual flowers, e.g., mulberry (*Morus alba*), Betula and oak.



OR

Explanation of various zones of a typical root with the help of a labelled diagram is as follows:



(i) Root cap : It is a thimble-shaped or cap-like parenchymatous multicellular structure which covers the root meristem. The cells of the root cap secrete mucilage which lubricates the passage of root through the soil. It also protect the root meristem from friction of the soil particles.

(ii) Growing point of meristematic zone : The growing point of the root is subterminal and lies protected below the root cap. It is made up of compactly or closely arranged small thin walled isodiametric and meristematic cells which have dense protoplasm. They undergo repeated divisions and produce new cells for the root cap and the basal region of the root.

(iii) Region or zone of elongation : It lies behind the growing point. The cells of this region are newly formed cells which lose the power of division. They elongate rapidly. This increases length of the root.

(iv) Root hair zone : Different types of primary tissues differentiate or mature in this region (*viz.*, xylem, phloem, pericycle, endodermis, cortex, epiblema, etc.). Most of the water absorption occurs in this region. Some of the outer cells of this zone give rise to lateral tubular outgrowths called roots hairs. The root hairs increase the exposed surface of the root for absorption.

(v) Region or zone of mature cells : It forms the bulk of the root. The cells of this region do not undergo any further change. The outermost layer of this region has thick walled or impermeable cells. So this region cannot help the root in water absorption. Its only function is to anchor the plant firmly in the soil. Lateral roots also arise from the interior of this region.

