

## NCERT Exemplar Solutions of Class 11 Biology – Chapter: 5 – Morphology of Flowering Plants

### VERY SHORT ANSWER TYPE QUESTIONS

1. Roots obtain oxygen from the air in the soil for respiration. In the absence or deficiency of  $O_2$ , root growth is restricted or completely stopped. How do the plants growing in marshlands or swamps obtain their  $O_2$  required for root respiration?

**Solution:**

In some plants, such as **Rhizophora** growing in swampy areas, many roots come out of the ground and grow vertically upwards. Such roots, called **pneumatophores**, help to get oxygen for respiration.

**Enhanced Explanation:**

Pneumatophores are specialized aerial roots that:

- Emerge above water/soil surface
- Have aerenchyma tissue with air spaces
- Allow gas exchange between atmosphere and submerged root system
- Examples: Mangroves (Rhizophora, Avicennia)

2. Write the floral formula for a flower, which is bisexual, actinomorphic, pentamerous sepal, petal, stamens free with the ovary, syncarpous, superior, and trilobular with axile placentation.

**Solution:**

$\oplus \ \sigma \ \rho \ K_5 \ C_5 \ A_5 \ G_{(3)}$

**Enhanced Explanation:**

- $\oplus$  = Actinomorphic (radially symmetrical)
- $\sigma \ \rho$  = Bisexual
- $K_5$  = 5 sepals
- $C_5$  = 5 petals
- $A_5$  = 5 stamens
- $G_{(3)}$  = 3 syncarpous carpels, superior ovary, trilobular

3. In *Opuntia*, the stem is modified into a flattened green structure to perform the function of leaves (i.e., photosynthesis). Cite two other examples of modifications of plant parts for photosynthesis.

**Solution:**

1. In **Australian Acacia**, the petiole takes the shape of the leaf and turns green to perform the function of photosynthesis.
2. The stem, i.e., about one internode long, modifies into a leaf-like structure to carry out photosynthesis, as in **Asparagus**.

**Enhanced Explanation:**

These adaptations occur in xerophytic conditions where:

- **Phylloclade (Opuntia):** Flattened stem performs photosynthesis while leaves become spines
- **Phyllode (Acacia):** Flattened petiole replaces leaf blade
- **Cladode (Asparagus):** Modified stem branches function as leaves

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**4. In swampy areas like the Sunderbans in West Bengal, plants bear special kind of roots called \_\_\_\_\_.**

**Solution:**

In swampy areas like the Sunderbans in West Bengal, plants bear special kinds of roots called **pneumatophores**.

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**5. In aquatic plants like Pistia and Eichhornia, leaves and roots are found near \_\_\_\_\_.**

**Solution:**

In aquatic plants like Pistia and Eichhornia, leaves and roots are found near **Node**.

**Enhanced Explanation:**

In aquatic plants, the shortened internodes result in leaves and roots being clustered around nodes, forming rosettes that help in flotation and efficient absorption.

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**6. Reticulate and parallel venation is characteristic of \_\_\_\_\_ and \_\_\_\_\_, respectively.**

**Solution:**

Reticulate and parallel venation is characteristic of **dicotyledons** and **monocotyledons**, respectively.

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**7. Which parts in ginger and onion are edible?**

**Solution:**

In ginger, the edible part is a **rhizome** which is a modified shoot that stores food materials. The edible part of the onion is **fleshy scale leaves**.

**Enhanced Explanation:**

- **Ginger rhizome:** Underground stem with nodes, internodes, and scale leaves
- **Onion bulb:** Underground bud with fleshy scale leaves surrounding a short stem

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**8. In the epigynous flower, the ovary is situated below the \_\_\_\_\_.**

**Solution:**

In an epigynous flower, the ovary is situated below the **sepals, petals and androecium**.

**Enhanced Explanation:**

In epigynous flowers, the ovary is inferior, appearing to be below the other floral parts due to the fusion of floral parts with the ovary wall.

**9. Add the missing floral organs of the given floral formula of Fabaceae.**

Given: ♀ ♂  $K_{(5)} \rightarrow A_{(+9)} G_1$

**Solution:**

The given floral formula lacks **Corolla**. The floral formula of the family Fabaceae is:

Br ⊕ ♂ ♀  $K_5 C_{1+2+(2)} A_{1+(9)} G_1$

**Enhanced Explanation:**

- **Br** = Bracteate
- **$C_{1+2+(2)}$**  = 1 standard + 2 wings + 2 keel petals (papilionaceous corolla)

**10. Name the body part modified for food storage in the following**

**Solution:**

- Carrot** – Root
- Colocasia** – Stem
- Sweet potato** – Root
- Asparagus** – Root
- Radish** – Root
- Potato** – Stem
- Dahlia** – Root
- Turmeric** – Stem
- Gladiolus** – Stem
- Ginger** – Stem
- Portulaca** – Root

**SHORT ANSWER TYPE QUESTIONS**

**1. Give two examples of roots that develop from different parts of the angiosperms plant other than the radicle.**

**Solution:**

**Banyan tree** – roots develop from the lower nodes of the stem. They are prop roots which grow downwards and touch the soil. They are meant for support.

**Sugarcane** – roots arise from the lower nodes of the stem and enter the soil. They are stilt roots which are meant to provide strength to the plant.

**Enhanced Explanation:**

Both are examples of **adventitious roots**:

- **Prop roots:** Provide mechanical support to large trees
- **Stilt roots:** Give stability to plants in marshy areas or strong winds

**2. The essential functions of roots are anchorage and absorption of water and minerals in the terrestrial plant. What functions are associated with the roots of aquatic plants? How are the roots of aquatic plants and terrestrial plants different?**

**Solution:**

The aquatic plants don't have to face problems in obtaining water. Therefore the main function of the roots of aquatic plants is **anchorage**.

**Aquatic plants**

Roots are either absent or underdeveloped  
 Vascular bundles are not well developed  
 Modifies to carry out photosynthesis food storage, and exchange of gases

**Terrestrial plants**

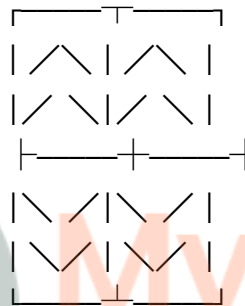
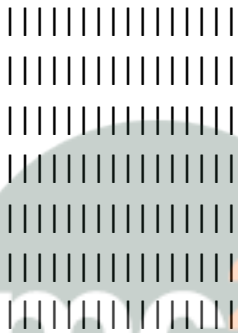
Roots are well developed  
 Vascular bundles are well developed  
 Provide anchorage and help in the absorption of nutrients from the soil

**3. Draw diagrams of a typical monocot and dicot leave to show their venation pattern.**

**Solution:**

MONOCOT LEAF  
 (Parallel venation)

DICOT LEAF  
 (Reticulate venation)



**Enhanced Explanation:**

- **Parallel venation:** Veins run parallel to each other and the leaf margin
- **Reticulate venation:** Veins form a network with smaller veinlets branching from larger veins

**4. A typical angiosperm flower consists of four floral parts. Give the names of the floral parts and their arrangements sequentially.**

**Solution:**

**Calyx** – It is the outermost whorl of the flower and the members are called sepals which are green, leaf-like and protect the flower in the bud stage.

**Corolla** – It is composed of petals. Petals are usually brightly coloured to attract insects for pollination.

**Androecium** – It is composed of stamens. Each stamen which represents the male reproductive organ, consists of a stalk or a filament and an anther.

**Gynoecium** – It 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.

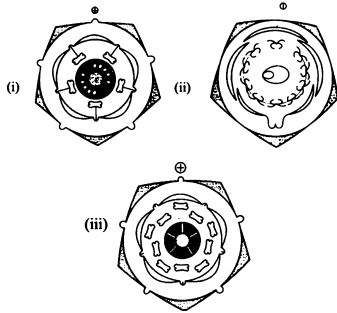
5. Given below are the floral formulae of some plants. Draw floral diagrams from these formulae.

(i)  $\oplus \ominus \otimes K_{5+5} C_{5+5} A_{5+5} G_{(2)}$

(ii)  $\oplus \ominus \otimes K_{(5)} C_{1+2+2} A_{9+1} G_1$

(iii)  $\oplus \ominus \otimes K_5 C A_{5+5} G_{(3)}$

**Solution:** [The document shows three circular floral diagrams with different arrangements of sepals, petals, stamens, and carpels corresponding to each formula]



6. Reticulate venation is found in dicot leaves while in monocot leaves venation is of parallel type. Mention one exception to this generalization.

**Solution:**

**Smilax** and **Dioscorea** are monocots having reticulate venation. **Calophyllum** and **Eryngium** are dicots having parallel venation.

7. You have heard about several insectivorous plants that feed on insects. **Nepenthes** or the pitcher plant is one such example, which usually grows in shallow water or marshlands. What part of the plant is modified into a 'pitcher'? How does this modification help the plant for food even though it can photosynthesize like any other green plant?

**Solution:**

The pitcher plant can't photosynthesize like other green plants so it gets its food from the insects as these insects are a good source of Nitrogen for the insectivorous plants.

**Enhanced Explanation:**

- **Modified part:** Leaf tip forms the pitcher
- **Reason:** These plants grow in nitrogen-deficient soils (bogs, marshes)
- **Benefit:** Insects provide essential nitrogen and other minerals that are scarce in their habitat
- **Process:** Pitcher has digestive enzymes that break down trapped insects

8. Mango and coconut are 'drupe' type of fruits. In mango, fleshy mesocarp is edible. What is the edible part of coconut? What does milk of tender coconut represent?

**Solution:**

The edible part of the coconut is the **endosperm**. The milk of tender coconut represents the **oily endosperm in liquid form**. Later it gets deposited along the walls of endocarp and forms edible flesh.

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**9. How can you differentiate between free central and axile placentation?**

**Solution:**

**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. Examples – china rose, tomato and lemon.

**Free central placentation:** When the ovules are borne on the central axis and septa are absent, the placentation is called free central. Examples – Dianthus and Primrose.

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**10. Tendrils are found in the following plants. Identify whether they are stem tendrils or leaf tendrils.**

**Solution:** a. **Cucumber** – Stem tendrils

b. **Peas** – Leaf tendrils

c. **Pumpkins** – Stem tendrils

d. **Grapevines** – Stem tendrils

e. **Watermelons** – Stem tendrils

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**11. Why is maize grain usually called as a fruit and not a seed?**

**Solution:**

The maize grain is usually called fruit because it is a **ripened ovary** which contains a ripened ovule.

**Enhanced Explanation:**

Maize grain (caryopsis) has:

- Pericarp (fruit wall) fused with testa (seed coat)
  - Contains one seed inside
  - Developed from a single carpel ovary
  - Therefore, botanically it's a fruit, not just a seed
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**12. Tendrils of grapevines are homologous to the tendril of pumpkins but are analogous to that of a pea. Justify the above statement.**

**Solution:**

The tendrils of grapevines are homologous to the tendril of pumpkins as both originated from the same part of the plant i.e. **stem** but have different functions. In grapevines, the function of tendrils is to climb, while in pumpkins is creeping.

**Enhanced Explanation:**

- **Homologous structures:** Same origin (stem), different function

- **Analogous structures:** Different origin (stem vs leaf), same function (climbing)
- Grapevine & Pumpkin tendrils: Both from stem (homologous)
- Grapevine & Pea tendrils: Different origin but same function (analogous)

**13. The rhizome of ginger is like the roots of other plants that grow underground. Despite this fact, ginger is a stem and not a root. Justify.**

**Solution:**

Ginger is a stem, not a root, because it possesses **nodes and internodes** which are not possessed by the roots.

**Enhanced Explanation:**

Characteristics proving ginger is a stem:

- Has nodes and internodes
- Scale leaves present at nodes
- Adventitious roots arise from nodes
- Shows positive phototropism when exposed to light
- Has terminal and axillary buds

**14. Differentiate between**

**a. Bract and Bracteole**

**Solution:** A bract is present at the base of the pedicle, whereas bracteole is present between bract and flower.

**b. Pulvinus and petiole**

**Solution:** Pulvinus is swollen leaf base present in leguminous plants, whereas petiole is a subcylindrical stalk which connects the leaf base with the lamina.

**c. Pedicel and peduncle**

**Solution:** The pedicel is a stalk of flower and peduncle is a stalk of whole inflorescence.

**d. Spike and spadix**

**Solution:** Spike is that the flowers are sessile that develop on an elongated peduncle in acropetal succession, whereas spadix is covered by one of the few large bracts called spathes.

**e. Stamen and staminode**

**Solution:** Stamen represents a male reproductive organ, whereas sterile stamen is called staminode.

**f. Pollen and pollinium**

**Solution:** Pollen is a male gametophyte of angiosperms, whereas pollinium is the group of pollen grains.