



Unit

4

The World of Plants



Learning Objectives

- ❖ To know about the varieties of plants.
- ❖ To know about the parts and functions of plants.
- ❖ To know the different forms of leaves, functions and their modifications.
- ❖ To understand that the food manufactured by plants is consumed by animals and human.
- ❖ To know the different types of habitats.
- ❖ To understand that plants exhibit adaptations and modifications based on the habitat.
- ❖ To know that life forms depend on each other.

Introduction

Rani and Ravi went to vegetable market with their mother. They saw variety of fresh green vegetables with attractive colours. Their mother bought cauliflower, cabbage and raddish. Ravi asked his mother 'Mom, do all the vegetables grow under the soil?' His mother answered, "No Ravi, we get some vegetable from stem, some from roots. Even some flowers are used for cooking". Rani and Ravi were surprised to know that vegetables are from different parts of the plant. After returning home they sorted out all vegetables from the bag and discussed which vegetable is from stem, which is from root and which is from flower. Their mother collected keezhanelli, curry leaves, and coriander leaves from the garden and said that the purpose of using these leaves in cooking is to add medicinal value and aroma. Discuss with your teacher about the pictures given below.



Biology is a natural science concerned with the study of life and living organisms, including their structure and functions.

The living world comprises of plants and animals. Plants can prepare food by themselves, grow in size, and reproduce. Various parts of the plants are used as food, medicine, wood, and shelter.

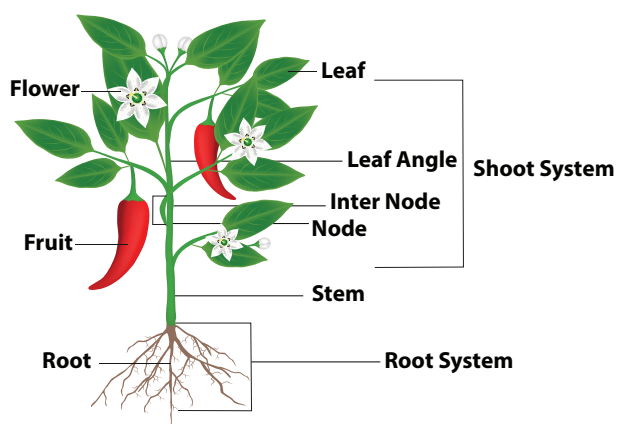
4.1 Plant forms and functions

Our body is made up of many organs. Similarly the plant body is also made up of several organs such as **root**, **stem**, **leaves** and **flowers**. Plants are of many forms and many colours, yet they are alike in some manner. That is, they all have stems and leaves above the ground which we can see easily and roots below the ground.

As shown in the picture, a flowering plant consists of two main parts. They are,

1. Root system.
2. Shoot system

Let us learn about them in detail.



1. Root System

The underground part of the main axis of a plant is known as **root**. It lies below the surface of the soil. Root has no nodes and internodes. It has a root cap at the tip. A tuft of root hairs is found just above the root tip. Roots are positively geotropic in nature

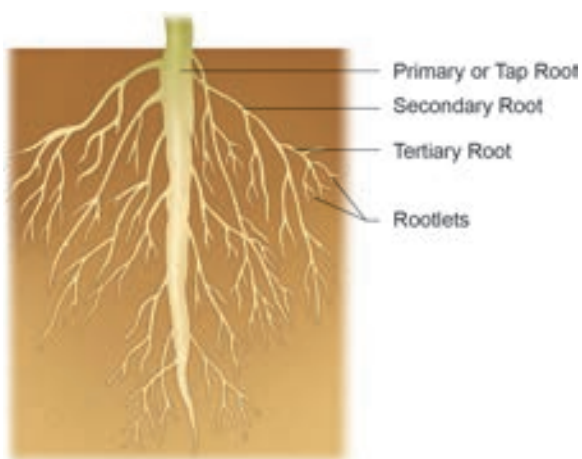
Root system is classified into two types.

- a. Taproot system
- b. Fibrous root system

a. Taproot system

It consists of a single root, called **taproot**, which grows straight down into the ground. Smaller roots, called lateral roots arise from the taproot. They are seen in dicotyledonous plants.

Example: Bean, Mango, Neem.



b. Fibrous root system

It consists of a cluster of roots arising from the base of the stem. They are thin and uniform in size. It is generally seen in monocotyledonous plants.

Example: Grass, Paddy, Maize.



Fibrous Root of Grass

Activity 1

Water absorption by Root

Aim: To observe absorption of water by root.

What you need? A carrot, a glass of water and blue ink.

What to do? Place a carrot in a glass of water with a few drops of blue ink. Leave the carrot in water for two to three days. Then cut the carrot into half length wise and observe.

What do you learn? Blue colour appears in carrot which indicates the upward movement of water in the carrot showing that root conducts water.

Functions of the Root

- ❖ Fixes the plant to the soil.
- ❖ Absorbs water and minerals from the soil.
- ❖ Some plants like carrot and beet root store food in root.

Guess it



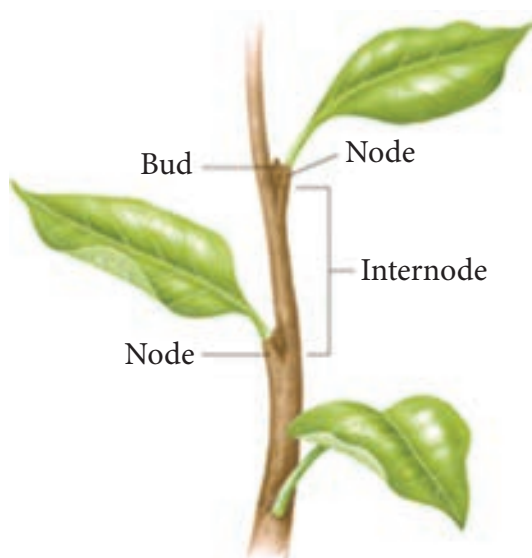
Is it a root or stem?

2. Shoot system

The aerial part of the plant body above the ground is known as the **shoot system**. Main axis of the shoot system is called the **stem**. The shoot system consists of stem, leaves, flowers and fruits.

Stem

Stem grows above the soil, and it grows towards the sunlight. It has nodes and internodes. **Nodes** are the parts of stem, where leaf arises. The part of the stem between two successive nodes is called **internode**. The bud at the tip of the stem is known as apical or **terminal bud**, and the buds at the axils of the leaves are called **axillary buds**.



Activity 2

Conduction of water

Aim: To observe conduction of water by stem.

What you need? A small twig of balsam plant, a glass of water and a few drops of red ink.

What to do? Place the small twig in the water with red ink.

What do you see? The stem becomes reddish.

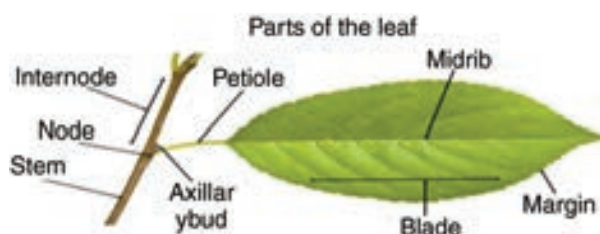
What do you learn? This is because red coloured water is being absorbed by the stem upwards.

Functions of the stem

- ❖ Supports the branches, leaves, flowers and fruits.
- ❖ Transports water and minerals from roots to upper aerial parts of the plant.
- ❖ Transports the prepared food from leaves to other parts through stem.
- ❖ Stores food as in the case of sugarcane.

Leaf

The leaf is a green, flat expanded structure borne on the stem at the node.



A leaf has a stalk called **petiole**. The flat portion of the leaf is called **leaf lamina** or **leaf blade**. On the lamina, there is a main vein called **midrib**. Other veins are branched out from mid rib. The portion of the leaf connected in the nodal region of the stem is known as the **leaf base**. Leaves of some plants possess a pair of lateral outgrowth on the base, on either side of axillary bud. These are called **stipules**.

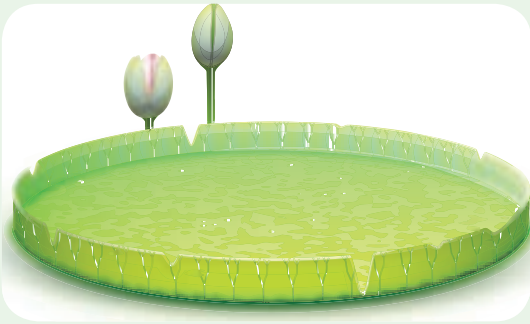
The green colour of the leaf is due to the presence of green coloured pigment called **chlorophyll**. On the lower side of the leaf there are tiny pores or openings known as **stomata**.

Functions of the Leaves

- ❖ The green leaves prepare food by photosynthesis.
- ❖ They help in respiration.
- ❖ They carry out transpiration.



The leaves of **Victoria amazonica** plant grows upto 3 metres across. A mature Victoria leaf can support an evenly distributed load of 45 Kilograms or apparently young person.



Think to learn

How do we classify the plants?

1. Based on flower, plants can be classified into two main groups. They are: Flowering plants and Non-flowering plants.



Sun Flower
(Flowering plant)



Riccia
(Non-Flowering plant)

2. Based on the presence of seed, plants can be divided into two groups. Angiosperms (Seeds are enclosed within a fruit) and Gymnosperms (Seeds are not enclosed within a fruit)



Mango (Angiosperm)



Cycas (Gymnosperm)

Activity 3

The teacher has to divide students into four groups. Each group leader will get a paper having the plant part (roots, stems, leaves, and flower) written on it, from the teacher. The teacher will take students around the campus to search for their assigned plant parts. They have to locate different types of plants discussed in the class room. The students will return to the class and discuss among themselves to create a poster. For example, flower group will create a poster by identifying correctly each part of the flower. Each group will share their posters within the class.

4.2. Habitat

Activity 4

Read the following story along with your friend

Once, I was a happy monkey. I lived in a beautiful thick forest with my mother and two brothers. We ran and played in the lush grass. On one hot day, I fell fast asleep in the cool shade of a tree. Suddenly the bright sun woke me up. I opened my eyes and could not believe what I saw. Everything has changed. Everything had been destroyed. I stood and looked at the stumps that used to be trees. Nothing was left apart from hard dry ground and only streets and building. I saw a deer that looked very sad. 'Where have all the trees gone and where are all the other animals?' I asked her.

She explained how humans had chopped down all the trees, but had not planted new ones to replace them. After a while, I said good bye to the deer. My home is gone. I didn't know where my family is, and I was hungry and thirsty, day and night. I walked in search of water, food and safe place to sleep. Whenever I stopped to rest, humans drove me away with sticks and angry voices. I could feel my body getting weak and tired. One day when I had almost given all the hope, I came across a cool and dark forest. As I walked through it, I found plenty of food and water. The forest was safe for me. There were no signs of human visiting it.

- ❖ Why did the deer feel sad?
- ❖ Who chopped the trees?
- ❖ Which is the safest place for monkey to live?

What is a habitat? Each and every organism needs a place to live and reproduce. Such a dwelling place is called habitat. From the depths of the ocean to the top of the highest mountain, habitats are the places where plants and animals live.



Types of Habitats

Let us study the two major types of habitats.

I. Aquatic habitat

When we visit a pond, we see some plants appear to float on water. One of the common plants is the Lotus plant. Its leaves float on the water. There is a small frog sitting on a leaf. It is ready to catch the insects flying / fluttering around the flowers. The stem of the plant is seen to be inside (submerged) the water. Its roots are found within the muddy floor of the pond. As this plant grows in water, shall we call it an **aquatic plant**?



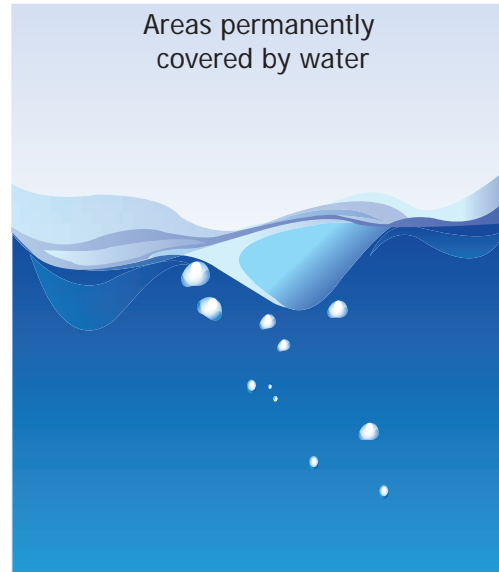
Aquatic habitat includes areas that are permanently covered by water and surrounding areas that are occasionally covered by water. There are two types of habitat namely fresh water habitat and marine water habitat.

Types of habitat

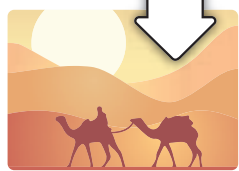
TERRESTRIAL



AQUATIC



Desert



Driest places on earth

Grasslands



Areas where vegetation is dominated by grasses

Mountains



Large land form that stretches above the surrounding land

Fresh water

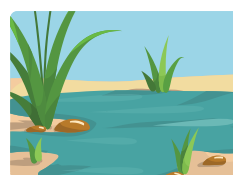
Rivers



Lakes



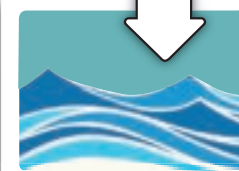
Pools



Ponds



Marine



a. Fresh water Habitat

Rivers, lakes, ponds and pools are the fresh water habitats. Water hyacinth, water lily and lotus are seen in the fresh water habitat. In these plants roots are very much reduced in size. Stem and leaves have air chambers that allow aquatic plants to float in water.



Air spaces in stems and petioles of lotus are useful for floating in water



b. Marine water habitat

From outer space Earth looks like an awesome blue marble, that's because more than 70% of Earth's surface is covered by oceans. Oceans also supports the growth of plants. Marine plants



perform about 40% of all photosynthesis that occurs on the planet.

Example: Marine algae, Sea grasses, Marsh grass, Phytoplanktons.



- Nile is the longest river in the world. It is 6650 Km long.
- The Longest river in India is Ganges. It is 2525 Km long.

II. Terrestrial habitat

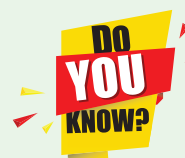
Terrestrial habitats are the ones that are found on land like forest, grassland and desert. It also includes man-made habitats like farms, towns and cities. They can be as big as a continent or as small as an island. They make up about 28% of the entire world habitat.

Example: Evergreen forest, scrub jungles.



Terrestrial habitat is classified into three types. They are:

- a. Forest b. Grass land c. Desert



The first land plant appeared around 470 million years ago. They were mosses and liverworts.

The Amazon Rain Forest in South America produces half of the world's oxygen supply.

a. Forest habitat

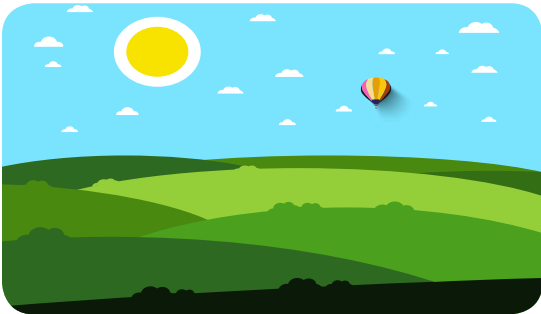
Forest is a large area dominated by trees. There are three types of forests. They are: Tropical forests, Temperate forests and Mountain forests. Annual rain fall here ranges from 25 - 200 cm.



b. Grass land habitat

Grassland is an area where the vegetation is dominated by grasses. Grasses range from short to tall.

Example: Savanna Grassland



c. Desert habitat

A habitat without much water is called deserts. Deserts are the driest place on earth. They get less than 25cm of rainfall annually. Deserts cover atleast 20% of the Earth. The plants which grow in this habitat have thick leaves that store water and minerals. The plants like cactus store water in their stem and the leaves are reduced to spines. They have long roots that go very

deep in the soil in search of water. Types of desert habitat include:

- (i) Hot dry deserts
- (ii) Semi arid deserts
- (iii) Coastal deserts
- (iv) Cold deserts.

Example: Cactus, Agave, Aloe, Bryophyllum



Fact file

Thar Desert, also called Great Indian Desert, is an arid region of rolling sand hills on the Indian subcontinent. It is located partly in Rajasthan state, north-western India, and partly in Punjab and Sindh (Sind) provinces, Eastern Pakistan.

Activity 5

Visit a nearby nursery. Choose any ten varieties of plants and place them under the appropriate habitats.

4.3 Plant Adaptations and Modifications

Adaptations are special features in plants which help them to survive in the habitats they live over a long period. Plants in a specific environment have developed special features which help them to grow and live in that particular habitat. In this section, Let us study about some adaptations like tendrils, twiners and thorns.



World habitat day is observed on 1st Monday of October every year.

These adaptations are seen in plants which live in terrestrial and desert habitats.

1. Tendril Climbers

Tendrils are a twining climbing organ of some weak stemmed plants like peas and bitter melon. Tendrils coil round a support and help the plant to climb.

Examples:

- Sweet Peas (*Lathyrus*) - Leaflets are modified into tendrils.
- Bitter Melon - Axillary buds are modified into tendrils which help the plant to climb.



Lathyrus



Bamboo is one of the fast growing plants, during active growth phase.



2. Twiners

Some plants have weak stems. They cannot stand straight on their own. They must climb on any support to survive.

Example: *Clitoria* and Jasmine



***Clitoria* sps**

3. Thorns

Leaves of some plants become wholly or partially modified into sharp pointed structures called 'thorns or spines' for defensive purpose.

Example:

- Agave - The leaf apex and margins are modified into thorns.
- Opuntia - The leaves are modified into spines.
- Bougainvillea - The stem has sharp thorns.



Agave



Opuntia

Activity 6

Field Investigation

Name of the student:

Date :

Location :

Plant types to be observed:

1. A tendril climber
2. A twiner
3. A plant with thorn

Tabulate the modification that you have observed in these plants

HOTS

Cactus plant is green in colour and performs photosynthesis. Which part of this plant does photosynthesis?

Points to Remember

- ❖ The plant body of flowering plant consists of two main parts. They are:
 1. Root system
 2. Shoot system
- ❖ Roots fix the plants to the soil. Roots absorb water and minerals from the soil.
- ❖ Stem is the ascending part of the plant axis. It has nodes and internodes.
- ❖ Leaves perform three major functions such as
 1. Photosynthesis
 2. Respiration
 3. Transpiration
- ❖ The surroundings where plants live are called their habitat
- ❖ The two major habitats are:
 1. Aquatic habitat
 2. Terrestrial habitat
- ❖ Adaptations are special features in plants which help them to survive in their habitat.
- ❖ Tendril is a climbing organ of some weak stemmed plants.
- ❖ Twiners have weak stem and they can not stand straight on their own.

Evaluation



I. Choose the correct answer.

1. Pond is an example of _____.
 - a) marine
 - b) freshwater
 - c) deserts
 - d) mountain
2. The important function of stomata is _____.
 - a) conduction
 - b) transpiration
 - c) photosynthesis
 - d) absorption
3. Organ of absorption is _____.
 - a) root
 - b) stem
 - c) leaf
 - d) flower
4. The habitat of water hyacinth is
 - a) aquatic
 - b) terrestrial
 - c) desert
 - d) mountain

II. Fill in the blanks.

1. Earth's surface is covered by _____ % of water.
2. The driest places on the Earth are _____.
3. Fixation and absorption are the main functions of _____.
4. Primary organs of photosynthesis are _____.
5. Taproot system is present in _____ plants.

III. State True or False. If false, correct the statement.

1. Plants can live without water.
2. All plants have chlorophyll.

- Plants have three parts: the root, the stem and leaves.
- Mountain is an example for freshwater habitat.
- Root is modified into spines.
- Green plants need sunlight.

IV. Match the following.

- | | | |
|-------------------|---|--------------|
| 1. Mountain | - | a. Monocot |
| 2. Desert | - | b. Branches |
| 3. Stem | - | c. Dry place |
| 4. Photosynthesis | - | d. Himalayas |
| 5. Fibrous root | - | e. Leaves |

V. Arrange the following in correct sequence.

- Leaf – Stem – Root – Flower
- Transpiration – Conduction - Absorption – Fixation

VI. Answer very briefly.

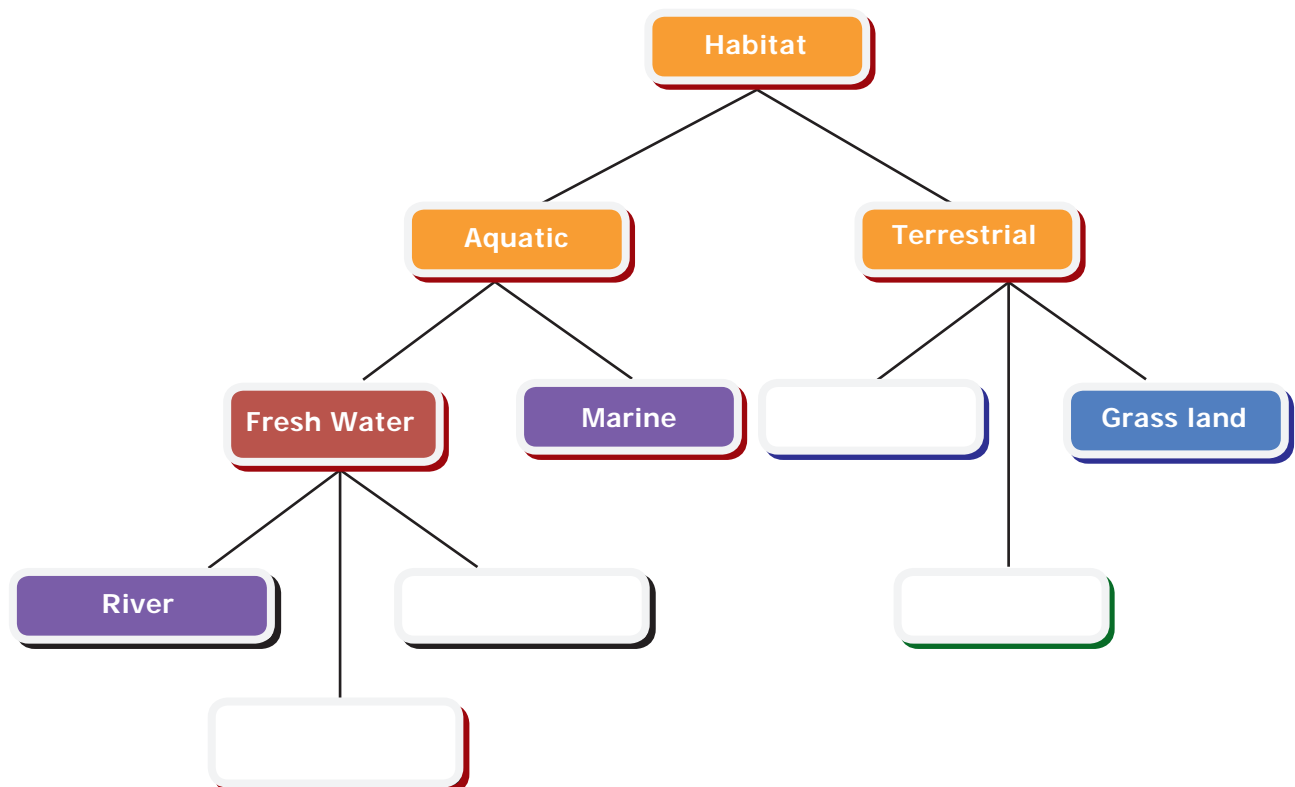
- Classify the plants on the basis of their habitats.
- Mention few desert plants.
- Define the term habitat.
- Relate the terms leaves and photosynthesis.

VII. Answer briefly.

- Why do we call jasmine plant, a twiner?
- Compare the taproot and fibrous root systems.
- Distinguish between terrestrial and aquatic habitats.
- List out the plants present in your school garden.

VIII. Answer in detail.

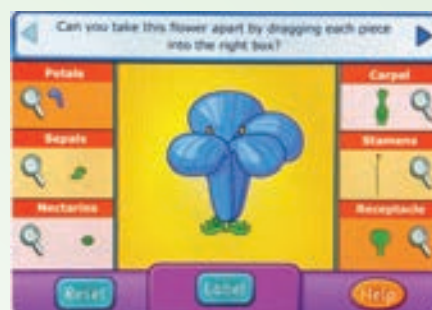
- Make a list of the functions of root and stem.
- Complete the map by filling the blanks.





Life cycle of plants

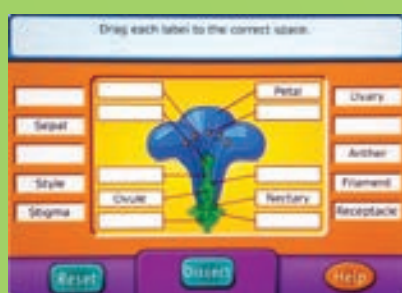
Lets learn parts of the flower.



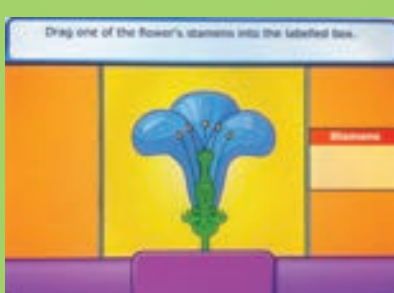
Steps 1: To learn more about the parts of the flower type science kids in the google / browser and select games. Then select life cycle of plants in the screen a flower with its part appear drag one of the flower's stamen into labelled box. Now drag the part of the flower and place it in the labelled box. It's a trial

Steps 2: Instructions will appear on the screen. When click ok next step will appear. Then we have to drag each and every part of the flower into the relevant box.

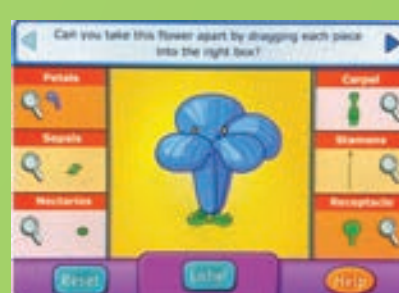
Steps 3: When we click the magnifying glass symbol, uses of the floral parts will appear. Then click ok button. Next an image of flower with its parts appears. It's an evolutionary exercise.



Step1



Step2



Step3

URL:

<http://www.sciencekids.co.nz/gamesactivities/lifecycles.html>

*Pictures are indicative only

