

# 4

## Pollination

We'll cover the following key points:

- Flower and its Importance
- Unisexual and Bisexual Flower
- Pollination



Hi, I'm EeeBee

Do you Remember:

Fundamental concept in previous class.

In class 3<sup>rd</sup> we learnt

- Parts of Plant

Still curious?  
Talk to me by  
scanning  
the QR code.



### Learning Outcomes

**By the end of this chapter, students will be able to:**

- Understand the concept of pollination and its importance in the life cycle of plants.
- Identify and differentiate between the types of pollination: self-pollination and cross-pollination.
- Explore examples of pollinators like bees, butterflies, birds, and the wind.
- Learn how pollination contributes to the production of fruits and seeds, ensuring the survival of plants.

### Guidelines for Teachers

The teacher can start the chapter by introducing the concept of pollination, encouraging students to observe flowers in their surroundings for clues about how pollination might occur. Discussions can focus on the role of pollinators, such as bees, butterflies, and wind, in transferring pollen from one flower to another. The teacher can also emphasize the importance of pollination for the survival of plants and the production of fruits and seeds, helping students understand how this process supports the balance of nature.



Look at the pictures and identify the flowers.



### Fun Fact

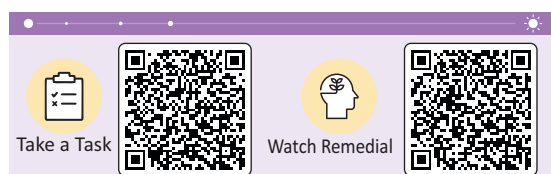
Pollination is nature's matchmaking service! Over 75% of flowering plants rely on animals like bees, butterflies, and even bats to transfer pollen. Some flowers, like sunflowers, can track the sun's movement to attract more pollinators. The cacao tree, which gives us chocolate, depends on tiny flies called midges for pollination. Wind-pollinated plants like grasses produce millions of pollen grains to ensure reproduction—talk about over achievers!

## Flower and Its Importance

A visit to a flower garden during spring time gives us an opportunity to see various activities of insects around the important part of a plant ; the **flower**. Often bees are seen buzzing and moving from flower to flower. Butterflies , hoverflies, beetles, etc. are seen doing the same thing silently. At times we may even see hummingbirds visiting different flowers. These birds and insects are attracted to a sweet liquid called **nectar** inside a flower. The nectar helps them grow and even lay eggs. In return, these animals help the plant too. As they move from one flower to another, they help in transfer of a dusty substance called **pollen** from the male part (anther) of a flower to the female part (stigma) of same or a different flower. This is the beginning of sexual reproduction in plants.

### Parts of a Flower

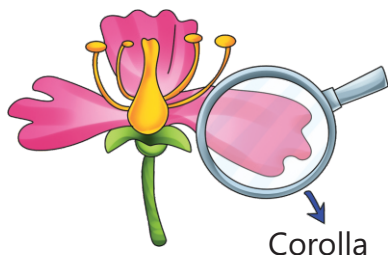
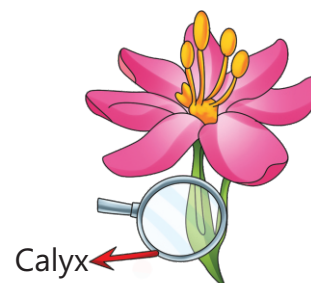
Flower, also known as blossom is the reproductive part of a flowering plant. In addition to being vibrantly coloured, producing nectar and sweet fragrance and thus attracting many insects and birds they play an important role in plant reproduction. Let us study the different parts of a flower



in detail. A typical flower may be divided into four distinct whorls namely Calyx, Corolla, Androecium and Gynoecium. Calyx and corolla are called the accessory whorls of a flower, whereas Androecium and Gynoecium are called the reproductive whorls.

### Calyx

It is the outermost whorl of a flower which consists of leaf like structures called **sepals**. The chief function of sepals is to protect the flower in its bud stage. Sepals that are mostly green help in making food too.



### Corolla

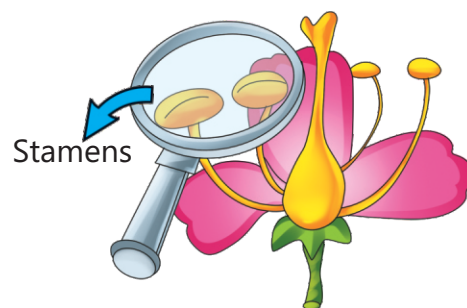
This whorl is present above the sepals whorl and consists of brightly coloured, leaf like structures called **petals**. They may often be of more than one colour and produce sweet fragrance to attract pollinating agents such as bees and bats.

### Androecium

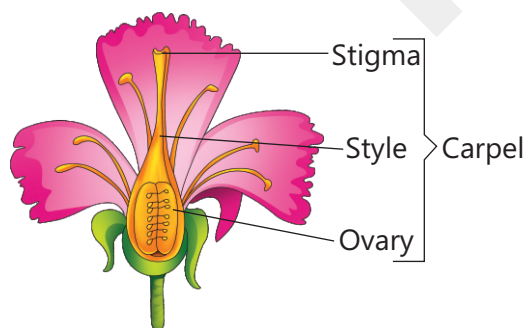
It is the third whorl of a flower that consists of a collection of **stamens**. Stamens are the male reproductive parts of a flower. Each stamen has a long, slender stalk called a filament and a lobed anther. The anther produces dusty pollen grains that contain the male reproductive cells.

### Gynoecium

This whorl is usually located at the center of a flower. It consists of one or more female reproductive parts called **pistil** or **carpel**. A pistil may be divided into three parts: A sticky stigma which catches the pollen grains, a long stalk like style and a swollen ovary. The ovary holds the ovules or eggs that contain the female reproductive cells. After fertilization the ovary changes into the fruit and the ovules change into seeds. The seeds when germinated produce baby plants.



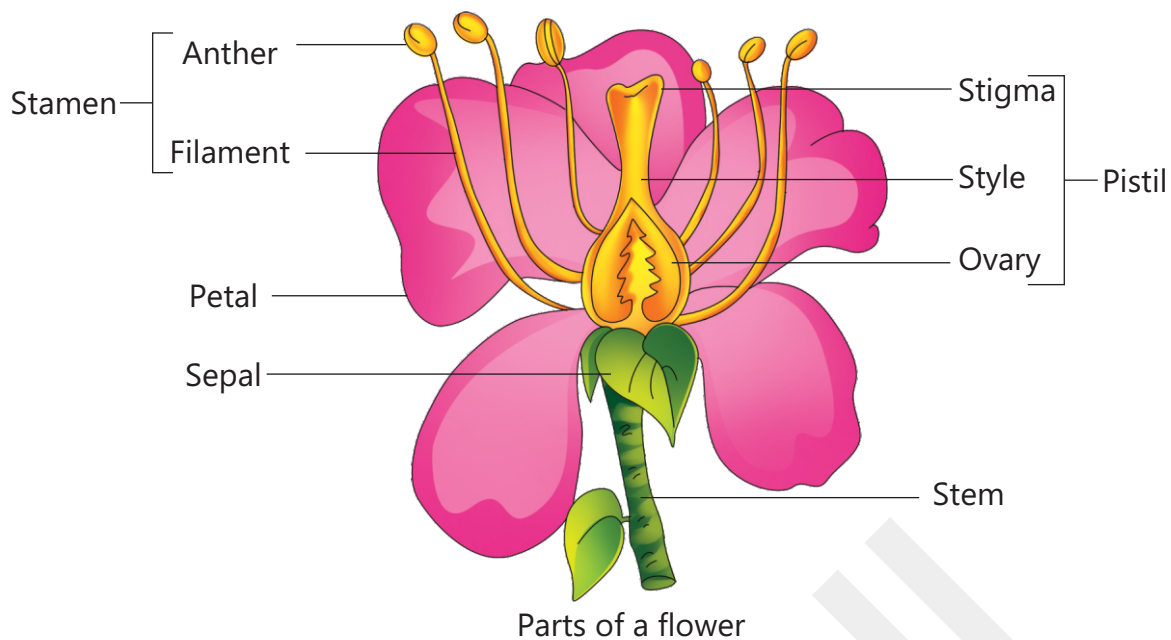
### Unisexual and Bisexual Flower



Flowers are the reproductive structures of a plant. **Unisexual** and **Bisexual** are the two types of flowers found among flowering plants. They are also called incomplete and complete flowers respectively. The main difference between a unisexual and a bisexual flower is that in unisexual flowers both

male and female reproductive organs are found in different flowers. Examples of such flowers are papaya, watermelon and corn. Whereas in bisexual flowers, both the male and the female reproductive parts are found in the same flower. Examples of such flowers are mustard, hibiscus and rose.

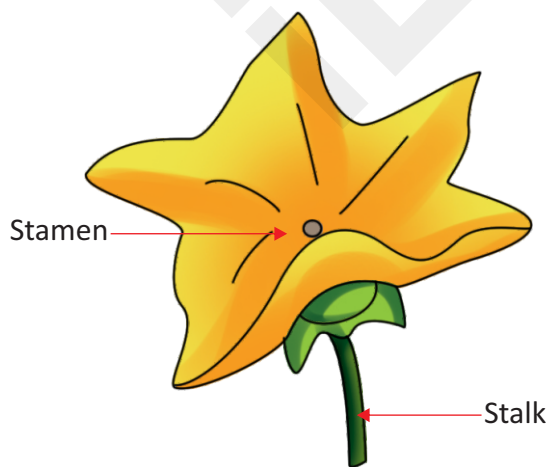
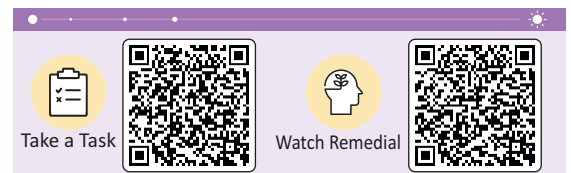
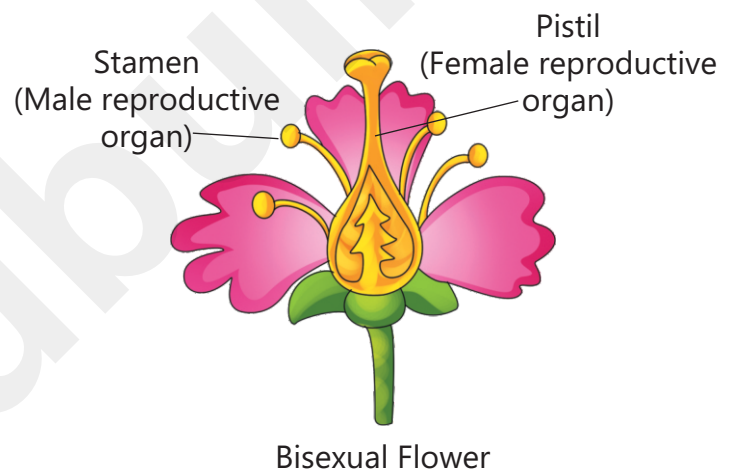




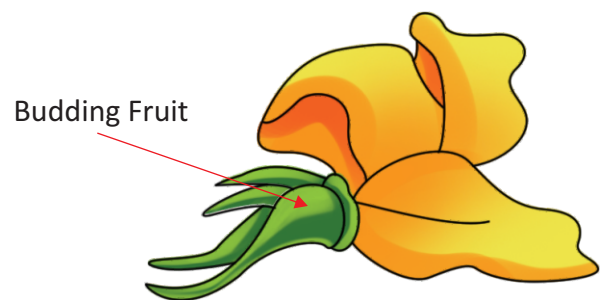
## Pollination

If you visit a garden or a park, you will notice that bees go from one flower to another trying to gather nectar from the flowers. As the bee passes from flower to flower the pollen from the anther of a flower sticks to the bee's body parts and gets transported to the stigma of the same or another flower. Thus causing pollination.

**Pollination** is the transfer of pollen grains from an anther to the stigma through various **pollinating agents**.



Male Flower



Female Flower

Unisexual Flower



Write 'T' for true and 'F' for false statements.

1. Calyx is the outer whorl of a flower which consists of sepals. ☐
2. Butterflies, hoverflies and beetles are attracted to a sweet liquid called nectar. ☐
3. Gynoecium consists of male reproductive parts. ☐
4. Unisexual flowers have both male and female reproductive organs. ☐
5. Mustard, hibiscus and rose are the examples of bisexual flowers. ☐

## Activity

## Creative Learning

### Aim

- ✦ To study the different parts of a flower and to make necessary observations.
- ✦ To study pollen grains and understand their role in plant reproduction.

### Materials Required

- ✦ A flower like hibiscus, petunia, lily, etc.
- ✦ Magnifying glass
- ✦ Lab note book to draw and record the observations.

### Procedure

Students may arrange themselves in groups of 5 and discuss the structure of a flower guided by the teacher. They may then draw the flower in their lab note books. The students may now observe each part of the flower in detail using a magnifying glass and by careful dissection of each part. Each student should dissect his or her flower by carefully removing each part, starting from outside the flower and working inwards.

### Observation

They must record their findings in the lab notebook along with a neatly labelled diagram of the flower.

## Types of Pollination

Pollination in flowers may be of the following two types : Self pollination and Cross pollination.

### Self Pollination

It is the type of pollination in which pollen grains are transferred from



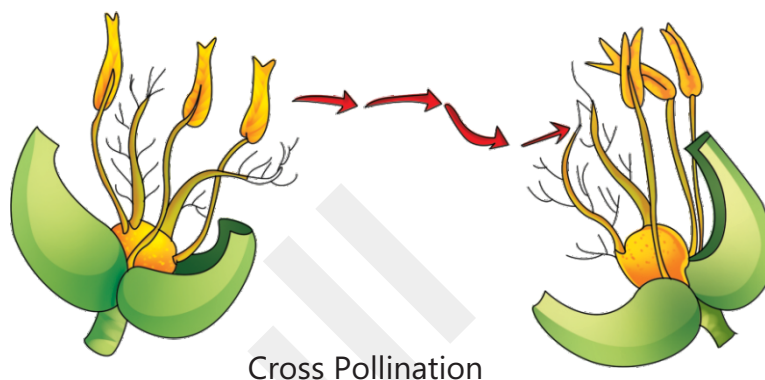
the anther of a flower to the stigma of the same flower or to another flower of the same plant. Tomatoes and rice are examples of flowers that show self pollination.

### Cross Pollination

It is the type of pollination in which pollen grains are transferred from the anther of one flower to the stigma of another flower of a different plant of the same species. Pumpkins and plums are examples of flowers that show cross pollination.

### Agents of Pollination or Pollinators

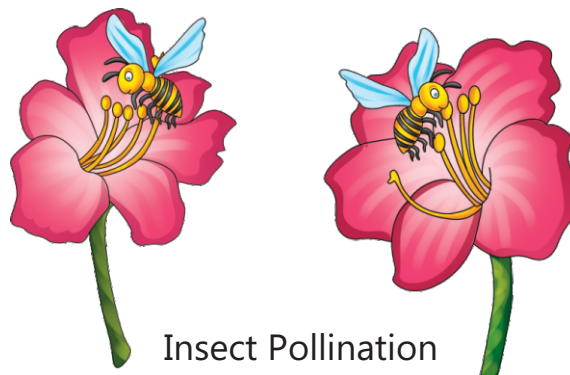
Pollination usually occurs naturally and most often it is due to insects, birds, and small mammals. The bright attractive colours of flowers along with the strong scent produced by them play a role in attracting them. Apart from these, flowers may also be pollinated by water and wind. These are known as agents of pollination or **pollinators**.



### Did you know ?

1. In the U.S., the annual benefit of managed honey bees to agriculture was estimated as \$14.6 billion in the year 2000.
2. The bad news is that over 250 of our insect pollinators are in danger of extinction.
3. Insects pollinate our crops and help provide one in every three mouthfuls of our food. Without them we wouldn't have chocolate or many other vegetables, fruits such as strawberries, apples or grapes, seeds and nuts.
4. Beetles pollinated the first flowers at the time of the dinosaurs - more than 140 million years ago!

**Pollination by insects:** Insect-pollinated flowers are large, colourful, fragrant and rich in nectar. Insects visit the flower in search of nectar and in the process, transfer pollen grains from one flower to another. Examples : Sweet pea, Salvia, Papaya, etc.





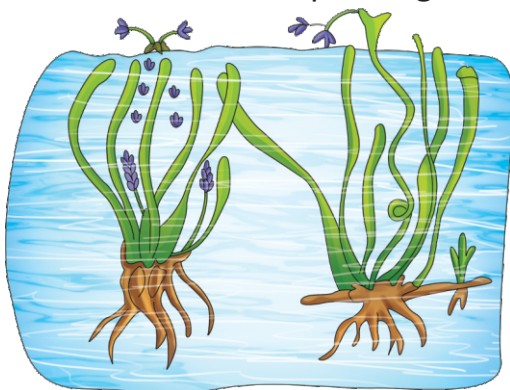
Animal Pollination

**Pollination by animals:** Animal pollinated flowers mostly do not produce scent but are brightly coloured to attract the pollinators and produce large quantities of nectar. Examples: Sugarbush (pollinated by mongoose), Pagoda lily (pollinated by cape elephant sengis), Agave flowers (pollinated by bats), etc.

**Pollination by wind:** Pollen grains of wind pollinated flowers are small, light, non-sticky and sometimes even winged to be easily carried away by the wind. The stigmas are large, and feathery to catch the air borne pollen grains. Examples: Maize, pine, wheat, etc.



Wind Pollination



**Pollination by water:** Water pollinated flowers are small, colorless, odorless and nectarless and pollen grains are produced in large quantities. In most of the water pollinated species, pollen grains are protected by a water resistant covering. Examples include Hydrilla, Vallisneria, Pondweed, etc.

### Did you know ?

The world's largest known pollinator is the Black-and-white ruffed lemur. They open the flowers of the Traveller's Palm with their fingers and push their long snouts into the opened flowers to get that sweet nectar. When they do that, the flowers' pollen coats their fur. The lemur then transports the pollen to other flowers and fertilizes them.



### Check 'N' Mate

### Critical Thinking

Fill in the blanks with correct words.

1. Pollination is the transfer of \_\_\_\_\_ (pollen/seeds) grains from anther to the stigma.
2. Pumpkin and plums are the examples of flowers that show \_\_\_\_\_ (self/cross) pollination.
3. \_\_\_\_\_ (Animal/Insect) pollinated flowers produce large quantity of nectar.
4. \_\_\_\_\_ (Water/Wind) pollinated flowers are small, colourless, odourless and nectarless.



## In a Nutshell

- ✦ Flower is the reproductive part of a plant.
- ✦ A typical flower may be divided into four distinct whorls namely Calyx, Corolla, Androecium and Gynoecium.
- ✦ Unisexual and bisexual are the two types of flowers found in flowering plants.
- ✦ Pollination is the transfer of pollen grains from the anther to the stigma through various pollinating agents or pollinators.
- ✦ Self and cross are the two types of pollination.
- ✦ Insects, animals, wind and water are the various types of pollinating agents.



## Key Words

## Improving Vocabulary

- Nectar** : A sugary fluid secreted by flowers that helps in pollination by attracting insects and other animals, collected by bees to make honey.
- Whorls** : An arrangement of sepals, leaves, petals, carpels or stamens, radiating from a specific point and wrapping around the stalk or stem.
- Fragrance** : A pleasant sweet smell
- Fertilization** : The process by which the male and the female fuse together to form a zygote or egg.



## EXERCISE

That turn curiosity into confidence—let's begin!



Gap Analyzer™  
Take a Test

### A. Objective Type Questions.

1. Which of the following mode is used in cross pollination?
 

a. Transfer by wind	<input type="checkbox"/>	b. Transfer by water	<input type="checkbox"/>
c. Transfer by animals	<input type="checkbox"/>	d. All of the above	<input type="checkbox"/>
2. Which important plant process needs pollination as a first step.
 

a. Photosynthesis	<input type="checkbox"/>	b. Transport	<input type="checkbox"/>
c. Reproduction	<input type="checkbox"/>	d. Flowering	<input type="checkbox"/>
3. An example of bisexual flower is:
 

a. Papaya	<input type="checkbox"/>	b. Hibiscus	<input type="checkbox"/>
c. Watermelon	<input type="checkbox"/>	d. Corn	<input type="checkbox"/>



4. Two main parts of the flower that are involved in pollination are:
 

a. Stigma and anther <input type="checkbox"/>	b. Stamen and pistil/carpel <input type="checkbox"/>
c. Sepals and petals <input type="checkbox"/>	d. Stigma and style <input type="checkbox"/>
5. Pollen grains are received on this part of the flower during pollination.
 

a. Anther <input type="checkbox"/>	b. Style <input type="checkbox"/>
c. Stigma <input type="checkbox"/>	d. Filament <input type="checkbox"/>
6. Papaya and sweet pea are examples of:
 

a. Insect pollinated flowers <input type="checkbox"/>	b. Wind pollinated flowers <input type="checkbox"/>
c. Water pollinated flowers <input type="checkbox"/>	d. Animal pollinated flowers <input type="checkbox"/>
7. Where can pollination happen?
 

a. Between pollen grains and stigma of the same flower	<input type="checkbox"/>
b. Between pollen grains and stigma of different flowers of the same species	<input type="checkbox"/>
c. Only between pollen grains and stigma of the same flower	<input type="checkbox"/>
d. Both (a) and (b) are correct.	<input type="checkbox"/>
8. Why do we consider wind as a good agent of pollination?
 

a. Because pollens are easily attracted to wind.	<input type="checkbox"/>
b. Because flowers sway in the wind.	<input type="checkbox"/>
c. Because pollen grains can easily float in the air.	<input type="checkbox"/>
d. Both (a) and (c) are correct	<input type="checkbox"/>
9. A small, colourless, odourless and nectarless flower is most likely to be pollinated by:
 

a. The wind <input type="checkbox"/>	b. Water <input type="checkbox"/>
c. Animals <input type="checkbox"/>	d. None of the above <input type="checkbox"/>
10. Flowers that are not brightly coloured are pollinated by:
 

a. Butterflies <input type="checkbox"/>	b. Bees <input type="checkbox"/>
c. The wind <input type="checkbox"/>	d. None of the above <input type="checkbox"/>

#### B. Fill in the blanks.

1. Stamens are the \_\_\_\_\_ reproductive part of a flower.
2. Each stamen has an \_\_\_\_\_ on it's tip. This is where millions of tiny \_\_\_\_\_ are attached.
3. The pistil is the \_\_\_\_\_ part of a flower.
4. Unisexual and bisexual flowers are also known as \_\_\_\_\_ and

- \_\_\_\_\_ flowers respectively.
5. Pollination is the movement of pollen from anther to the top of the \_\_\_\_\_.
6. \_\_\_\_\_ is the whorl containing one or more female reproductive parts known as pistil or carpel.
7. Each carpel has a sticky \_\_\_\_\_ long, slender stalk called \_\_\_\_\_ and a swollen \_\_\_\_\_.

### C. Very Short Answer Questions.

**Name them.**

1. Two wind pollinated flowers \_\_\_\_\_.
2. Two flowers pollinated by water \_\_\_\_\_.
3. Two types of pollination \_\_\_\_\_.
4. Two examples of animal pollinators \_\_\_\_\_.
5. Two examples of unisexual flowers \_\_\_\_\_.
6. Two examples of bisexual flowers \_\_\_\_\_.
7. Two things that attract pollinators to a flower \_\_\_\_\_.

### D. Short Answer Questions.

1. Name the four distinct whorls of a flower. What do you understand by accessory whorl and reproductive whorls of a flower?
2. Which characteristics of flowers help them in attracting pollinators?
3. Define pollination. What are the two main types of pollination?
4. Describe the structure of a pistil or carpel. How does the ovary and ovules change after fertilization?

### E. Long Answer Questions.

1. With the help of a neat labelled diagram describe the structure of a typical flower stating the function of each floral whorl.
2. What are pollinators? Explain with examples the various agents of pollination.
3. What is the importance of flower in the life of a plant?
4. Differentiate between unisexual and bisexual flowers.
5. Differentiate between self pollination and cross pollination.
6. Differentiate between androecium and gynoecium.



## Time to Recall

### Remembering and Analysing

Fill in the table below:

Structure	Function
Anther	
Filament	
	Holds up the stigma
Ovary	
	This is stick to catch grains of pollen
	Develop into seeds
Carpel	

## Time to Apply

### Applying and Creating

World's costliest plant product saffron grows only in Kashmir and not in any other part of country. Why?



## Time to Discuss

### Pondering and Communicating

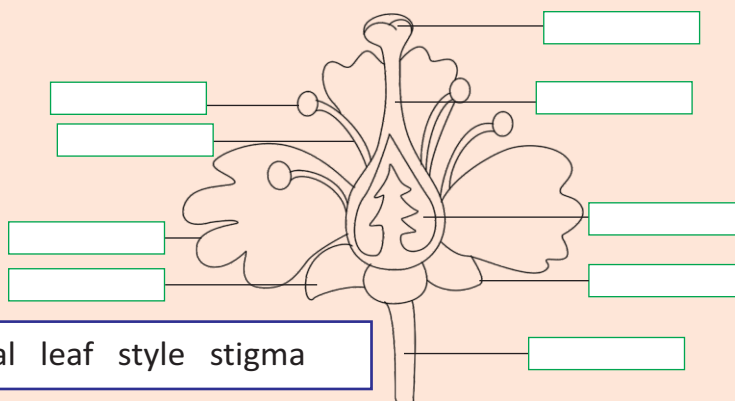
Some plants do not bear any flower. Why? Name those plants and discuss.



## Time to Observe

### Observing, Critical Thinking, Analysing

Fill in the boxes with the name of the flower part from the words in the box below. Colour the petals red, the sepals green, and the pollen yellow.



anther filament stem ovary petal sepal leaf style stigma



## Time to Create

### Creating and Collaborating

Collect pictures of some different types of flowers. Paste them in your scrapbook and label them correctly.