Chapter 8

Reproduction in Plants

We'll cover the following key points:

- Modes of Reproduction
- Sexual Reproduction
- Seed Dispersal

Hi, I'm EeeBee

Do you Remember:

Fundamental concept in previous class.

In class 5th we learnt

- Sexual Reproduction in Plants
- Seed Dispersal

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

Learning Outcomes

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

- Students will understand the different modes of reproduction in plants.
- They will be able to explain the processes of asexual reproduction and vegetative propagation in plants.
- Students will learn about the role of flowers in sexual reproduction and how seeds are dispersed to new locations.
- They will gain insights into how these processes contribute to the survival and spread of plants.

Guidelines for Teachers

To introduce the chapter, the teacher can begin by asking students about how plants grow and spread in different environments. This can lead into a discussion about the plant's reproductive strategies. The teacher can use visuals or diagrams to show both asexual and sexual reproduction processes in plants. Demonstrating common forms of vegetative propagation.

For sexual reproduction, a demonstration using flower parts can help students visualize how pollination occurs. A real-life demonstration of seed dispersal using wind or water (e.g., dandelion seeds or coconuts) can also make learning interactive.

NCF Curricular Goals and Competencies

This chapter addresses the following curricular goals and competencies:

- **CG-7 (C-7.1):** Students communicate their own questions, observations, and conclusions related to science.
- **CG-7 (C-7.2):** Explains processes related to plant life cycles and reproduction.

Mind Map

REPRODUCTION IN PLANTS

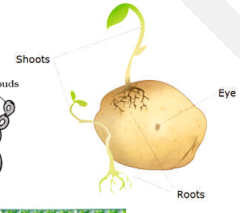
Modes of reproduction

Asexual

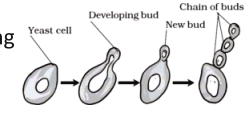
Sexual

Asexual : New plants are obtained without production of seeds.

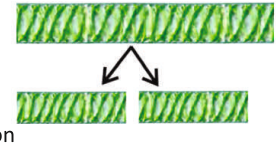
i. Vegetative propagation



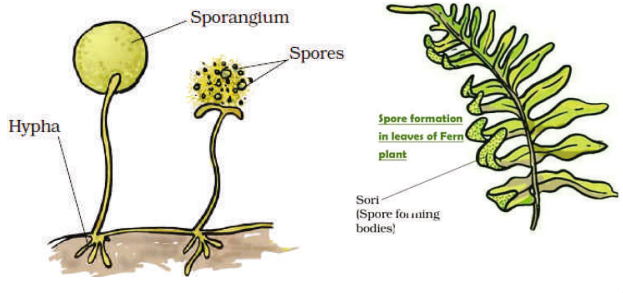
ii. Budding



iii. Fragmentation



iv. Spore formation



Sexual reproduction

➢Flowers are the reproductive parts of a plant.

✓ **Flower Reproductive parts**

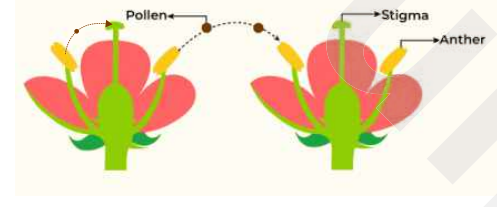
i.Male (Stamen**)**

- ✓ Anther
- ✓ Filament

ii. Female (Pistil**)**

- ✓ Stigma
- ✓ Style
- ✓ Ovary
- ✓ Ovule

➢**Pollination**

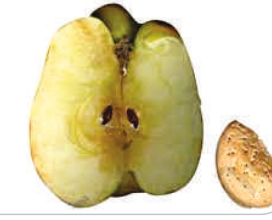


➢**Fertilisation**

The process of fusion of male and female gametes (to form a zygote) is called fertilization.

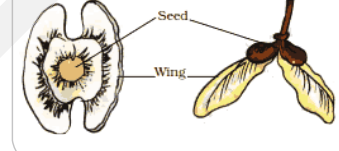
Fruits and seed formation

After fertilisation, the ovary grows into a fruit and other parts of the flower fall off. The fruit is the ripened ovary. The seeds develop from the ovules. The seed contains an embryo enclosed in a protective seed coat.



Seed dispersal

It is the movement or transport of seed away from the parent plant.



Based on NCERT*

Modes of Reproduction

The teacher is holding a sugarcane stem and a Bryophyllum leaf.

Reproduction is defined as a process by which new individual organisms are produced. Reproduction is a fundamental feature of all living organisms including plants.

- Reproduction is the most important characteristic of living organisms.
- It is the basic life process that helps maintain the continuity of lineage.

In History...

- **Theophrastus:** Described plant re-production and classified plants by their reproductive parts.
- **Carolus Linnaeus:** Developed the classification system for plants based on their reproductive organs.
- **Gregor Mendel:** Established the basic principles of heredity, impacting our understanding of plant **genetics** and reproduction.
- **Charles Darwin:** Explored how sexual reproduction aids in **adaptation** through natural selection.
- **Barbara McClintock:** Discovered mobile genetic elements in plants, advancing plant genetics research.

KEYWORDS

Genetics: Genetics is the study of heredity and variation in organisms, explaining how traits are passed from parents to offspring.

Adaptation: Adaptation is the process by which organisms develop traits that enhance their survival and reproduction in specific environments.

Plants exhibit two types of reproduction, namely asexual and sexual. In addition, some plants multiply by vegetative reproduction.

- **Asexual reproduction:** It involves simple division of the plant body into two or more plants or the formation of spores under unfavourable conditions.
- **Vegetative reproduction:** It is also a type of asexual reproduction in which a cell, tissue or a part of plant bod develops into a new organism. It is also called vegetative propagation.
- **Sexual reproduction:** It takes place by the formation of **gametes**. In this case, two parents are needed to give rise to a new individual.

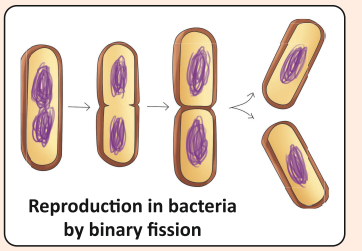
Asexual Reproduction

In asexual reproduction, a single organism is able to reproduce on its own. Common forms of asexual reproduction are budding, fission, fragmentation and spore formation.

1. Budding

Budding is an asexual method of reproduction. In budding a small part of the body of the parent plant grows out as a bulb-like projection called 'bud' which then detaches and becomes a new plant. The new plant grows, matures and produces more buds. If this process continues, a large number of plants are produced in a short time.

Yeast is a non-green plant. It is a single-celled organism i.e, unicellular organism. Yeast reproduces by the process of budding. Let us study how yeast reproduces by budding.



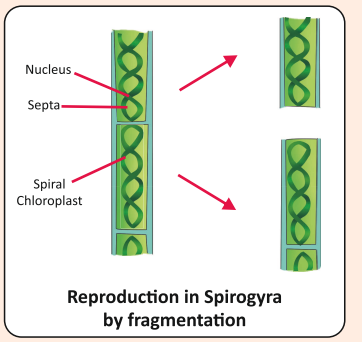
Reproduction in bacteria by binary fission

2. Fission

Fission is a process of asexual reproduction in which an individual is divided into two (binary fission) or more (multiple fission) new individuals. It is seen in bacteria.

3. Fragmentation

Spirogyra is a multicellular algae, found in fresh water ponds and in slow streams. It occurs as a slimy dark-green scum in ponds. Their body is **filamentous**, having a row of rectangular cells lying one above the other. They have a nucleus and spiral **chloroplasts**. When the filament of Sprirogyra gets broken into small fragments or pieces, the fragments grow into complete organisms.



Reproduction in Spirogyra by fragmentation

KEYWORDS

Gametes: Gametes are specialized reproductive cells, such as sperm and eggs, that fuse during fertilization to form a zygote.

Filamentous: Filamentous structures are thread-like and often found in fungi, algae, or bacterial colonies, forming long, thin strands.

Chloroplasts: Chloroplasts are organelles in plant cells responsible for photosynthesis, converting sunlight into energy stored as glucose.

4. Spore Formation

Mould growing on bread which is a form of fungus. If a sample of bread mould is examined under a microscope, you will be able to see fine threads called hyphae with knob-like structures called sporangia. Each knob has hundreds of minute spores inside it. When the sporangium ripes, it bursts open and disperses the spores into the air. These spores are the asexual reproductive units that can withstand unfavourable conditions like high temperature and low humidity. Under favourable conditions, a spore germinates into a new mould. Moulds can grow on wood, paper, carpet, and food.

Spores are also found in ferns. Their leaves are called fronds. The underside of fronds have sori (singular sorus). Each sorus is made up of many sporangia (singular sporangium). Each sporangium produces many spores. When the sporangium matures, it bursts open dispersing the spores.

Activity

To observe budding in yeast

Take some yeast powder from a bakery or chemist shop. Place a pinch of yeast powder in a 100 ml beaker having some luke warm water. Add a spoonful of sugar and shake it well to dissolve sugar. After an hour or so, put a drop of this liquid on a glass slide and observe it under a microscope. You will see the formation of new yeast cells. Draw a simple line diagram of what you see on the slide. Does your diagram match with figure? The new yast cell grows, matures and produces there yeast cells. If this process continues for some time, a large number of yeast cells are produced in a short time.

Vegetative Reproduction

Vegetative reproduction is a type of asexual reproduction in which new plants are produced from roots, stems, leaves and buds. These parts are vegetative parts of a plant.

Therefore, this type of reproduction is called vegetative propagation. All the plants produced by vegetative popagation from one plant are exact copies (clones) of the parent plant.

You may have never seen the seeds of potatoes, sugarcane, rose and Bougainvillea. How do these plants reproduce? These plants reproduce vegetatively through their stems.

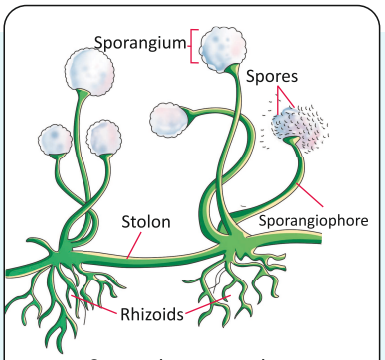
Banana, garlic, mint, grapes, roses and many other plants are grown by vegetative propagation. There are a number of natural as well as artificial methods by which plants reproduce vegetatively.

Why are potato, ginger, sweet potato, etc. swollen? These plant parts store food in the form of carbohydrates. So they become swollen. This stored food is used by the plants when they multiply by vegetative propagation.

Activity

To study spores of Rhizopus under microscope :

Collect a slice of bread having bread mould (Rhizopus). Take a clean slide and with a forceps put some blackish threads on it. Observe under the microscope. Black-coloured spores are seen in sporangium borne on a sporangiophore.

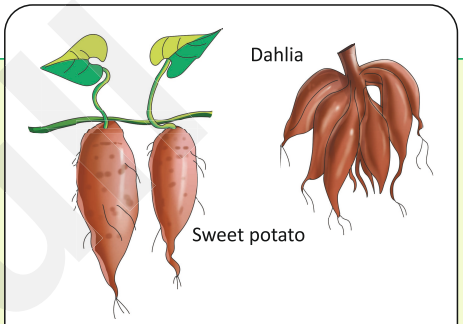


Spores in sporangium of Rhinzopus

Methods of Natural Vegetative Propagation

By Roots

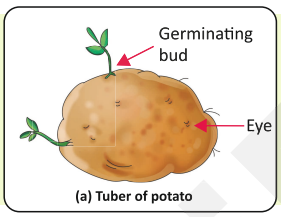
Tuberous roots of Dahlia, sweet potato and Asparagus become swollen due to food stored in them. In the next season, new plants are produced from these roots.



Tuberous roots of sweet potato and Dahli

Vegetative Propagation by Stems

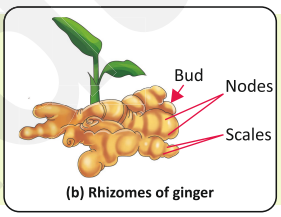
The underground stems are modified for vegetative propagation. These are of following types:



(a) Tuber of potato

TUBER

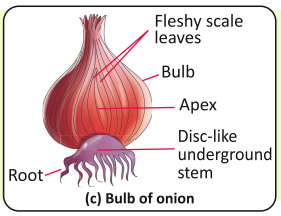
Potato is an underground stem tuber that is swollen due to food stored in it. It has buds in the depressions called the eyes. These buds give rise to new plants. The stored food is used up by the new plants to grow.



(b) Rhizomes of ginger

RHIZOME

Rhizomes are underground stems that have buds to give rise to new plants. Ginger and turmeric are thick horizontally growing stems in which buds develop into branches which grow upwards into the air and then produce normal green leaves. Roots develop from the lower surface of the underground stems.



(c) Bulb of onion

BULB

It is a very short underground stem surrounded by fleshy scale leaves. The scale leaves store food. It is found in onion. In the spring, the stem shoots up from the centre of the scale leaves to form a new plant.

Did You Know ?

The eyes in potato are nodes and buds in the eyes are axillary buds. These buds develop into new plants. A node is a part of stem at which a leaf arises.

Activity

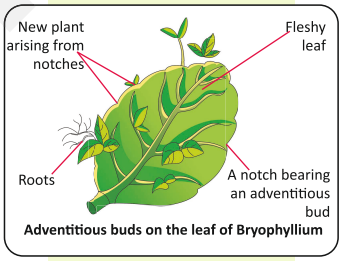
To observe vegetative reproduction in potato.

Take a potato and locate depressions (eyes) on its surface. Each eye has a bud which can grow into a new plant.

Cut a few pieces of the potato, each with an eye. Bury them in moist soil. Keep the soil moist by adding water regularly. After a few days, each bud grows into a new plant. Likewise, you can also grow ginger or turmeric.

Vegetative Propagation by adventitious buds on leaves

The fleshy leaves of Bryophyllum bear adventitious buds in the notches present along their margin. When such a leaf falls on the soil, each bud grows into an independent plant. Plants with fleshy stems, such as each produce new plants when their parts get detached from the main plant body. Each detached part can grow into a new plant.



Adventitious buds on the leaf of Bryophyllium

Methods of Artificial Vegetative Propagation

Artificial vegetative propagation is a simple, fast and less expensive method of plant propagation. It is, therefore, commonly used in horticulture and agriculture. The techniques used are stem cutting, layering, grafting and tissue culture.

Vegetative propagation is a common method to develop new varieties of rose, guava, mango, lemon and orange.

Advantages of vegetative propagation

- Vegetative propagation is a more rapid, easier and cheaper method of plant propagation as compared to the raising plants by seeds. Plants grown by vegetative propagation take less time to grow and bear flowers and fruits early.
- The new plants are exact copies of the parent plant as they are produced from single parent.
- It produces a large number of plants in a short time.
- Plants grown vegetatively usually need less attention in the early stages than the plants grown from seeds.
- Plants like banana, seedless grapes, roses, pineapples and dahlias which do not produce niable seeds can only be grown vegetatively.

SCAN TO ACCESS

Take a Task

Watch Remedial

Let's recall what we know

Apply Concept in Context

Apply

- How does vegetative propagation help plants reproduce without seeds? Provide examples of plants that use this method.
- If a plant cannot produce seeds, how might it still ensure its survival and reproduction?

Skills Covered: Critical thinking, Applicative thinking, Brainstorming

Examine Further

Analyse

- What will happen if the structures used for vegetative propagation, such as buds, stems, or leaves, are damaged?
- Give your answer in relation to the plant's ability to reproduce and grow.

Skills Covered: Critical thinking, Analytical thinking, Brainstorming, Research, Investigation

Self-Assessment Questions

Evaluate

- What is asexual reproduction, and how is it different from sexual reproduction in plants?
- What is vegetative propagation, and which plant structures are involved in this process?
- How do plants like Bryophyllum and potato propagate asexually?
- What are the advantages and disadvantages of asexual reproduction in plants?

Skills Covered: Research, Observation, Recall

Creative Insight

Create

Asexual reproduction and vegetative propagation are efficient ways for plants to reproduce without seeds. New plants can grow from structures like roots, stems, leaves, or buds, ensuring survival even in the absence of pollinators or favorable conditions for seed production.

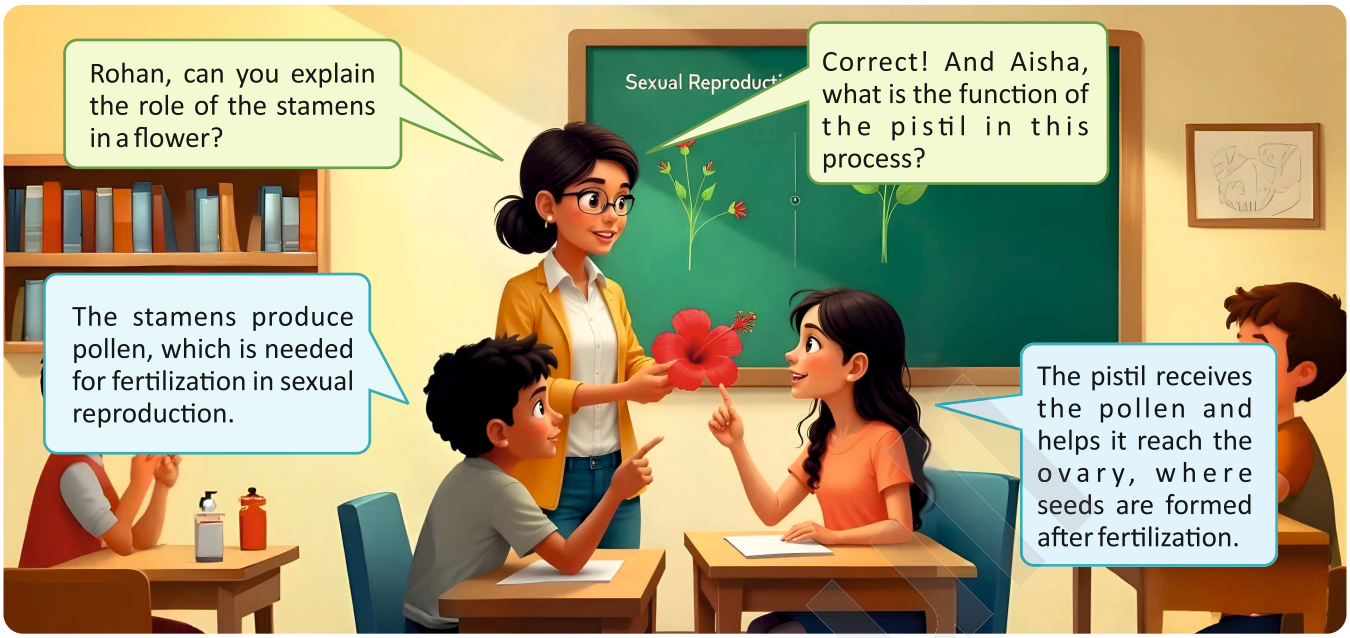
Task: Create a diagram showing different types of vegetative propagation (e.g., tubers, runners, plantlets) and provide examples for each type.

Skills Covered: Research, Creativity, Observation, Brainstorming

Bloom's Taxonomy

Sexual Reproduction

The teacher is holding a hibiscus flower and pointing to its stamens and pistil.



Sexual reproduction occurs as a result of fusion of male and female gametes. The gemetes are produced in separate male and female reproductive organs which may be present in the same plant or in separate male and female plants.

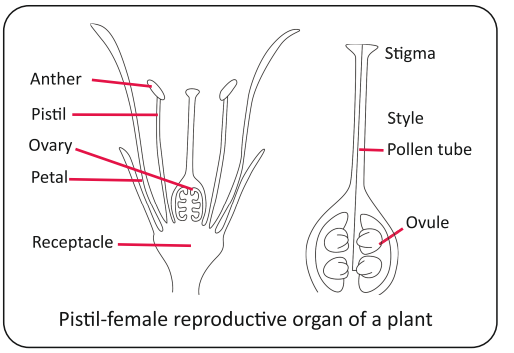
Flower-The Reproductive Part of a Plant

Flower is the reproductive part of a plant. The stamens are the male reproductive parts and the pistil is the female reproductive part of a flower.

Usually, a flower contains both male and female parts. Such flowers are called bisexual flowers, e.g., rose, mustard, etc. The flowers which contain either stamens or pistil are called unisexual flowers, e.g. maize, papaya, cucumber, etc.

Both male and female unisexual flowers may be present in the same plant or in different plants.

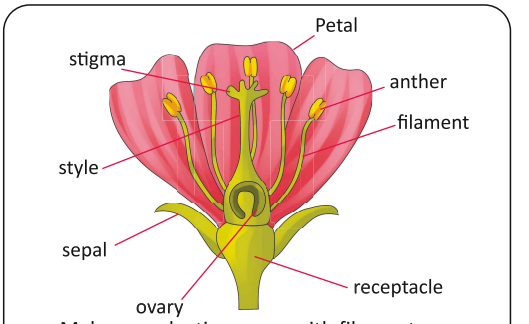
Pistil : Pistil is the female reproductive organ of the plant. It is made of three parts: stigma, style and ovary. The top sticky part of a pistil is called stigma. The middle part of the pistil is called style. It is a tube which connects stigma to the ovary. The swollen part at the bottom of a pistil is called ovary.



Pistil-female reproductive organ of a plant

The ovary contains ovules. Ovules produce female gametes. Each ovule contains only one female gamete, called the egg. The female reproductive organ of the plant called pistil is also known as carpel.

Stamen : Stamen is the male reproductive organ of the flower. It has two parts: A **filament** and an **anther**. The stalk of stamen is called filament and the swollen top of stamen is called anther. Anther contains the pollen grains. Pollen grain contains the male gametes. Pollen grains appear to be yellow powder to us. Pollen grains generally have a tough protective coating which prevents them from drying up.



Male reproductive organ with filament

Pollination

The transfer of pollen grains (containing male gametes) from the anthers to the stigma of pistil is known as pollination. This is the first step in the process of seed formation.

Types of pollination

Pollination is of two types: self-pollination and cross-pollination.

- **Self-pollination:** In this process, pollen lands on the stigma of the same flower or of a different flower of the same plant.
- **Cross-pollination:** In this case, pollen lands on the stigma of a flower borne on a different plant of the same kind.

Agents of pollination

Pollination takes place with the help of some external agents such as wind, water, insects, birds or mammals. These external agents are called agents of pollination.

- **Pollination by wind:** The blowing wind carries pollen grains from on flower to other flowers and helps in pollination. Wind pollinated flowers do not have large, brightly coloured and scented petals or nector because they do not have to attract insects.
- **Pollination by insects:** Insects like honey bees, wasps, moths and butterflies visit flowers for nectar. While collecting nectar, some pollen grains stick to the body of these insecets. When these insects visit another flower, the pollen grains are brushed off, some of which fall on the stigma.


Insect pollination in sweet pea flower

Examples of insect-pollinated flowers are sweet pea, orchids, buttercup, sunflower, etc.

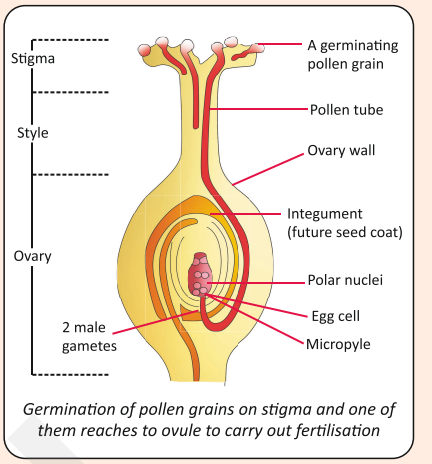
Why are flowers generally so colourful and fragrant? Flowers are colourful and fragrant to attract insects for pollination.

- **Pollination by water**: Pollination in aquatic plants is usually carried out by water.

The examples of water-pollinated plants are sea grass, Hydrilla and Vallisneria. Water-pollinated flowers release their pollen grains into the water. These pollen grains are passively carried to other flowers by water currents for pollination.

Fertilisation

On reaching the stigma, pollen grain grows out into a thin pollen tube. It extends through the style, reaches the ovary and enters the ovule. The pollen tube contains two male gametes, one of which fuses with the female gamete or egg and forms a zygote. The process of fusion of a male and a female gamete is called fertilisation.



Germination of pollen grains on stigma and one of them reaches to ovule to carry out fertilisation

After fertilisation, following changes occur in the flower:

- The fertililsed egg, now called zygote, grows into the embryo.
- The ovary grows into a fruit and other parts of the flower fall off.
- The ovules develop into seeds.
- The seed contains an embryo enclosed in a protective seed coat.

Seed

A seed is a mature ovule that contains the embryo and the stored food. It is enclosed by a seed coat formed of two coverings.

Fruit

A fruit is the seed-bearing structure of a flowering plant. Actually, it is the ripened ovary of the plant and seeds are the matured ovules of the fruit.

Fruits may be fleshy and juicy or stony and hard. Mango, apple and orange are fleshy and juicy fruits, whereas almonds and walnuts are stony and hard fruits.

Let's recall what we know

Apply Concept in Context

Apply

- How does sexual reproduction in plants ensure genetic variation? Explain with an example.
- If pollination does not occur in a flowering plant, how might it affect the production of seeds and fruits?

Skills Covered: Critical thinking, Applicative thinking, Brainstorming

Examine Further

Analyse

- What will happen if the reproductive structures in a flower, such as the stamens or pistil, are damaged?
- Give your answer in relation to the plant's ability to reproduce sexually and produce seeds.

Skills Covered: Critical thinking, Analytical thinking, Brainstorming, Research, Investigation

SCAN TO ACCESS

Take a Task

Watch Remedial

Self-Assessment Questions

Evaluate

- What is sexual reproduction in plants, and which parts of the flower are involved in this process?
- What is the role of pollination in sexual reproduction?
- How does fertilization occur in flowering plants?
- What are the advantages of sexual reproduction in plants compared to asexual reproduction?

Skills Covered: Research, Observation, Recall

Creative Insight

Create

Sexual reproduction in plants involves the fusion of male and female gametes, leading to the formation of seeds and fruits. Pollination plays a key role in transferring pollen from the male anther to the female stigma, enabling fertilization.

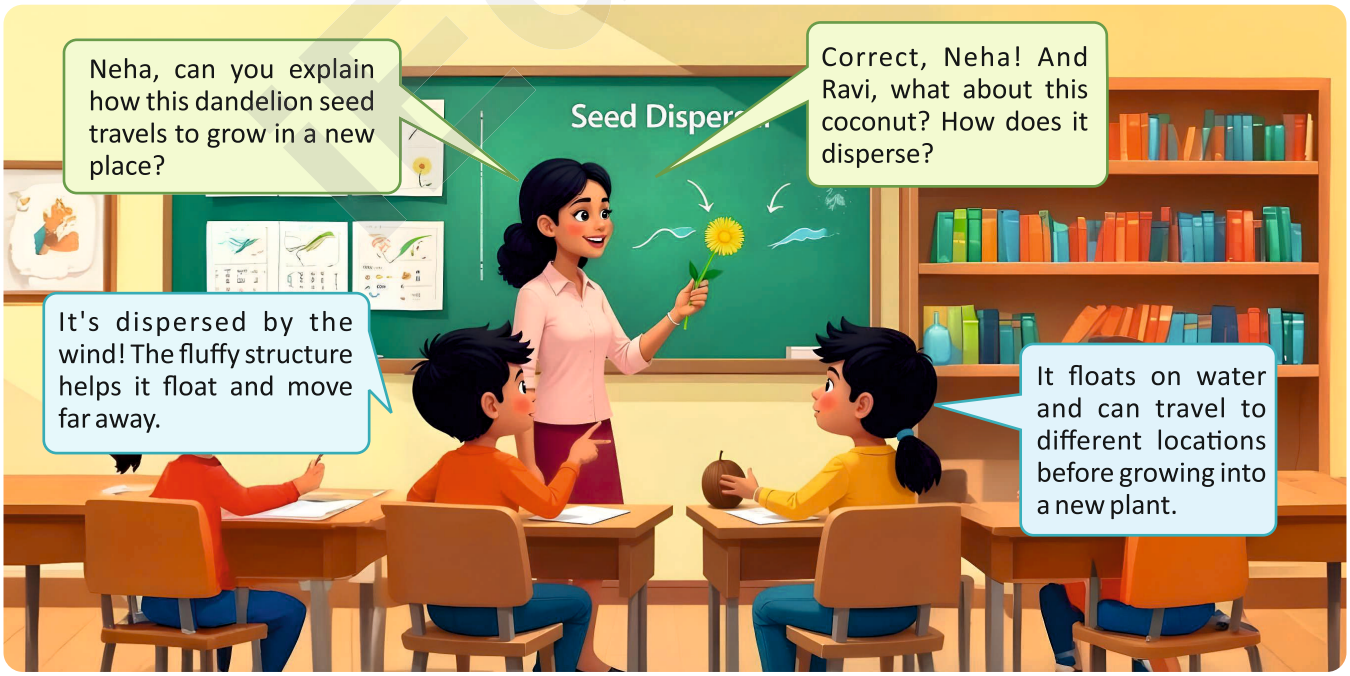
Task: Create a flowchart showing the steps involved in sexual reproduction, from pollination to seed formation, highlighting the roles of the flower's reproductive parts.

Skills Covered: Research, Creativity, Observation, Brainstorming

Bloom's Taxonomy

Seed Dispersal

The teacher is holding a dandelion seed and a coconut.



The main function of the fruit is to help the seeds to disperse to different places to increase their chances of survival. In case seeds fall at the same place, there would be severe competition for space, sunlight, water and minerals. Therefore, dispersal of seeds is beneficial to plants as:

- It ensures that the plants are dispersed over wide areas.
- It avoids overcrowding and competition among the plants for space, sunlight, water and minerals.

Seeds and fruits are dispersed by wind, water, animals, etc.

Dispersal by Wind

Some seeds are carried to a new place by the wind.

- Grasses have very light seeds.
- Dandelion has hairy growth which acts like little parachutes and carries the seeds far away from the parent plant.
- Madar (aak) and sunflower plants have fruits which are hairy and are blown away to far off places. The seeds then germinate into new plants in that place.
- Poppy fruits sway in the wind. This causes the seeds to fall out.
- Drumstick and maple seeds have wings which help in dispersal.
- Seeds and fruits are dispersed by wind, water, animals, etc.

Wind dispersal of dandelion

Dispersal by Water

Dispersal by water takes place in some aquatic plants and in some which grow near a water body. Seeds of water lily float and thus dispersed by water. The coconut seed has a tough fibrous covering which has plenty of air inside. This helps the coconut seeds in floating on water.

Coconut fruit floating on river

Dispersal by Animals

Some seeds are dispersed by animals. Such seeds have spines or hooks which cling to the bodies of animals and are carried to long distances as in Xanthium and Urena.

Xanthium seeds with hooks

Let's recall what we know

SCAN TO ACCESS

Take a Task

Watch Remedial

Apply Concept in Context

Apply

- How does seed dispersal help plants colonize new areas? Provide examples of seeds dispersed by wind, water, and animals.
- If a plant's seeds are not dispersed effectively, how might it affect the plant's growth and survival?

Skills Covered: Critical thinking, Applicative thinking, Brainstorming

Examine Further

Analyse

What will happen if seeds are dispersed too close to the parent plant? Give your answer with relation to competition for sunlight, water, and nutrients.

Skills Covered: Critical thinking, Analytical thinking, Brainstorming, Research, Investigation

Self-Assessment Questions

Evaluate

- What is seed dispersal, and why is it important for plants?
- Name three modes of seed dispersal and provide examples of plants for each mode.
- How do seeds dispersed by animals differ from those dispersed by wind?

Skills Covered: Research, Observation, Recall

Creative Insight

Create

Seed dispersal ensures that plants can grow in new locations, reducing competition with the parent plant and increasing the chances of survival. Seeds can be dispersed by various agents like wind, water, animals, or self-dispersal mechanisms.

Task: Create a chart showing different modes of seed dispersal with illustrations or diagrams for each mode (e.g., wind, water, animals, self-dispersal) and examples of plants that use them.

Skills Covered: Research, Creativity, Observation, Brainstorming

Bloom's Taxonomy

SUMMARY

Asexual Reproduction

Definition: Asexual reproduction in plants involves the production of offspring without the involvement of gametes (eggs and sperm). The offspring are genetically identical to the parent plant.

- No fertilization involved.
- Offspring are clones of the parent.
- Can occur through structures like spores, runners, tubers, bulbs, and cuttings.

Examples:

- **Budding:** A new plant grows as a bud on the parent plant and eventually detaches.
- **Fragmentation:** A piece of the parent plant breaks off and develops into a new plant (e.g., in Bryophyllum).
- **Spore Formation:** Fungi and some plants like ferns reproduce by producing spores.

Vegetative Propagation

Definition: A type of asexual reproduction in which new plants grow from parts of the parent plant such as roots, stems, or leaves.

- Can occur naturally or artificially.
- Plants like potatoes, strawberries, and ginger reproduce through vegetative propagation.

Sexual Reproduction in Plants

Sexual reproduction in plants involves the fusion of male and female gametes (pollen and ovules) to form seeds, which grow into new plants.

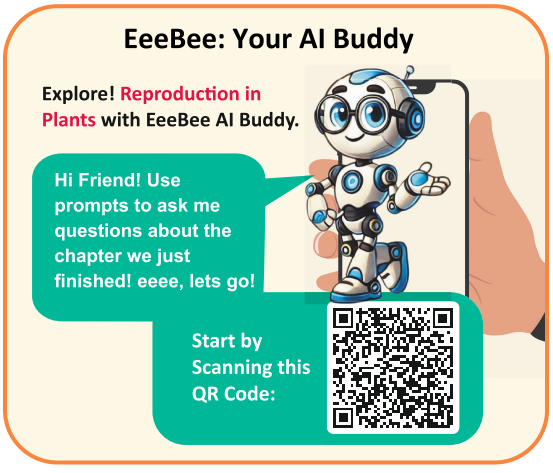
Flower Structure:

- **The stamen (male part)** consists of the anther (produces pollen) and the filament.
- **The pistil (female part)** consists of the stigma, style, and ovary (which contains the ovules).
- **Pollination:** Transfer of pollen from the anther to the stigma. Pollination can be biotic (insects, birds) or abiotic (wind, water).
- **Fertilization:** After pollination, the pollen grain germinates on the stigma, and sperm cells move down the style to fertilize the ovules in the ovary, forming a zygote that develops into a seed.
- **Seed Formation:** The fertilized ovule becomes a seed, which contains an embryo plant ready to grow when conditions are favorable.

Seed Dispersal

The process of spreading seeds away from the parent plant to reduce competition and enable plant colonization.

- **Wind Dispersal:** Lightweight seeds have wings or parachutes to float in the air.
- **Water Dispersal:** Floating seeds (e.g., coconut) are carried by rivers or oceans.
- **Animal Dispersal:** Animals eat fruits and excrete seeds in new locations.



EXERCISE

That turn curiosity into confidence—let's begin!

Gap Analyzer™
Take a Test

A. Choose the correct answer.

1. Which of the following is a method of asexual reproduction in plants?
   (a) Pollination ☐ (b) Seed dispersal ☐
   (c) Vegetative propagation ☐ (d) Fertilization ☐
2. Which part of the flower produces pollen in plants?
   (a) Ovary ☐ (b) Stigma ☐
   (c) Anther ☐ (d) Style ☐
3. What is the function of the phloem in plants?
   (a) Transporting water ☐ (b) Transporting food ☐
   (c) Producing oxygen ☐ (d) Protecting the plant ☐
4. In sexual reproduction of plants, the fusion of which two parts results in seed formation?
   (a) Stigma and anther ☐ (b) Ovule and pollen ☐
   (c) Petal and sepal ☐ (d) Ovary and style ☐
5. Which of the following is responsible for seed dispersal in plants?
   (a) Root ☐ (b) Stem ☐
   (c) Leaves ☐ (d) Animals, wind, or water ☐

B. Fill in the blanks.

1. In asexual reproduction, new plants are produced from parts of the parent plant, such as _____ and _____.
2. _____ is a type of vegetative propagation where a new plant grows from a cutting of the stem, leaf, or root of the parent plant.
3. The transfer of pollen from the anther to the stigma is called _____.
4. The process where seeds are dispersed by external agents like wind, water, or animals is called _____.
5. The male reproductive part of a flower is called the _____.

C. Write True or False.

1. Asexual reproduction in plants requires the involvement of flowers. _____
2. The pollen grain contains the male gamete in sexual reproduction. _____
3. Seed dispersal is necessary to reduce competition between parent and offspring plants.__
4. Vegetative propagation is a method of sexual reproduction. _____
5. The ovary of a flower develops into the fruit after fertilization. _____

D. Define the following terms.

1. Asexual Reproduction
2. Vegetative Propagation
3. Pollination
4. Fertilization
5. Seed Dispersal

E. Match the columns.

Column A	Column B
1. Asexual Reproduction	(a) Transfer of pollen to stigma
2. Pollination	(b) Formation of seeds from ovule
3. Vegetative Propagation	(c) Reproduction without seeds
4. Fertilization	(d) Growth of new plants from vegetative parts
5. Seed Dispersal	(e) Spread of seeds by wind, water, or animals

F. Give reasons for the following statements.

1. Vegetative propagation allows for the production of genetically identical plants.
2. Pollination is necessary for sexual reproduction in plants.
3. Asexual reproduction is important for the rapid spread of plants.
4. Seed dispersal helps in the colonization of new areas by plants.
5. Fertilization is essential for the formation of seeds in plants.

G. Answer in brief.

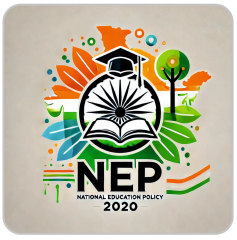
1. What is the role of vegetative propagation in plant reproduction?
2. How does pollination occur in plants?
3. What is the difference between sexual and asexual reproduction in plants?
4. How do plants ensure the successful dispersal of seeds?
5. What happens to the ovule after fertilization in plants?

H. Answer in detail.

1. Describe the process of sexual reproduction in plants, including pollination and fertilization.
2. Explain the role of vegetative propagation in plant reproduction and give examples of plants that use this method.
3. Describe the structure of a flower and explain how each part contributes to reproduction.
4. Discuss the various methods of seed dispersal and explain why each method is advantageous for the plant.

Flexible Learning Paths:

The policy emphasizes the importance of adaptive and flexible learning tools that cater to individual learning speeds and preferences.



Skill-based Activity

Explore Asexual and Vegetative Propagation

STEM

Perform the given activity at your home to understand how plants reproduce through asexual and vegetative propagation.

You will need a potato, a glass of water, and a knife (use under adult supervision).

1. Cut a potato into pieces, ensuring each piece has at least one "eye" (bud).
2. Place one piece in a glass of water, partially submerged, with the bud facing upward.
3. Observe how roots and shoots begin to grow from the bud over time.
4. Compare the growth to a seed-based reproduction process.

Now, answer the following questions:

1. What is asexual reproduction, and how does it differ from sexual reproduction?
2. What role do buds play in vegetative propagation?

How is vegetative propagation beneficial in agriculture?

Skills Covered: Observation, Analytical thinking, Logical thinking, Brainstorming

Reproductive Parts of Plants Model

Art

Create a 3D model of a flowering plant using clay and craft materials:

- Include parts involved in sexual reproduction, such as the stamens, pistil, ovary, and petals.
- Use additional materials to show vegetative propagation structures like stems, roots, and leaves (e.g., a runner or tuber).

Skills Covered: Creativity, Analytical thinking, Organization, Brainstorming

Seed Dispersal in Action!

Group Activity

Students can collect seeds from their surroundings and classify them based on their mode of dispersal (e.g., wind, water, animals, or self-dispersal). They can then experiment by creating a model of each dispersal method using materials like paper fans (wind), water bowls (water), and Velcro strips (animal attachment).

Skills Covered: Critical thinking, Logical thinking, Brainstorming, Collaboration, Social skills, Networking

Factors Influencing Seed Dispersal

Case to Investigate

Investigate how the following factors affect seed dispersal. Talk to your teacher and collect data based on observations or experiments.

Factors	Data Collected
Size and shape of seed	
Mode of dispersal	
Distance traveled	
Environmental conditions	

Compile your findings and present them as a report.

Skills Covered: Critical and analytical thinking, Research, Brainstorming, Investigation, Communication

Sustainable Planting Practices

Aligning with SDGs

Discuss how modern techniques such as grafting, tissue culture, and hybrid seed production enhance vegetative propagation and sexual reproduction in plants. Reflect on how these practices address challenges like low crop yield and seed wastage.

Aligned with SDG 2: Zero Hunger

Skills Covered: Global awareness, Critical thinking, Research, Analytical thinking, Problem-based thinking

Personalized Garden Design

Integrated Learning

Using your knowledge of reproduction in plants, create a personalized garden design for a friend. Include plants that reproduce sexually and asexually, and suggest methods to encourage natural seed dispersal. Consider your friend's available space, climate, and preferences when designing the plan.

Skills Covered: Applicative thinking, Critical thinking, Research, Brainstorming, Empathy, Emotional intelligence