10
Chapter

Living Creatures: Exploring Their Characteristics

We'll cover the following key points:

- Distinguishing Living from Non-living
- Life Cycle
- Factors Influencing Seed Germination

Hi, I'm EeeBee

Do you Remember:

Fundamental concept in previous class.

In class 5th we learnt

- Seed Germination

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

Learning Outcomes

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

- identify and describe the main characteristics that distinguish living organisms from non-living objects.
- understand the requirements for seed germination.
- comprehend growth and movement in plants.
- learn about the life stages of plants and animals, and grasp the significance of each stage in ensuring species survival and continuity.

Guidelines for Teachers

The teacher can introduce the topic by engaging students in an interactive discussion about their surroundings, encouraging them to observe and list everyday objects. This exercise will help students think critically about what qualifies as living or non-living. She/He can introduce the core characteristics of living things through examples and hands-on activities, such as observing seed germination or conducting simple experiments to demonstrate plant growth. The teacher can also explore the concept of life cycles by examining the life stages of various plants and animals.

NCF Curricular Goals and Competencies

This chapter aligns with the following curricular goals and competencies:
CG-6 (C 6.1 and 6.2) investigates the nature and processes of science, emphasizing scientific knowledge development and inquiry-based learning.

Introduction:

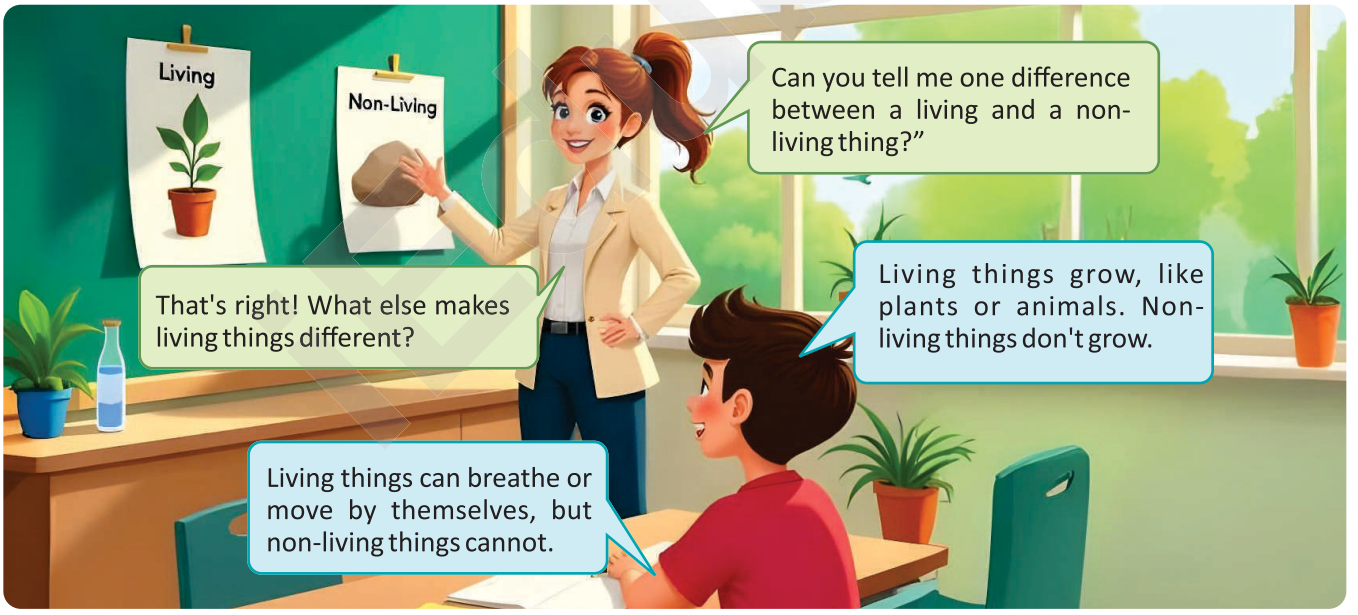
Living creatures are all around us, from the plants in our gardens to the animals we see daily. These organisms share certain unique traits that distinguish them from non-living things, such as the ability to grow, respond to their environment, and reproduce. Living beings rely on energy to carry out various life processes, whether through sunlight, food, or other means. This chapter dives into the fascinating characteristics that define life, helping us understand what makes something truly "alive" and how different forms of life sustain themselves and interact with their surroundings.

In History...

Aristotle, in the 4th century BCE, was among the first to classify living organisms based on their observable traits, laying the foundation for biology. During the 17th century, Antonie van Leeuwenhoek's invention of the microscope led to the discovery of microorganisms, greatly expanding the understanding of what constitutes a living organism. In the 19th century, Charles Darwin's theory of evolution by natural selection further advanced the study of living beings by emphasizing adaptation and diversity. The 20th century saw major advancements, including the discovery of DNA, which helped explain the hereditary nature of all living creatures.

Distinguishing Living from Non-living

A teacher and a student are in a classroom discussing living and non-living things during a science lesson.

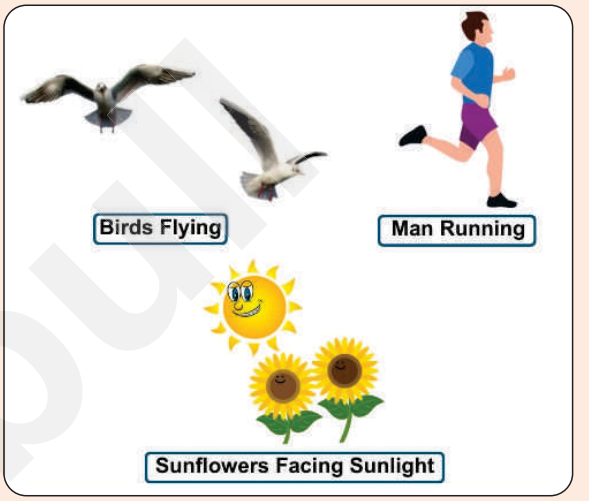


The world around us is filled with both living and non-living entities, each playing a crucial role in shaping the environment. Distinguishing living things from non-living ones is fundamental to understanding the complexity of life and nature. Living organisms, such as animals, plants, and microorganisms, possess unique characteristics like growth, reproduction, and the ability to respond to stimuli. In contrast, non-living things, like rocks, water, and air, do not exhibit these life processes. This distinction not only helps us classify and appreciate the diversity of nature but also aids in understanding the intricate balance that sustains life on Earth.

Living things are characterized by a set of key traits that distinguish them from non-living things. These traits include **movement, growth, nutrition, respiration, excretion, response to stimuli, and reproduction**. In the absence of these characteristics, a thing is classified as non-living. Let us explore these characteristics in greater detail.

1.Movement

Movement is one of the defining characteristics that separate living beings from non-living objects.

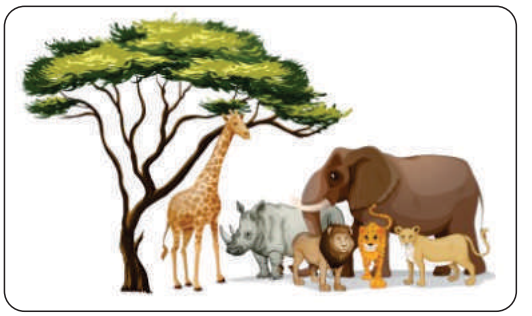


- **Animals:** Most animals actively move in search of food, mates, or shelter. Animals are capable of exhibiting different types of bodily movements, such as running, flying, swimming, or crawling.
- **Plants:** Unlike animals, plants do not move from one location to another as they are fixed to the ground. However, plants exhibit movement in some specific areas. Roots grow downward into the soil, while stems grow upward towards sunlight. Additionally, some plants exhibit specific types of movement despite being stationary:
- **Insectivorous Plants:** Insectivorous plants such as Drosera exhibit movement to capture insects. Drosera is recognized by its saucer-shaped leaves with hair-like projections. These projections move inward and trap insects using their sticky ends.
- **Climbers:** Climbers like cucumber and grapes display movement by coiling themselves around nearby objects for support.

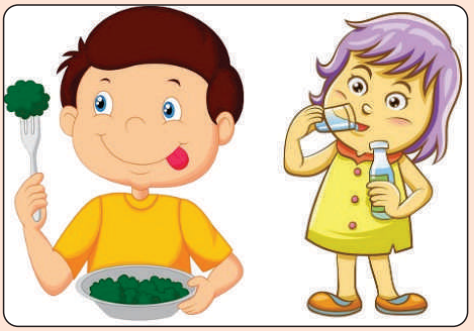
2. Growth

All living things exhibit growth, which is defined as an increase in size or mass over time.

- Living Organisms: Growth in living organisms is a permanent, internal, and irreversible process. For example, a human baby grows into an adult, and a seed grows into a mature plant.
- Non-living Objects: Non-living objects do not grow on their own. If they show any apparent growth, it is usually due to the addition of external materials. For instance, a small snowball can grow in size if more snow is added. This type of growth is reversible and external.



3. Nutrition



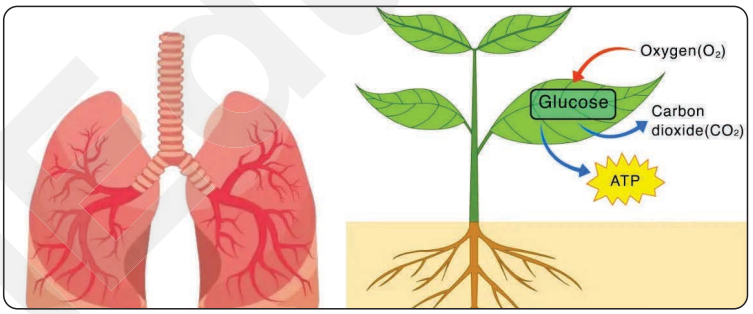
Nutrition is essential for the growth, development, and sustenance of all living beings. Food provides the energy required for various life processes.

- **Plants:** Plants are autotrophic and prepare their own food through the process of photosynthesis.
- **Animals and Humans:** Animals and humans are heterotrophic and depend on plants or other organisms for food.

4. Respiration

Respiration is the process through which living organisms release energy from food, usually in the presence of oxygen.

- **Breathing vs. Respiration:** Breathing is the physical process of inhaling oxygen and exhaling carbon dioxide. Respiration, on the other hand, involves the release of energy from food and is a broader process.
- **Respiration in Animals:** Different animals have different mechanisms for respiration. Most animals, including humans, breathe in oxygen through lungs. Fish, however, use gills to extract oxygen from water, while earthworms breathe through their moist skin.
- **Respiration in Plants:** Plants take in oxygen and release carbon dioxide through tiny pores on their leaves called stomata.



5. Excretion

Excretion is the process of removing waste materials produced by the body as a result of digestion and respiration. These wastes are toxic and must be eliminated to maintain healthy functioning.

- **Animals:** Animals excrete waste products such as carbon dioxide, urine, feces, and sweat to maintain homeostasis.
- **Plants:** Plants excrete waste through different mechanisms. Water vapor and oxygen are expelled through the stomata on leaves. Some plants also produce sticky excretory products such as latex.

6. Response to Stimuli

Living organisms can respond to changes in their environment, a characteristic known as responsiveness. A stimulus is any external change that triggers a reaction, while a response is the action taken by the organism as a result.

- **Plants:** Plants respond to stimuli by moving specific parts. For example, the stem of a plant tilts towards sunlight. Flowers like sunflowers face the sun throughout the day. Mimosa pudica (touch-me-not) closes its leaves when touched, showing its response to stimuli.
- **Animals and Humans:** Animals, including humans, have the ability to quickly respond to external stimuli. For example, humans **reflexively** withdraw their hands if they touch a hot object.

7. Reproduction

Reproduction is the biological process through which living organisms produce new individuals of their own kind, ensuring the survival and continuation of their species.

- **Animals:** Animals reproduce in various ways. Birds lay eggs, while mammals, including humans, give birth to live young.
- **Plants:** Plants reproduce through different methods. Some plants, such as mango, gram, and pea, use seeds for reproduction. Others, like roses and henna, use vegetative propagation through stem cuttings. In Bryophyllum, reproduction occurs via the leaves, and in potatoes, it occurs through stems.

Characteristic	Description	Examples
Movement	Ability to change location or show movement of parts.	Animals move in search of food and shelter. Plants exhibit movements like growth of roots, opening of insectivorous plants, and response to sunlight.
Growth	Increase in size or mass over time. In living organisms, growth is internal and irreversible.	A baby grows into an adult, a seed grows into a tree. Growth in non-living things, such as a snowball, occurs by adding external material.

KEYWORDS

Reflexively: It means doing something automatically without thinking, like a quick reaction. For example, blinking your eyes when something comes close is a reflexive action.

Nutrition	Need for food to provide energy and support life processes.	Plants make their own food through photosynthesis. Animals and humans rely on other organisms for nourishment.
Respiration	Release of energy from food, often involving oxygen.	Humans use lungs for respiration, fish use gills, and plants use stomata for gas exchange.
Excretion	Elimination of waste products produced during metabolic processes.	Animals excrete urine, sweat, carbon dioxide, and feces. Plants release water vapor and oxygen through stomata or may produce sticky substances like latex.
Response to Stimuli	Ability to react to changes in the environment.	Plants like Mimosa pudica close their leaves when touched. Animals react to heat by quickly withdrawing from the source.
Reproduction	Biological process of producing new individuals to ensure species survival.	Animals may lay eggs or give birth to young. Plants reproduce via seeds, stem cuttings, or leaves.

Let's recall what we know

Apply Concept in Context

Apply

- List different characteristics that differentiate living organisms from non-living objects. Provide examples from your surroundings.
- Imagine you have a potted plant at home. Describe how it demonstrates growth, movement, nutrition, and response to stimuli.

Skills Covered: Observation, Applicative Thinking, Creativity, Critical and Logical Thinking, Scientific Recording

Examine Further

Analyse

- Why is it important for plants to have stomata? Explain how plants use stomata for respiration and excretion.
- Describe a scenario where an animal or human responds to an external stimulus. Why is this response crucial for survival?

Skills Covered: Critical Thinking, Research, Analysis, Applicative Thinking, Problem-solving

SCAN TO ACCESS

Take a Task

Watch Remedial

Bloom's Taxonomy

Self-Assessment Questions

Evaluate

- Name and describe three characteristics that clearly distinguish living beings from non-living things.
- Which characteristic of living organisms is being exhibited when a sunflower faces the sun?
- What might happen to an organism if its body cannot remove waste materials through excretion?

Skills Covered: Self-assessment, Logical Thinking, Evaluation, Conceptual Understanding

Creative Insight

Create

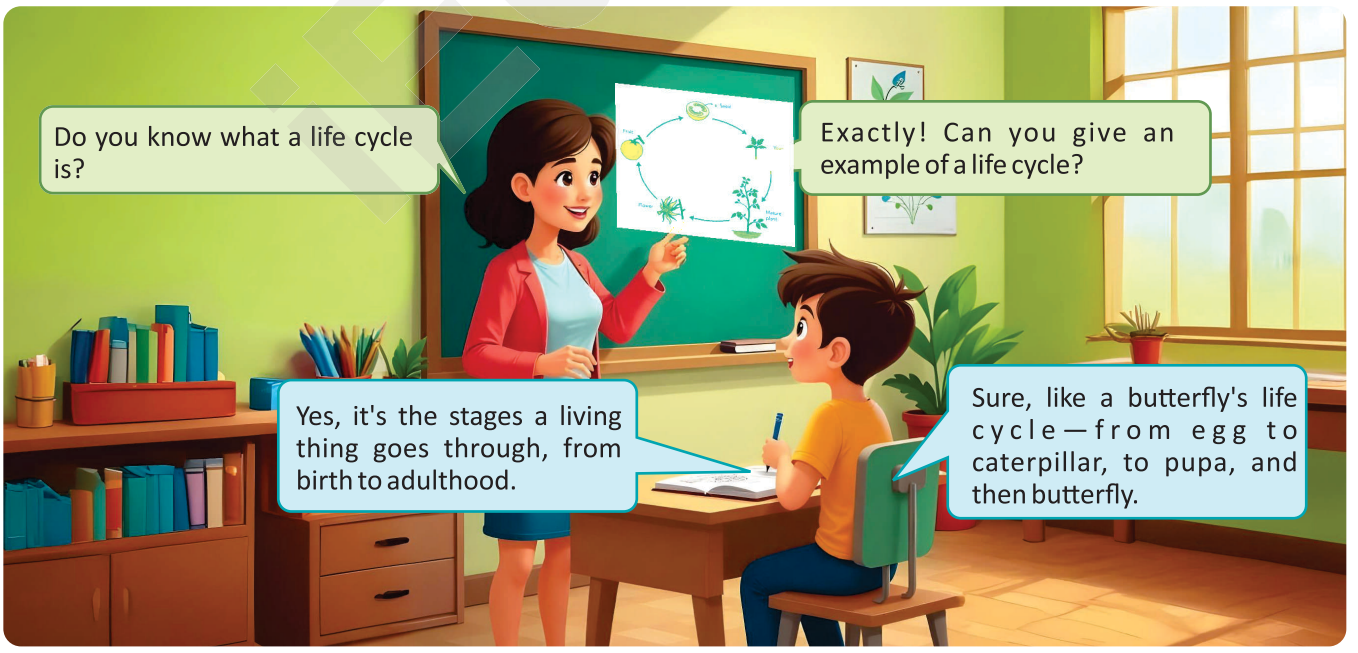
Design an experiment to observe movement in a plant (e.g., sunflower or Mimosa pudica). Record your observations and describe the movement in detail.

- Take a potted plant and place it in a spot where it gets sunlight. Observe how it tilts towards the light over time.
- Write down your observations about the plant's movement and how it responds to its environment.

Skills Covered: Creativity, Observation, Critical Thinking, Experimental Design, Scientific Recording

Life Cycle

A teacher and a student are in a classroom discussing the concept of the life cycle during a science lesson.



All living organisms, whether plants or animals, go through a series of events from birth to death. A life cycle represents the sequence of **biological changes** that occur as an organism grows and matures. It begins at the earliest stage, such as an egg or seed, and progresses through various stages of development until the organism becomes an adult. Eventually, the cycle concludes with the end of its life. Each stage of the life cycle is crucial for the growth, reproduction, and continuation of the species. Understanding these stages helps illustrate the complete journey of an organism from its origin to maturity and beyond.

1. Life Cycle of a Plant

Introduction to the Life Cycle:

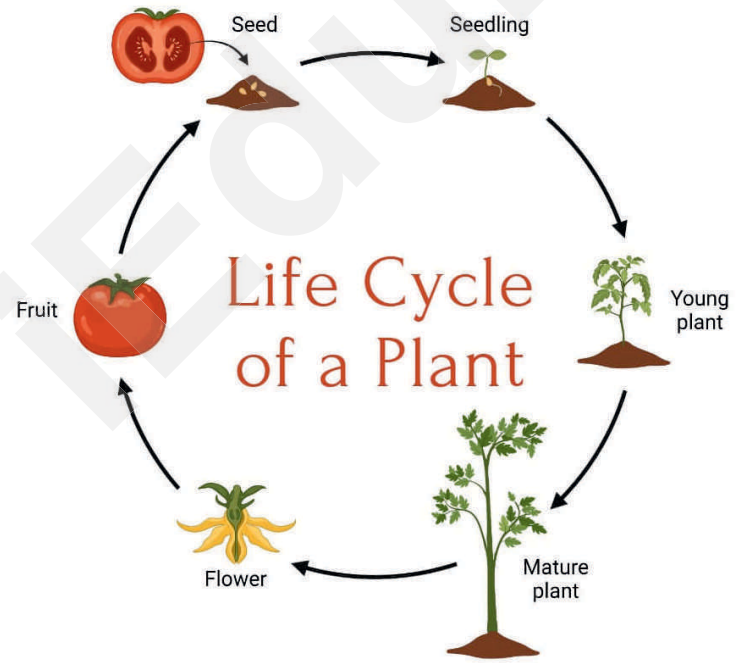
The life cycle of a plant refers to the entire process of growth and reproduction, starting from a seed and continuing until the plant produces the next generation of seeds.

Stages of the Plant Life Cycle

Seed to Young Plant: The life cycle begins when a seed **germinates** and grows into a young plant or seedling.

Mature Plant: As the plant grows, it matures and produces flowers and fruit.

Reproduction: The fruit contains seeds, which eventually lead to the development of new plants, continuing the cycle.



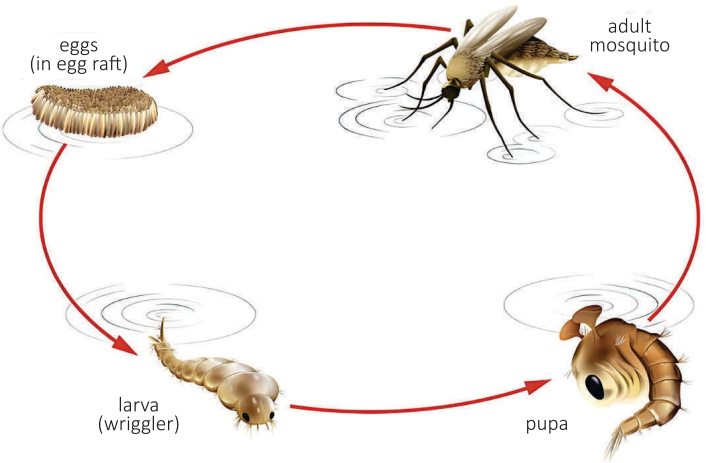
KEYWORDS

Biological changes are natural processes in living things that happen over time, such as growing, aging, or adapting to the environment.

Germination is the process by which a seed grows into a new plant when provided with water, air, and the right temperature.

2. Life Cycle of a Mosquito

Mosquitoes are common insects found in many surroundings, often breeding in areas with standing water.



Stages of the Mosquito Life Cycle

Egg Stage:

- Female mosquitoes lay eggs on stagnant water, commonly found in open containers, plant pots, and coolers.
- Eggs hatch into larvae when conditions are favorable.

Larva Stage:

- Larvae, called "wrigglers," live in water and feed on microorganisms and organic matter.
- They come to the surface to breathe through tubes called siphons.

Pupa Stage:

- The pupa, or "tumbler," does not feed and undergoes transformation into an adult mosquito.
- The pupal stage is a resting phase lasting a few days.

Adult Stage:

- The adult mosquito emerges from the pupa, resting briefly on the water before flying away.
- Adult females lay eggs on or near water, continuing the cycle. They typically live for 10-15 days.

3. Life Cycle of a Frog

The life cycle of a frog is a fascinating transformation process involving several distinct stages. You may have noticed white, jelly-like clusters on the surface of ponds or attached to aquatic plants—these are frog eggs, commonly known as spawn. Each spawn contains numerous frog eggs that begin their journey through various life stages, ultimately developing into adult frogs.

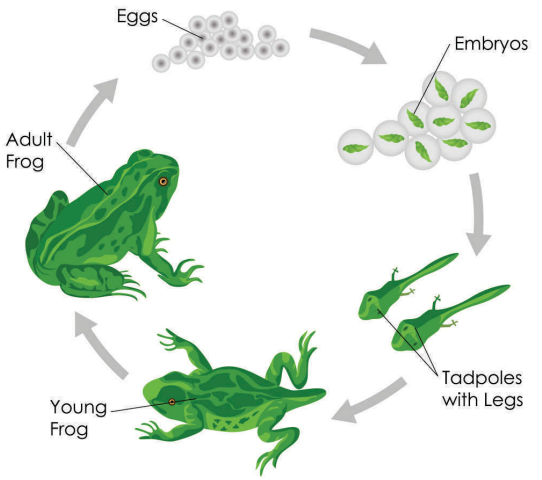
Stages of the Frog Life Cycle

Egg Stage

- The life cycle begins when frogs lay eggs in water.
- These eggs are surrounded by a jelly-like substance that provides protection and keeps them moist.

Embryo Stage

- Inside the egg, the embryo begins to develop.
- The embryo grows and undergoes changes, eventually hatching into a tadpole.



Tadpole Stage

- After hatching, the young frog is called a tadpole.
- Characteristics: The tadpole has a long tail, no legs, and lives entirely in water, breathing through gills.
- Development: As it grows, the tadpole gradually develops hind legs, and later front legs, while its tail starts to shrink.

Froglet Stage

- The tadpole transforms into a froglet, which starts to resemble a small adult frog.
- The froglet still has a short tail but can now breathe through lungs and spend time both in water and on land.

Adult Frog Stage

- The cycle concludes when the froglet matures into an adult frog.
- The adult frog has no tail and is fully developed, capable of reproducing to start the life cycle again.

Let's recall what we know

Apply Concept in Context

Apply

- Why is it important to eliminate standing water around our homes?
- How do the tadpole and adult frog differ in terms of body structure and habitat?
- It is mosquito season, and you see many larvae in stagnant water near your home. How can you prevent these larvae from developing into adult mosquitoes?

Skills Covered: Critical and Logical Thinking, Brainstorming, Applicative Thinking, Problem-solving, Observation

Examine Further

Analyse

- What changes occur in a tadpole as it grows into an adult frog?
- Why are mosquito eggs often found in areas with stagnant water, and what makes this environment ideal for their growth?

Skills Covered: Critical and Logical Thinking, Analysis, Research, Problem-solving

SCAN TO ACCESS

Take a Task

Watch Remedial

Bloom's Taxonomy

KEYWORDS

Hatching is the process in which a baby animal comes out of an egg. For example, a tadpole hatches from a frog's egg.

Self-Assessment Questions

Evaluate

- Define the life cycle of a frog in your own words.
- Explain how a tadpole's body changes as it becomes a frog.
- List the four stages of a mosquito's life cycle.
- Why do frog eggs need water to survive?

Creative Insight

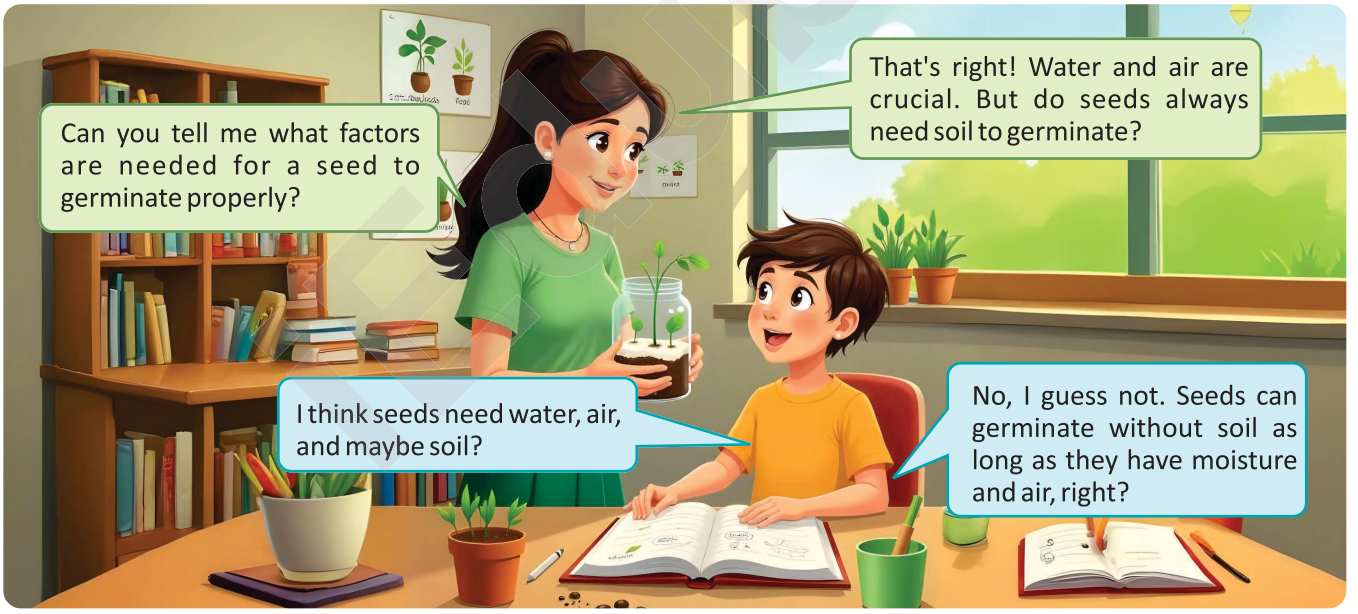
Create

- Draw a diagram that shows the life cycle of a mosquito, labeling each stage. Present your drawing to the class.
- Research another amphibian that undergoes a life cycle similar to that of a frog. Create a poster explaining its life cycle stages.

Skills Covered: Creativity, Critical and Logical Thinking, Research, Brainstorming, Visual Representation

Factors Influencing Seed Germination

A teacher and a student are in a classroom discussing the factors that influence seed germination.



Seed Germination

Seed germination is the process through which a seed begins its journey into becoming a young plant or seedling. It is an essential phase of a plant's life cycle, marked by a transformation from dormancy to active growth. Germination is initiated only under specific favorable conditions, such as sufficient water, adequate air, and suitable light or dark conditions. These factors collectively trigger the growth of the seed's internal embryo, resulting in the emergence of a new plant.

Essential Conditions for Seed Germination

Successful seed germination is dependent on several key factors: water, air, and suitable light or dark conditions. Each of these elements plays a critical role in enabling the seed to awaken from dormancy and develop into a healthy seedling.

1. Water

Water is perhaps the most crucial factor for seed germination. It plays multiple roles in initiating and supporting the germination process:

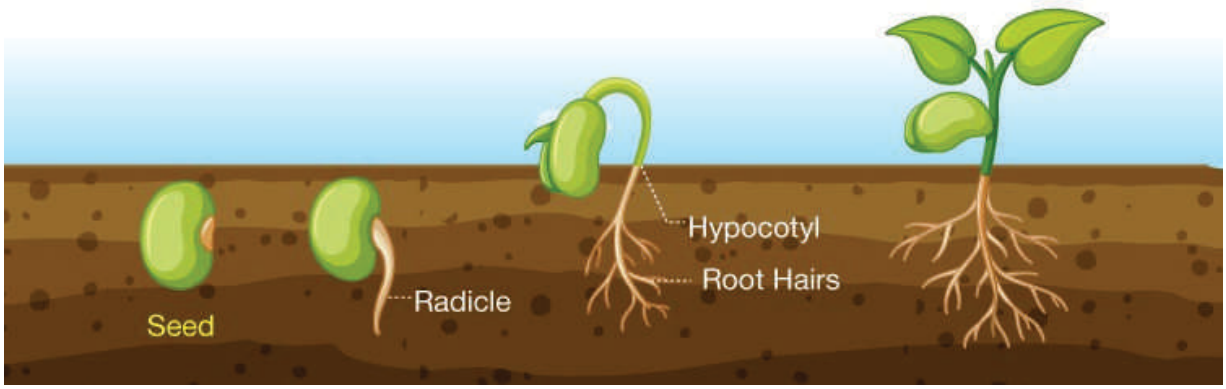
- **Hydration of the Seed Coat:** The outer layer of a seed, known as the seed coat, is often tough and needs to be softened for germination to begin.
- **Growth of the Embryo:** Water activates the enzymes within the seed, which are necessary for the embryo to begin its metabolic processes.
- **Dissolved Oxygen:** Water also dissolves oxygen, making it available for the growing embryo.

2. Air and Soil

Air, specifically oxygen, is another essential factor that plays a significant role in seed germination:

- **Oxygen Requirement:** Like all living organisms, the developing seed embryo requires oxygen for respiration.
- **Air in Soil:** Seeds obtain the required oxygen from the air trapped within the gaps between soil particles. When soil is loose and well-aerated, it has plenty of space between its particles, allowing the oxygen to reach the germinating seed.
- **Growth Without Soil:** Seeds can germinate without soil as long as other essential factors like water and oxygen are provided. For example, seeds can germinate on moist paper towels or cotton wool, as long as these conditions are met.

Note: While soil is not always necessary for the germination process itself, it becomes essential once the seedling begins to grow, as it provides a stable environment, moisture, and nutrients for further development.



3. Light and Dark Conditions

The role of light and dark conditions in seed germination varies based on the type of plant:

- **General Light Requirements:** In general, most seeds do not require light for germination. Seeds rely on stored nutrients for energy during germination, which means light is not a critical factor for the seed to sprout.
- **Light-sensitive Seeds:** Some seeds, such as those of certain flowering plants like coleus and petunia, require light to germinate. Exposure to light acts as a signal for these seeds to start the germination process.

- **Dark-requiring Seeds:** On the other hand, some seeds require darkness to germinate effectively. For example, seeds from plants like Calendula and zinnia need to be covered with soil to germinate properly. Darkness acts as a trigger for these seeds, enabling them to begin the germination process.

4. Movement in Response to Stimuli

Gravitropism (Response to Gravity)

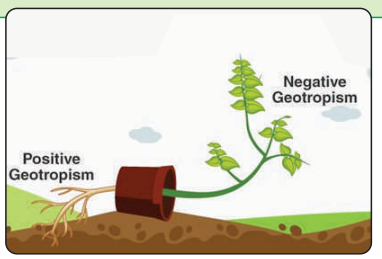
- **Upright Position:** Shoots grow upwards for sunlight, and roots grow downwards for anchorage and nutrient absorption.
- **Inverted Position:** Shoots bend upward, and roots bend downward to reorient themselves to gravity.

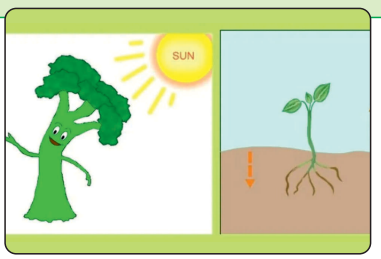
Phototropism (Response to Light)

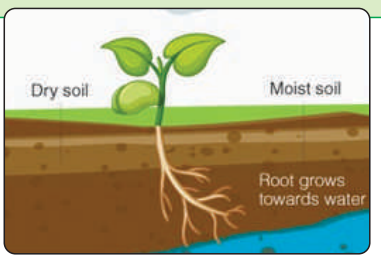
- **Shoots:** Grow towards light to maximize sunlight for photosynthesis.
- **Roots:** Grow downward, unaffected by light direction.

Hydrotropism (Response to Water)

- **Roots:** Grow toward water sources to efficiently absorb moisture.







Let's recall what we know

SCAN TO ACCESS

Take a Task

Watch Remedial

Apply Concept in Context

Apply

- List the essential factors required for seed germination. Suggest changes you can make to improve the germination rate in your home garden.
- Imagine you have seeds that fail to germinate in your garden. Devise a step-by-step plan to identify the missing factors and ensure successful germination.

Skills Covered: Creativity, Applicative thinking, Brainstorming, Critical and logical thinking, Observation

Examine Further

Analyse

- Why does water play a critical role in seed germination? Explain the process of seed imbibition and how it helps germination.
- Research how temperature affects seed germination. Why do some seeds fail to sprout in extremely cold or hot conditions?

Skills Covered: Critical and logical thinking, Research, Brainstorming, Applicative thinking, Problem-solving

Self-Assessment Questions

Evaluate

- What are the three most important environmental factors influencing seed germination?
- Name a seed that requires exposure to light for germination and another that germinates best in darkness.

Skills Covered: Evaluation, Logical thinking

Creative Insight

Create

Describe the process of scarification, and perform a simple experiment to show its effect on seed germination.

- Take seeds with a hard coat, such as beans, and soak half of them in water overnight.
- Leave the other half untreated.
- Plant both sets of seeds and observe the differences in germination rates.
- Record your observations and share the results.

Skills Covered: Creativity, Critical and logical thinking, Brainstorming, Applicative thinking, Observation

Bloom's Taxonomy

SUMMARY

Distinguishing Living from Non-living

Living things exhibit growth, reproduction, respiration, excretion, response to stimuli, movement, and nutrition, while non-living things do not. Examples of living organisms include plants, animals, and microorganisms. Non-living examples include rocks and air.

- **Movement:** Animals move actively, while plants exhibit passive movement (e.g., phototropism towards light or hydrotropism towards water).
- **Growth:** Living organisms grow internally and irreversibly, while apparent growth in non-living things (e.g., snowballs) is external and reversible.
- **Response to Stimuli:** Plants like Mimosa pudica close leaves when touched, and animals react to external changes for survival.

Life Cycle of Living Beings

A life cycle represents the stages of an organism's life, from birth to reproduction and eventual death.

- **Plants:** Seeds germinate, grow into seedlings, mature, and reproduce to form seeds for the next generation.
- **Frogs:** Their life cycle includes eggs, tadpoles (aquatic, tail-bearing), froglets (develop legs, lose tail), and adult frogs.
- **Mosquitoes:** Eggs laid in stagnant water hatch into larvae, transform into pupae, and then into adult mosquitoes.

Factors Influencing Seed Germination

Seed germination is the process by which seeds develop into seedlings, requiring specific conditions:

- **Water:** Softens the seed coat (imbibition) and activates enzymes, enabling the embryo to grow.
- **Air:** Oxygen is essential for respiration, providing energy for germination. Aerated soil supports better oxygen flow to seeds.
- **Light/Dark:** Light-sensitive seeds (e.g., petunia) require light, while dark-sensitive seeds (e.g., zinnia) require darkness. However, most seeds germinate regardless of light if provided moisture and oxygen.

Seeds can germinate without soil in controlled conditions like moist paper towels.

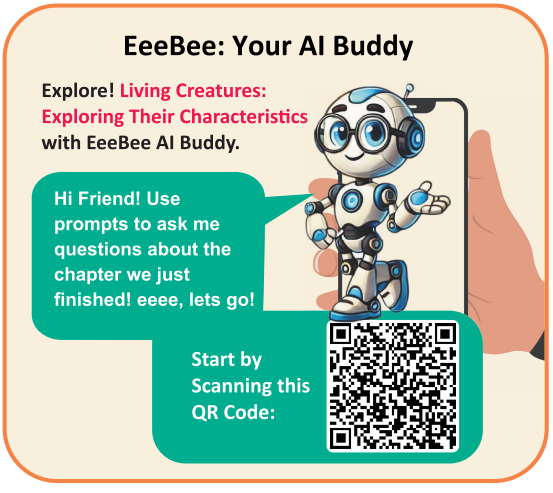
Growth and Movement in Plants

Although stationary, plants exhibit movement in response to environmental stimuli:

- **Gravitropism:** Roots grow downward, and shoots grow upward, responding to gravity.
- **Phototropism:** Shoots grow towards light for photosynthesis.
- **Hydrotropism:** Roots grow towards water to access moisture.

Historical Contributions

Pioneering scientists like Aristotle (classification of organisms), Antonie van Leeuwenhoek (discovery of microorganisms), Charles Darwin (evolution), and Jagadish Chandra Bose (plant sensitivity using the crescograph) significantly advanced our understanding of life.



EXERCISE

That turn curiosity into confidence—let's begin!

Gap Analyzer™
Take a Test

A. Choose the correct answer.

1. Which of the following characteristics distinguishes living organisms from non-living objects?
   (a) Respiration ☐ (b) Hardness ☐
   (c) Weight ☐ (d) Color ☐
2. Which process is responsible for the movement of water in plants towards sunlight?
   (a) Phototropism ☐ (b) Hydrotropism ☐
   (c) Respiration ☐ (d) Gravitropism ☐
3. What is the primary factor required to trigger seed germination?
   (a) Soil ☐ (b) Water ☐
   (c) Oxygen ☐ (d) Light ☐
4. Which stage of a mosquito's life cycle involves a resting phase before becoming an adult?
   (a) Larva ☐ (b) Pupa ☐
   (c) Egg ☐ (d) Adult ☐
5. Which of the following seeds requires darkness to germinate?
   (a) Zinnia ☐ (b) Wheat ☐
   (c) Petunia ☐ (d) Maize ☐

B. Fill in the blanks.

1. _____ is the process through which living organisms eliminate waste from their bodies.
2. _____ is a stage in the life cycle of a frog where it has a long tail and no legs.
3. The primary role of water in seed germination is to _____ the seed coat and activate enzymes.
4. Plants grow towards light in a movement called _____.
5. _____ is the device invented by Jagadish Chandra Bose to measure plant growth.

C. Write True or False.

1. Living organisms can grow and reproduce, while non-living objects cannot. _____
2. A mosquito's larva is also known as a "tumbler." _____
3. Phototropism is the movement of plant roots towards water. _____
4. Seeds can germinate without soil if provided with moisture and air. _____
5. Frog eggs are protected by a jelly-like substance that prevents them from drying out. ____

D. Define the following terms.

1. Phototropism
2. Seed Germination
3. Excretion
4. Life Cycle
5. Respiration

E. Match the columns.

Column A	Column B
1. Seed Germination	(a) Movement towards light
2. Phototropism	(b) Growth of a plant from a seed
3. Froglet	(c) Intermediate stage in frogs
4. Excretion	(d) Elimination of body waste
5. Tadpole	(e) Stage with tail and no legs

F. Give reasons for the following statements.

1. Water is essential for breaking the seed coat during germination.
2. Plants exhibit phototropism to maximize their exposure to sunlight.
3. Excretion is necessary to maintain the health of living organisms.
4. Seeds can germinate even without soil if conditions like water and oxygen are provided.
5. A froglet is an important stage in the life cycle of a frog as it transitions to adulthood.

G. Answer in brief.

1. Why is water important in the seed germination process?
2. How does phototropism help plants grow?
3. What role does the tadpole stage play in the life cycle of a frog?
4. Why do mosquito eggs need stagnant water to hatch?
5. What is the purpose of excretion in living organisms?

H. Answer in detail.

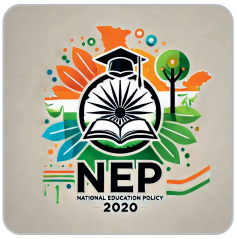
1. Discuss the importance of distinguishing living from non-living things with examples.
2. Explain the stages of seed germination and the factors influencing it.
3. Describe the life cycle of a mosquito and how each stage contributes to its survival.
4. Compare the movements of plants in response to gravity and light.
5. Highlight the similarities and differences in the life cycles of frogs and mosquitoes.

NEP Corner

Know about NEP 2020

Goodbye, Single Language Studies!

NEP 2020 promotes multilingual education. Learn in your mother tongue, but also master global languages like English and French.



Skill-based Activity

DIY Experiment: Observing Plant Phototropism

STEM

Conduct an experiment to observe how a plant reacts to light:

- Take a potted plant and place it near a window.
- Observe the direction of growth over a week.
- Rotate the pot and continue observing for another week.

Questions:

- Why does the plant grow towards the window?
- What would happen if the plant were placed in a dark room?
- How does phototropism help plants survive?

Skills Covered: Observation, Analytical Thinking, Applicative Thinking

Poster Making: Characteristics of Living Organisms

Art

Design a poster showcasing key characteristics of living organisms, such as growth, respiration, and reproduction, with examples.

Skills Covered: Creativity, Visual Representation, Awareness-building

Planning a Mini-Garden for Seed Germination

Group Activity

Plan a garden project to grow seeds in your school or home.

Questions:

- What conditions will you provide to ensure germination?
- How will you measure the growth of plants?
- Suggest ways to involve others in maintaining the garden.

Skills Covered: Teamwork, Collaboration, Innovation

Investigating Life Cycles in Nature

Case to Investigate

Research the life cycles of other animals or plants in your region and compare them with frogs and mosquitoes.

Questions:

- What are the common stages in the life cycles of frogs and other animals?
- How do different species adapt their life cycles to the environment?
- What role does each stage play in ensuring survival?

Skills Covered: Research, Analytical Thinking, Comparative Analysis

Innovations in Seed Germination Techniques

Aligning with SDGs

Research modern technologies used to enhance seed germination, like hydroponics and aeroponics.

Questions:

- How do hydroponics and aeroponics optimize germination conditions?
- Why is sustainable germination important for global food security?
- Suggest three ways to improve seed germination rates sustainably.

Aligned with SDGs: SDG 2: Zero Hunger – Ensure sustainable agriculture., SDG 12: Responsible Consumption and Production – Promote resource efficiency., SDG 15: Life on Land – Support biodiversity through improved germination techniques.

Skills Covered: Innovation, Problem-solving, Applicative Thinking

The Role of Plant Growth

Integrated Learning

Write a short report on how understanding plant growth and life cycles contributes to environmental conservation through habitat preservation and resource sustainability.

Questions:

- How does phototropism differ from gravitropism in plants?
- Why is it important to understand the life cycle of plants for conserving biodiversity?
- Discuss the impact of habitat destruction on the life cycle of plants and their ability to reproduce.

Skills Covered: Integrated Thinking, Logical Reasoning, Research