- Living Creatures Characteristics
- Seed Germination
- Plant Growth and Movement
- Life Cycle of Plants
- Life Cycle of Animals
- Quick Reference Table
- Common Mistakes and Misconceptions
- Glossary

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Living Creatures Characteristics

Introduction to Living and Non-living Things

Living beings and non-living things surround us. We can distinguish them by their characteristics. Living beings show signs of life such as growth, respiration, reproduction, and movement. Non-living things do not exhibit these signs.

Activity: Identifying Living and Non-living Objects

By listing objects around us and describing their characteristics, we can identify them as living or non-living based on their ability to grow, breathe, reproduce, and respond to stimuli.

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This table compares guesses about whether each item is living or non-living with correct answers and reasons, helping understand how to identify living things.

Characteristics of Living Beings

Living beings exhibit movement, growth, nutrition, respiration, excretion, response to stimuli, and reproduction. These are essential characteristics that differentiate them from non-living things.

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Examples of life cycles of plants, mosquitoes, and frogs illustrate growth and development.

Movement in Living Beings

Animals move from place to place, while plants exhibit specialized movements such as opening flowers, insect trapping, and climbing for support.

Growth

Growth is universal in living beings, resulting from cell division and nutrient absorption. Plants grow by photosynthesis and mineral absorption.

Respiration

Respiration is vital for energy. Animals inhale oxygen and exhale carbon dioxide. Plants respire through stomata on leaves.

Excretion

Living organisms remove waste. Animals excrete through sweat and urine. Plants excrete excess water and minerals, visible as droplets on leaves.

Response to Stimuli

Living beings respond to environmental changes. Humans react to pain; plants like Mimosa fold leaves when touched, and amla leaves fold after sunset.

Reproduction

Reproduction ensures species survival. Animals give birth to young ones; plants produce seeds. Non-living things do not reproduce.

Death

When an organism no longer exhibits life characteristics despite resources, it is considered dead.

Solved Examples

Example 1: Identify if a pencil is living or non-living and justify.

Solution: A pencil is non-living because it does not grow, reproduce, respire, excrete, respond to stimuli, or move on its own.

Example 2: Explain why plants are considered living despite not moving from place to place.

Solution: Plants show movement through opening flowers, insect trapping, and climbing. They grow, respire, excrete, respond to stimuli, and reproduce, fulfilling living characteristics.

Practice Set

- **Level 1 (Easy):** List three characteristics that differentiate living beings from non-living things.
- **Level 2 (Moderate):** Explain how plants respond to stimuli with examples.
- **Level 3 (Challenging):** Discuss why movement alone cannot be used to classify an object as living or non-living.

Answer Key

Level 1: Growth, respiration, reproduction.

Level 2: Plants respond to stimuli by folding leaves (Mimosa) or opening flowers in response to light.

Level 3: Movement in non-living things like cars is mechanical and externally powered, unlike biological movement in living beings. Hence, movement alone is insufficient for classification.

Seed Germination

Process of Seed Germination

Seed germination is the process where a seed begins to grow into a new plant under favorable conditions. It involves the seed coat softening, the embryo developing roots and shoots, and the seedling emerging.

Factors Affecting Germination

Water, air, and suitable temperature are essential. Water softens the seed coat and activates metabolic processes. Air provides oxygen for respiration. Light is not essential for germination but is needed for seedling growth.

Experimental Observation

Four pots with bean seeds under different conditions show that moisture is crucial for germination, while light is not essential at this stage.

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Water enables seed hydration and metabolic activation. Air spaces in soil allow root growth and oxygen supply. Light is generally not required for germination but is necessary for seedling development.

Solved Examples

Example 1: Why did seeds in pot A not germinate?

Solution: Pot A lacked water, which is essential for softening the seed coat and activating growth processes.

Example 2: Can seeds germinate in the dark?

Solution: Yes, seeds can germinate in the dark as moisture and air are sufficient for germination, but light is needed later for seedling growth.

Practice Set

- **Level 1 (Easy):** Name two essential factors for seed germination.
- **Level 2 (Moderate):** Explain why excess water can prevent seed germination.
- **Level 3 (Challenging):** Design an experiment to test the effect of light on seed germination.

Answer Key

Level 1: Water and air.

Level 2: Excess water saturates soil, displacing oxygen needed for respiration, causing seeds to drown.

Level 3: Sow seeds in two pots with equal moisture and air; keep one in light and the other in darkness; observe germination rates to assess light effect.

Plant Growth and Movement

Growth in Plants

Plants grow by cell division and elongation, developing roots, stems, and leaves.

Movement in Plants

Plants exhibit movements such as flower opening, insect trapping (Drosera), and climbing (vines). These movements are responses to environmental stimuli.

Effect of Light on Growth Direction

Plants show phototropism: shoots grow towards light, roots grow downward (geotropism). Experiments with plants in different orientations and light conditions demonstrate this behavior.

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Shoots grow upward or towards light; roots grow downward or away from light, regardless of plant orientation.

Solved Examples

Example 1: What happens to the shoot and root growth when a plant is inverted?

Solution: Shoots bend and grow upward; roots bend and grow downward, showing growth is directed by gravity and light.

Example 2: How does a plant respond when light comes from one direction?

Solution: Shoots grow towards the light (positive phototropism), roots grow away from light (negative phototropism).

Practice Set

- **Level 1 (Easy):** Define phototropism.
- **Level 2 (Moderate):** Explain why roots grow downward even when the plant is inverted.
- **Level 3 (Challenging):** Predict the growth direction of shoots and roots if a plant is placed horizontally with light from above.

Answer Key

Level 1: Phototropism is the growth of plant parts in response to light direction.

Level 2: Roots grow downward due to geotropism, responding to gravity regardless of plant orientation.

Level 3: Shoots will grow upward towards light; roots will grow downward due to gravity.

Life Cycle of Plants

Stages of Plant Life Cycle

Plants begin as seeds, which germinate into seedlings. Seedlings grow into mature plants that produce flowers, fruits, and seeds, continuing the cycle.

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The life cycle includes seed planting, germination, leaf growth, flowering, fruit development, seed dispersal, and plant decline.

Solved Examples

Example 1: How long does it take for the first flower to appear in a plant's life cycle?

Solution: Approximately 40 days after seed planting.

Example 2: What develops from the ovary of a flower?

Solution: The ovary develops into a fruit containing seeds.

Practice Set

- **Level 1 (Easy):** Name the first stage in a plant's life cycle.
- **Level 2 (Moderate):** Describe what happens after the flower petals fall off.
- **Level 3 (Challenging):** Explain why seed dispersal is important in the plant life cycle.

Answer Key

Level 1: Seed stage.

Level 2: The ovary develops into fruit containing seeds.

Level 3: Seed dispersal allows plants to spread to new areas, reducing competition and promoting species survival.

Life Cycle of Animals

General Animal Life Cycle

Animals undergo birth, growth, reproduction, and death. Some species experience metamorphosis, changing form during development.

Life Cycle of Mosquito

Mosquitoes lay eggs in stagnant water. Eggs hatch into larvae, which develop into pupae, then adult mosquitoes.

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Larvae are slender and active; pupae are rounded and less active. Both come to the water surface to breathe.

Preventing Mosquito Breeding

Eliminate stagnant water to prevent mosquito breeding and reduce disease spread.

Life Cycle of Frog

Frogs lay jelly-like eggs (spawn) in water. Eggs hatch into tadpoles, which develop legs and lungs, becoming froglets, then adult frogs.

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The life cycle includes spawn, embryo, tadpole with tail, tadpole with legs, froglet, and adult frog stages.

Solved Examples

Example 1: What stage comes immediately after the mosquito egg?

Solution: The larval stage follows the egg stage.

Example 2: How do frog tadpoles differ from adult frogs?

Solution: Tadpoles have tails and gills for aquatic life; adult frogs have legs and lungs for life on land and water.

Practice Set

- **Level 1 (Easy):** Name the four stages in the mosquito life cycle.
- **Level 2 (Moderate):** Describe the changes in the frog life cycle from tadpole to adult.
- **Level 3 (Challenging):** Explain why preventing stagnant water is important in controlling mosquito populations.

Answer Key

Level 1: Egg, larva, pupa, adult.

Level 2: Tadpoles develop legs, lose tails, and develop lungs to become adult frogs.

Level 3: Stagnant water is breeding ground for mosquitoes; removing it reduces mosquito numbers and disease transmission.

Quick Reference Table

Living Characteristics: Movement, Growth, Nutrition, Respiration, Excretion, Response to Stimuli, Reproduction, Death.

Seed Germination Factors: Water, Air, Suitable Temperature.

Plant Movements: Phototropism (shoots towards light), Geotropism (roots downward).

Life Cycles: Plants: Seed → Seedling → Mature Plant → Flower → Fruit → Seed.
Animals (Mosquito): Egg → Larva → Pupa → Adult.
Animals (Frog): Egg → Tadpole → Froglet → Adult.

Common Mistakes and Misconceptions

1. Movement alone does not classify an object as living; mechanical movement is not biological.

2. Seeds are living even when dormant because they can germinate under favorable conditions.

3. Plants do move, but their movement is different from animal locomotion.

4. Germination requires water and air; light is not essential at this stage.

5. Mosquito larvae and pupae breathe air at the water surface, not underwater.

Glossary

- **Breathing:** Process of taking in oxygen and releasing carbon dioxide.
- **Excretion:** Removal of waste products from the body.
- **Germination:** Process of a seed developing into a new plant.
- **Life Cycle:** Series of stages an organism passes through from birth to reproduction and death.
- **Movement:** Change in position or location of an organism or its parts.
- **Reproduction:** Biological process of producing offspring.
- **Response:** Reaction to a stimulus.
- **Stimulus:** External factor causing a response.
- **Death:** End of all biological functions.
- **Larva:** Immature stage of some animals, different from adult form.
- **Tadpole:** Aquatic larval stage of a frog with a tail.
- **Froglet:** Juvenile frog with developing legs and tail.
- **Pupa:** Stage in insect development where transformation occurs.

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