SUBJECT: Biology
Class: VI
Lesson 3: Living creatures- Exploring their characteristics

NCERT FOLDERS

I) VERY SHORT ANSWER:

1. Visit a pond and list animals found in the water.

Animals commonly found in a pond include fish, frogs, tadpoles, water beetles, pond snails, and turtles.

2. Name some plants that live in dry areas (xerophytes).

Cactus (e.g., Opuntia), aloe vera, agave, and date palms are plants adapted to dry areas.

3. Mention a few aquatic plants found in a pond.

Hydrilla, Lotus, Water Lily, and Eichhornia (Water Hyacinth) are typical aquatic plants found in a pond.

4. Name one characteristic that shows seeds are living.

Respiration is the key characteristic, as seeds consume oxygen and release carbon dioxide (and heat) even when they appear dormant.

5. Name the habitats of the following plants: (a) Cactus (b) Hydrilla.

- (a) Cactus: **Desert / Arid habitat**
- (b) Hydrilla: **Aquatic / Freshwater habitat**6. What are biotic components?

Biotic components are the living parts of an ecosystem, such as plants, animals, fungi, and microorganisms.

7. Explain abiotic components?

Abiotic components are the non-living chemical and physical parts of an environment that affect living organisms, including sunlight, air, water, soil, and temperature.

8. Name the process by which living things obtain energy from food.

Respiration is the cellular process that breaks down food molecules to release energy.

9. Name two aquatic plants that are completely submerged.

Hydrilla and Vallisneria are examples of completely submerged aquatic plants.

10. Name two terrestrial habitats.

Deserts and Forests (or Grasslands/Mountains) are common types of terrestrial habitats.

11. What is a stimulus?

A stimulus is any change in an organism's environment that causes the organism to react or respond to it (e.g., pulling your hand away from a hot object).

12. Name an animal in which gas exchange during respiration takes place through the skin.

Earthworms (and frogs when they are in water) exchange gases directly through their moist skin.

13. What do you mean by movement?

Movement is a change in the position of a body part relative to the rest of the organism's body, which is seen in both plants (e.g., opening of flowers) and animals.

14. List any two characteristics that distinguish living things from non-living things.

- **Respiration**: Living things breathe to generate energy.
- **Reproduction**: Living things produce offspring of their own kind.

15. Why is "movement on its own" not a reliable test for life? Give one living example that does not locomote.

It is not reliable because non-living things like clouds, cars, or water can move on their own due to external forces, while many living organisms do not change their location. A prime living example that does not locomote is a **plant** (or a sponge).

16. State the three essential conditions required for germination of most seeds.

Water (moisture), air (oxygen), and suitable temperature (warmth) are the three mandatory conditions required for seed germination.

II) SHORT ANSWER TYPE :

1. List the Common characteristics of living things

- **Nutrition**: Consuming food for energy and growth.
- **Respiration**: Breaking down food to release energy.
- **Excretion**: Removing metabolic wastes from the body.
- **Response to stimuli**: Reacting to changes in the environment (e.g., touch, light).
- **Movement**: Showing internal or external motion.
- **Growth and development**: Increasing in size, shape, and maturity.
- **Reproduction**: Producing offspring of their own kind.

2. Why speed is important for survival in the grasslands

- Grasslands have very few trees and hiding spots, making prey animals easily visible to predators.
- High speed allows herbivorous animals (like deer) to outrun and escape carnivores (like lions).

3. Adaptations seen in frogs (amphibians)

- **Webbed feet**: Help them swim easily in water.
- **Strong back legs**: Aid in leaping and moving fast on land.
- **Skin and lungs/gills**: Breathe through moist skin and lungs on land, or through skin underwater.

4. Which plants have leaves without pores?

- Submerged aquatic plants (such as **Hydrilla** or **Vallisneria** underwater leaves) lack stomata (pores) because they absorb gases and nutrients directly through their general body surface.

5. What is adaptation?

- The presence of specific body features, physical traits, or behavioral habits that help an organism survive and reproduce in its specific surroundings.

6. Define ecology
   - The branch of biology that studies the interactions and relationships between living organisms (biotic factors) and their physical environment (abiotic factors).

7. What is reproduction?
   - The biological process by which living organisms produce new individual organisms (offspring) of the same kind.

8. What is excretion?
   - The biological process by which living organisms eliminate metabolic waste products and toxic substances from their bodies.

9. What are organisms?
   - Individual living entities—such as plants, animals, fungi, and microorganisms—that exhibit the characteristics of life.

10. Define autotroph and heterotroph
    - **Autotroph**: An organism that makes its own food using simple inorganic substances.
      - *Example*: Green plants.
      - *Key resource*: Sunlight (or carbon dioxide and water).
    - **Heterotroph**: An organism that cannot make its own food and depends on other organisms for nutrition.
      - *Example*: Animals (e.g., lion, human).
      - *Key resource*: Organic food (plants or other animals).

11. Respiration in plants versus animals
    - **Plants**:
      - *Place/organs*: Stomata in leaves and lenticels/general surface in stems/roots.
      - *Purpose*: To break down glucose to release energy for cellular functions.
    - **Animals**:
      - *Place/organs*: Specialized organs like lungs (humans/mammals), gills (fish), or skin/trachea (insects/amphibians).
      - *Purpose*: To release energy from food for movement, growth, and metabolic activities.

12. Excretion in living organisms

    - **Animal example**: Humans excrete nitrogenous wastes (urea) mainly through urine produced by the kidneys, and carbon dioxide through the lungs.

- **Plant example**: Plants release oxygen as a waste product of photosynthesis through stomata, or shed waste-filled leaves and bark.

13. Three tropic movements (roots and shoots)
- **Phototropism (response to light)**:
    - *Shoots*: **Positive** (grow toward light).
    - *Roots*: **Negative** (grow away from light).
- **Gravitropism / Geotropism (response to gravity)**:
    - *Shoots*: **Negative** (grow upward against gravity).
    - *Roots*: **Positive** (grow downward with gravity).
- **Hydrotropism (response to water)**:
    - *Shoots*: Neutral/variable.
    - *Roots*: **Positive** (grow toward moisture sources).
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14. Nyctinasty and Thigmonasty in plants
- **Nyctinasty (sleep movement in response to light/darkness)**:
    - *Description*: The folding or drooping of leaves/petals at night and opening during the day.
    - *Example*: Lotus or *Oxalis* (leaves fold at dusk).
- **Thigmonasty (movement in response to touch/mechanical shock)**:
    - *Description*: Rapid leaf ovement or closing caused by physical touch or vibration.
    - *Example*: **Mimosa pudica** (Touch-me-not plant).

15. Stages in the life cycle of a mosquito & prevention

- **Stages**: **Egg** \(\rightarrow \) **Larva** \(\rightarrow \) **Pupa** \(\rightarrow \) **Adult**.
- **Two household measures to prevent breeding**:
    - Empty, cover, or change stagnant water in coolers, flower pots, and buckets regularly.
    - Introduce small fish (like Gambusia) or a thin layer of oil/larvicide in standing water containers.

16. Stages in frog metamorphosis from egg to adult

- **Egg**: Laid in clusters (spawn) in water.
- **Tadpole (Larva)**: Hatches with a tail and gills, living strictly underwater.
- **Froglet (Metamorphosing tadpole)**: Grows legs, lungs develop, and the tail gradually shrinks.

- **Adult Frog**: Air-breathing, four-legged amphibian capable of living on land and in water.

17. How mode of respiration changes?
Early tadpole - External gills
Late tadpole - Internal gills
Froglet. - Lungs, skin, gills
Adult frog - Lungs , skin.

III) LONG ANSWERS:

1. "Characteristics of life" discuss any five with a brief example for each.

Living things display specific characteristics that distinguish them from non-living matter:

- **Cellular Structure:** All living organisms are made up of basic functional units called cells.
    - *Example:* An *Amoeba* consists of a single cell, while a human body contains trillions of cells.
- **Nutrition:** Living things require food to obtain nutrients and energy for survival and metabolic functions.
    - *Example:* Green plants manufacture their own food through photosynthesis using sunlight.
- **Respiration:** Organisms break down nutrients inside their cells to release energy, consuming oxygen and releasing carbon dioxide.
    - *Example:* Humans inhale oxygen to break down glucose and generate metabolic energy (ATP).
- **Growth:** Living organisms undergo a permanent, irreversible increase in size, mass, and cell number.
    - *Example:* A small mango seed germinates and progressively grows into a massive tree.
- **Reproduction:** The biological process by which existing organisms produce offspring of their own kind to maintain continuity.
    - *Example:* A cat gives birth to kittens

2. Design an experiment to test the role of water and air in seed germination.

- **Objective:** To demonstrate that both water and oxygen (air) are indispensable factors for seed germination.

- **Setup:** Take three identical tumblers/beakers and place gram seeds inside each under different conditions:
    - **Tumbler A (Control):** Seeds are placed on moist cotton and kept at room temperature with free access to air.
    - **Tumbler B (No Water):** Seeds are placed on dry cotton and kept at room temperature with free access to air.
    - **Tumbler C (No Air):** Seeds are placed in a beaker filled completely with boiled water (to drive out dissolved air), and a thin layer of oil is poured on top to prevent atmospheric air from entering.
- **Variables:**
    - *Independent Variables:* Presence or absence of water and air.
    - *Dependent Variable:* Germination rate/success.
    - *Controlled Variables:* Temperature, seed type, and light levels.
- **Observations:** After a few days, only the seeds in **Tumbler A** sprout into healthy seedlings. Seeds in **Tumbler B** and **Tumbler C** show no signs of germination.
- **Conclusion:** Germination requires a combined environment containing both moisture and atmospheric oxygen.

3. Why sunlight is not essential to start germination but becomes important after sprouting.

- **Initial Germination Stage:** When a seed is buried under the soil, it relies entirely on its internal reserves. The process is initiated by **imbibition** (the physical absorption of water), causing the seed coat to swell and rupture. This moisture activates internal hydrolytic enzymes (**enzyme activation**), which digest complex starches stored in the cotyledons into simple, soluble sugars. Because this relies purely on chemical breakdown of internal food storage, external sunlight is not required.
- **Post-Sprouting Stage:** Once the shoot emerges above the soil line and develops its first green leaves, the seed's stored food supply is depleted. To continue growing, the plant must switch to autotrophic nutrition via **photosynthesis**. Sunlight becomes essential because chlorophyll requires solar light photons to convert water and carbon dioxide into sugars.

4. Plant Movements: Tropic vs. Nastic, and Types of Tropism

- **Core Distinction:**
    - **Tropic Movements:** Growth-dependent movements where the direction of the response is directly determined by the direction of the stimulus.

    - **Nastic Movements:** Growth-independent, non-directional responses where the direction of movement is independent of where the stimulus comes from.
- **Types of Tropisms:**
    - **Phototropism:** Growth response to unidirectional light. *Example:* Plant shoots bending toward a sunlit window.
    - **Geotropism:** Growth response to gravitational pull. *Example:* Plant roots growing downward into the soil (positive geotropism).
    - **Hydrotropism:** Growth toward water gradients. *Example:* Plant roots changing direction toward a moist area of soil.
    - **Thigmotropism:** Growth response upon contacting a solid object. *Example:* Climbing tendrils wrapping around a fence post or support stick.

5. Describe how Mimosa pudica responds to touch and why this is not growth but a turgor-driven movement.

- **Response to touch:** When the leaves of *Mimosa pudica* (touch-me-not plant) are touched, an electrical-chemical signal propagates through the plant tissue to specialized swollen cell clusters at the leaf base called the **pulvinus**.
- **Turgor Mechanism:** The stimulus triggers cells on the lower side of the pulvinus to rapidly leak potassium ions and water into intercellular spaces. This sudden drop in internal fluid pressure (**turgor pressure**) causes the cells to collapse, forcing the leaflets to fold and drop almost instantly.
- **Why it is not growth:** Unlike tropisms, this movement involves no cellular elongation or permanent cell division. It is **rapid, fully reversible, and temporary**, resetting back to normal once water returns to the pulvinus cells.

6. Trace a complete plant life cycle from seed to seed and explain senescence.

- **The Plant Life Cycle Steps:**
    1. **Seed:** A dormant state containing a protective coat and an embryo.
    2. **Germination:** Emergence of the radicle (root) and plumule (shoot) under favorable water and air conditions.
    3. **Vegetative Development:** Growth of stem branches, extensive root networks, and green leaves.
    4. **Flowering & Pollination:** Production of flowers followed by the transfer of pollen grains to ovaries.
    5. **Fertilization & Fruit Set:** Development of fertilized ovules into seeds enclosed within a ripening fruit.

- **Senescence:** This is the natural, programmed biological aging phase of a plant or its parts (like leaves). During senescence, metabolic activity drops, chlorophyll breaks down (causing leaves to turn yellow), and nutrients are remobilized before the tissue or plant ultimately dies.

7. Comparison of Mosquito and Frog Life Cycles

Life Stage / Metric	Mosquito Lifecycle	Frog Lifecycle
Egg Stage	Laid on or near stagnant water surfaces.	Laid in large gelatinous clusters (spawn) directly in water.
Larval Stage	**Wriggler:** Fully aquatic, worm-like form; breathes through a tail siphon at the water surface.	**Tadpole:** Fully aquatic, fish-like body with a long tail; breathes through internal/external gills.
Pupal/Intermediate Stage	**Tumbler:** Aquatic but non-feeding comma shape; breathes via thoracic respiratory trumpets.	**Metamorphosing Tadpole:** Starts growing hindlegs, then forelegs; tail shrinks as lungs develop.
Adult Stage	**Terrestrial/Aerial Insect:** Has wings, 6 legs, antennae; breathes air through body spiracles.	**Terrestrial/Amphibious Amphibian:** Four-legged, tailless body; breathes via lungs and moist skin.

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