

Diversity in the Living World



Learning Objectives

- Observe variety in plants and animals
- Identify simple grouping features of organisms
- Tell the difference between herbs, shrubs and trees
- Describe how animals move in different ways
- Explain the meaning of habitat and adaptation

Warm Up

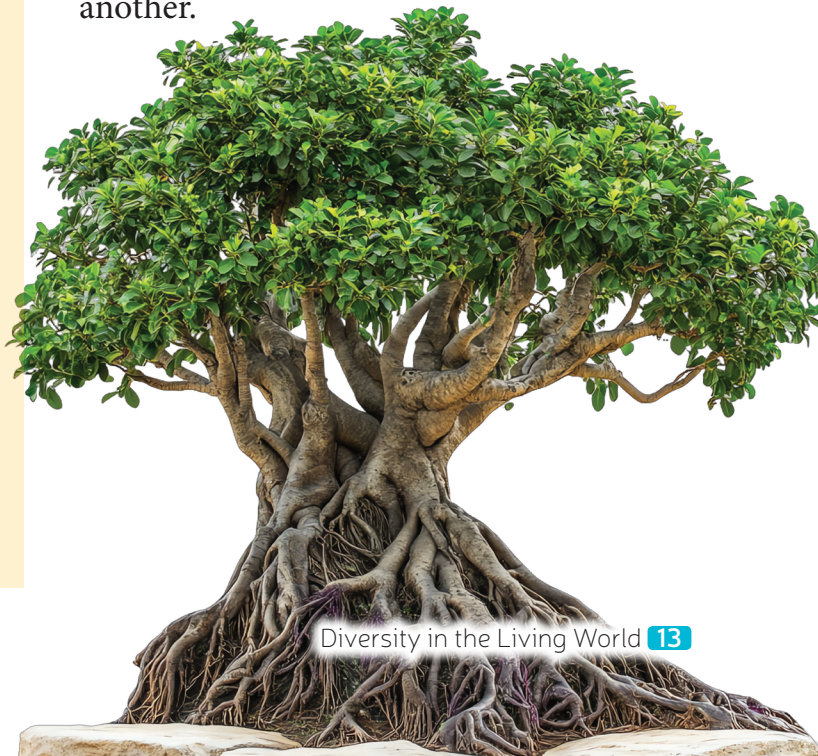
CG 7 Curiosity and Exploration NCF 2023

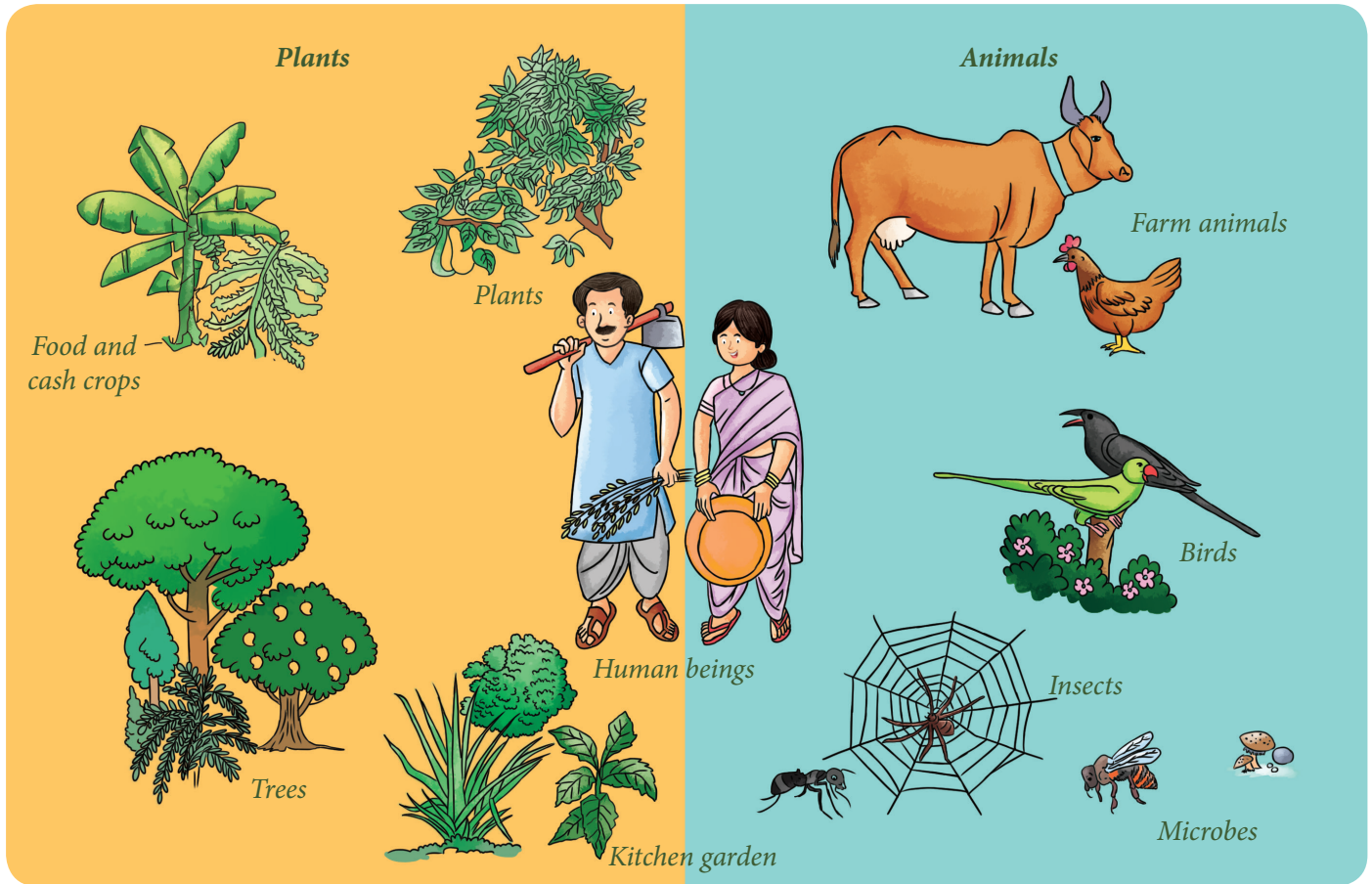
Tick (✓) the correct options.

1. What does biodiversity mean?
 - a. Only plants in an area
 - b. Only animals in an area
 - c. The variety of life on Earth
 - d. The weather in an area

2. Which of the following is an example of a herb?
 - a. Mango tree
 - b. Hibiscus bush
 - c. Coriander plant
 - d. Banyan tree

Look carefully at the living world around you. Tiny insects crawl over leaves, birds sing on branches and tall animals, like elephants, walk through forests. In one small park, you may notice grass, bushes, trees, flying insects, reptiles and many birds. This wide range of living forms — plants, animals, fungi and even tiny microbes—is called **biodiversity**. Studying this variety helps us understand how all life is connected and dependent on one another.





Some Plants and Animals

To study so many living things, scientists arrange them into groups. Imagine entering a library where books are placed randomly; it would be hard to find the one you want. Just as libraries arrange books in order, living organisms are also grouped by their features. This classification makes it easier to compare, identify and learn about their roles in nature.

Biodiversity

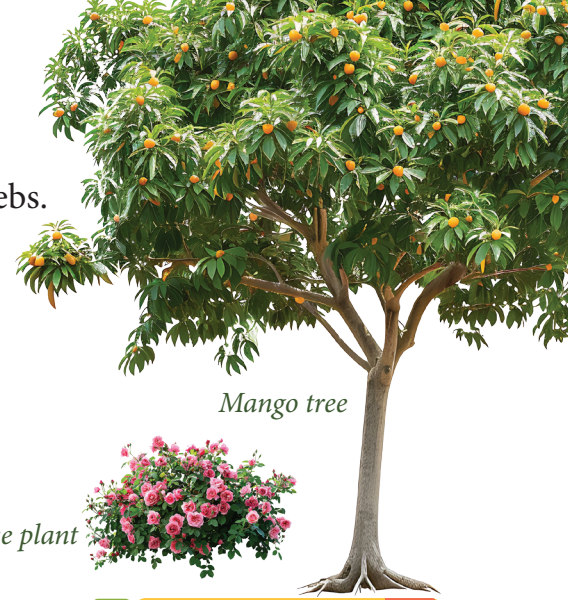
Biodiversity means the variety of all living things found on Earth. It includes plants, animals, fungi and tiny microorganisms that live in different parts of the world. This variety is not only about the number of species but also about the special roles they play in keeping nature balanced. For example, both birds and butterflies can fly, but birds use feathers while butterflies have colourful wings. A mango tree grows tall with a thick trunk while a rose plant is smaller with thin stems. In deserts, we usually see only a few tough plants like cactus and animals like camels or lizards. In the Himalayas, however, there are many kinds of trees, shrubs, birds and animals. These differences in size, colour, movement, food habits and ways of reproduction show how rich life on our planet really is.



Importance of Biodiversity

- It keeps nature balanced by supporting food chains and food webs.
- It gives us food, medicines, oxygen and useful materials.
- It makes soil fertile so that crops can grow properly.
- It helps control rainfall, temperature and keeps the air clean.
- It provides jobs and resources for people.
- It protects plants and animals from disappearing.

Without biodiversity, life on Earth could not continue.



Mango tree

Rose plant

Activity 1 -- (Observing Local Flora)

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Experiential Learning

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Aim: To notice and record the variety of plants (flora) nearby

Materials Required: Notebook, pen or pencil, magnifying glass (if available), water bottle

Steps:

1. Visit a garden, park or open courtyard.
2. Spend about 15 minutes observing at least five different plants.
3. Note their size, colour of leaves or flowers and special features, like thorns or smell.
4. Observe whether the plant grows close to the ground, medium height or tall.



Lemon Grass



Marigold



Hibiscus



Banyan tree

Recording Table (Flora)

S. No.	Local name of plant	Stem (Soft/Hard)	Leaves (Shape/Arrangement)	Size	Any other features
1.	Lemon grass	Soft and thin	Long, narrow, parallel venation		Strong aroma
2.	Marigold	Hard and thin			Used in garlands
3.	Hibiscus	Hard	Broad leaves, net-like venation		
4.	Banyan		Many small leaves with reticulate venation		Aerial roots
5.	Any other				

Observation: Plants show variety in stem type, leaf pattern and flowers.

Conclusion: Even a small area can have many kinds of plants.

Activity 2 (Observing Local Fauna)

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Aim: To observe and record the variety of animals (fauna) nearby

Materials Required: Notebook, pen or pencil, water bottle

Steps:

1. Spend about 15 minutes quietly watching animals in the same area.
2. Choose at least five different animals and note their size, colour and movement.
3. Record how each animal moves (flying, crawling, swimming, walking).
4. Write down where the animal lives or is usually found.



Pigeon



Butterfly



Goat

Recording Table (Fauna)

S. No.	Name of the animal (local)	Place where they live	Food they eat	The way they move	Number of legs	Any other features
1.	Pigeon	Roofs, trees	Seeds, Grains	Fly and walk		Coos while resting
2.	Butterfly	Gardens	Nectar from flowers	Fly		Colourful wings
3.	Goat		Grasses, leaves	Walk		Provides milk
4.	Any other					
5.	Any other					

Observation: Animals differ in the food they eat, where they live and movement.

Conclusion: In one area itself, many different animals can be seen with unique features.

Think and Answer

Logical Reasoning

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If you observed a cat, a fish and a snake, what common features might you use to group them together despite their differences in movement and habitat?

Organising the Living World: Classification

The living world is full of countless forms of life, from tiny microbes to giant trees and animals. To study them properly, scientists use a method called 'classification,' which means organising organisms according to their common features, so that the similarities and differences become clear. It is a systematic way of arranging life forms so that their relationships can be better understood.

This makes it easier to identify them, compare them and understand their role in nature. Instead of looking at every organism separately, classification arranges them into groups that show both similarities and differences.

Think of how a cupboard is arranged — clothes are placed by type or colour so that finding them becomes simple. In the same way, classification arranges living things based on their body structure, functions or way of life. For plants, this may include grouping them as herbs, shrubs and trees depending on their height and stem. Some may also be grouped as climbers and creepers depending on how they grow. Animals can be grouped by their food habits: herbivores that eat plants, carnivores that eat flesh and omnivores that eat both plants and animals. Such organisation helps bring order to the study of life and makes it more systematic and meaningful.

Grouping Plants Based on Structure

Plants can be grouped by carefully observing the visible parts such as their stems, leaves, flowers and roots. This kind of grouping makes it easier to compare different plants and to understand how they grow and survive in their surroundings.

1. Based on Size

Plants show a wide range in height and overall growth pattern. To understand this more clearly, let us look at some familiar plants such as holy basil (a herb), bougainvillea (a shrub) and coconut (a tree).

- **Herbs:** These are small plants, usually less than 1 metre in height. They have soft, green stems that are tender and easy to bend. Herbs do not generally develop woody stems. Examples include coriander, spinach, holy basil, mint and wheat.



Coriander



Spinach



Mint



Holy Basil



Wheat

- **Shrubs:** These are medium-sized plants, usually between 1–3 metres tall. Their stems are woody but not very thick and their branches grow close to the ground, giving them a bushy shape. Examples include hibiscus, rose, jasmine, cotton and bougainvillea.



Hibiscus



Rose



Jasmine



Cotton plant

- **Trees:** These are large and tall plants, often more than 3 metres in height. They possess a strong, thick, woody trunk and their branches spread out higher above the ground. Examples include neem, mango, banyan and coconut trees.



Neem



Mango



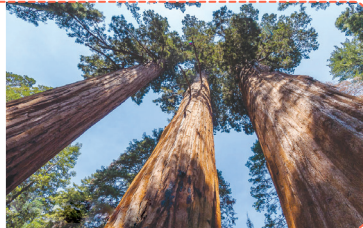
Banyan



Coconut

Did You Know?

The Giant Sequoia trees, found in California, can live for thousands of years and are considered the largest single trees by volume in the world!



Fun Zone

Some trees communicate with each other through underground fungal networks, sharing nutrients and vital information.

2. Based on Stem Support

Plants may also be grouped on the basis of the strength and support of their stems. This helps us understand the way they spread or climb.

- **Climbers:** These are plants with weak stems that cannot stand upright by themselves. They grow upward with the help of a stick, wall or nearby support. Examples include money plant, pea plant and grapevine. Climbers often have thin, thread-like outgrowths, called **tendrils**, which coil around supports and help them climb.
- **Creepers:** These are plants with stems so weak that they spread along the ground. Their branches usually crawl on the surface of the soil. Examples include pumpkin, watermelon and strawberry.



Money plant



Pea plant



Pumpkin plant



Watermelon plant

Activity 3

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Experiential Learning

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Aim: To identify and classify different plants based on their size and stem support

Materials Required: Notebook, pencil, nearby garden or school ground

Steps:

1. Visit a garden or nearby open space.
2. Observe at least one herb, one shrub, one tree, one climber and one creeper.
3. Write down their names and classify them according to the size or stem support.

4. Note one special feature you observe about each plant.

Table for Recording Observations

S. No.	Name of Plant	Height (Short/Medium/Tall)	Stem Nature (Green/Brown, Tender/Hard, Thick/Thin)	Branching (Close to Ground / Higher Up)	Name of Plant Group
1.	Mango	Tall	Brown, Hard, Thick	Higher up on the stem	Tree
2.					
3.					
4.					
5.					

Conclusion:

- **Herbs:** Plants with green and tender stems. They are usually short and may not have many branches.
- **Shrubs:** Plants with hard but not very thick stems. They branch out near the base and are of medium height.
- **Trees:** Plants with hard and thick brown stems (trunks). They branch out on the upper part of the stem and are very tall.
- **Climbers & Creepers:** Plants with weak stems that cannot stand upright. They either take support (Climbers) or spread on the ground (Creepers).

3. Based on Leaves

Leaves are one of the most important parts of a plant because they make food through photosynthesis. To understand leaves better, we observe their parts closely. Each leaf has a strong line running through its centre, called the **midrib**. The midrib acts like the backbone of the leaf, keeping it upright and firm. From the midrib arise many thin lines called **veins**. These veins branch and spread across the leaf to carry water, minerals and prepared food. They also provide strength and shape to the leaf. The pattern made by the midrib and veins is called **venation**.

- **Reticulate Venation:** In this type, the veins branch out from the midrib and join together to form a network, much like a spider’s web. This is usually found in dicot plants. Examples: hibiscus, mango, guava
- **Parallel Venation:** In this type, the veins run side by side from the base of the leaf to the tip without forming a net. This is usually found in monocot plants. Examples: grass, maize, banana



Hibiscus leaf with reticulate venation



Banana leaf with parallel venation



Grass leaf with parallel venation

By looking carefully at the midrib and vein arrangement, we can easily tell whether a leaf has reticulate venation or parallel venation.

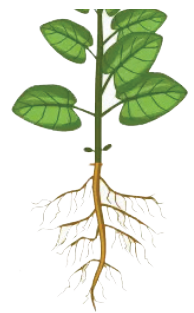
Fun Facts

Some plants, like the Venus flytrap, are carnivorous and can 'eat' animals, such as insects, to obtain nutrients.

4. Based on Roots

Roots are very important because they keep the plant fixed in the soil and supply it with water and minerals. In addition, roots can also store food and, in special cases, help plants survive in difficult conditions.

- **Taproot System:** In this system, one main thick root grows straight down into the soil. From it, many smaller side roots, called **lateral roots**, spread out. This allows the plant to reach deep water sources. Some plants, such as carrot and radish, use taproots to store extra food, making them fleshy and edible. Examples: carrot, radish, oak



Taproot System



Fibrous root

- **Fibrous Root System:** Here, many thin roots of equal size grow from the base of the stem. They spread widely like a net, holding the plant firmly and absorbing water quickly from the upper soil layers. Examples: wheat, rice, onion.
- **Special Roots:** Some plants develop roots for special functions. Mangrove trees, for example, grow in swampy areas where the soil has little air. They produce breathing roots that grow above the soil to take in oxygen.

There is a clear relationship between leaves and roots. Plants with reticulate venation usually have taproots, while plants with parallel venation usually have fibrous roots. This means we can often guess the type of root system by simply looking at the venation of the leaves.

The study of roots shows that they not only give support and absorb water and minerals, but can also store food or take in air when needed. Along with venation, root type is an important feature for grouping plants.

Activity 4

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Aim: To observe and compare the link between venation and root type

Materials Required: Periwinkle (Sadabahar) plant, Lemon grass plant, trowel (kharpi), water

Steps:

1. Carefully dig out both plants without breaking their roots (loosen the soil with water first).
2. Wash the roots gently and note whether they are taproot or fibrous.
3. Observe the leaves of both plants to identify whether they have reticulate or parallel venation.
4. Record your observations in the table below.



Lemon Grass plant



Periwinkle (Sadabahar) plant

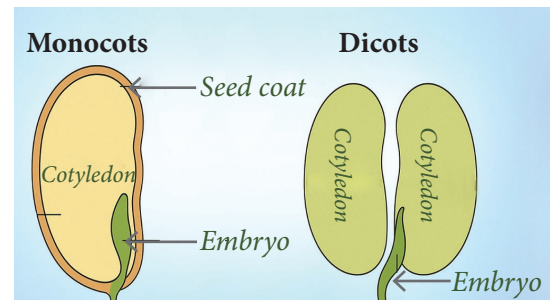
Plant Observed	Leaf Venation	Root Type
Periwinkle		
Lemon grass		

Observation: The Periwinkle plant (a dicot) shows reticulate venation with a taproot while the Lemon grass plant (a monocot) shows parallel venation with fibrous roots.

Conclusion: Venation type and root system are closely connected in plants.

5. Seed Structure

Seeds are an important part of plants because they carry the future plant inside them. A seed has two main parts – the baby plant (embryo) and the stored food that helps it grow in the beginning. The food is kept in special structures called **cotyledons**. Based on the number of cotyledons, plants can be grouped into two categories:



- **Monocotyledons (Monocots):** The word monocotyledon means ‘one cotyledon.’ These plants have seeds with only a single cotyledon. The single seed leaf stores and supplies food for the growing seedling. Monocots generally show parallel venation in their leaves and have fibrous root systems. Examples include maize, rice and wheat.
- **Dicotyledons (Dicots):** The word dicotyledon means ‘two cotyledons.’ These plants have seeds with two seed leaves or cotyledons. When the seed germinates, both cotyledons provide food to the young plant until it can make its own food. Most dicots show reticulate venation in their leaves and usually have taproot systems. Examples include chickpea, groundnut and bean.

Activity 5 (Observing Animal Movement)

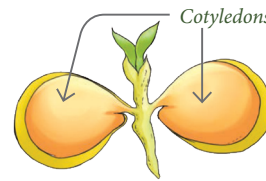
CG 6 Experiential Learning NCF 2023

Aim: To observe and compare dicot and monocot seeds

Materials Required: One dry chickpea seed, one maize grain, water and a hand lens

Steps:

1. Soak the seeds in water for a few hours.
2. Peel off the seed coat carefully.
3. Observe the number of cotyledons inside each seed.
4. Record your findings in the table below.



Dicot seed (chickpea)



Monocot seed (maize)

Seed Observed	Seed Type	Number of Cotyledons	Type of Venation	Type of Roots
Chickpea	Dicot	Two	Reticulate	Taproot
Maize	Monocot	One	Parallel	Fibrous

Observation: The chickpea seed shows two cotyledons and the maize seed shows only one.

Conclusion: Seeds can be grouped into dicots and monocots based on the number of cotyledons. Additionally, the type of venation and root system (reticulate and taproot for dicots, parallel and fibrous for monocots) helps further in classification.

Grouping Animals Based on Movement and External Features

Just as plants can be grouped using their visible traits, animals too can be classified by observing their outer features and the way they move. This helps us compare different animals and understand their lifestyles more easily.

1. Modes of Movement

Different animals use different body parts to move from one place to another. The type of movement is often linked with their body structure and place of living.

- **Flying:** Birds (like pigeons and eagles) and insects (such as butterflies) use wings to fly in the air.



Birds



Land Animal

- **Walking, Running or Jumping:** Land animals (such as goats, tigers, horses and kangaroos) move with the help of legs. Some are adapted for running fast while others can leap or hop.

- **Swimming:** Water animals (like fish, whales and dolphins) move with fins or flippers. Their streamlined bodies reduce resistance and help them swim smoothly.



Water Animal



Rabbit

- **Crawling or Gliding:** Snakes crawl using the muscles of their body while snails glide slowly with the help of a muscular foot. Flying squirrels glide from one tree to another using special folds of skin.
- **Burrowing:** Animals such as rabbits, moles and earthworms dig and create tunnels in the ground as their mode of movement.

By studying these movements, animals can be grouped and compared in a meaningful way.

Activity 6 (Observing Animal Movement)

CG 6 Experiential Learning NCF 2023

Aim: To identify animals and their modes of movement

Materials Required: Notebook, pen, nearby garden or park visit

Steps:

1. Observe different animals around your surroundings, such as birds, pets or insects.
2. Note down how they move – flying, walking, running, swimming, crawling or burrowing.
3. Write your observations in the table below.



Pigeon

Animal Name	Mode of Movement	Body Parts Used
Pigeon	Flying	Wings

Observation: Different animals have different modes of movement.

Conclusion: Animals can be classified based on the way they move which is connected to their body structure and habitat.

2. Features of Animals

Animals can also be studied by looking at their external features, not only by the way they move. These features show us how animals are suited to their surroundings and daily needs.

1. Body Covering: The outer covering of an animal protects it from heat, cold and enemies.

- **Fur or Hair:** Soft coverings in mammals such as lions, dogs and rabbits. They keep the body warm.
- **Feathers:** Light coverings on birds like pigeons and eagles. They help in flight and also keep the bird warm.
- **Scales:** Hard plates on reptiles and fish. Snakes, lizards and carp use scales for protection and to prevent water loss.
- **Shells:** Hard coverings on animals like turtles, snails and crabs. These shells work like armour.



Lion



Turtle

- **Thick Skin:** Found in elephants and rhinoceroses. It protects them from heat, thorns and insect bites.
- **Spines or Quills:** Sharp coverings on porcupines and hedgehogs that keep enemies away.
- **Slimy Coating:** A moist layer on frogs and earthworms that helps in breathing and stops drying.

- **Camouflage Colouring:** Colours and patterns that blend with the surroundings. Chameleons and leaf insects use these to hide from predators.

2. Body Shape: The shape of an animal's body is linked with its lifestyle.

- **Streamlined Shape:** Fish and dolphins have narrow bodies that make swimming easier.
- **Strong Limbs:** Horses, kangaroos, goats and elephants have powerful legs for walking, running or jumping.
- **Light Body with Wings:** Birds (such as sparrows and eagles) have light bodies with wings to fly.
- **Long and Narrow Body:** Snakes and earthworms have long bodies for crawling or burrowing.
- **Flexible Body:** Cats and monkeys have bendable bodies that help in climbing and leaping.



Kangaroos

3. Breathing Organs: Animals take in oxygen using different organs.

- **Lungs:** Mammals (like cows, dogs and humans) use lungs to breathe air.
- **Gills:** Fish (such as carp and sharks) use gills to take oxygen from water.
- **Tracheae:** Insects (like ants and grasshoppers) breathe through small tubes called tracheae.
- **Moist Skin:** Frogs and earthworms breathe through their moist skin.
- **Book Lungs or Spiracles:** Spiders and scorpions breathe through book lungs or tiny openings called spiracles.

Some animals, like frogs, can use more than one breathing organ, such as lungs and skin. This helps them live both on land and in water.



Frog



Cow

4. Feeding Habits: Animals eat different kinds of food and are grouped based on this.

- **Herbivores:** Plant-eating animals, such as cows, elephants and deer. They have flat teeth for chewing leaves and grass.

- **Carnivores:** Meat-eating animals, such as lions, tigers and eagles. They use sharp teeth or hooked beaks for tearing flesh.
- **Omnivores:** Animals that eat both plants and meat, like humans, crows and bears. They have mixed teeth for different foods.
- **Parasites:** Animals that live on or inside other animals. Leeches, ticks and lice feed on blood or body fluids.



Tiger



Fish

5. Presence of Backbone: Animals are also grouped by whether they have a backbone or not.

- **Vertebrates:** Animals with a backbone, such as dogs, birds, fish, frogs and humans. They have well-developed organs like brain, heart and lungs.

- **Invertebrates:** Animals without a backbone, such as insects, snails, octopuses and earthworms. They may have soft bodies or a hard outer shell.

These external features, together with their modes of movement, help us classify animals and understand how they survive in different habitats.

Activity 7

CG 6 Experiential Learning NCF 2023

Aim: To observe and understand how the external features of animals (body covering, feeding habits, breathing organs and presence of a backbone) are adapted to their surroundings and daily needs

Materials Required: Pen and notebook, pictures of different animals (optional), chart paper for recording observations (optional)

Steps:

1. Choose at least 5 different animals (like camel, penguin, fish, elephant, frog) to study. You can either use images or observe them in real life.
2. For each animal, record the following information in the table provided:
 - **Body Feature:** Observe their body feature, like covering (e.g. fur, scales, feathers).
 - **Presence of Backbone:** Is the animal a vertebrate (has a backbone) or an invertebrate (no backbone)?
 - **Feeding Habits:** Does the animal eat plants (herbivore), meat (carnivore) or both (omnivore)?
 - **Breathing Organs:** Does the animal breathe using lungs, gills or skin?
3. Based on your observations, fill in the table with the correct information for each animal. Record your findings in the table below.

Animal	Body Feature	Presence of Backbone	Feeding Habits	Breathing Organs	Adaptation Reason
Camel	Long legs, wide hooves, thick skin	Vertebrate	Herbivore	Lungs	Helps in hot desert (wide hooves, long legs)
Penguin					
Fish					
Elephant					
Frog					

Observation: Animals have unique adaptations in body features, breathing organs and feeding habits that help them survive in their specific environments.

Conclusion:

- Animals have special adaptations like fur, scales and feathers to protect them from environmental conditions.
- Their feeding habits and breathing organs, such as lungs and gills, help them survive in their specific habitats.
- The presence of a backbone classifies animals into vertebrates and invertebrates, allowing for better understanding of their structure and behaviour.

Fun Facts

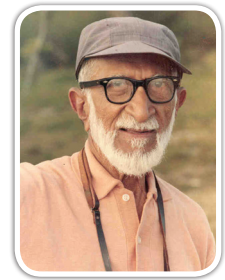
Some animals, like the Arctic Tern, travel amazing distances, flying thousands of kilometers each year from their breeding areas to feeding grounds and back!



Know Your Scientist

Salim Ali (1896–1987)

Dr. Salim Ali, also known as the 'Birdman of India,' was a famous ornithologist who spent his life studying birds. He travelled across India, observing different bird species, their migration paths and their natural habitats. His research was vital in identifying places rich in bird diversity, which helped in the creation of protected areas, like the Keoladeo National Park in Rajasthan. His valuable contributions to science earned him the Padma Vibhushan award in 1976.



Plants and Animals in Different Surroundings

Biodiversity refers to the variety of life on Earth, which is influenced by factors such as temperature, water availability and terrain. Living organisms have developed special features, called **adaptations**, that help them survive in their specific environments. These adaptations are vital for their survival in diverse habitats.

An organism's **habitat** is the natural environment where it lives and finds the resources it needs, like food, water, air and shelter. Different organisms can live in the same habitat, but their specific features and behaviours allow them to survive in that environment. Broadly, habitats can be divided into the following categories:

Terrestrial Habitats (Land Habitats)

These habitats are found on land, such as deserts, forests, grasslands and mountains. Animals living in these habitats are called **terrestrial animals**.

Desert Habitats

Deserts receive very little rainfall, often less than 250 mm annually, and experience extreme temperatures, being extremely hot during the day and cold at night. Desert plants and animals



Cactus

- ▶ **Acacia Trees:** These trees have deep roots that access underground water sources and their small, waxy leaves reduce water loss.



Camel

- ▶ **Fennec Foxes:** These foxes have large ears to release heat and fur-lined feet to protect them from the hot sand.



Acacia Trees

have developed special adaptations to survive these harsh conditions.

• **Adaptations in Plants:**

- ▶ **Cactus:** Cactus plants have thick, fleshy stems that store water, helping them survive long periods without rainfall. Their leaves are modified into spines to minimise water loss.

• **Adaptations in Animals:**

- ▶ **Camels:** Camels have long legs and wide hooves that prevent them from sinking into the sand. They store water in their humps and can survive for long periods without drinking. They also conserve water by producing minimal urine and sweat.



Fennec Fox

Mountain Habitats

These habitats are characterised by high altitudes, cold temperatures and varying levels of precipitation. These regions experience extreme weather conditions like heavy snow and cold winds.



Deodar Trees

• **Adaptations in Plants:**

- ▶ **Deodar Trees:** These trees have cone-shaped structures and sloping branches that help snow slide off easily, preventing damage from heavy snow.

- ▶ **Rhododendrons:** These plants have smaller leaves and shorter height to resist cold winds and snow at high altitudes.



Rhododendron

- **Adaptations in Animals:**

- **Snow Leopards:** These animals have thick fur and large paws to stay warm and walk on snow without sinking.



Snow Leopard



Mountain Goat

- **Mountain Goats:** These goats have strong legs and hooves that allow them to climb rocky and steep terrains.

Differences between Rhododendrons in Different Regions

Feature	Rhododendrons in Nilgiris (Shola Forests)	Rhododendrons in Sikkim (Mountain Regions)
Height	Shorter height due to strong mountain winds	Taller height due to milder mountain climate
Leaf Size	Smaller leaves to withstand cold and wind	Larger leaves in regions with less harsh winds
Adaptation	Adapted to survive strong winds and cold	Adapted to thrive in less harsh mountain conditions

Polar Habitats

Polar regions are characterised by freezing temperatures, snow and ice. The conditions are harsh with long winters and little sunlight.

- **Adaptations in Plants:**

- **Arctic Moss:** This plant stores nutrients in its thick tissues and grows in cold conditions.



Arctic Moss



Willow Trees

- **Willow Trees (in polar regions):** These plants are small and low-growing to avoid cold winds, with flexible stems that help them survive harsh winds.



Polar Bear

- **Adaptations in Animals:**

- ▶ **Polar Bears:** These animals have thick white fur that blends with the snow and a thick fat layer for insulation.

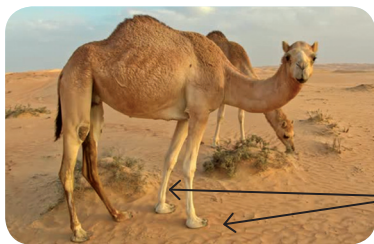


Penguin

- ▶ **Penguins:** Penguins have dense feathers and a thick fat layer to insulate against freezing temperatures. They are adapted to swim in cold waters and withstand extreme cold.

Differences between Camels in Hot and Cold Deserts

Feature	Camels in Hot Desert	Camels in Cold Desert
Legs	Longer legs with wide hooves for walking on sand	Shorter legs to prevent sinking in snow
Humps	One hump to store fat	Two humps for fat storage during food scarcity
Hair	Short hair for hot conditions	Long hair on head and neck to protect from cold
Water Conservation	Excretes small amounts of urine and has dry dung	Adapted to survive cold with fat storage



Hooves

A camel living in the hot desert of Rajasthan



Hooves

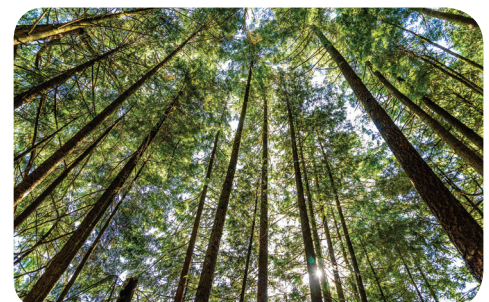
A camel living in the cold desert of Ladakh

Forest Habitats

Forests are large areas covered chiefly with trees and plants. They receive moderate to heavy rainfall and support a huge variety of life. Forests can be hot and humid (like rainforests) or moderate (like deciduous forests).

- **Adaptations in Plants**

- ▶ **Tall Trees:** In dense forests, trees often grow very tall to reach the sunlight. They have broad leaves to capture as much light as possible for photosynthesis.



Tall Trees

- ▶ **Climbers:** Many vines and creepers grow on trees to reach sunlight that cannot penetrate the thick canopy below.



Red-Eyed Frog

- ▶ **Monkeys:** They have long tails for grasping branches and strong arms to swing from tree to tree, helping them live high up in the canopy.



Tiger



Vines

- **Adaptations in Animals:**

- ▶ **Red-Eyed Frog:** Living on trees, these frogs have sticky pads on their feet that help them climb trees on which they live.



Monkeys

- ▶ **Jaguars/Tigers:** These predators have camouflage (spots or stripes) that helps them hide behind the thick vegetation to stalk their prey.

Grassland Habitats

Grasslands are windy, open areas where the vegetation is dominated by grasses rather than large trees. These regions receive moderate rain—less than forests but more than deserts.

- **Adaptations in Plants:**

- ▶ **Grasses:** Grasses have flexible stems that bend easily in the wind without breaking. They have strong, deep roots that hold the soil firmly and allow the plant to grow back quickly even after being grazed by animals.



Grasses



Acacia Trees

Acacia Trees: Scattered trees often have small leaves to reduce water loss and deep roots to find moisture underground.



Lions

- **Adaptations in Animals:**
 - ▶ **Lions (Predators):** They have a light brown colour that helps them hide in the dry grasslands while hunting. Their eyes are placed in the front of their face, allowing them to focus correctly on their prey.



Deer

- ▶ **Deer (Prey):** They have strong legs to run fast and escape predators. Their eyes are on the sides of their head, giving them a wide view to look out for danger. They also have large ears to hear the movement of predators.

Aquatic Habitats (Water Habitats)

Aquatic habitats are environments found in water, such as oceans, rivers, lakes and ponds. These habitats can be categorised into two main types: **marine** (saltwater) and **freshwater** (low salinity). Both marine and freshwater habitats support various species of plants and animals adapted to survive in water.



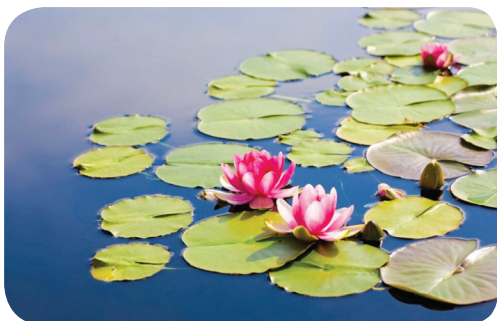
Plants in Marine Habitat

Marine Habitats (Saltwater)

- **Plants:** Marine plants like seaweed and kelp grow in oceans, seas and estuaries. They are adapted to live in salty water, with some species growing in shallow waters while others thrive in deeper waters.
- **Animals:** Marine animals such as fish, dolphins, whales and jellyfish thrive in these habitats. Their streamlined bodies and adaptations help them move efficiently in saltwater.

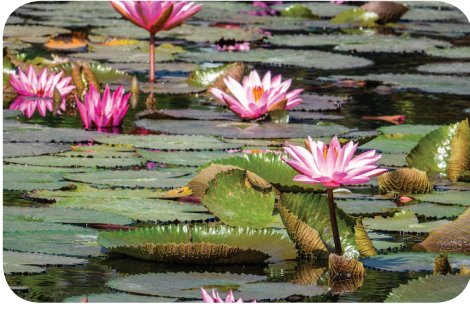


Freshwater Habitat



Freshwater Habitats

- **Plants:** Freshwater plants like water lilies, lotus and duckweed grow in rivers, lakes and ponds. These plants are suited for low-salinity environments, often floating on the surface of still waters.



Water Lilies

- **Duckweed:** This small floating plant has tiny leaves that float on water surfaces. Its fast growth helps it survive in fluctuating water levels.



Duckweed



Turtles

- **Water Lilies:** These aquatic plants have large, flat leaves that float on the surface of water, allowing them to absorb sunlight for photosynthesis. Their stems are flexible, helping them move with the water.
- **Animals:** Freshwater animals like fish, frogs and turtles live in these habitats. They are adapted to survive in low-salinity environments, with features like specialised kidneys to conserve water.

Adaptations in Aquatic Plants and Animals

- **Plants:** Aquatic plants such as lotus and water hyacinth have broad leaves with a waxy coating that helps them float on the water surface and prevents waterlogging. Their stems are flexible, allowing them to move with the water's flow.
- **Animals:** Aquatic animals like fish have fins and streamlined bodies that help them swim smoothly. Whales and dolphins, although mammals, are adapted to live in water with specialised lungs that allow them to hold their breath for long periods underwater.

Amphibians

Amphibians are unique animals that can live both in water and on land. Examples include frogs, toads and salamanders. These animals have special adaptations that help them survive in both environments. They can breathe through their skin in moist environments and use their lungs when on land. Amphibians play an important role in ecosystems as both predators and prey.

Adaptations in Amphibians

- **Frogs:** Frogs have strong, webbed feet for swimming and can breathe through both their skin and lungs. Their skin remains moist in aquatic environments but can also survive on land by using their lungs.



Frog



Salamander

- ▶ **Salamanders:** Salamanders are amphibians with smooth, moist skin that helps them absorb water. They live in damp environments, such as forests or near ponds. Some species of salamanders can even regenerate lost limbs. Salamanders rely on both their skin and lungs for breathing.

Activity 8 (Analysing Habitats)

CG 6 Experiential Learning NCF 2023

Aim: To study and compare plants and animals from different habitats

Materials Required: Notebook or blackboard, chalk/pen, internet access (optional)

Steps:

1. Draw a table with columns for Desert, Mountain and Ocean.
2. Write 3–4 examples of plants and animals found in each habitat and discuss their special adaptations.
3. Note one adaptation for survival for each example.

Habitat	Plants & Animals	Adaptation for Survival
Desert	Cactus, Camel	Stores water, can survive extreme heat
Mountain	Deodar Tree, Snow Leopard	Thick fur, sloping branches
Ocean	Fish, Whale, Seaweed	Streamlined bodies, salty water

Observation: You will notice that different organisms have special features suited to their surroundings, like cactus plants store water, while fish have fins for swimming.

Conclusion: The environment shapes the adaptations of plants and animals, helping them survive in their specific habitats.

The Need for Conservation

Biodiversity is crucial for maintaining a balanced ecosystem. Unfortunately, human activities such as deforestation, pollution and excessive use of natural resources are rapidly damaging habitats and threatening many species. As a result, the loss of biodiversity is accelerating and it is essential that we prioritise conservation efforts to safeguard the variety of life on Earth.

To help preserve the endangered species, the Government of India has launched several initiatives. **Project Tiger**, started in 1973, has



Bengal Tiger

been successful in protecting the Bengal Tiger by preserving its habitat and creating protected areas. Other species, like the Cheetah and Great Indian Bustard, have also suffered from habitat loss. To address this, the **Cheetah Reintroduction Project** was launched in 2022 to restore the Cheetah population in India. Additionally, 'Protected Areas' have been established in states such as Gujarat, Rajasthan and Maharashtra to protect the habitats of the Great Indian Bustard, ensuring its survival.

Know More

'Sacred Groves' are protected patches of forests found all over India. These areas, varying in size, are home to various plants and animals, including medicinal plants. Local communities protect these groves and no one is allowed to harm the animals or cut the trees. Sacred groves are vital for preserving biodiversity.



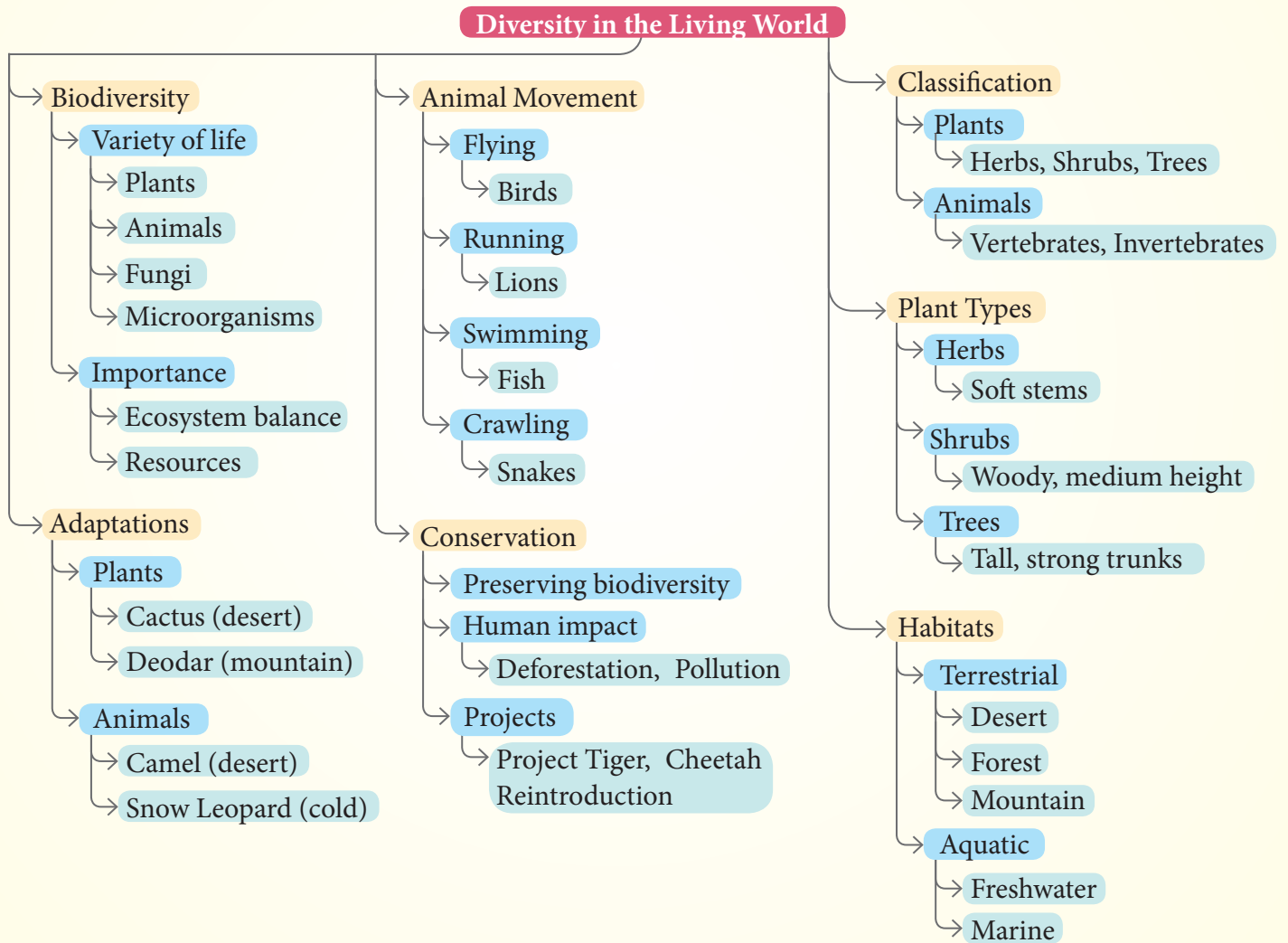
Sacred grove from the Western Ghats

Value Corner

All of us share the responsibility to protect the natural world. Human activities like deforestation and pollution harm habitats, causing a loss of biodiversity. By practising sustainability and protecting areas like sacred groves, we can help maintain healthy ecosystems and support diverse life on Earth.

Chapter Recap

- Biodiversity refers to the variety of living organisms found in different environments. This includes plants, animals, fungi and microorganisms. It is essential for maintaining the ecological balance.
- Biodiversity's Importance lies in its ability to support food chains, provide resources (like food, medicine, oxygen and materials) and regulate environmental conditions, such as temperature and rainfall.
- Classification of living organisms into groups makes it easier to study their features, functions and relationships. Groups can be based on size, stem type, leaves or movement.
- Monocots generally exhibit parallel venation in their leaves and possess fibrous roots while dicots typically exhibit reticulate venation in their leaves and possess taproots.
- Plants Classification includes grouping them into herbs, shrubs and trees based on size and stem structure. Some plants, like climbers and creepers, require support for growth.
- Animal Classification can be based on features like movement (flying, swimming, crawling), body coverings (fur, scales, feathers) and feeding habits (herbivores, carnivores, omnivores).
- Adaptations in plants and animals allow them to survive in their habitats, from desert plants like cactus storing water to animals like camels with specialised features for hot climates.
- Conservation efforts are crucial for maintaining biodiversity, with initiatives like Project Tiger and the Cheetah Reintroduction Project aiming to protect the endangered species.



Key Terms

- › **Biodiversity:** Variety of life on Earth
- › **Classification:** Organising organisms based on features
- › **Vertebrates:** Animals with a backbone
- › **Invertebrates:** Animals without a backbone
- › **Adaptations:** Features that help organisms survive
- › **Habitat:** Natural environment where organisms live
- › **Camouflage:** Ability to blend with the surroundings
- › **Venation:** Pattern of veins in leaves
- › **Climbers:** Plants that need support to grow
- › **Creepers:** Plants that spread along the ground
- › **Taproot:** Main thick root in plants
- › **Fibrous Root:** Roots growing from base of stem
- › **Reticulate Venation:** Network-like vein pattern in leaves
- › **Parallel Venation:** Veins running parallel in leaves



A. Read each question carefully and tick (✓) the correct option.

1. Which term refers to the variety of life found on Earth?

a. Adaptation	<input type="checkbox"/>	b. Biodiversity	<input type="checkbox"/>	c. Classification	<input type="checkbox"/>	d. Habitat	<input type="checkbox"/>
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2. What is the main feature of a camel's adaptation to the hot desert?

a. Two humps for storing fat	<input type="checkbox"/>	b. Long legs with wide hooves	<input type="checkbox"/>
c. Short hair to prevent heat loss	<input type="checkbox"/>	d. Large ears for cooling	<input type="checkbox"/>
3. Which type of venation is found in plants like hibiscus?

a. Parallel	<input type="checkbox"/>	b. Reticulate	<input type="checkbox"/>	c. Circular	<input type="checkbox"/>	d. Longitudinal	<input type="checkbox"/>
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4. What is the primary function of roots in plants?

a. Store food	<input type="checkbox"/>	b. Make food	<input type="checkbox"/>
c. Absorb water and minerals	<input type="checkbox"/>	d. Support the plant	<input type="checkbox"/>
5. Which of these animals is a carnivore?

a. Elephant	<input type="checkbox"/>	b. Cow	<input type="checkbox"/>	c. Lion	<input type="checkbox"/>	d. Rabbit	<input type="checkbox"/>
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B. Read each sentence carefully and fill in the blank with the correct word.

1. The process of grouping organisms based on their features is called
2. plants have deep roots that help them store water in the desert.
3. In mountain habitats, animals like have thick fur to keep them warm.
4. is a group of plants that have similar features and grow to a height of more than 3 metres.
5. animals are those that eat both plants and meat.

C. Read each statement carefully and write whether it is True or False.

1. The Ganga is an example of a marine habitat.
2. All plants in desert habitats are tall with thick trunks.
3. Penguins have adaptations to survive in polar habitats.
4. Amphibians are adapted to live both in water and on land.
5. The presence of a backbone classifies an animal as a vertebrate.

D. Read each group carefully and choose the word that does not belong to the group.

1. Deer, Elephant, Lion, Giraffe
2. Swimming, Flying, Crawling, Climbing
3. Herb, Shrub, Tree, Predator

4. Lungs, Gills, Tracheae, Spine

5. Desert, Ocean, Jungle, City

E. Picture-based questions

NCERT

1. Here are two types of seeds. What differences do you find among the roots and leaf venation of their plants?



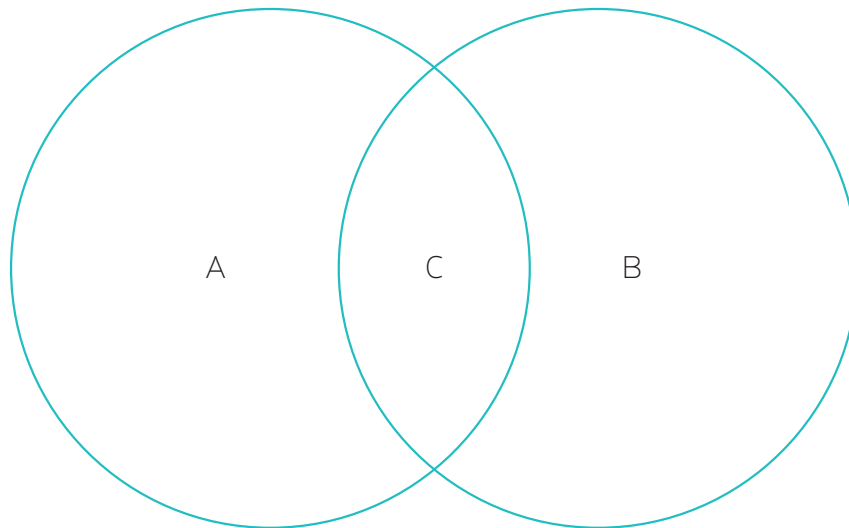
Wheat



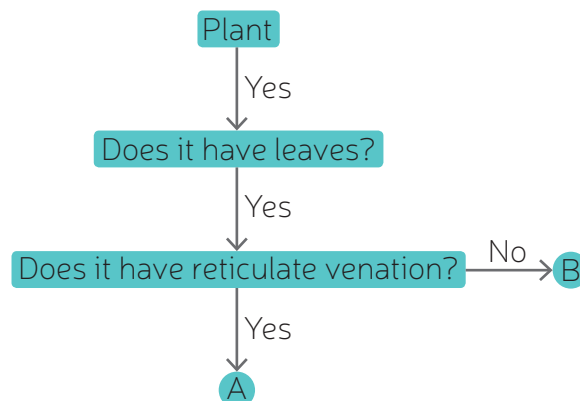
Kidney beans

2. Names of some animals are given below. Group them based on their habitats. Write the names of aquatic animals in the area marked 'A' and terrestrial animals in the area marked 'B'. Enter the names of animals living in both habitats in part 'C'.

Horse, Dolphin, Frog, Sheep, Crocodile, Squirrel, Whale, Earthworm, Pigeon, Tortoise



3. Analyse the flowchart. What can be examples of 'A' and 'B'?



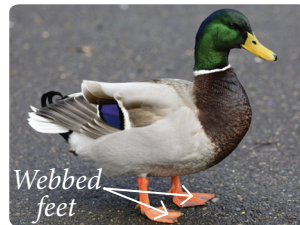
Descriptive Questions

A. Answer the following questions in one or two short sentences.

1. What is biodiversity?
2. How do plants in desert habitats conserve water?
3. What is the role of the midrib in leaves?
4. Name two adaptations of animals living in cold climates.
5. What is the primary feature that distinguishes vertebrates from invertebrates?

B. Answer the following questions briefly in three to four sentences.

1. Describe the features of a cactus plant that help it survive in the desert.
2. How do camels adapt to the desert environment?
3. What are the differences between dicot and monocot plants?
4. How does a fish adapt to aquatic habitats?
5. Raj argues with his friend Sanjay that, "Gudhal (hibiscus) plant is a shrub." What questions can Sanjay ask for clarification? NCERT
6. Observe the labelled part of a duck in the picture given below. What differences do you observe in the feet of the duck compared to the pigeon? Which activity would the duck be able to perform using this part? NCERT



Duck



Pigeon

C. Answer the following questions in five to seven complete sentences.

1. Describe the process of plant classification based on stem structure.
2. Discuss the importance of biodiversity in maintaining ecological balance.
3. How do amphibians survive in both aquatic and terrestrial environments?
4. Explain the conservation efforts being made in India to protect the endangered species like the Bengal tiger.
5. Based on the information in the table, find out examples of plants for each group.

Group	Type of seed	Type of root	Examples
A	Dicot	Taproot	
B	Monocot	Fibrous roots	

- a. What other similarities do plants of group A have?
- b. What other similarities do plants of group B have?

Competency-based Questions

A. Case-Based Questions

CG 5 Interdisciplinary Integration NCF 2023

Read the case carefully and answer the questions that follow.

Desert ecosystems have extreme heat, limited water and large temperature fluctuations. Plants like cacti store water in their thick stems while animals like camels store fat in their humps and have behavioral adaptations to conserve water.

- How do desert plants like cacti conserve water in such a harsh environment?
- What adaptations help camels survive in the extreme conditions of the desert?

B. Assertion and Reason Questions

CG 6 Logical and Analytical Reasoning NCF 2023

Read the following statements carefully and choose the correct option using the codes given below:

- A. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion
- B. Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion
- C. Assertion (A) is true, but Reason (R) is false
- D. Both Assertion (A) and Reason (R) are false

1. **Assertion (A):** Cactus plants store water in their thick stems.

Reason (R): Cactus plants have shallow roots that absorb water quickly.

2. **Assertion (A):** Snow leopards have thick fur to protect them from the cold.

Reason (R): Snow leopards are found in hot desert habitats.

3. **Assertion (A):** Camels can survive without water for long periods in the desert.

Reason (R): Camels store water in their humps which allows them to go without drinking for weeks.

C. Higher Order Thinking Skills **HOTS**

CG 9 Analysis, Evaluation and Synthesis NCF 2023

1. What do you think would happen if you planted a cactus in a heavy rainfall area like a tropical rainforest? Would it survive better or worse?
2. In what ways do the adaptations of snow leopards and mountain goats help them survive in cold habitats?

Projects and Activities

A. Projects

CG 6 Hands-on Experiential Learning NCF 2023

1. Visit a nearby park or garden and observe at least five plants and animals. Record their features and classify them based on size, type and habitat.
2. Prepare a chart comparing the size, stem type and height of at least three herbs, three shrubs and three trees in your area.

B. Activity

CG 6 Critical Thinking NCF 2023

Aim: To study adaptations of animals in different environments

Materials Required: Pictures or videos of forest, desert and aquatic animals

Procedure:

- Observe how elephants, camels and dolphins adapt to their habitats.

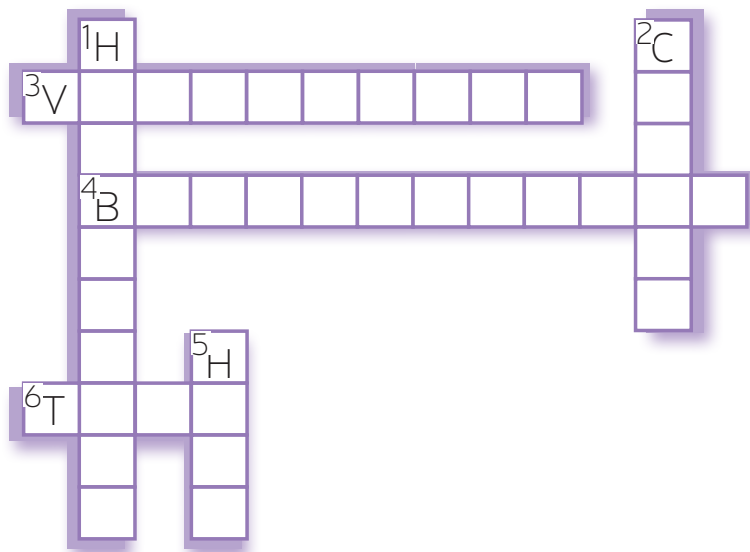
- List the special features of each animal based on their environment.

Observation:

Conclusion:

C. Solve the Crossword

Use the clues to complete the crossword using words from the chapter.



Down

- Animals that eat only plants
- Plant that stores water in their stems
- Plant with soft, tender stems

Across

- Animal with a backbone
- The variety of life on Earth
- A plant that grows to a height of more than 3 meters

Diagram Skills

CG 7 Holistic Development NCF 2023

- Draw a diagram of a leaf showing reticulate venation and parallel venation. Label the midrib, veins and the leaf type. Explain the difference between these two types of venation and their occurrence in dicot and monocot plants.
- Draw the structure of a dicot seed showing the cotyledons, embryo and seed coat. Label these parts and explain the function of the cotyledons.

Subject Integration

CG 5 Hands-on Experiential Learning NCF 2023

- How does plant biodiversity in science relate to conservation efforts in social studies?
(Social Studies Integration)
- How does deforestation impact habitats and food chains, integrating environmental studies and geography?
(Environmental Integration)