

1. The Living World : Adaptations and Classification



Let's recall.

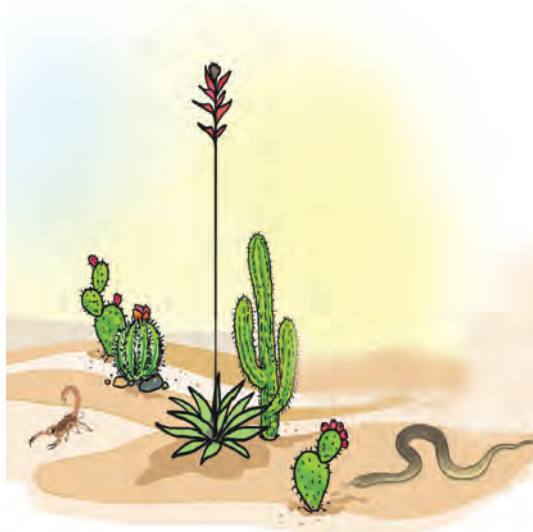
In what different ways is the diversity in living things seen ?

A great variety of plants is found on the earth. Some plants have colourful flowers. Some plants grow in water whereas some are to be found in deserts which have a scarcity of water. Some plants are found only in snowy regions. Some plants cannot be seen without a microscope whereas some are huge in size. Like plants, animals too show diversity. Some are unicellular, others, multicellular. Some are vertebrates whereas others are invertebrates. This world is full of a variety of animals – aquatic, terrestrial, amphibian, reptilian, aerial, etc. These observations give rise to the question – How did this great diversity come into being?



Can you tell ?

Are the plants and animals from Kashmir and Rajasthan of the same type? Can you elaborate on any differences between the two?



1.1 Desert

Coniferous trees like pine and deodar flourish in snowy regions like Kashmir. However, in the deserts of Rajasthan, plants like cactus and acacia (*babhul*) are to be found. The camel, a desert animal, is not found in Kashmir. What is the reason for these differences?

Adaptation

Gradual changes occur in the body parts and also in the behaviour of organisms which help them to adjust to their surroundings. Such changes are called **adaptations**. They take place over a long period of time.

Adaptation in plants

Observe and complete the chart. (Include other plants from your own region too.)

Plant	Habitat	Type of root	Characteristics of leaves	Characteristics of stem
Lotus	Aquatic	Fibrous	Large and round with waxy layer	Hollow and flexible
Cactus				
Banyan				

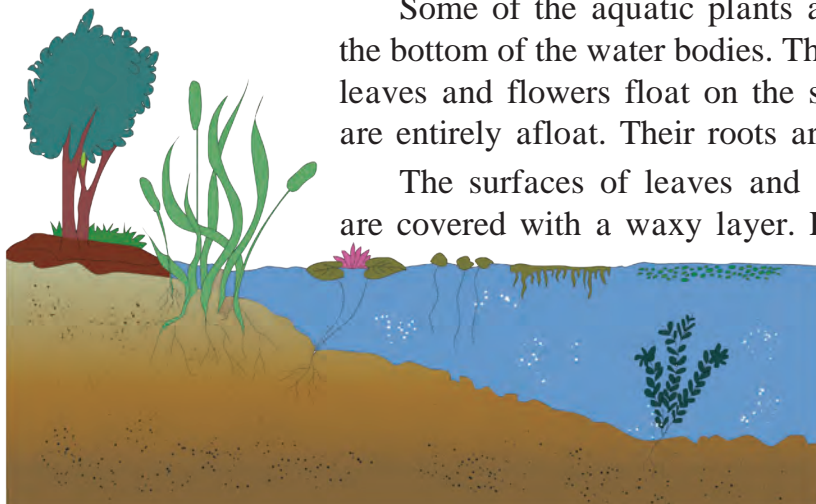
Adaptation in aquatic plants



Try this.

Visit various water bodies such as a river, brook, pond, lake, in your surroundings. What differences do you observe between terrestrial and aquatic plants?



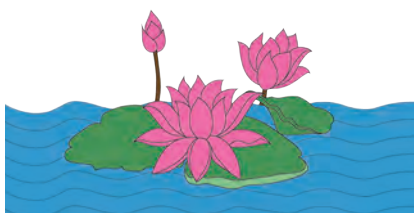


1.2 Aquatic plants

Some of the aquatic plants are firmly rooted in the soil at the bottom of the water bodies. Their stems are submerged, while leaves and flowers float on the surface. However, some plants are entirely afloat. Their roots are not anchored in the soil.

The surfaces of leaves and stems of many aquatic plants are covered with a waxy layer. Leaves of some aquatic plants

are thin and slender like a ribbon. This shape helps them to withstand fast currents of water. Air spaces in stems and petioles of aquatic plants are useful for floating in water.



1.3 Lotus stalk



Use your brain power!

1. Why does water trickle off lotus leaves?
2. Why don't the leaves of these plants rot in water?
3. Why are their roots short and fibrous?

Adaptation in desert plants



Try this.

Take two potted plants – one, a cactus and the other, a leafy plant. Tie plastic bags loosely around the leaves of these plants and keep them in sunlight from early in the morning. In the afternoon, bring those pots into the classroom and observe them.

Has the same quantity of water collected in both bags?

Desert plants are either leafless or their leaves are like small needles or have been modified into thorns. As a result, they lose very little water by evaporation. The stem stores water and food and is therefore fleshy. The stems are green as they perform photosynthesis in the absence of leaves. Their roots penetrate deep into the soil and some roots spread away into the soil in search of water. There is a thick layer of a waxy substance on the stems of these plants, too.



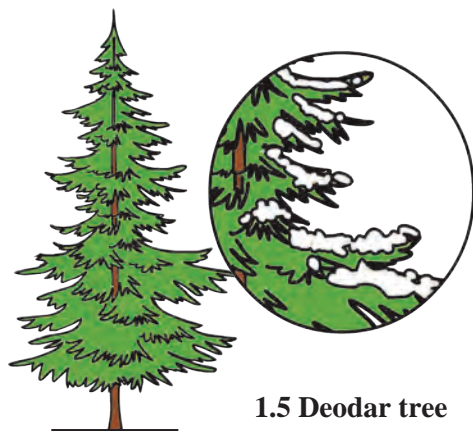
1.4 Cactus

Adaptation in plants of snowy regions



Can you tell ?

In what way are sloping branches useful to plants in a snowy region?



1.5 Deodar tree

Plants of snowy regions mainly include conifers like deodar and pine. These trees are conical in shape due to their sloping branches. In the heavy snowfall and extreme cold in these regions, their conical shape prevents the snow from accumulating on the tree and the thick bark helps the tree to withstand the cold.

Adaptation in plants of forest regions

A variety of plants – trees, shrubs and herbs – are found in forests. These plants compete amongst themselves for sunlight. Hence, trees grow tall to get sunlight and climbers and vines grow to a great height with the support of trees. Spring-like tendrils on the stems of some climbers is an example of adaptation.



1.6 Forest

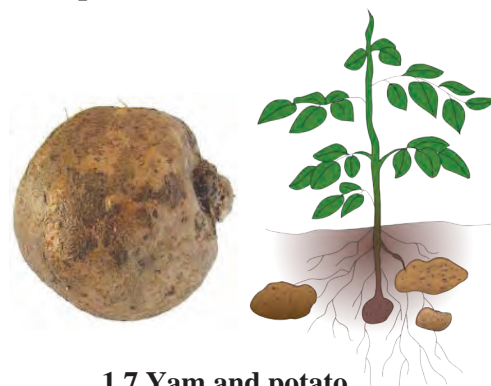
Adaptation in grassland plants

Diverse types of bushes and grasses are found in the grasslands. Fibrous roots of grasses prevent soil erosion. Forests in the equatorial region are dense. Animals like tiger, elephants and deer can remain hidden in these grasses. However, grasses in cold regions are very short. Animals like the rabbit are found in such grasses. Vast meadows are found in hilly areas as well as plains.



Observe and discuss.

Observe and note down the adaptations in the parts of plants like potato, groundnut, yam, water hyacinth, aloe, acacia, carrot, onion, beet, bitter-gourd, grape vine, etc. and other plants in your surroundings.



1.7 Yam and potato



Adaptation for ingestion of food in plants



1.8 Cuscuta

Most of the plants are anchored in the ground and are autotrophic. However, plants like dodder (*Cuscuta*) are parasitic. The plant body of dodder consists of yellow wire-like stems. It is leafless and cannot perform photosynthesis. However, it has haustorial (sucking) roots for absorbing nutrients from the host plant. These roots penetrate upto the conducting vessels of the host plant to absorb water and food.

Fungi do not have chlorophyll and cannot perform photosynthesis. They obtain food from starchy foodstuffs like *bhakri* and bread. They have root-like fibers for absorption of food.

Plants need nitrogen, phosphorus and potassium for growth. Plants that grow in soil which is deficient in nitrogen, like *drosera* (sundew), Venus flytrap, pitcher plant, etc. fulfill their need for nitrogen by consuming insects. Adaptations are seen in these plants which serve to attract insects and hold them captive.



1.9 Venus flytrap

My friend, the internet!

Collect information about plant adaptations from websites like – www.mbgnet.net

Adaptation in animals

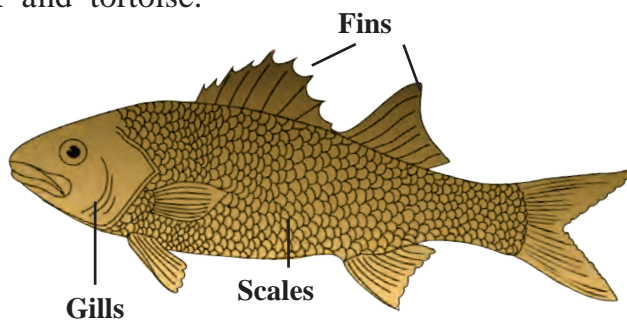
Make a list of animals in your surroundings. Compare the diversity of animals listed by your friends, with your list. Discuss the habitats, food-habits, characteristics of body structures like vertebral column, wings, gills, tails, etc. and prepare a chart.

What differences do you see between terrestrial and aquatic animals?

As compared to terrestrial animals, the skin and body shape of aquatic animals appear to have undergone changes. Fishes have scales on the skin and fins on the body. Their body tapers towards both its ends, like a spindle. Fish breathe with gills instead of a nose. Their eyes have transparent eyelids. They have air bladders within the body to help them to float.

Observe the bodies of the frog, duck and tortoise.

- (1) Of what use are their legs to these animals?
- (2) What helps frogs to breathe underwater?
- (3) Of what use are the long hind legs of a frog?
- (4) Why doesn't a duck get wet in water?

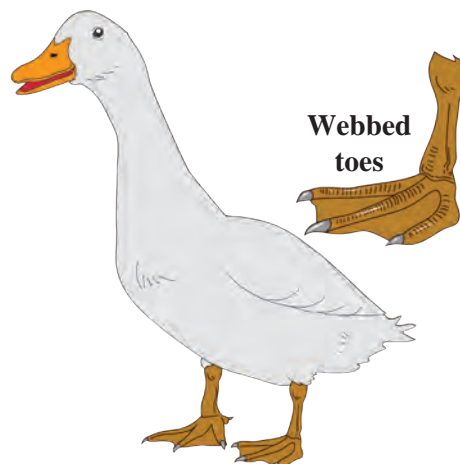


1.10 Fish



As the frog and duck have webbed toes, they can use their legs like oars. Water flows off the waxy feathers of birds like duck and waterhen. Webbed toes, slippery, smooth skin and a triangular head help frogs to swim easily through water. They can live on land as well as in water due to their ability to breathe through the skin in water and using the nose and lungs on land. The typical colours of a frog's back help it to hide among grasses.

Make a list of the names of some other amphibians you know and study their adaptations.



1.11 Duck

Adaptation in forest and grassland animals



1.12 Lion

Carnivorous animals like the wild dog, fox, tiger and lion have strong legs to run fast and capture their prey. They have claws and their canine teeth are sharp and pointed. What is the function of such teeth?

Tigers have padded paws. This enables them to silently stalk their prey and capture it easily. The eyes of predatory carnivores are located in the front of their head. It helps them to spot their prey from a long distance.



1.13 Blackbuck

The eyes of herbivores are below the forehead, on either side of the head. This gives them wide-angle vision which helps to protect them from predators. Their legs are long and tapering with strong hooves, which enables them to run fast taking long leaps. Their long and freely moving ears can receive sounds from long distances and different directions. Deer and blackbucks have colours that merge with their surroundings. Their teeth are strong for chewing tough plant material.

Adaptation in desert animals

Deserts are characterized by severe scarcity of water. Hence, desert animals have a thick skin to prevent loss of water from the body. Their legs are long with flat and cushioned soles. The nostrils are protected by folds of skin. The eyelashes are long and thick. Rats, snakes, spiders, lizards in deserts live in deep burrows during daytime and are active at night.



1.14 Desert animals



Adaptation in animals of snowy regions

From the internet, download images of animals like yak, polar bear, white fox, silver fox, mountain goat, Siberian husky dog and snow leopard. Compare these images with those of similar animals from tropical forests.

A white or silver body colour, long, thick hair on the skin are typical characteristics of animals of snowy region. How are these useful to them?

Adaptation in aerial animals



Can you tell ?

What is the main difference between vehicles on the road and aeroplanes?

The spindle-shaped body of birds also minimises the resistance of air while flying. With hollow bones, a body covering of feathers and modification of forelegs into wings, their body is light in weight and adapted for flying.

The body of insects also is light in weight and tapers at both ends. They can fly with two pairs of wings and also walk with six stick-like legs. Bats can fly with the help of the patagium, a thin fold of skin between their forelegs and hind legs.

Observe the various birds and insects in your area.

Adaptation in reptiles

Observe, from a distance, how snakes and earthworms creep. Which organs do they use for creeping? Are there any special changes for that purpose? Note any such changes. Animals like house lizard, garden lizard, crocodile use their muscles for creeping. Similarly, they show adaptations in skin, soles of feet, body colour, etc. For example, the house lizard and monitor lizards have clawed toes and thin soles, whereas snakes have a scaly skin.



1.17 Reptiles



1.15 Animals of snowy regions



Tapering slender body



1.16 Adaptations in birds



Adaptation for food in animals

We can categorize animals as herbivores and carnivores. Special adaptations are seen in each category to make the process of feeding easy. We will discuss this in greater detail in the chapter on Nutrition.

Watch the programmes on channels like National Geographic Wild, Discovery, etc. to learn about the feeding habits of animals like frogs, snakes, birds, mosquitoes, butterflies, etc.



1.18 Adaptation for food in animals



Complete the following chart from your own observations.

Adaptation	Animal	Use of adaptation
Sharp teeth	Lion, tiger	To tear the flesh
Long and pointed beak		
Short beak		
Long and sticky tongue		
Long neck		

Adaptation for blending with the surroundings

We cannot easily spot colourful butterflies, lizards and grasshoppers. They get camouflaged amidst grasses, parts of plants like stem, leaves, flowers, etc. That is because their colours blend with those of their surroundings.

Changes that take place in the various organs and life-processes of organisms, that enable them to live, feed, reproduce to perpetuate themselves and protect themselves from their enemies in specific surroundings, depending upon the habitat and its geographical conditions, are called adaptations.

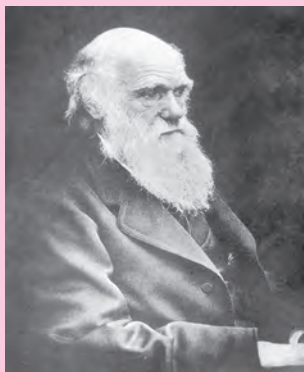


Always remember –

Adaptation is not a sudden process. It is gradual and continuous. Differences in the structure and appearance of present-day animals and animals of thousands of years ago are the adaptations that occurred according to prevailing conditions. It is our duty to conserve this diversity.



Great Scientists



Darwin's theory of evolution

Charles Darwin, a biologist, studied numerous types of plants and animals and suggested that only those organisms are likely to survive which can best adapt themselves to a changing environment. This is called the theory of **survival of the fittest**. This is Darwin's first principle.

If an organism is born with a new beneficial characteristic and is able to survive, this change is preserved in the next generation. This is Darwin's second principle and is called the theory of '**natural selection**'.

Classification of living organisms



Let's recall.

Why are living things classified?

Which are the criteria used for classification of plants and animals?

It is difficult to study and remember all the organisms in this diverse living world at the same time. Classification helps in this respect.

Different scientists have used different criteria and independently classified plants and animals. A hierarchy is formed in the classification that starts with Kingdom Animalia or Kingdom Plantae; further groups and sub-groups are formed depending upon basic similarities and differences. This is called the '**hierarchy of classification**'.

Hierarchy	Mango	Human
Kingdom	Plantae	Animalia
Phylum	Anthophyla	Chordata
Class	Dicotyledonae	Mammalia
Order	Sapindales	Primates
Family	Anacardiaceae	Hominidae
Genus	<i>Mangifera</i>	<i>Homo</i>
Species	<i>indica</i>	<i>sapiens</i>

Binomial nomenclature by Carl Linnaeus

Imagine that there are four students with a name 'Kabir' or 'Kiran' in a classroom. If you are talking about any one of them, how would you ensure that others know which one of them you are talking about, without any confusion? We would tell the full name i.e., the first name and the last name. This is similar to binomial nomenclature.

Binomial nomenclature is used to identify each organism. Accordingly, a scientific name has been assigned to each organism. It consists of two parts – the first part is 'genus' and second, 'species'. All identified organisms have been assigned a binomial name as per the guidelines of the International Code of Nomenclature.

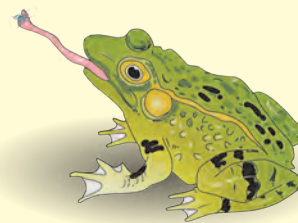
All the organisms of a species are so similar that irrespective of differences in colour, height, habitats and habits, they can reproduce among themselves and form new individuals like themselves. For example, all domestic cats in the world belong to the same species. The same is true in the case of animals like hen, cow, dog, etc. and plants like mango, wheat, maize, etc.



Following are some examples of organisms from Kingdom Plantae and Animalia classified by the binomial method of nomenclature :

Living Things	Scientific Name
Dog	<i>Canis lupus familiaris</i>
Cow	<i>Bos taurus</i>
Hibiscus	<i>Hibiscus rosa-sinensis</i>
Jowar	<i>Sorghum bicolor</i>

Find out the scientific names of other animals and plants in your surroundings and discuss in class.



29th April is observed as 'World Frog Protection Day'.

Killing or harming frogs is prohibited by the Wild Life Protection Act.



1. Find my match !

'A' Group

(1) Lotus

(2) Aloe

(3) Cuscuta

(4) Venus flytrap

'B' Group

(a) flower and leaves attract insects

(b) Haustorial roots for absorption of food

(c) Adapted to live in deserts

(d) Adapted to live in water.

2. Read the paragraph and answer the following questions.

I am a penguin. I live in polar region covered by snow. My abdomen is white. My skin is thick with a layer of fat underneath. My body is spindle-shaped. My wings are small. My toes are webbed. We live in flocks.

- Why is my skin white and thick and why is there a thick layer of fat underneath?
- Why do we live in flocks sticking close to each other?
- Which geographical region do I inhabit? Why?
- Which adaptations should you have to enable you to live permanently in the polar region? Why?

3. Who is lying?

- Cockroach – I have five legs.
- Hen – My toes are webbed.
- Cactus – My fleshy, green part is a leaf.

4. Read each of the following statements. Write a paragraph about adaptation with reference to each statement.

- There is extreme heat in deserts.
- Grasslands are lush green.
- Insects are found in large numbers.
- We hide.
- We have long ears.

5. Answer the following.

- Why is the camel called the 'Ship of the desert'?
- How can the plants like cactus and acacia live in deserts with scarce water?
- What is the inter-relationship between adaptations of organisms and their surroundings?
- How are organisms classified?

Activity : Find out how the gradual adaptation from primitive man to modern man must have taken place.

