

**SCIENCE**  
**STANDARD EIGHT**  
**TERM III**

## Note to the teacher...

As we present this revised edition of the Science Textbook, we would like to express our deepest gratitude to the learners and the teaching community for their enthusiastic responses.

In science some concepts could be subject to change from time to time as new theories and principles are constantly being evolved.

We have tried to present facts and concepts of science (both concrete and abstract) in a visually appealing manner without detracting from the content.

Activity based learning is now accepted as the basis of science education. These activities should be regarded as a means for open-ended investigation rather than for verification of principles/content given in the textbook has been designed to facilitate low-cost activities and experiments using locally available materials. With a view to streamlining the activities, we have now segregated them into three groups:

- **I Do** - activities to be done by an individual learner.
- **We Do** - activities to be done by a group of learners. and
- **We Observe** - activities to be demonstrated by the teacher.

The third group of activities have a higher degree of difficulty or require careful handling as it may involve dealing with chemicals, electricity etc.,

The “**More to know**” snippets in the text represents some unusual and interesting facts or information *in which the students need not be examined*.

The evaluation section is nothing but another space for learning in a different manner. As the focus is on understanding, rote learning is to be discouraged thoroughly. Application of learnt ideas, problem solving skills and critical thinking is to be encouraged. There could be scope for more than one answer to a question, which should be acknowledged always.

To facilitate further reference, books and websites have been suggested at the end of each lesson. Suggestions and constructive criticism are most welcome. Valuable suggestions will be duly incorporated.

**Authors**

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# 1. DIVERSITY IN LIVING ORGANISMS

Look at some of the plants and animals around you. Do they have the same shape and size? No, they differ in their size, shape and structure.

Our world is filled with many varieties of living organisms. Animals vary in size from the tiny amoeba to the huge blue whale. However, their bodies can adapt to their living condition.

## 1.1. CELL AS A FUNDAMENTAL UNIT OF LIFE

Cell is the structural and functional unit of all living organisms. Cell was discovered by Robert Hooke in 1665.

Theodor Schwann and Matthias Jacob Schleiden postulated the cell theory in 1839. The two important postulates of the cell theory are:

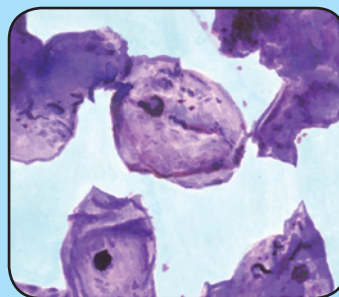
1. All living organisms are made up of cells.
2. New cells are formed only from the pre-existing cells.

### 1.1.1. Types of Human Cells Related to Function

Based on the function, the size and the shape of the cells differ. Generally, cells are round, spherical or elongated. Some cells are long and pointed at both ends. They are spindle shaped. Cells, sometimes, are quite long. Some are branched

#### ACTIVITY 1.1 WE OBSERVE

- ◆ We observe the microscopic slides of an epithelium cell through a compound microscope with the help of our teacher.
- ◆ We record the observations and draw the diagram.



Human cheek Cells

like the nerve cell or a neuron. The following table shows the various types of cells and their shape.

Example:-

Cells	Shape
Nerve cells	Star
Flame cells	Tubular
Gland cells	Cuboidal
Squamous epithelium	Polygonal
Columnar epithelium	Cylindrical
Egg cells	Oval
RBC	Round
Fibrous Muscle cells	Elongated

Let us learn about the cells and the functions of certain cells. A list is provided below :

Cells	Function
Squamous epithelium	Protective & give shape
Muscle cells	Contractile & Retractable
Fat cells	Storing more fat droplets
Nerve cells	Conduction of nerve impulses
Bone cells	Rigidity
Rods and cone cells	Vision & colour
Ear cochlear cells	Conduction of sound waves
Gland cells	Secretory

## 1.2. STRUCTURE AND FUNCTIONS OF CELL ORGANELLES

The cell organelles are present in the cytoplasmic matrix, which are the living structures of the cell. They have the properties of growth and multiplication at the time of necessity within the cell.

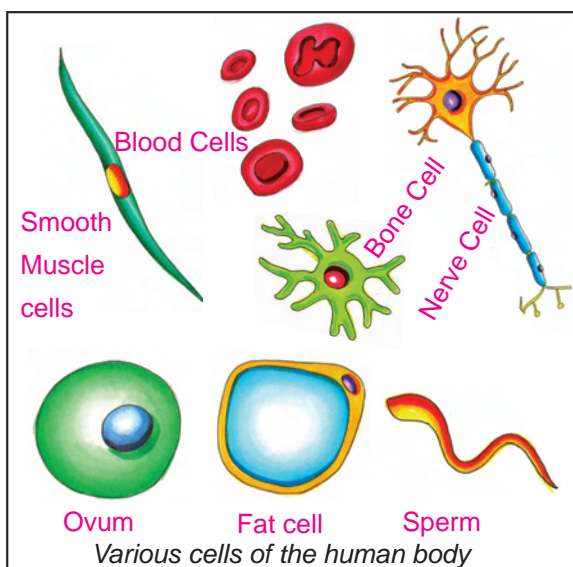
### 1.2.1. Cell Organelles and their Functions

The Cell Organelles are

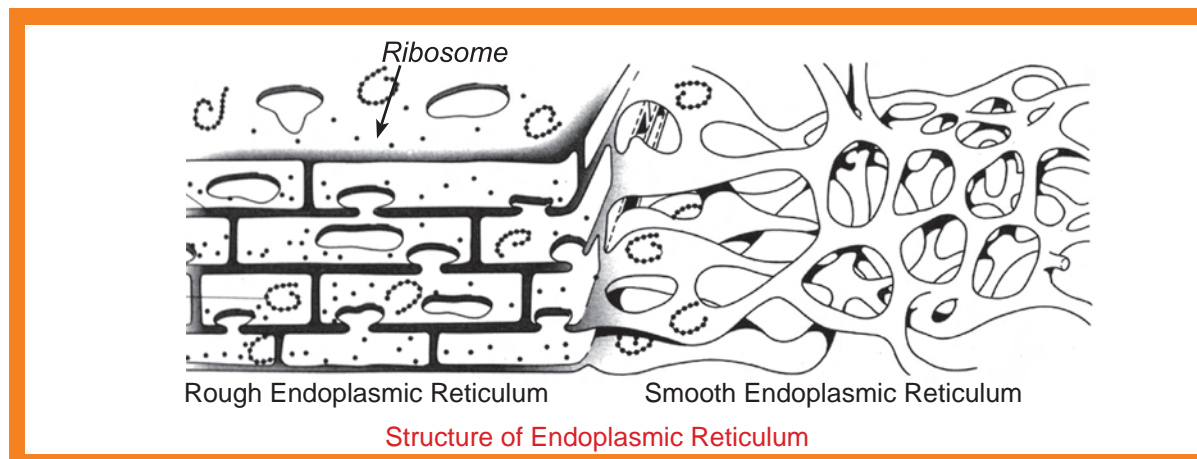
1. Endoplasmic Reticulum
2. Ribosome
3. Golgi apparatus
4. Lysosomes
5. Mitochondria
6. Centrioles

#### 1. Endoplasmic Reticulum

The electron microscopic study by Porter in 1945 revealed a network of membranous system with vacuoles in the endoplasm. This was named as endoplasmic reticulum by Porter in 1952. It is assumed that the endoplasmic reticulum originated by evagination of the nuclear membrane. Two types of endoplasmic reticulum have been observed. They are rough ER and smooth ER, based on the presence or absence of ribosome in the ER respectively.







## Functions of the Endoplasmic Reticulum

1. The endoplasmic reticulum provides an ultra structural and skeletal framework to the cell.
2. The smooth endoplasmic reticulum helps in the synthesis of lipids and in the breaking down of glycogen.
3. During cell division, the endoplasmic reticulum membranes disappear and form a new nuclear envelope after each nuclear division.

## 2. Ribosome

Many minute spherical structures known as ribosomes remain attached with the membrane of endoplasmic reticulum and form the (granular) rough endoplasmic reticulum. The ribosomes are produced in the nucleolus. Each ribosome is composed of two structural units, one smaller

and the other a larger unit. The small sub-units occur on the larger unit and form a cap-like structure. The ribosome also may occur freely in the cytoplasm. They are the sites of protein synthesis.

### MORE TO KNOW

Three researchers, who made the crystal structure of the ribosomes received the Nobel Prize for Chemistry in the year 2009 - **Venkatraman Ramakrishnan**, an Indian born U.S.A scientist, **Thomas Steitz** of U.S.A and **Ada Yoath** of Israel.

## 3. Golgi Apparatus

The electron microscopic observation of Golgi bodies reveals the presence of three membranous components. They are

- i. Disc shaped group of flattened sacs or cisternae
- ii. Small vesicles
- iii. Large vacuoles

## Functions

1. It produces secretory vesicles like zymogen granules that may have enzymes inside.
2. It forms certain yolk substances in the developing oocytes.
3. It helps in retinal pigment formation in the retinal cells.
4. It helps in the formation of acrosome in sperm cells.

## 4. Lysosomes

Lysosomes are a kind of waste disposal system of the cell. Lysosomes originate either from the Golgi apparatus or directly from the endoplasmic reticulum. Each lysosome is of a rounded structure. It is filled with dense material.

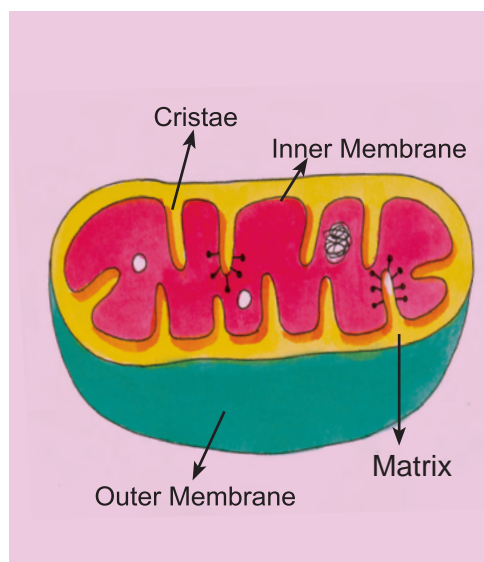
## Functions

1. Lysosomes help to keep the cell clean by digesting any foreign material as well as worn-out cell organelles.
2. When the cell gets damaged lysosomes may burst and the enzymes digest their own cell. Therefore lysosomes are also known as suicidal bags of a cell.

## 5. Mitochondria

In the cytoplasm of most cells, large size filamentous, rounded or rod-like structure known as mitochondria

may be seen. The mitochondria are bounded by two membranes made of proteins. The outer membrane forms a bag like structure around the inner membrane, which gives out many finger like folds on the lumen of the mitochondria. The folds of inner mitochondrial membrane are known as cristae.



Internal structure of Mitochondria

## Functions

Mitochondria are considered to be the power houses of the cell because they are the seat of cellular respiration. They also synthesize the energy rich compound ATP- Adenosine Tri Phosphate.

## 6. Centrioles

Centrioles were first described by **Henneguy** and **Leuhosseck** in 1897. The centrioles are micro tubular structures, found in two shapes-rods and granules located near the nucleus of the animal cell.

At the time of cell division, the centrioles produce spindle fibres and astral bodies. They also decide the plan of cell division.

### 1.2.2. Nucleus

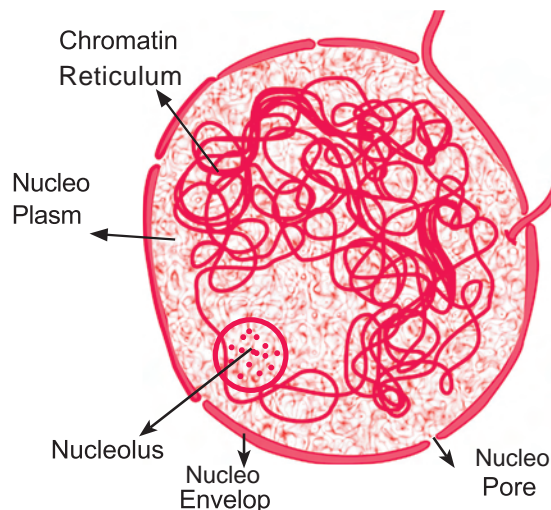
The nucleus is a highly specialised cell organelle which controls all the activities in a cell. It is the brain of a cell. It is round or oval in outline and possesses four parts.

They are :

1. Nuclear Membrane
2. Nucleoplasm
3. Chromatin Reticulum
4. Nucleolus

The nuclear membrane is the outer delicate covering of the nucleus. It contains pores of different dimensions.

The nucleoplasm is the protoplasmic substance of the nucleus. It is also known as nuclear sap. Chromatin Reticulum is composed of a network with highly elongated chromatin threads



Structure of Nucleus

which overlap one another and are embedded in the nucleoplasm. At the time of cell division, the chromosomes become clearly visible.

The nucleolus is generally present in the nucleus of most of the cells. The nucleolus become enlarged during active period of cell division and are less developed in quiescent stage. It is often called as cell organizer.

### Functions

1. It controls all metabolic processes and hereditary activities of the cell.
2. The nuclear membrane allows exchange of ions between the nucleoplasm and the cytoplasm.

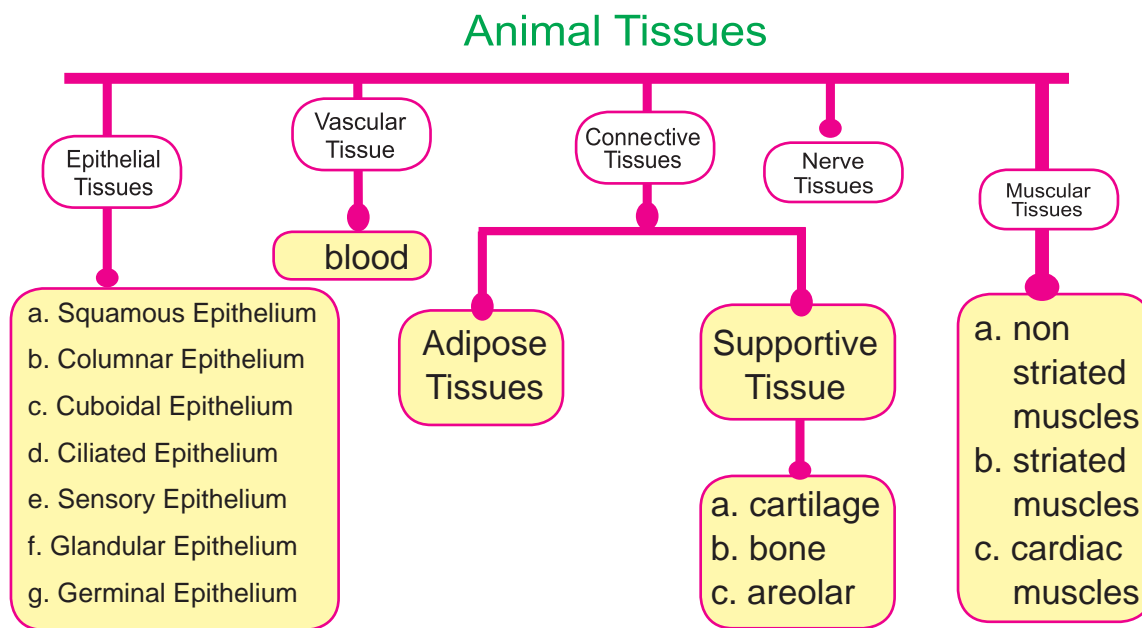
## 1.3. ORGANIZATION – CELLS – TISSUES – ORGANS – ORGAN SYSTEM

In multicellular animals, cells multiply by the process of cell division and specialise themselves in performing a particular function. For example, the muscle cells perform contraction and relaxation of organs that help in locomotion and conduction.

### 1.3.1. Tissues

A group of cells having common origin, structure and function is referred to as tissue. The bodies of animals are composed of several distinct tissues. On the basis of the function,

We can classify animal tissues into five broad categories.



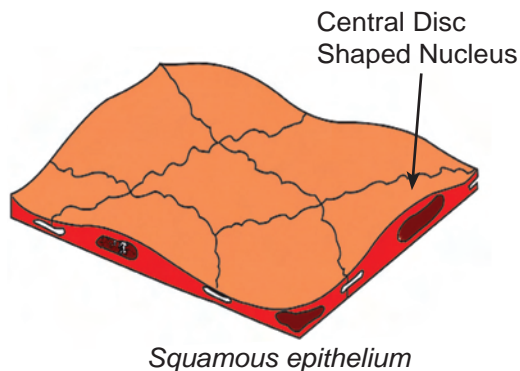
## 1. Epithelial Tissues

Epithelial tissues cover most organs and cavities within the body. Since the cells are closely packed, there is very little space between them. The absence of intercellular space is the characteristic of epithelial tissues. The cells in this tissue remain attached to the basement membrane that separates it from the other tissues.

Based on the shape, arrangement of cells and the functions, Epithelia are classified into seven types.

### A. Squamous Epithelium

Squamous epithelium consists of a single layer of flattened cells with a central disc like nucleus. The inner lining of the cheek and the membranes within the body are examples of this epithelium.

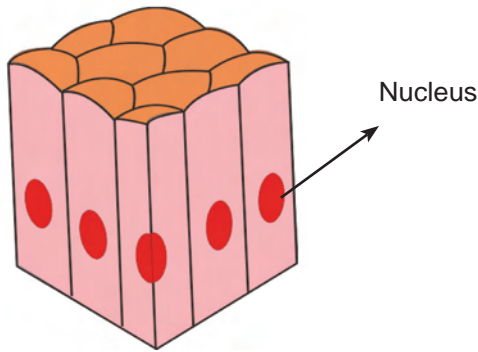


### Functions

Protection is their function. In the alveoli they help in exchange of gases.

### B. Columnar Epithelium

The cells are cylindrical and tall, the height of each cell being greater than its width. The oval nuclei are usually found at the base of these cells. E.g. : The inner lining of the intestine.



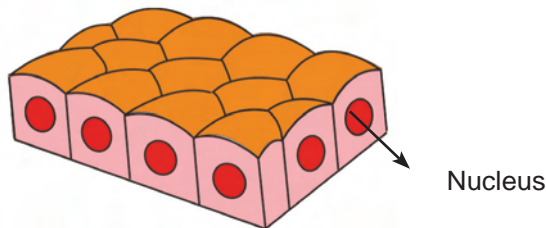
Columnar Epithelium

**Function**

Secretion of enzymes in the stomach and absorption of digested food in the intestine.

**C. Cuboidal Epithelium**

The cells of this epithelium are cube shaped. The walls of the intestine and the endocrine glands are examples of Cuboidal type of epithelium.



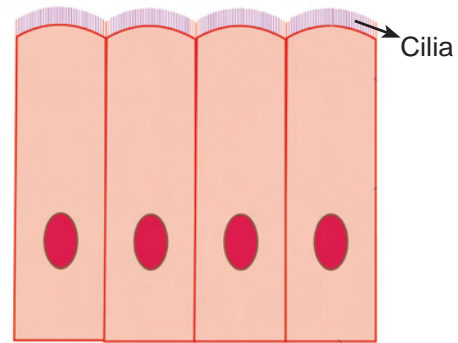
Cuboidal Epithelium

**Function**

This tissue helps in secretion and re-absorption of water in kidney tubules.

**D. Ciliated Epithelium**

Its structure is like the columnar epithelium. In addition it contains a number of fine protoplasmic projections called cilia. The wind pipe or trachea is internally lined by ciliated epithelium.



Ciliated Epithelium

**Function**

They remove the dust particles by the vibration of the cilia.

**E. Sensory Epithelium**

Some of the epithelial cells are modified to respond to stimuli and they form the sense organs.

**2. Vascular Tissues**

This is a liquid tissue adapted for the transportation of the nutritive materials, respiratory gases, excretory materials and others. It consists of 55% plasma and 45% blood cells. There are three kinds of blood cells.

They are,

- i) Red Blood Cells (Erythrocytes) : RBC
- ii) White Blood Cells (Leucocytes) : WBC
- iii) Blood Platelets (Thrombocytes)

i) **Erythrocytes:** The Red Blood Cells are present in vast majority. Each red cell is a circular or biconcave disc without a nucleus. These are formed in the bone marrow. Their life span



is between 100 and 120 days. They contain haemoglobin, a respiratory pigment that chiefly carries oxygen from the lungs to the other parts of the body.

ii) **Leucocytes:** The nucleated white blood cells are irregular and contain no pigment. They are produced in the bone marrow and in the lymph glands. The life span of WBC is two to three weeks.

They are the police force of the body and protect it from disease producing organisms.

iii) **Thrombocytes:** The blood platelets are the smallest of the blood cells. They are responsible for the clotting of the blood when blood vessels are damaged.

### 3. Connective tissues

The cells of connective tissues are loosely spaced and embedded in an inter cellular matrix. The matrix may be a jelly like fluid, dense or rigid. They are of two types. They are

- A) Adipose tissue
- B) Supportive tissue

**A) Adipose Tissue:-** This is modified for storing fat. The inter cellular material is more or less absent. It is found chiefly below the skin and in between the internal organs.

**B) Supportive Tissue:-** This tissue gives support to the entire body.

### ACTIVITY 1.2 WE OBSERVE

- ◆ We observe the different types of epithelial tissues under a compound microscope.
- ◆ We identify their important features.

The supportive tissues are of three types. They are :

- i) Cartilage tissue
- ii) Bone tissue
- iii) Areolar tissue

i) **Cartilage Tissue:-** It has widely spaced cells. The solid matrix is composed of proteins and sugars. The cartilage smoothens the bone surface at the joints and is also present in the nose, ear, trachea and larynx.

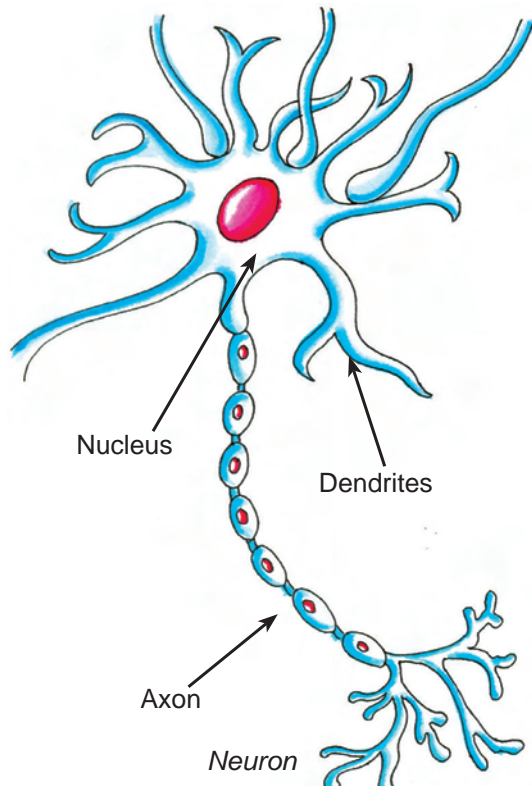
ii) **Bone Tissue:-** It forms the framework that supports the body. Bone cells are composed of calcium and phosphorous compounds. Two bones can be connected to each other by the ligament. This tissue is very elastic and the ligaments contain very little matrix.

iii) **Areolar Tissue:-** It is found between the skin and the muscles around the blood vessels, nerves and in the bone marrow. It fills the space inside the organs. It supports the internal organs and helps in repairing the tissues.

#### 4. Nervous Tissue

The nervous tissue is formed of nerve cells called neurons and nerve fibres. It has highly developed powers of irritability and conductivity. The brain, spinal cord and nerves are all composed of nervous tissues.

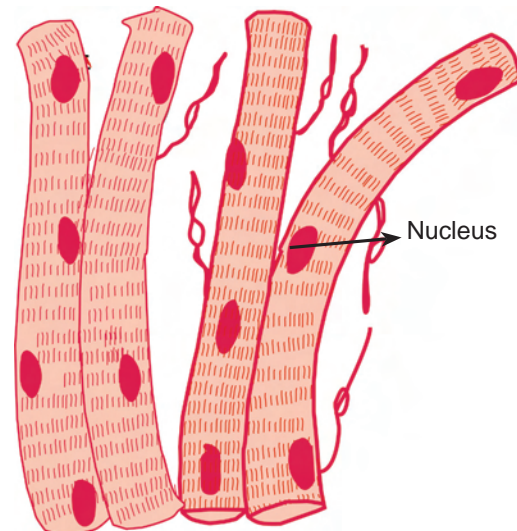
**Neurons:** It is a structural unit of the nervous system. It has a cell body



called cyton which assumes different shapes in the different regions of the nervous system, and a long tail called axon. Neurons may be either rounded or oval shaped. The protoplasm of the cyton has a number of small dark granules referred to as **Nissl's bodies**. The cyton gives out numerous branches called dendrons. These in turn, divide into finer branches called dendrites.

#### 5. Muscular Tissue

It consists of elongated cells, also called muscle fibres. This tissue is responsible for movement in our body. Muscular tissue contains proteins called **Contractile Proteins**. There are three types of muscular tissues:

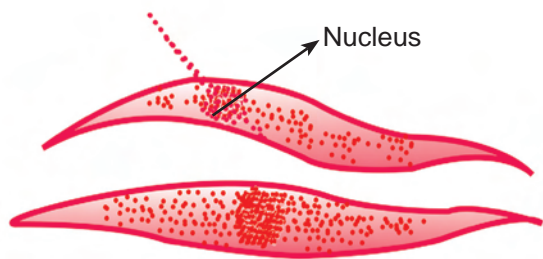


Striated Muscle

**a) Striated Muscle:** Since these muscles are attached to the skeleton, they are also called Skeletal Muscles. Each muscle fibre in this muscle is a long parallel sided cylindrical structure with cross striations and are hence named striped muscles. There are a number of nuclei placed near the periphery. They are covered by a membrane called Sarcolemma. Since their contraction is under conscious control they are also called voluntary muscles.

**b) Non-striated muscles:** The cells are arranged to form a sheet of muscular tissue commonly found in the wall of the digestive tract, urinary bladder and



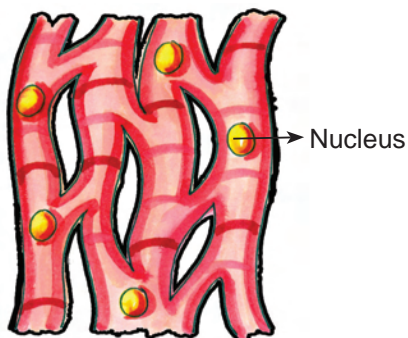


*Non-striated Muscles*

other internal organs. They are not under the control of our willpower. So, they are called involuntary muscles.

**c) Cardiac muscle:** In structure it is between the striped and unstriped muscles fibres. These are found only in the heart.

They are multi nucleated but the nuclei are centrally located. **Dark** and **Light** bands are present. The muscle of the heart show rhythmic contraction and relaxation **throughout life**. These involuntary muscles are called cardiac muscles.



*Cardiac Muscle*

## 1.3.2. ORGANS

Two or more kinds of tissues associate together to form an organ. An organ is a specialized part of the body performing some specific

functions. For example, the eye, has epithelial tissue, connective tissue, nervous tissue and muscular tissue. We have many such organs in our body like eyes, ears, lungs, etc.

Now let us study in detail the structure of the eyes.

### The eyes (Photoreceptor)

The sense organ eye is concerned with vision. The eye which is spherical in shape is kept in the orbit of the skull.

The eye is made up of three coats.

1. the outer- Sclerotic coat
2. the middle - Choroid coat
3. the inner - Retina coat

#### 1. Sclerotic coat

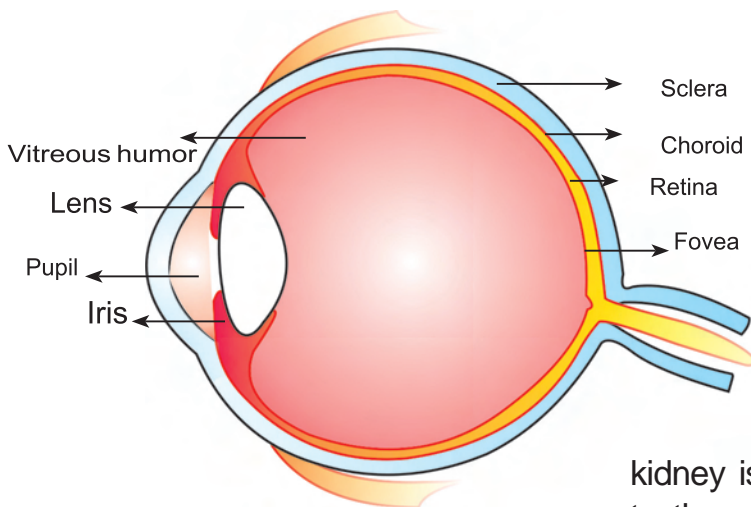
The outer sclerotic coat is white in colour except in the front where it forms the transparent cornea.

#### 2. Choroid coat

It is highly vascularised and deeply pigmented. In front of the eye the choroid coat forms the iris and lens. An opening called the pupil is present in the centre of the Iris.

#### 3. Retina coat

Retina is the sensitive part of an eye. It contains two types of receptor cells - the **rods and cones**. Rods are sensitive to different shades of light but not to colour. Cones are sensitive to colour. The fovea or yellow spots of the retina are densely packed



Cross-Section of the eye

with cones. It is the part, that is used when one concentrates on something. e.g. when reading, sewing etc. The lens is transparent, elastic and biconvex in shape. It is attached by ligaments to the ring shaped ciliary muscles. The aqueous humor is a clear, watery liquid between the cornea and the lens. The vitreous humor is a viscous liquid which fill the space between the lens and the retina. Vitreous humor helps in image formation and in maintaining the spherical shape of the eye.

### 1.3.3. Organ System

Several organs of the body together perform a common function. They constitute an organ system. Now let us discuss the excretory system and their functions.

#### Excretory system

Excretion is the elimination of metabolic waste products from the body. The major function of the excretory system is the elimination of nitrogenous waste products from the body. The mammalian urinary

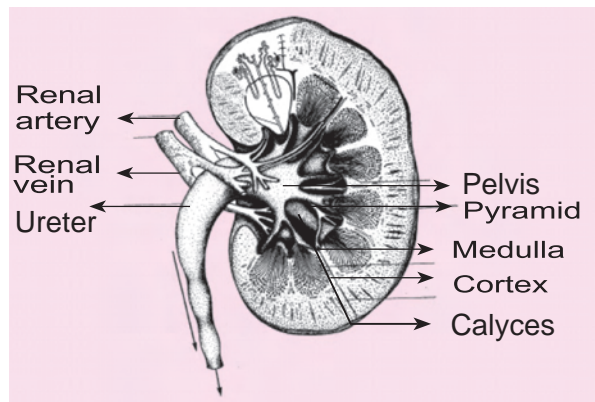
system consists of two kidneys, ureters and an urinary bladder.

#### Kidney

There is a pair of kidneys located inside the abdomen on either side of the vertebral column in the lumbar region and against the posterior abdominal wall. The right

kidney is slightly on the lower side due to the presence of the liver. The outer surface is **convex** and the inner surface is concave. The concave side is called **hilus**.

A vertical section of the kidney shows an outer dark portion called the **cortex** and an inner pale region called medulla. The medulla has a number of cone like

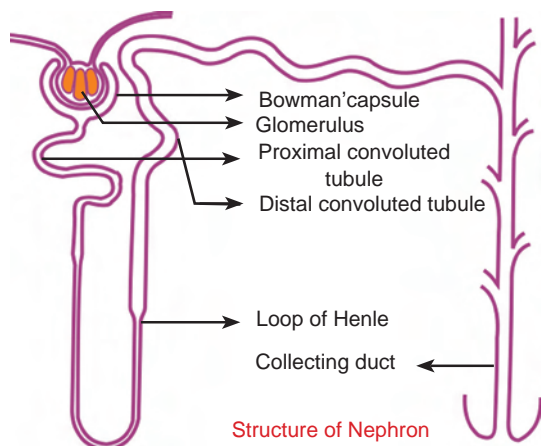


Vertical section of the kidney

structures called **pyramids**. The pelvis projects in between the pyramids as cup like spaces called **calyces**.

#### Nephrons

The kidney contains many minute tubular nephrons. These are the structural and functional units of the kidney.



Structure of Nephron

## Functions of the Kidney

- The kidney not only removes the waste product from the blood but also maintains a constant composition of blood.
- It maintains the  $p^H$  of blood.
- The kidney regulates the loss of excess water from the body.

### ACTIVITY 1.3 WE OBSERVE

- ◆ We observe the preserved organs like, the human eye, the kidney and models of some organs with the help of the teacher.

## 1.4. HOMEOSTASIS

Homeostasis is the maintenance of a constant internal environment of the body. It was first pointed out by the French physiologist **Claude Bernard** in 1857. All mammals are capable of maintaining a constant body temperature despite changes in the external temperature. Behavioural and physiological responses are two important regulating mechanisms that maintain the stability of Homeostasis.

## For example

The control of blood glucose level is a good example of homeostasis and it involves the secretion of at least six hormones. A rise in the blood glucose level stimulates insulin secretion whereas a fall in the blood glucose level inhibits insulin secretion and stimulates the secretion of glucagon and other hormones which raise blood glucose levels.

## 1.5. CELLULAR RESPIRATION

Respiration is the process by which chemical energy in organic molecules is released by oxidation. This energy is then made available to living cells in the form of ATP.

The biochemical process which occurs within cells is called cell respiration. If it uses oxygen, it is called as **aerobic respiration**. If the process takes place in the absence of oxygen, it is termed as **anaerobic respiration**.

### Aerobic respiration

It involves the utilisation of free oxygen and results in complete oxidation of glucose into carbon-dioxide and water.

### Anaerobic Respiration or Fermentation

Here oxygen is not utilized for respiration. So, it is called anaerobic respiration. It is often referred to as fermentation.

A variety of micro organisms use anaerobic respiration as their major source of ATP - E.g. bacteria, yeast.

## 1.6. METABOLISM

The word **metabolism** has its root from the Greek word **Metabole** which means **change**. The sum total of the biochemical reactions involved in the release and utilization of energy or energy exchange within the organism is termed as metabolism.

Such a chemical reaction in the metabolic process can be divided into two categories.

### 1. Anabolism

The simple substances obtained from the food are converted into cellular substance. This process is called Anabolism. During this process energy is not released.

#### **For example,**

Glucose → Glycogen and other sugars

Amino acids → Enzymes, hormones, proteins

Fatty acids → Cholesterol and other steroids.

### 2. Catabolism

Organic substances which are obtained from the food are broken down to produce energy for the purpose of physiological functions of the cells. This process is called as **catabolism**.

The following are examples for catabolism.

Glucose → CO<sub>2</sub>, Water and heat

Protein → amino acid

Fats → Glycerol, fatty acid, etc.

The repeated anabolism and catabolism reactions in the metabolic process maintain the homeostatic condition of the body.

Because of the metabolic process, the ionic balance is being maintained in the body.

The metabolic process is responsible for movement, growth, development, maintenance and repair of the cells, tissues and the human body.

This metabolic process occurs in different organs of living species.

## 1.7. DESIGN OF THE BODY – ITS BEAUTY – STRUCTURE AND FUNCTION – SOME EXAMPLES

Our body structure suits its function. The human foot, which was originally a climbing structure, has been readapted for bipedal walking and running.

Likewise, there are various animals that range from unicellular to multicellular organisms whose body structures suit their function and the movements they make.

Some animal movements are very beautiful. For example, an insect walking on the reverse of a leaf, the soaring of eagles and the running of Jaguar and other animals.





*Soaring of eagle*

## Body Contour

Contour is nothing but the shape of the body. Observe a race horse. Its body has been beautifully designed by nature. The body is spindle-shaped, its streamlined contour offering minimum resistance in air.



*Racehorse*

The body of fish is also streamlined so that it can freely swim in the water.



*Fish - Rohu (Belongs to Kendai)*

## How do animals fly?

The nature of the flight of an aeroplane differs from that of birds, animals and insects. Planes have fixed wings that create lift when air flows past. They move forward by pushing air through a jet engine or around a propeller very swiftly.

The wings of animals do both these jobs at once. When the wings flap downwards, the body of a bird or a bat or an insect is pushed forward and it is kept aloft and stable in its flight.



*Bat*

Bats are the only mammals that truly fly, by flapping their wings. The wing of bat is a fold of skin called patagium supported by all digits of the hand except the first.

Now let us learn about the various shapes of beaks.

They have been beautifully designed by nature to suit their feeding habits.

Pelicans feed on fish, which they scoop up in the flexible pouch that lies under their long beaks.



Pelicans

When a bird eats insects, worms or berries, its bill or beak helps it to get the food it wants. For most birds, bill is a special tool that has the right shape. In fact, the bills of many birds work just like the tools you may have at home.

A sparrow eats seeds it finds on the ground. Its bill helps it to pick up things easily.

A heron gets its food found in water. It lifts fish out of water, and swallows them.



Heron



Sparrow

**ACTIVITY 1.4** **I DO**  
 Find out the type of beaks in sparrow, parrot, eagle, duck, pelican etc. they can choose any 5 animals and draw the beaks they can get information from books or internet.

## EVALUATION

### 1. Match the following.

- |                          |     |                  |
|--------------------------|-----|------------------|
| a) Endoplasmic Reticulum | ___ | sweat gland      |
| b) Glandular Epithelium  | ___ | streamlined body |
| c) Retina                | ___ | porter           |
| d) Kidney                | ___ | cone cells       |
| e) Fish                  | ___ | nephron          |

## 2. Choose the correct answer :

- Muscle fibres are branched in \_\_\_\_\_ (cardiac/ skeletal) muscle.
- Bone and cartilage are types of \_\_\_\_\_ (nerves/ connective) tissues.
- Ciliated epithelium is found in \_\_\_\_\_ (trachea / oesophagus)

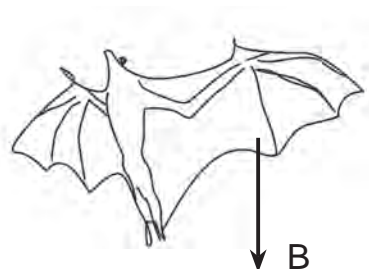
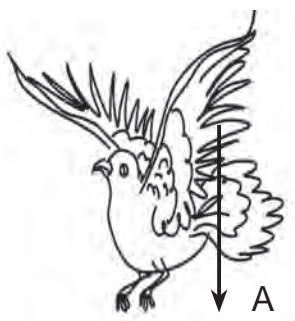
## 3. Choose the correct answer :

- Assertion : The image falls on Fovea
- Reasoning : Because of refraction of light by vitreous humors
  - A is correct      B is wrong
  - B is correct      A is wrong
  - B explains      A
  - A explains      B.

## 4. Complete the table by filling the functions.

Tissues	Functions
1) Columnar epithelium	
2) Glandular epithelium	
3) Ciliated epithelium	

- Identify part A and part B.
  - How does part A differ from part B ?



6. Our kidneys help our body to lead a healthy life - How?

7. Can you name and describe the muscle which is present only in our heart and works throughout our life?



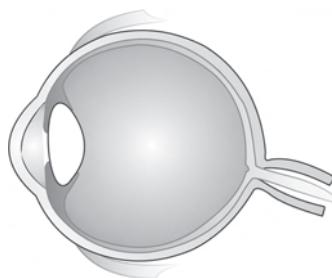
8. Identify the odd item from column A and write it under column B. Write the common features of the other two items in column.

S.No	A	B	C
1.	Cristae, Matrix, Ribosome		
2.	Nerve, Muscle, Golgi apparatus		

In Column A, 3 terms are given of which 2 belong to one group and 1 remains odd. Identify the odd item and write it under Column B. Write the common features of the other two under Column C.

9. Copy the diagram of the human eye. Label the following parts:

- The transparent part of the sclera.
- The spot on the retina where cones are most abundant.



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## 2. Conservation of Plants and Animals

### 2.1. CONSERVATION OF FOREST AND WILD LIFE

**Forest Ranger:** Hello Sheelan, Good Morning. Welcome to Topslip. This is one of the forest areas in the state, which is rich in bio-diversity. This is the Anaimalai Tiger Reserve.

**Sheelan :** Thank you sir. I was told to meet you and get all information regarding forest and wildlife.

**Forest Ranger:** Fine! I would be glad to share interesting facts about forests and wildlife with you. Trees, what do they mean to you?

**Sheelan:** Well, trees provide a number of economically valuable commodities, the most important being



*A forest*

timber, fuel wood, bamboo, resins, gums and leaves.

**Forest Ranger:** You know that they also support living organisms like animals, birds, insects and also many micro organisms.

**Sheelan:** Sir, it is said that forests are signs of prosperity.

**Forest Ranger:** Yes, Forests are of immense economic importance as they are a source of livelihood for many different human settlements as well as governments. They also provide timber and timber products which are a source of income for many people. They are habitats to diverse animal and plant species, they prevent soil erosion and help in maintaining the water cycle.

Hence it is important that we should conserve the existing forests covering the Himalayas, the Western and Eastern Ghats, and start establishing more National Parks and sanctuaries and maintaining properly the existing ones. Let us wander into the forest and explore its wonders.

Conservation can be defined in simple terms, as the management of resources in such a manner that largest number of people benefit for the longest possible time without harming the natural or ecological balance.

All non-domesticated and non cultivated biota found in the natural habitat are termed wildlife.

### Need for Conservation

- Wildlife is an asset to be protected and preserved because of its aesthetic, ecological, educational, historical and scientific values.
- Wildlife is essential for ecological balance.
- Wildlife is a big boost to tourism.
- The innumerable plants could yield products of immense medicinal value.
- Wildlife is an important source of genetic material used in genetic engineering.

India being a sub-tropical country, the temperature in most parts of the country is conducive to plant growth.

Based on this, the forests can be divided into five major types.

1. **Desert (Dry forests)** - Rajasthan, Southern parts of Punjab & Haryana
2. **Deciduous forests** - Peninsular region
3. **Tropical Evergreen forests** - Western Ghats, hilly areas in North Eastern India, The Sub Himalayan belt
4. **Hilly (mountainous) forests** - The Himalayas, Southern India
5. **Tidal forest** - Estuaries of Ganges & Mahanadi.

Plot or shade the different types of forests in India



- DESERT VEGETATION
- TROPICAL DECIDUOUS FOREST
- TROPICAL EVERGREEN FOREST
- MOUNTAIN FOREST
- TIDAL FOREST

## 2.2. DEFORESTATION AND AFFORESTATION

Selfish and anti-social elements have been destroying our natural wealth. Deforestation is one such dangerous act harming the ecological balance in the hilly areas.

The ill-effects of deforestation are reduced rainfall, change in climatic conditions, soil erosion and greenhouse effect (global warming). The process of planting new trees is called afforestation. This is generally done in deserts and open grounds to check the velocity of wind. How can people involve themselves in planting new trees?

Afforestation is aimed at two kinds of forestry programmes such as **social forestry** and **agro forestry**. In a locality, 'Tree lovers Club' can be started, and more people can be invited to join these clubs'. Tree saplings can be planted on the road side. Sapling can be gifted to friends on special occasions and celebrations.

### Social Forestry

In India, the Social Forestry Project was started in 1976. Its aim is to promote natural forests and create forests on unused lands. Social forestry

also aims at raising plantations by the common man so as to meet the growing demand for timber, fuel wood, fodder etc. thereby reducing the pressure on the traditional forest area.

### Agro Forestry

Planting of trees in and around agricultural boundaries and on marginal, private lands, in combination with agricultural crops is known as agro-forestry. The land can be used to raise agricultural crops and trees and to rear animals.

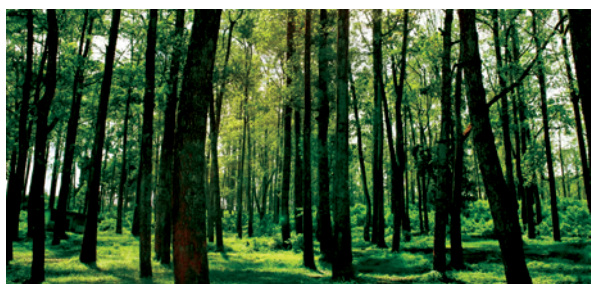
**MORE TO KNOW**

Cutting down forests increases the amount of carbon dioxide in the atmosphere, which can affect climate and destroy homes of many animals and plants. Deforestation leads to soil erosion, irregular rainfall and global warming.

## 2.3. FLORA AND FAUNA

India has a large variety of plants, about 45,000 species in number. Of these

- Flowering plants - 15,000
- Algae - 1,676
- Lichens - 1,940
- Fungi - 12,480
- Gymnosperms-64



**AFFORESTATION**



**DEFORESTATION**

SCIENCE





**Lion tailed monkey**

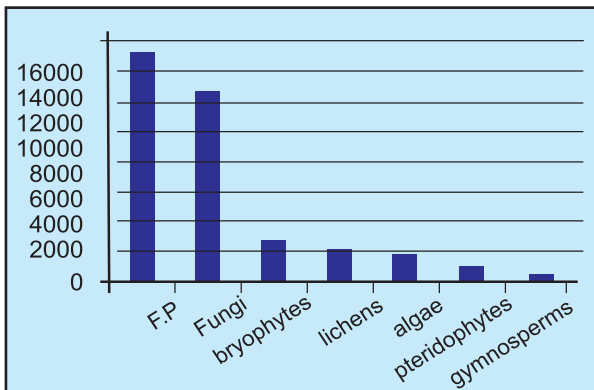
- Bryophytes - 2,843
- Pteridophytes - 1,012

India can be divided into eight distinct floristic regions.

India has a great variety of fauna numbering 81,251 species, which represent 6.67 % of the world's fauna. Of these,

- Insects - 60,000
- Mollusca - 5,000
- Mammals - 372
- Birds- 1,228
- Reptiles - 446
- Amphibians - 204
- Fishes - 2, 546

The Zoological Survey of India (ZSI) is responsible for carrying out surveys of the faunal resources of the country.



Deforestation refers to the indiscriminate cutting down of forest trees for use in wood-based industries (furniture making, paper, plywood) as domestic fuel and to accommodate agriculture and industries, in many parts of our country natural vegetation is being destroyed illegally.

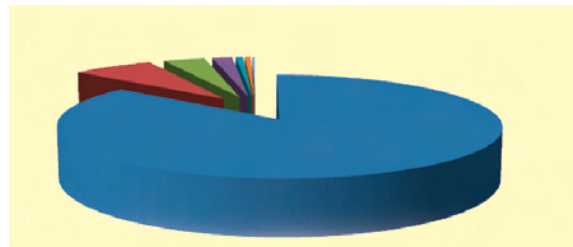
### ACTIVITY 2.1 WE DO

- We identify the different plants in our school campus and label them with common names and botanical names.
- We grow medicinally important plants like *Acalypha indica* (Kuppaimeni), *Phyllanthus amarus* (Keezhanelli) etc. in the school garden.

### 2.4. ENDANGERED SPECIES

Why did animals begin to live on land?

The very earliest creatures lived in water. Then, plants began to grow on land. These provided a new source of food and some animals came away from water to the land. They developed lungs instead of gills for breathing.



- Molluscs
- Birds
- Insects
- Fishes
- Reptiles
- Mammals

The first to come on land were the amphibians.

How did the dinosaurs become extinct?

They are prehistoric animals and disappeared due to natural calamities. Their names are of Greek terms. The word dinosaur means 'terrible lizard'

Today many species of animals are in danger of extinction. They include rhinos, whales, wolves, eagles and a few rain forest birds. Some are being killed for their horns, skins, bones or the land they live on. Others are being poisoned by man - made chemicals and are caught in traps. In ancient days, kings and high officials of Royal Britain hunted many wild animals. Today, poachers keep hunting the animals for their own benefits. Monal found in Himachal Pradesh is one of the most beautiful birds and it has been hunted to the level of extinction. Species that are less in number and are in considerable danger of becoming extinct are termed as **Endangered Species**.

There are many Projects which were

proposed by the Government of India. such as Project Tiger, Project Elephant, Operation Rhino, Gir Lion Project and the Crocodile Breeding Project.

**“Project Tiger”** The population of tigers (*Panthera tigris*) reduced from 40,000 to 1827 in 1972. On 1<sup>st</sup>, April 1973, Project Tiger was launched by the Government of India, it resulted in the increase of population of tiger.

**“Project Elephant”** Elephant is our National heritage animal. The population of the Indian elephant-*Elephas maximus*, is threatened due to habitat destruction and poaching for ivory. An ambitious programme “Project Elephant” was launched by the Ministry of Environment and Forests, which focuses on solving the problems of humans and elephants competing for the same habitat.

**“Operation Rhino”** Number of Indian rhinos or one horned Rhinoceroses (*R.unicornis*) are lost due to hunting and natural calamities. To protect the Indian species, a centrally sponsored

Due to deforestation and various causes, the populations of several species of plants and animals are at the verge of extinction and are considered endangered.



rehabilitation programme was undertaken in Dudhwa National Park.

**“Lion Sanctuary”** In 1972, a five year plan was proposed by the Government of Gujarat, to protect this magnificent feline species in the Gir Sanctuary. Its National Park and ecological balance of the habitat are properly protected. This has resulted in an increase in lion population.

**Crocodile Breeding Project:** Crocodile Breeding and Management Project was launched by the Government of India in 1975 for all the three endangered crocodile species namely, the fresh water crocodile (*Crocodylus palustris*), saltwater crocodile (*Crocodylus porosus*) and the rare gharial (*Cravialis gangeticus*)



### ACTIVITY 2.2

### I DO

- If I find stray dogs disturbing the public, I inform the Blue cross and request them to take care of the dogs.

## 2.5. RED DATA BOOK

It is a record book. The International Union for Conservation of Nature and Natural Resources (IUCN) maintains the Red Data Book. The Red Data Book contains a record of animals which are identified as endangered species or animals which are on the verge of extinction.

In India, animals like the Indian one - horned Rhino, Nilgiri Tahr, Lion - tailed Macaque, Asiatic Lion, Indian Tiger, Olive Ridley turtle and birds like Hornbill, Monal, Great Indian Bustard, and Pheasant are on the verge of extinction.

### MORE TO KNOW

NGC (National Green Corps) of the Ministry of Environment and Forests, Government of India.

National Animal - Tiger

National Bird - Peacock

National Flower - Lotus

National Fruit - Mango

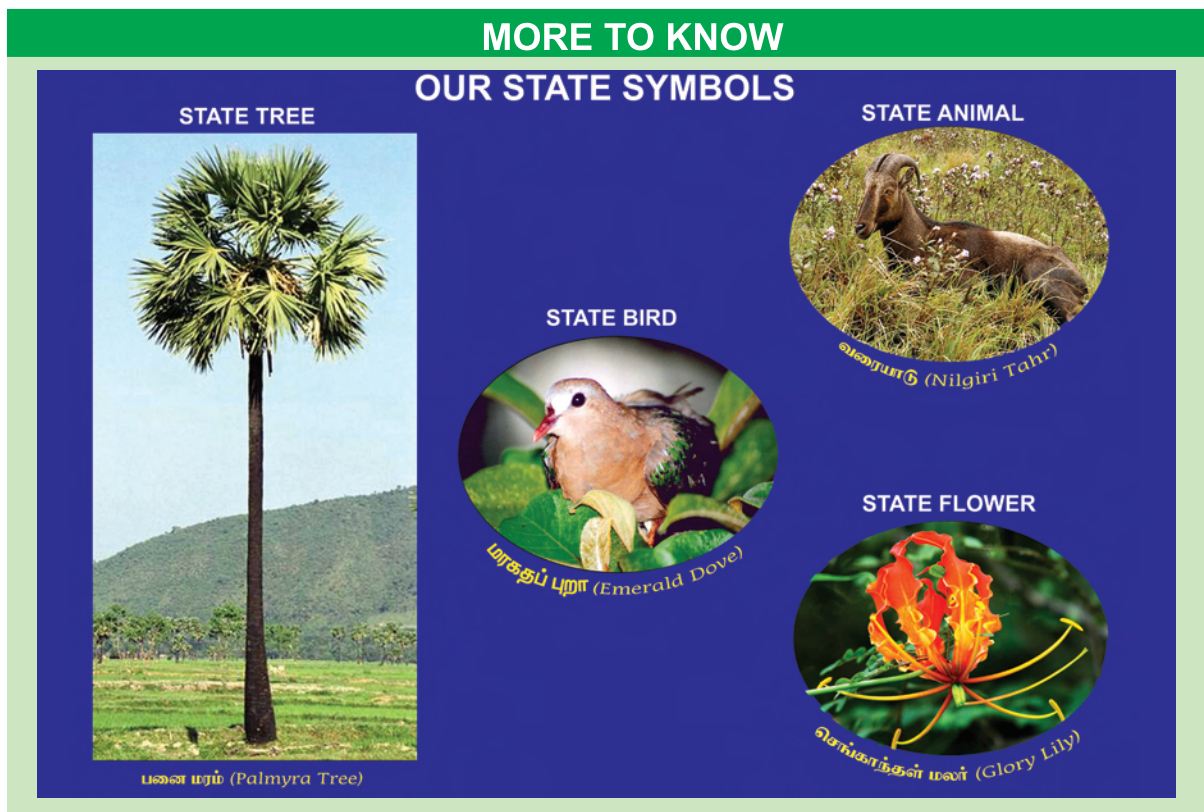
National Tree - Banyan tree

National Heritage Animal- Elephant

Lion, Tiger, Leopard, Snow leopard and Clouded leopard are found in India. Cheetahs became extinct in the 1950s.

The breeding area of the famous Olive Ridley's turtle is the Coast of Odisha while the Hawksbill Turtle is on the Coast of Tamil Nadu.





## 2.6. MIGRATION

All animals have an instinctive perception of the changes in temperature and just as people seek or spend their summer in cool places and their winter in warm places, all animals that can do so, shift their habitat in various seasons

**ARISTOTLE, 384 – 322 B.C**, History of animals

Aristotle recognized the seasonal movements of animals 2000 years ago. Migration is the phenomenon of the movement of animals from their habitat to some other habitat for a particular time or period every year for a specific function like safe breeding. The Vedanthangal Bird Sanctuary is one of the most spectacular breeding grounds in India. This Sanctuary has been protected by the local people for

over 250 years. **Vedanthangal** is a home for migratory birds such as pintail, garganey, grey wagtail, blue-winged tail, common sandpiper and other birds.

### Navigation Databanks of Migratory Birds

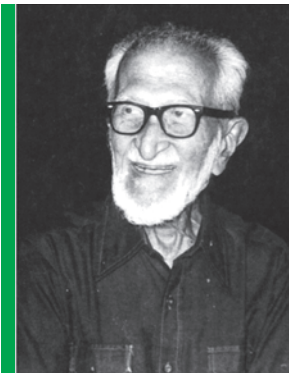
Each year as the days shorten and the food supply dwindles, many bird species prepare themselves for a long flight to warmer and more congenial



*Migration of birds*

### SCIENCE

climates. Then one day, driven by deep ancestral urges, they set out for unknown destinations. For example, the swallows of Northern Europe may fly 6800 miles (11,000 km) or so, to their African wintering grounds. When they move in groups they are protected from their predators. Many birds that migrate may be sensitive, to variations that occur in the earth's magnetic field. With the help of that, they find their destinations. Racing pigeons find their way home only by this method.



**Dr. Salim Ali**  
(1896 – 1987)

**Orinthologist,**  
known as  
“the bird man  
of India ”

### MORE TO KNOW



When a swarm of desert locust is on the move (a single swarm is about 50,000 million) it eats 3000 tons of vegetation in one day.

- The salmon fish travel up to 1500 miles (2400 km) from the sea to fresh water for breeding. Most of them die after breeding due to exhaustion.
- The Brazilian turtles travel up to 1250 miles (2000 km) in eight weeks time for breeding
- Barren grounds Caribou of North America travel over 3700 miles (5000 km) the longest annual migration of any mammal





*Migration of turtle*

## 2.7. WILD LIFE SANCTUARY AND NATIONAL PARKS

Why do herds of elephants enter the villages ?

It is not the herd of wild elephants that enter the village, or field etc. Humans have occupied their habitat (territory).

The Government has taken many steps to protect wild life by creating Sanctuaries and National Parks.

**Sanctuaries** : Sanctuaries are places where the animals are well protected from any danger. Hunting or capturing is highly prohibited there. In our country there are about 500 sanctuaries. One of the most important missions of sanctuaries, beyond caring for the animals is educating the people. The individuals should be educated about the importance of animals so that the

animals can be protected, and a good ecological balance can be maintained.

### Bio-diversity Loss

Loss of bio-diversity occurs when either the habitat essential for the survival of a species is destroyed or a particular species is destroyed. The former is more common. The latter reason is encountered when particular species are exploited for economical gain and hunted for sports or food.



*Peacock*

## Conservation of Plants and Animals

The main objectives and advantages of bio-diversity conservation are as follows:

- To preserve the continuity of food chain.
- The genetic diversity of plants and animals is preserved.
- It provides immediate benefits to the society such as recreation and tourism.
- It ensures the sustainable utilization of life supporting systems on earth.

### Some important Sanctuaries in Tamilnadu

S.No	NAME OF THE SANCTUARY / LOCATION	ANIMALS
1.	Mundanthurai and Kalakkadu Sanctuary-Tirunelveli	Lion- tailed monkey, Tiger
2.	Srivilliputtur sanctuary - Virudhunagar	Grizzled squirrel, Barking Deer
3.	Vedanthangal sanctuary - Kancheepuram	Cormorants, Grey Heron
4.	Mudhumalai sanctuary - The Nilgiris	Elephants, Gaur, Langur
5.	Viralimalai sanctuary - Tiruchirappalli	Wild Peacocks
6.	Kodikkarai sanctuary - Nagapattinam	Chital, Wild Bear

**NATIONAL PARKS:** National Park is an area dedicated to protect the environment, the natural objects and the wild life there in. Many National Parks were initially wild life sanctuaries. There are about 89 National Parks in India.

### Some important National Parks in India

Name and Location	Important Species
1. Bandipur National Park, Mysore - Karnataka	elephant, panther, barking deer, tiger, sambar.
2. Corbett National Park, Garhwal - Uttarpradesh	four horned antelope, elephant, chital, tiger, nilgai.
3. Gir National Park, Junagarh - Gujarat	Asiatic lion, panther, nilgai wild boar, chinkara.
4. Kaziranga National Park, Jorhat - Assam	elephant, one horned rhinoceros, wild buffalo, tiger, leopard.
5. Periyar Sanctuary, Idukki - Kerala	elephant, chital, nilgai, sambar, tiger, barking deer.

#### ACTIVITY 2.3

#### WE OBSERVE

We try to have a pet corner at school so that an awareness about the love and care of animals is created among students. eg. aquarium, birds.

## 2.8. THREATS TO BIO-DIVERSITY

Currently bio-diversity is estimated to range from 10 to 100 million species, of which only 1.4 million have been formally catalogued. There are 12 mega diversity centres in the world. India is one among them. Diversity among the living organisms is known as Bio-diversity. The bio-diversity of the earth is unimaginable.

The natural causes for the loss of bio-diversity are floods, earthquakes, landslides, natural competition between species, lack of pollination and diseases.

At the same time, man is the only cause for the loss of bio-diversity. Destruction of habitats occurs in the wake of developmental activities like

housing, agriculture, construction of dams, reservoirs, roads, railway tracks etc. These developmental activities affects bio-diversity.

Even the loss of a single species is a tragedy, because each form of life is a storehouse of irreplaceable genetic resources. Extinction is an irreversible process and when a species becomes extinct it leads to a cascade of extinctions.

All life on earth is interdependent and man is only a strand in this delicate web of relationships.

We keep rapidly eliminating the conditions necessary for the continued existence of bio-diversity due to over exploitation and ignorance.

### Nature Big Cats of India

Tigers and lions belong to the cat family. They are commonly known as "Big Cats".

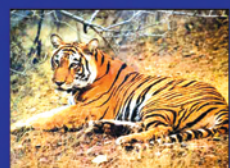
India is the only country having 5 species of big cats in its forests.

But, we should have, had six. Unfortunately, Cheetahs became extinct in 1950s





Lion



Tiger



Leopard



Snow Leopard



Clouded Leopard

No other country has this diversity.  
But have you realized its significance ?



### 2.9. TRADITIONAL KNOWLEDGE & PEOPLE'S INITIATIVES IN BIO-DIVERSITY

#### Sacred grove

These are the tracts of forests that are communally protected. As they have a temple or a deity pertaining to a particular forest, conservation of the sacred grove is of high priority and the whole community is involved in it. Tradition of tree worship (to protect) is observed all over India.

Worship of the species varies according to community, region, as well as use value as per availability. Because of traditions these species are protected. Traditional practices still followed by the tribals do not commercialize forest products and they never exploit them in an unsustainable manner.

Traditional knowledge is transmitted orally from generation to generation. It tends to be collectively owned and takes the form of stories, songs, folklore, proverbs, cultural value beliefs and rituals including the development of plant species and animal breeds.

**Sheelan:** Thank you, sir. I have gained a lot of knowledge about the importance of conserving our forests, I promise to spread this awareness to my friends and others.

#### ACTIVITY 2.4

#### I DO

- I present a sapling to the school on my birthday.
- I grow new plants in the empty places near my surroundings including the space inside my house and on the terrace of my house too.



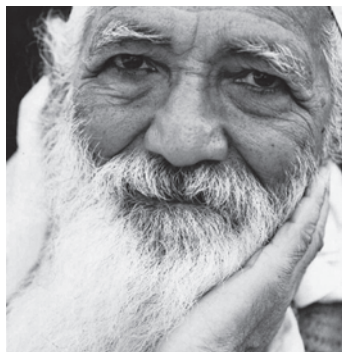
Sacred grove

## 2.10. HUMAN WILD LIFE CONFLICTS

It is a well known fact that man has been the sole creature responsible for the destruction of a large number of habitats, by over population, crowding, over exploitation etc. As human population keeps on increasing, we move into the forest land and occupy the habitats of plants and animals. So conflicts arise between the animals and man. Animals like elephants, wild buffaloes, and tigers come in groups to the farmlands for food and water and destroy them. Human beings encroach their lands for their benefits. So the animals are not to be blamed.

Protecting the environment is every one's responsibility. There is an increased awareness among the people towards the conservation of ecologically sensitive areas. Green Peace – a group devoted to environmental protection was responsible for the ban on whaling. In India, the Chipko movement was initiated by Sunderlal Bahuguna who stopped the felling of trees in some parts of the Himalayas.

Some of the activities in the areas of environmental conservation include:



Sunderlal Bahuguna

- Holding rallies and marches to bring about a mass awakening to environmental issues.
- Spreading awareness through mass media.
- Introducing environmental legislation to tackle the issue.



### ACTIVITY 2.5

### I DO

1. I list the factories disturbing the bio-diversity of my area. Some of these factories and human activities may disturb bio-diversity unknowingly. I list these human activities and analyse how these can be checked.
2. I find the endemic (confined to my area alone) plants and animals of the region where I live, and I specify how many varieties are very rare.



## EVALUATION

### 1. Choose the best answer:

- a. Species with low population numbers that are in considerable danger of elimination are termed as \_\_\_\_\_(endangered species / extinct)
  - b. All non-domesticated and non-cultivated biota in the natural environment are termed \_\_\_\_\_(wildlife / ordinary life)
  - c. The natural vegetation in a particular area is termed as \_\_\_\_\_(flora / forest)
  - d. All the organisms of the animal kingdom are termed as \_\_\_\_\_(fauna / protozoans)
  - e. The word 'dinosaur' means \_\_\_\_\_(terrible lizard / dragon lizard)
2. In India, Social Forestry was started in 1976. Its aim is to promote natural forests and create man made forests on unused lands. Suggest some steps to convert a sterile land into a cultivable one.
  3. Wildlife is essential for ecological balance and is a big attraction to tourism. Support the statement with your suggestions.
  4. People tried several methods to keep wild animals away from the fields and villages. Power fences were erected around the fields against animals. Is it a healthy practice? Do you have any alternative that would help both animals and man?
  5. Planting trees is known as afforestation and cutting down trees is deforestation. Is there any permanent solution to the problem of deforestation?
  6. Deforestation leads to many changes in the following but they are not in the right order. Arrange them in proper sequence.  
a) Earth   b) cities (urban area)   c) environment   d) wild animals  
e) villages   f) rural areas   g) the next generation

7. What will happen if
  - a. we go on cutting down trees?
  - b. the habitat of an animal is disturbed ?
  - c. the top layer of the soil is exposed ?
8. Indiscriminate cutting of trees will lead to deforestation. How does it reduce rainfall on the one hand and lead to floods on the other hand?

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