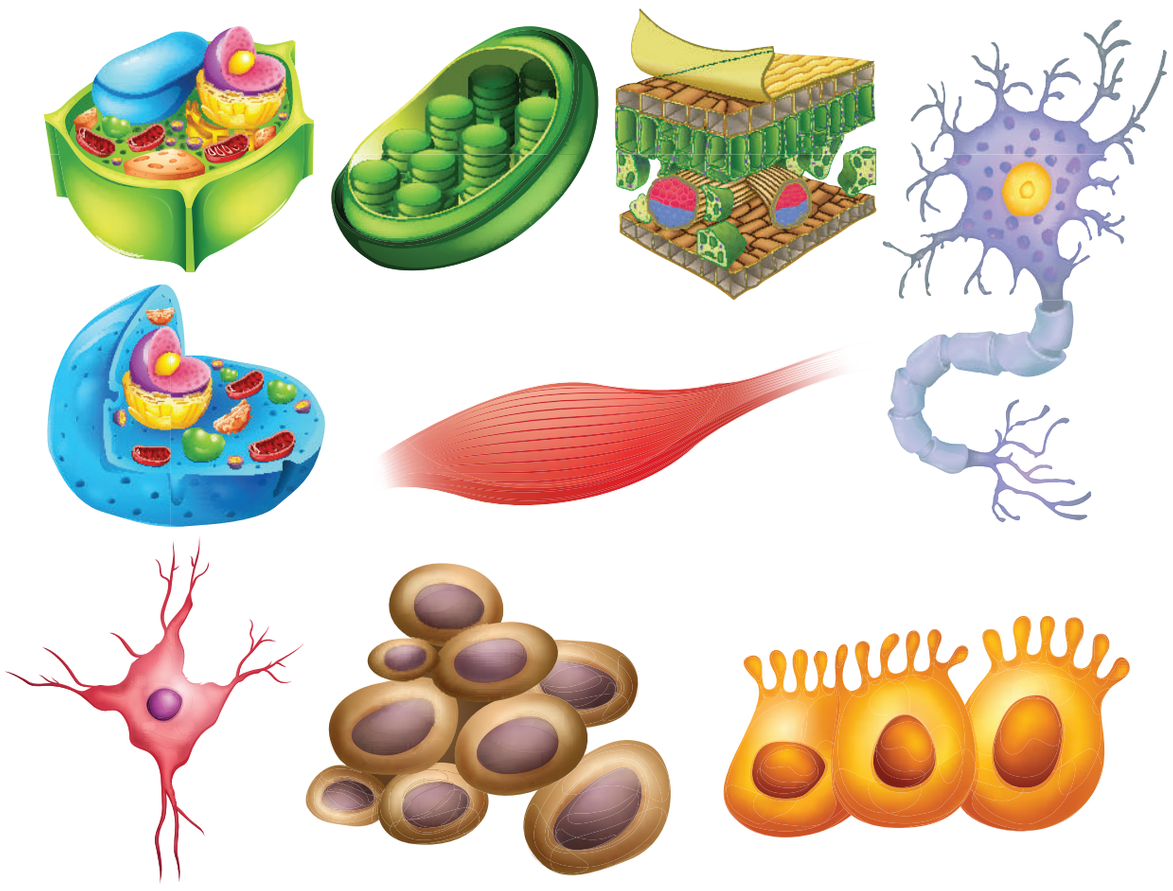
Unit 4

Cell Biology



Learning Objectives

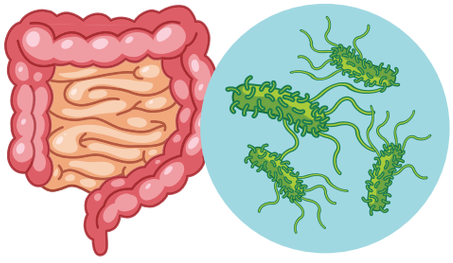
- To compare the plant cell with the animal cell and understand their similarities and dissimilarities
- To understand the cell as a fundamental unit of life
- To know and understand the different types of Human cells and their related functions
- To know the functions of different cell organelles
- To compare different cell organelles, their functions and know their similarities and specialties

Q1J6C9

Introduction

Sona had a dinner, some hour later, she experienced a stomach pain and went to a clinic. After examination, the Doctor told Sona that she had eaten food contaminated with a type of bacteria which might have caused food poisoning. Bacteria are micro-organisms that can be seen only under microscope and not seen through nacked eyes. Salmonella species is a bacteria that can cause food-borne infection.

Salmonella bacteria



Our earth is a beautiful place where in different types of organisms happily coexist. From minute mosses to huge conifers, invisible bacteria to huge blue whale, all have a basic unit called Cell. Let us study about the cell.

ACTIVITY 1

Do you remember the lesson studied in previous class, how will you find whether on object is living or non – living? Write it down. An object is living or non – living?

1. Form a team and work together to write down some of the functions of life, which you can remember.

_____

2. Do you think that an individual cell is living? Explain your answer

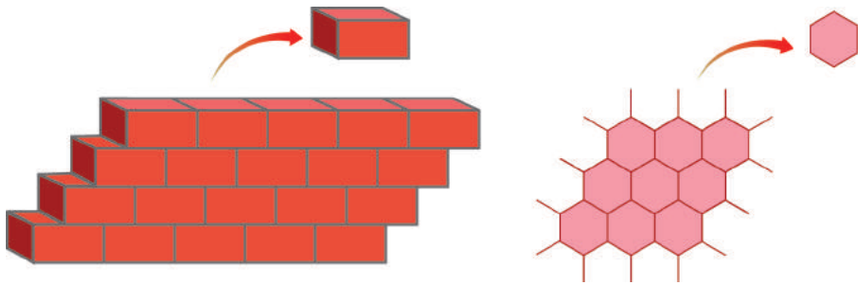
_____

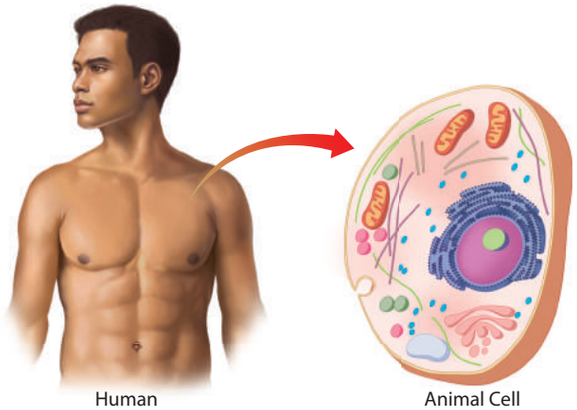
3. Write about various organelles of a cell which you know.

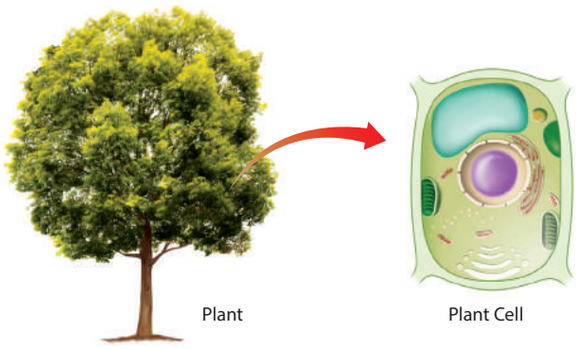
_____

4.1 Cell as a fundamental unit of life:

The building wall is made up of numerous bricks. In the similar manner, a bee hive is composed of numerous hexagonal units. Some of the organisms are represented by a single cell. Therefore, they show a simple organization. The basic functional unit of an organism is called, a cell. Structure of a cell represent the arrangement





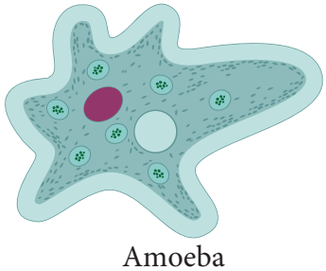


of parts or organells in a cell. Function is the activity of each part or organell in a cell. Cells are the basic building blocks of an organism. You learnt that atoms are the basic building blocks of matter in chapter three. Likewise, human body is made up of animal cell and plant is made up of plant cell.

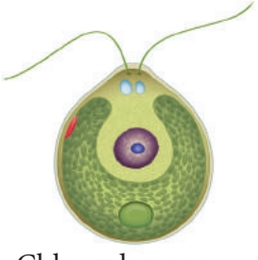
Unicellular organisms

Some simple organisms, are made up of only one cell. They are called unicellular organisms, which can be seen with the help of a microscope. There are many single – celled microscopic organisms.

Have a look at the image. *Chlamydomonas* and an *Amoeba*, a single cell organisms which carryout entire functions. The body of all organisms are made up of tiny building blocks called, cells. Bacteria are also one celled unicellular organisms.



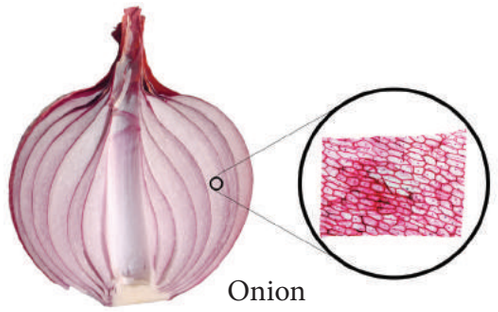
Amoeba



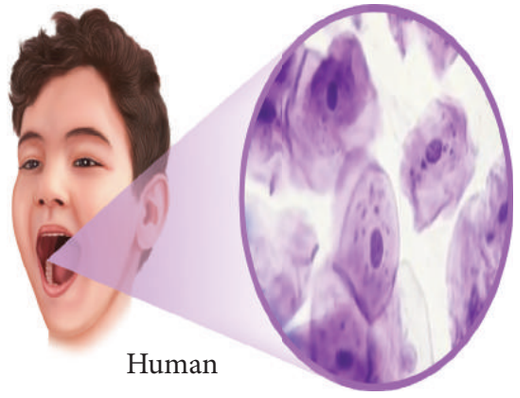
Chlamydomonas

Multicellular Organism

The cells are organized into tissues, organs and organ systems in a multicellular organism. Macroscopic organisms are visible and consists of many cells. The body of macroscopic organisms involves various functions. You can see cells of onion and human through a microscope. Onion and man are examples for multicellular organism.



Onion



Human

Cell to organism

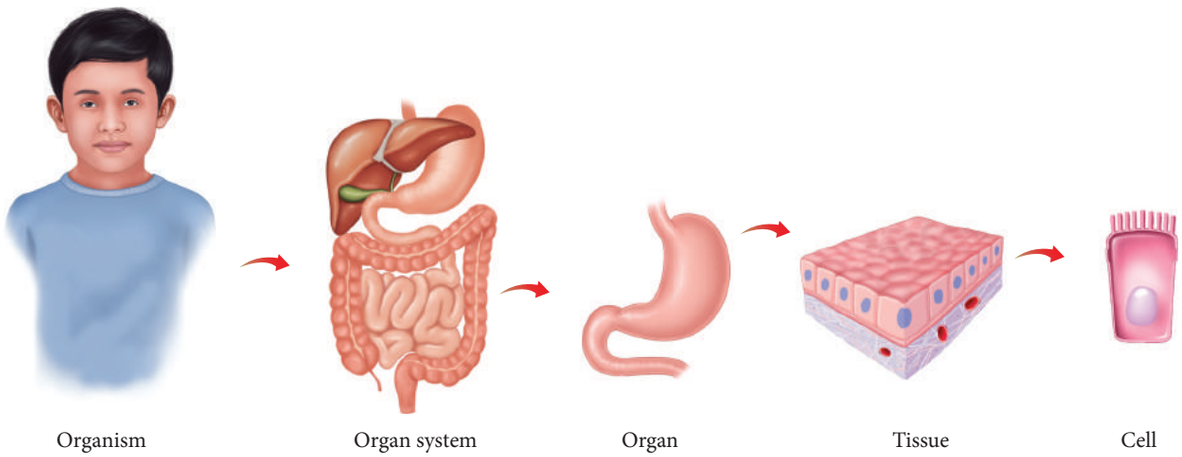
Many cells function together to form tissues, different tissues combined together to form an organ and different organs to form an organ system, which leads to form an organism.

Organisms.

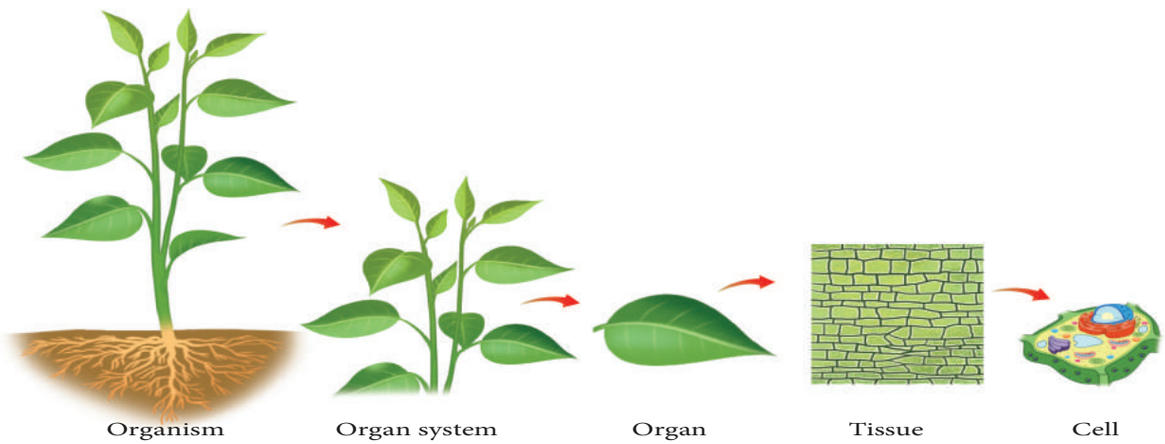
Many types of organ systems function together in a body, e.g. respiratory system, digestive system, excretory system circulatory system etc.

Organ System

Many organs together form an organ system, which is concerned with a specific function. For example, Respiratory system, which has organs like nostrils, nasal chamber, wind pipe and lungs that helps in the process of respiration. In a plant, the root system consists of primary root, secondary root and tertiary root, which does the function of conduction of



Human body



Plant body

water, mineral and also fixation.

Organ

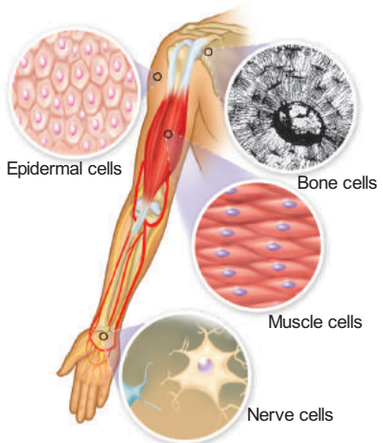
A collection of different tissues worked together to perform a specific function or functions is called an organ. Human body has different organs like stomach, eye, heart, lungs etc., are made up of different type of tissues. Plant have organs such as leaves, stems, and roots.

Tissue

Tissue is a group of cells, organized for a specific function. Tissues have following features like same shaped cells or different shaped cells to perform a common function. Human and other animals are made up of nervous, epithelial, connective and muscle tissues. Plants have transport, protective and ground tissues.

Cell

The cell is a basic structural and functional unit of life. Cell is the building unit of living organisms. You can see in a hand, how many types of cells are there to work together to perform its functions. So, cell is known as the basic unit of l[illegible]



ACTIVITY 2

Find out major organs that are part of the circulatory system of a human body and listout their functions

4.2 Plant and Animal cell comparison

Why do plant cells differ from animal cells? They differ from each other because they have to perform different functions.

F3J9Q4

Now you know that there are many main similarities between plant and animal cells. Let us see how they differ from one another as given in the picture (Activity 3).

4.3 Human cells related to functions

Different types of cells

Our body is made up of many different kinds of cells. Each type of cell is specialized to perform a specific function. Depending on the function, cell has specific shape, size and may have some components which other type of cells do not have. Have a look at the differences between nerve cells and red blood cells in the images. Even though there are many different types of cells, there are some components common to all type of cells. Let us take a look at this in the next section.

What's inside a cell?

Inside a cell, there are many tiny structures called cell organelles. These organelles are responsible for providing needs of the cell. They work to bring in food supplies, get rid of waste, protection and repair of the cell, and help it to grow and reproduce. Each one has a specific function to do for the cell. And, if any one organelle stops its function, then the cell is programmed to die.

Cell Structure

C4E2J5

As we have mentioned before, all cells have some common structure.

These are

1. Cell membrane
2. Cytoplasm, and
3. Nucleus (In most eukaryotic cells).

The structure of a typical plant and animal cell shows following peculiarities:

Cell membrane

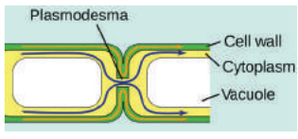
The boundary of an animal cell is the plasma membrane, which is also called as cell membrane

Cell wall - "Supporter and Protector"

All animal and plant cells are enclosed or surrounded by a cell membrane as you learned before. However, as you might have noticed previously that, animal cells often have an irregular shape, whereas plant cells have a much more regular and rigid shape.

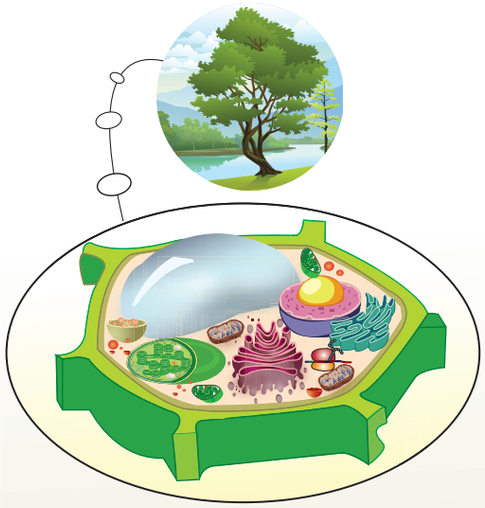
Plant cells have an additional layer on the outer side of the cell membrane. This is called as the cell wall, that provides a frame work for support and stability.

The cell wall is formed from various compounds, the main one being cellulose. Cellulose helps to maintain the shape of the plant cell. This allows the plant to remain rigid and upright even if it grows to great heights. Each cell is interconnected with its neighboring cells through openings called Plasmodesmata.



Cell wall

PLANT CELL



Cell Wall

The outer most covering of the plant cell. It maintain the shape and protect the cell.

Chloroplast

Chloroplast is a organelle, characterized by its two membranes and a high concentration of chlorophyll and carry out the photosynthesis.

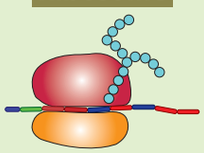
Large vacuole

filled with both inorganic and organic molecules, along with water to support the organelle

Nucleus

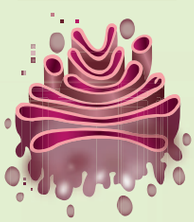
The nucleus is the control centre of the cell. It is the largest Organelle.

Ribosome



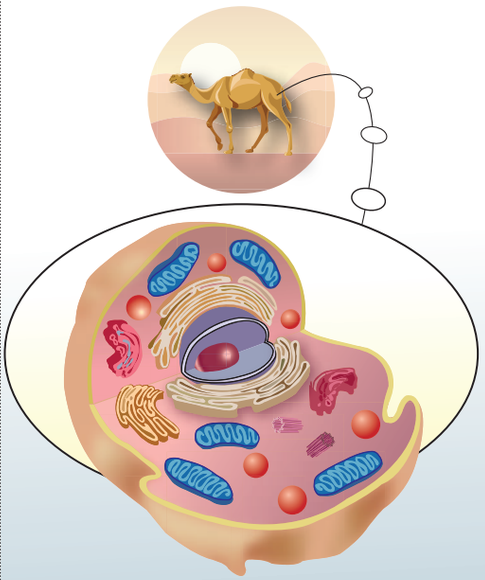
Ribosome is a minute particle consisting of RNA. They synthesize polypeptides and proteins.

Golgi body

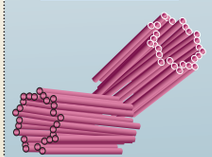


Golgi body is a complex of vesicles and folded membranes, involved in secretion and intracellular transport.

ANIMAL CELL



Centriole



Centriole is a pair of minute cylindrical, involved in the development of spindle fibres in cell division.

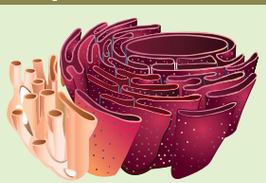
Small vacuole

filled with both inorganic and organic molecules, along with water to support the organelle

Cytoplasm

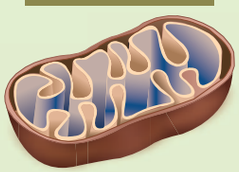
The cytoplasm includes all living parts of cell with in the cell membrane but excluding the nucleus.

Endoplasmic reticulum



Endoplasmic reticulum a network of membranous tubules and is involved in protein and lipid synthesis.

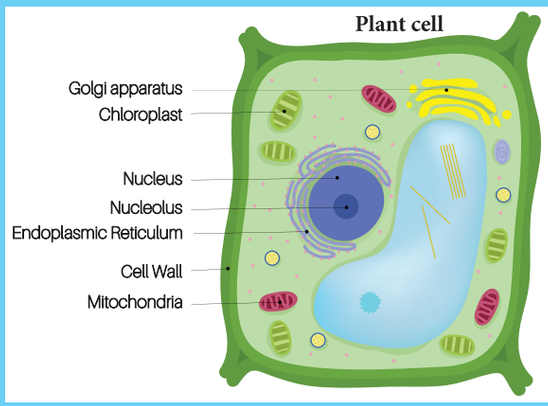
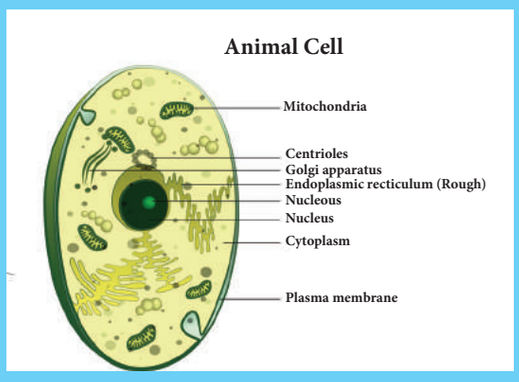
Mitochondria

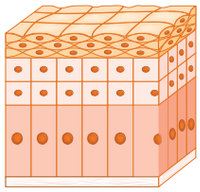
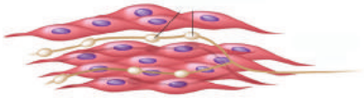


Mitochondria are organelles, They make most of the cell's supply of adenosine triphosphate (ATP), a molecule that cells use as a source of energy. Their main job is to convert energy.

ACTIVITY 3

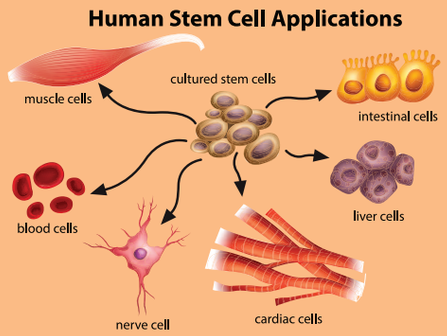
Study the pictures given and write the differences between cells that you observe in the given table

Plant cell	Animal Cell
	
1. 2. 3. 4. 5.	

Specialised cell	Structure	Function
Epithelial cells – they are mostly flat and columnar in shape		They cover the surface of the body for protection
Muscle cells – they are long and spindle shaped		They can contract and relax allowing the cell for movement.
Nerve cells – the body of nervous cell is branched with an elongated nerve fiber.		Nerve cells are specialized to carry and conduct messages that coordinate the functions of the body.
Red blood cells – Round, biconcave and disc shaped		Red blood cells carry oxygen and collect carbon dioxide from various part of the body.

Stem Cells

Stem cells are quite amazing as they can divide and multiply while at the same time with their ability to develop into any other type of cell. Embryonic stem cells are very special as they can become absolutely any type of cell in the body, for example, blood cell, nerve cell, muscle cell or gland cell. So they are utilized by the Scientist and Medicos, to cure and prevent some diseases like Spinal cord injury.



Cytoplasm - I am the "Area of Movement".

When you look at the temporary mounts of an onion peel, you can see a large region of each cell an enclosed by the cell membrane. This region takes up very little stain. It is called the cytoplasm.

The cytoplasm includes all living parts of the cell with in the cell membrane, excluding the nucleus. The cytoplasm is made up of the cytosol and cell organelles. The cytosol is a watery, jelly-like medium made up of 70% - 90% water and usually colourless.

Cell organelles and structures present in a cell are endoplasmic reticulum, vacuole, ribosome, golgi body, lysosome, mitochondria, centriole, chloroplast, surrounded by plasma membrane and cell wall.

Protoplasm vs. Cytoplasm

In particular, the material inside and outside the nuclear membrane is known as Protoplasm. The fluid inside the nucleus is known as the nuclear fluid or nucleoplasm and outside the nucleus is called as cytoplasm.

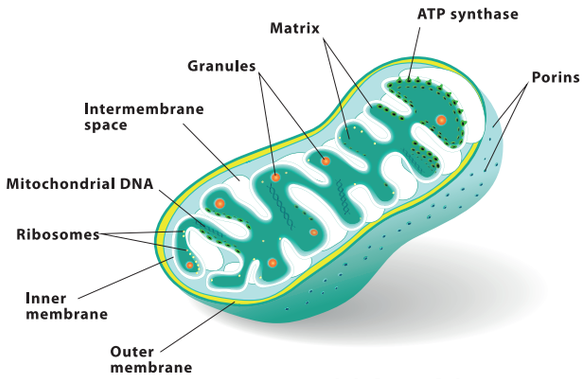
Inside the cytoplasm

Mitochondria - "Power house of the Cell".

Do you remember learning about the food as the energy source for the body? Just as wood is burnt to release the stored potential energy to make a fire to heat some water. The food that you ate to be broken down in order to release the energy which can be used by your body to function. Mitochondria are responsible to do this function.

Very active cells have more mitochondria than cells that are less active. Which type of cell, do you think, will have more mitochondria, a muscle cells or a bone cell?

Mitochondrian is an oval or rod shaped double membrane bounded organelle. Aerobic respiratory reactions take place with in the mitochondrion to release energy. So it is known as "the Power House" of the cell. The energy produced within the mitochondrion is used for all the metabolic activities of the cell



Mitichondrion

Chloroplast- "Food Producers".

Do you notice the green organelles present in plant cells and absent in animal cells. Chloroplasts are the only cell organelles that can produce food from the sun energy. Only plants with chloroplast are able to do photosynthesis because they contain the very important green pigment, chlorophyll. Chlorophyll can absorb radiant energy from the Sun and convert it to the chemical energy which can be used by the plants and animals. Animal cells lack chloroplasts and are unable to do photosynthesis.

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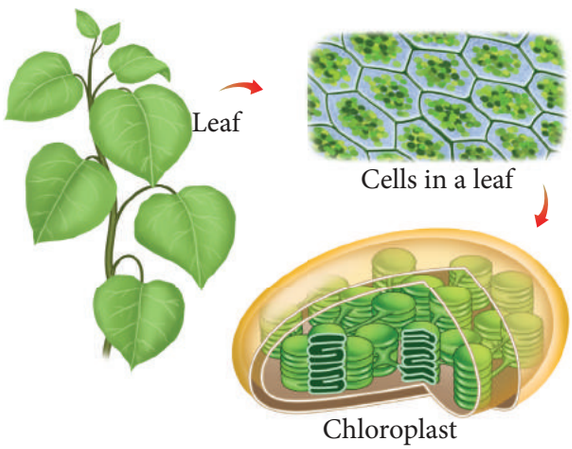


Observing chloroplast in algae

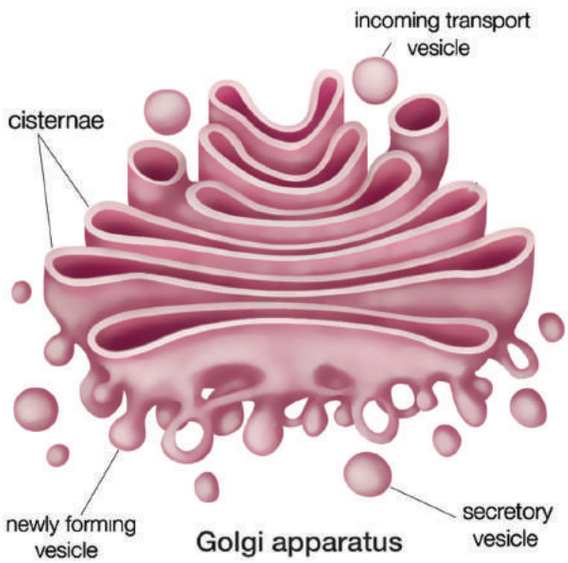
Collect some algae from pond and separate out thin filaments of them. Place a few filaments on a slide. Observe it under the microscope. Take the help of given figure and draw the picture of chloroplast that you have observed under the microscope. Chloroplast is a type of plastid. which are present only in plant cells. Plastids are mainly of two types - chromoplasts (coloured) and leucoplasts (colourless).

DO YOU KNOW?

Various range of these plastids impart different colours to various parts of plant. Chromoplast impart colour to flower and fruits. As fruits ripen, chloroplasts change to chromoplasts. Starch is converted to sugar.

Golgi Complex- I need a break

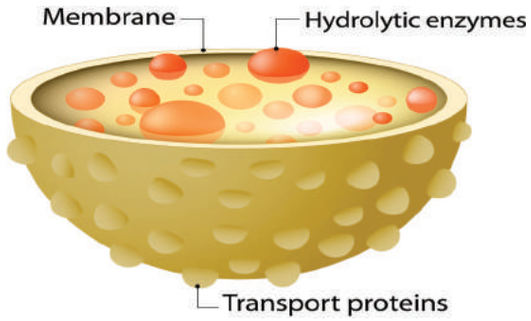
Membrane bounded sacs are stacked on top of the other with associated secretory vesicles are collectively known as golgi complex. Functions of golgi complex are the production of secretory substances, packaging and secretion. This is the secret behind the change in the colour and taste of fruits



Lysosome- "Suicidal Bag".

Everything I touch, I destroy

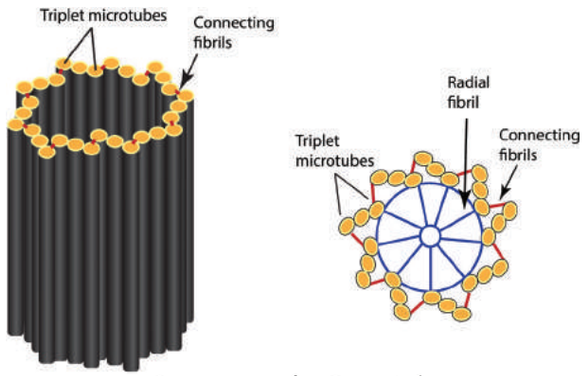
You will find organelles called as lysosomes, which are very small to view using a light microscope. They are the main digestive compartments of the cell. They lyse a cell, hence they are called "suicidal bag".



Lysome

Centrioles

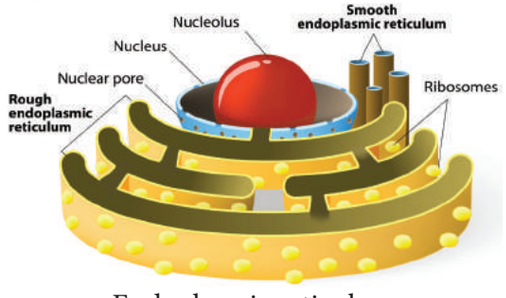
They are generally found close to the nucleus and are made up of tube-like structures. Centrioles or centrosomes are present only in animal cells and absent in plant cells. It helps in the separation of chromosomes during cell division.



Structure of a Centriole

Endoplasmic reticulum - You guys, be quiet, I have so much work to do

It is an inter membranous network made up of flat or tubular sacs within the cytoplasm. Endoplasmic reticulum is of two types. They are rough endoplasmic reticulum and smooth endoplasmic reticulum.



Endoplasmic reticulum

Rough endoplasmic reticulum are rough due to the ribosomes attached to the membrane. which helps in the synthesis of protein.

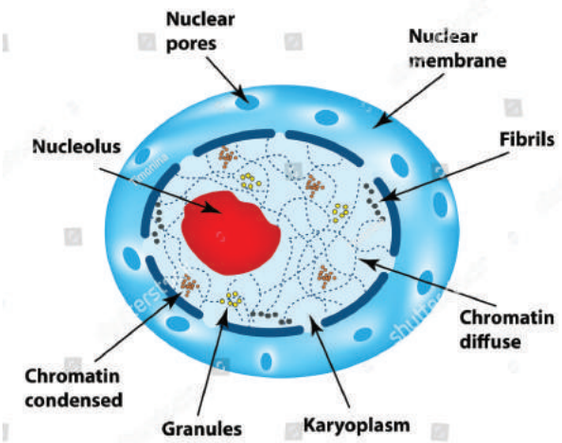
Smooth endoplasmic reticulum. It is a network of tubular sacs without ribosomes on the membrane. They play a role in the synthesis of lipids, steroids and also transport them within the cell.

Nucleus - Everyone do what I say. Acting like the "Brain" of the cell

- Plant and animal cells have a nucleus inside the cytoplasm. It is surrounded by a nuclear envelope. One or two nucleolus and the chromatin body are present inside the nucleus. During cell division, the chromatin body is organised into a chromosome. Storage of genetic material and transfers heredity characters from generation to generation are the functions of chromosome.

Functions of Nucleus

- In controls all the processes and chemical reactions that take place inside the cell.
- Inheritance of character from one generation to another.



Nucleus

ACTIVITY 3

Summarise what you have learnt

Now you've studied the internal structure of a cell. Let us summerise what we have learnt so far Complete this table by filling the main function of each of the cell structures

S.No	Cell Structure	Function(s)
1	Cell membrane	
2	Cell wall	
3	Cytoplasm	
4	Mitochondria	
5	Vacuole	
6	Chloroplast	
7	Endoplasmic reticulum	

Red blood cells

Red blood cells do not contain a nucleus. Without a nucleus, these cells die quickly; about two million red blood cells die every second! Luckily, the body produces new red blood cells every day.

POINTS TO REMEMBER

- Cells are the basic structural and functional units of all living organisms.
- Cells are microscopic and can be seen only under a microscope.
- Cell membranes are selectively permeable, which means they only allow certain substances to pass in and out of the cell.
- Plant cells have a cell wall around the cell membrane that is rigid and provides support and protection to the cell content.
- The Cytoplasm includes the organelles and the cytosol. The Cytosol is the jelly-like medium, in which many chemical reactions take cell. Everything inside the cell membrane, except the nucleus, is considered to be the cytoplasm.
- Mitochondria are responsible for cellular respiration, which releases the energy from the food.
- Plants have chloroplasts with chlorophyll pigments to produce food by photosynthesis.
- Stem cells are cells that have the ability to divide and develop into many different types of the cell.
- A group of different tissues makes up an organ.
- Organs working together in groups form a systems or organ systems.
- Organ systems make up an organism, such as a human.

Evaluation

J5H2R8

I. Choose the correct answer

1. Basis unit of life.
   A) Cell
   B) Protoplasm
   C) Cellulose
   D) Nucleus

2. I am the outer most layer of an animal cell. Who am I?
   A) Cell wall B) Nucleus
   C) Cell membrane D) Nuclear membrane

3. Which part of the cell is called the brain of the cell?
   A) Lysosome B) Ribosome
   C) Mitochondria D) Nucleus

4. _____ helps in cell division
   A) Endoplasmic reticulum
   B) Golgi complex
   C) Cnetrivole
   D) Nucleus

5. Suitable term for the various components of cell is__
   A) Tissue B) Nucleus
   C) Cell D) Cell organelle

II Fill in the Blanks

1. The jelly like substance present in the cell is called _____
2. I convert the Sun's energy into food for the plant. Who am I? ____
3. Mature Red blood cell do not contain a ____.
4. Unicellular organisms can only be seen under a _____.
5. Cytoplasm plus nucleoplasm is equal to___.

III. True or False – If false give the correct answer

1. Animal cells have a cell wall.
2. Salmonella is a unicellular bacteria.
3. Cell membrane is fully permeable
4. Only plant cells have chloroplasts.
5. Human stomach is an organ.
6. Ribosomes are small organelles with a membrane.

IV. Match the following

1.	Transporting channel	Nucleus
2.	Suicidal bag	Endoplasmic reticulum
3.	Control room	Lysosome
4.	Power house	Chloroplast
5.	Food producer	Mitochondria

V. Analogy

1. Bacteria : microorganism :: mango tree : _____
2. Adipose : tissue :: eye : _____
3. Cell wall : plant cell :: centriole : ____
4. Chloroplast : photosynthesis :: mitochondria : ____

VI. Choose the correct alternative from the following

1. **Assertion (A) :** Tissue is a group of dissimilar cells.
   Reason (R) : Muscle is made up of Muscle cell.
   a). Both A and R are true
   b). Both A and R are false
   c). A is true but R is false.
   d). A is false but R is true.
2. **Assertion (A) :** Majority of cells cannot be seen directly with naked eye because.
   Reason (R) : Cells are microscopic.
   a). Both A and R are true
   b). Both A and R are false
   c). A is true but R is false.
   d). A is false but R is true.

VII. Very short answer

1. What are the functions of cell wall in plant cell?
2. Which organelle uses energy from sunlight to make starch?

3. What are the main things in a nucleus?
4. What does cell membrane do?
5. Why lysosomes are known as scavengers of the cell?
6. Teacher said "A virus is not an organism" Do you agree with this statement or not? Explain Why?

VIII. Give short Answer

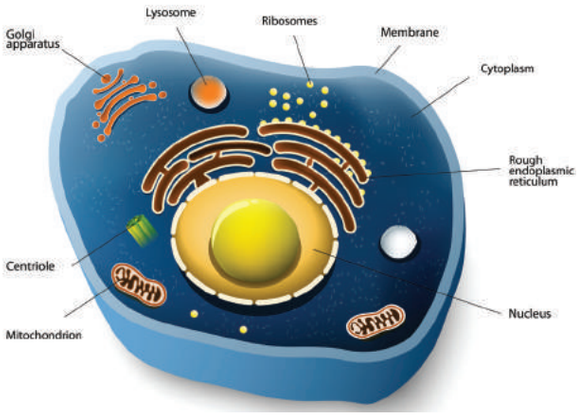
1. Why the cell is very important for us?
2. Distinguish between the following pairs
   Smooth ER and Rough ER
   Cell wall and cell membrane
   Chloroplast and mitochondria
3. Write correct sequence from cell to organism?
4. Write a short note on nucleus.
5. Classify the following terms into cells, tissues, organs and write in the tabular column given below
   Neuron, Lungs. Xylem, brain, adipose, Leaf, RBC, WBC, hand, muscle, heart, ovum, squamous, phloem, cartilage.

Cell	Tissue	organ

6. On the lines given below, write about what you have learned from the activities done in this lesson.
   Let me tell you about some of the important things I've learned about cells. First, I'll start with…_____
   _____.

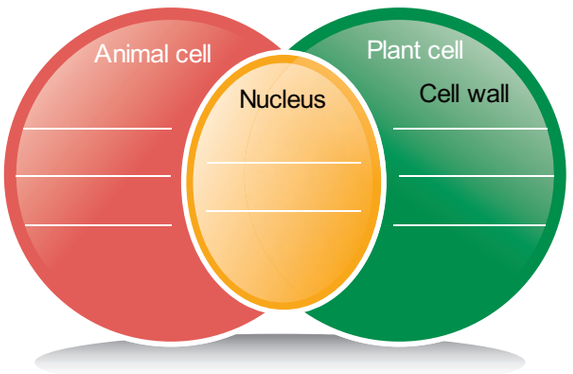
IX. Give long answer

1. Write about any three organelles in detail.
2. In a situation, how to explain, while your friend ask what is this, never seen before?



Animal Cell

3. Compare the plant cell and the animal cell and complete the illustration given below.

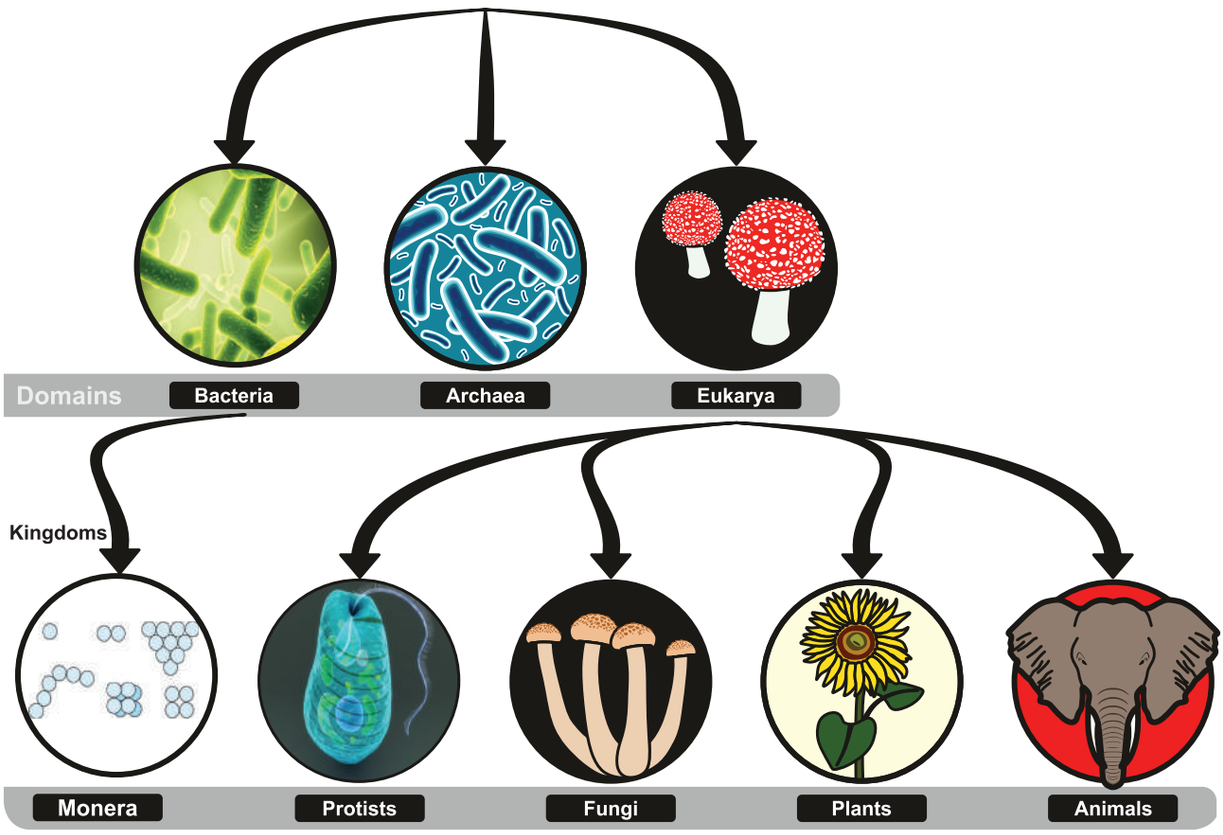


X. Higher order thinking question

Virus is called Acellular. Why?

Unit 5

Basis of Classification



Learning Objectives

- To understand the need for dichotomous classification
- To classify animals according to their characteristic features
- To know the classification of animals and get the knowledge about invertebrates and vertebrates
- To acquire knowledge about the classification of plants
- To know the importance of five kingdom classification
- To understand the Binomial Nomenclature

G7W5V5

Introduction

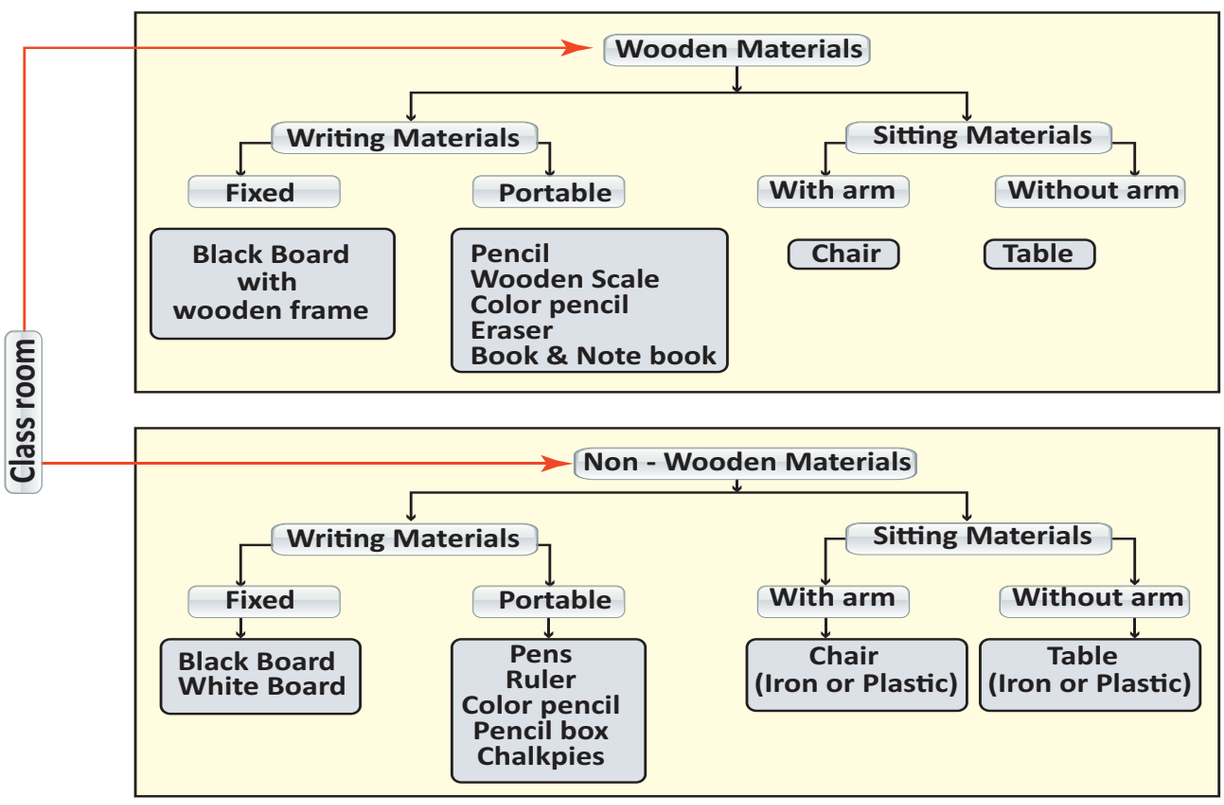
When you get ready to go to school, all your things - uniform, lunch box, water bottle, shoes etc., to be kept ready. Just imagine if all these things are not ready you will need to spend too much time to collect them. Likewise, in a grocery shop, medical shop and bakery all the items are systematically arranged. Sorting of things is very much required and important for all living beings. We see various plants and animals around us. It is estimated that about 8.7 million species of living organisms have been identified and named till now. However many scientists believe that, only a small portion of the total species existing on earth has been identified. In order to know about the behavior and relationship among organisms, that are known, biologists have classified them into two broad groups, plants and animals. Grouping of living organisms based on their common features is known as biological classification.

List out things found in your class room

Chair, Table, Black board, Chalk piece, Cupboard, Fan, Light, Switches, School bag, Lunch bag, Text book, Note book, Water bottle, Pencil box, Pencil, Pen, Rubber, Ruler, Door, Window, Writing pad, Colour pencil, Eraser, Sharpener, Compass, and Chart papers.

1. Find out one common difference among these materials to classify the above things into two **Wooden / Non Wooden**
2. Find out another difference to classify each group into two sub groups Wooden sitting materials / Wooden writing materials and Non wooden sitting material / Non wooden writing materials.
3. Continue to identify differences to classify each small subgroups into two Fixed / Portable, With arm / Without arm

There are some similarities and differences exist among these materials. So we need to observe and identify those similarities and differences to



construct a dichotomous key. The dichotomous key allows us to make quick reference and identify a particular thing. Classification provides scientists a systematic easy way of studying organisms. Classification is done using this dichotomous key. What is dichotomous key? It is a tool used to classify organisms based on their similarities and differences.

Features of dichotomous key

- A single feature that differentiate a group easily.
- One character selected to separate the group, as present or absent.
- Continue the 2nd step until only one item will remain at the end.

Dichotomy of Animals

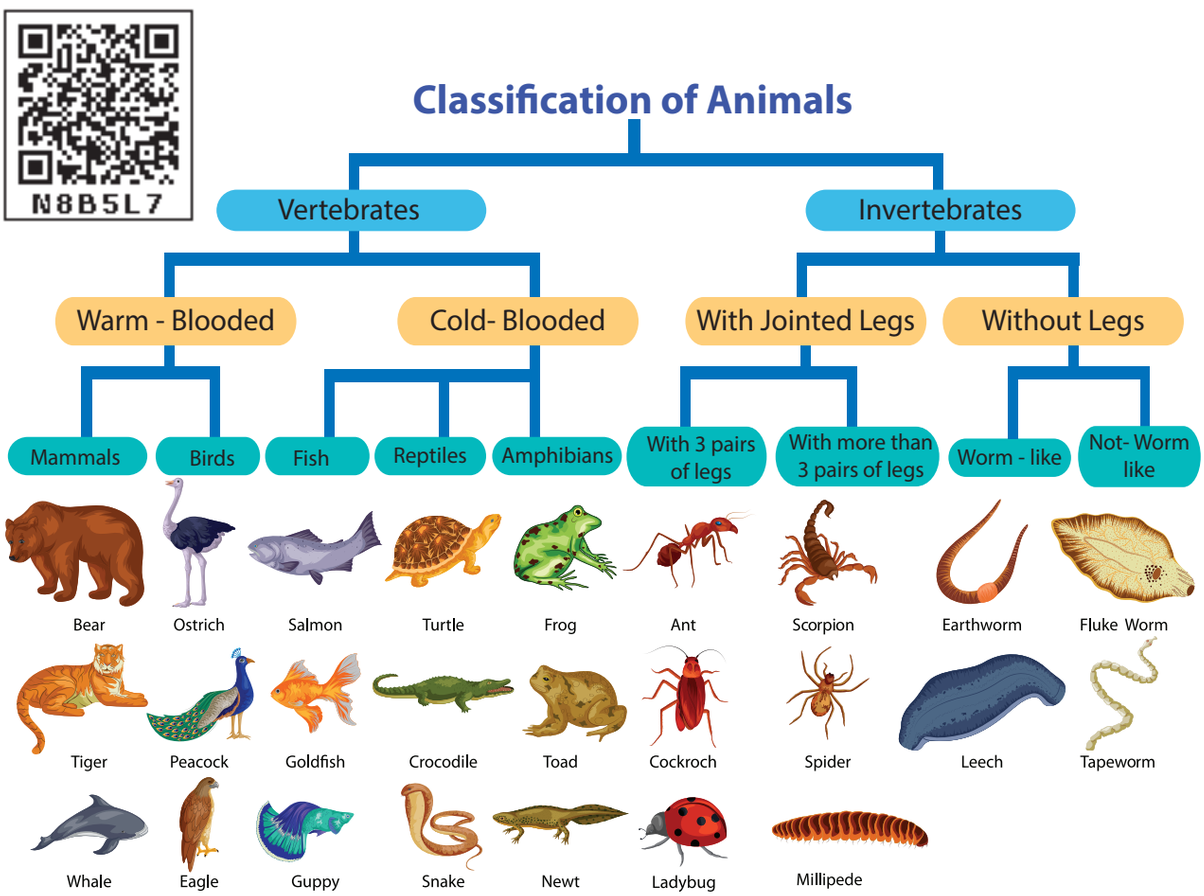
Using a dichotomy pattern, classify the given list of animals: Ostrich, peacock, monkey, frog, toad, turtle, snake, shark, goldfish, ant, tapeworm, earthworm and leech.

1. Presence or absence of back bone, we can classify them into two groups.
2. Animals with back bone can be divided into its subgroup based on its body temperature.
3. Further classification can be done based on its difference like presence of feather or hair, scales etc.

5.1. Basics of Classification:

Living organisms are so large in number that they need to be classified into smaller groups. Classification of living organisms is made on the basis of their characteristics, similarities and differences

Identify animals with backbone and without backbone based on the figure.



DO YOU KNOW?

Aristotle was a Greek philosopher and thinker who lived about 2400 years ago. Aristotle came up with the following grouping system that was used for almost 2000 years after his death!

- He classified all organisms into either animals or plants.
- Then he classified into those 'with blood' and those 'without blood'.
- Then the animals are classified into three groups based on their method of movement: walkers, flyers or swimmers.

ACTIVITY 1

Aim : To sort out a box of given buttons and classify them into different types.

Materials Required : A box full of different types of buttons.

Procedure:

1. Take a box of given buttons.
2. Work in small groups of three or four and classify the buttons based on the following classification criteria.
   (i) Shape
   (ii) Buttons with four holes
   (iii) Buttons with two holes.
   (iv) Colour
3. Identify other features that can be used to sort out buttons into different groups.

Based on the, special features and characters, the students identify each button, according to its size, hole and colour. This is known as identification. Then teacher shall ask students to separate the buttons according to the size, hole and colours. This is known as assortment.

After assorting the buttons the teacher ask the students to gather the buttons according to their, size, hole and colours. This is termed as grouping. Identification, assortment and grouping, which results in classification

Classification:

The method of arranging the organisms into groups is called classification. When we classify things we put them into groups based on their characteristics.

Why do we classify things?

1. Classifying things makes it easy for us to know their similarities and differences.
2. Things with similar characters are classified into same group. These things are usually similar in at least one characteristic.
3. Things with different characteristics are classified into different groups. These things are usually different in at least one characteristic.
4. Classification helps us to understand, living and non – living things in better way. For example, we can classify a newly discovered organism, we would come to know, how it relates with other.

Need for Classification

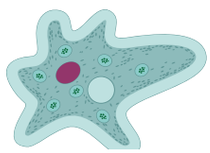
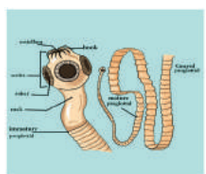
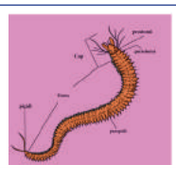
- ❖ Classification is needed to identify an organism correctly.
- ❖ It helps to know the origin and evolution of an organism.
- ❖ To establish the relationship among different organisms.

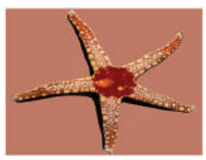
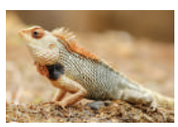
- ❖ It provides the information about living things in different geographical regions.
- ❖ It helps in understanding how complex organisms must have evolved from simpler ones.

Scientists have been able to discover and classify more than 2 million organisms on the earth ranging from tiny bacteria to the largest blue whales. Each organism has been classified in a category based on its evolutionary relationship with other group of organisms. We can define hierarchy of organisms as:

"The system of arranging taxonomic categories in a descending order based on their relationships with other group of organism is called **hierarchy of categories"**. This system was introduced by Linnaeus and is called **Linnaean hierarchy.** There are seven main categories of hierarchies namely, **Kingdom, Phylum, Class, Order, Family, Genus and Species.** Species is the basic unit of classification

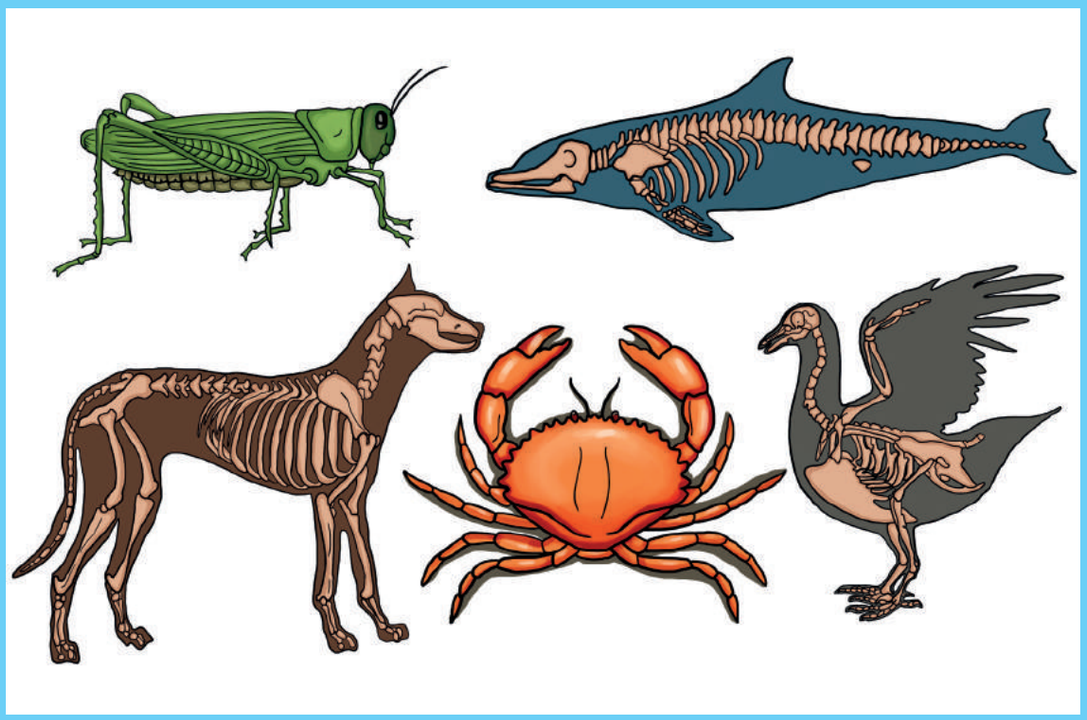
Based on the above classification the following table shows different phylum, with general features and examples of different phyla and classes

S. NO	General Characters	Division
1	Microscopic unicellular, pseudopodia, flagella and cilia for locomotion, reproduce by fission or conjugation.	Phylum **Protozoa** Eg. *Amoeba, Euglena* and *Paramoecium* 
2	Multicellular organisms with holes in the body. Skeleton formed of spicules, asexual and sexual reproduction.	**Phylum Porifera** E*g. Leucosolenia, Spongilla, Sycon.* 
3	Multicellular organisms Diploblastic, sessile or free swimming, solitary or colonial, asexual and sexual reproduction	Phylum **Coelenterata** Eg. Hydra, Sea anemone, Jelly fish, Corals. 
4	Acoelomates, parasites inside the body of animals and human beings, mostly hermaphrodite (bisexual).	Phylum **Platyhelminthes** Eg. *Planaria*, Liver fluke , Blood fluke, Tapeworm 
5	Unsegmented body, mostly parasites in human beings and animals, causing diseases, asexual reproduction.	Phylum **Aschelminthes** or Nematoda Eg. *Ascaris lumbricoides* 
6	Triploblastic, segmented body, mostly hermaphrodite (bisexual and unisexual).	**Phylum Annelida** Eg. Earthworm, Nereis, Leech. 

7	Segmented body, thick chitinous cuticle forming an exoskeleton, paired and jointed legs, unisexual exhibits sexual dimorphism.	Phylum **Arthropoda** Eg. Crab, Prawn, Millipede, Insects, Scorpion, Spider	
8	Soft bodied, unsegmented, muscular head, foot and visceral mass, mantle, a calcareous shell, sexual reproduction.	Phylum **Mollusca** Eg. Cuttle fish, Snail, Octopus	
9	Exclusively marine, spines and spicules over the body, water vascular system, tube feet, for feeding, respiration and locomotion, sexual reproduction.	Phylum **Echinodermata** Eg. Starfish, Sea – Urchin, Brittle star, Sea cucumber and Sea- lily	
	Phylum - CHORDATES		
10	Aquatic, cold blooded vertebrates with boat shape body and jaws, locomotion by paired and median fins, sexual reproduction.	Class **Pisces** Shark, Catla, Mullet, Tilapia	
11	Amphibious, cold- blooded, two pairs of limbs, sexual reproduction.	Class **Amphibia** Eg. Frog, Toad, Salamander, Caecilian	
12	Cold- blooded , lung breathing, scales over the body, pentadactyl limb, adapted for climbing, running and padding, oviparous.	Class **Reptilia** Garden lizard, House lizard, Turtles, Tortoise , Snakes, Crocodile	
13	Warm blooded, exoskeleton of feathers, flight adaptation, spongy bones with air cavities, powerful eyes, sexual reproduction, oviparous.	Class **Aves** Wader bird, Roller bird, Hoopoe bird, Parrot, Sparrow, Hen, Ostrich, Kiwi	
14	Terrestrial warm blooded, external ear or pinna, muscular diaphragm, non – nucleated RBC, heterodont and diphyodont dentition, viviparous give birth to young ones.	Class **Mammalia** Duck bill Platypus, Kangaroo, Cat, Dog, Tiger, Zeebra, Man	

ACTIVITY 2

Fill up the blanks with the suitable organisms



1. Vertebrates _____, _____ and _____

2. Invertebrates _____, _____ and _____.

3. Name the vertebrates with wings _____, _____.

4. Name the invertebrates with wings _____, _____.

5. Name the invertebrates with segmented legs _____, _____.

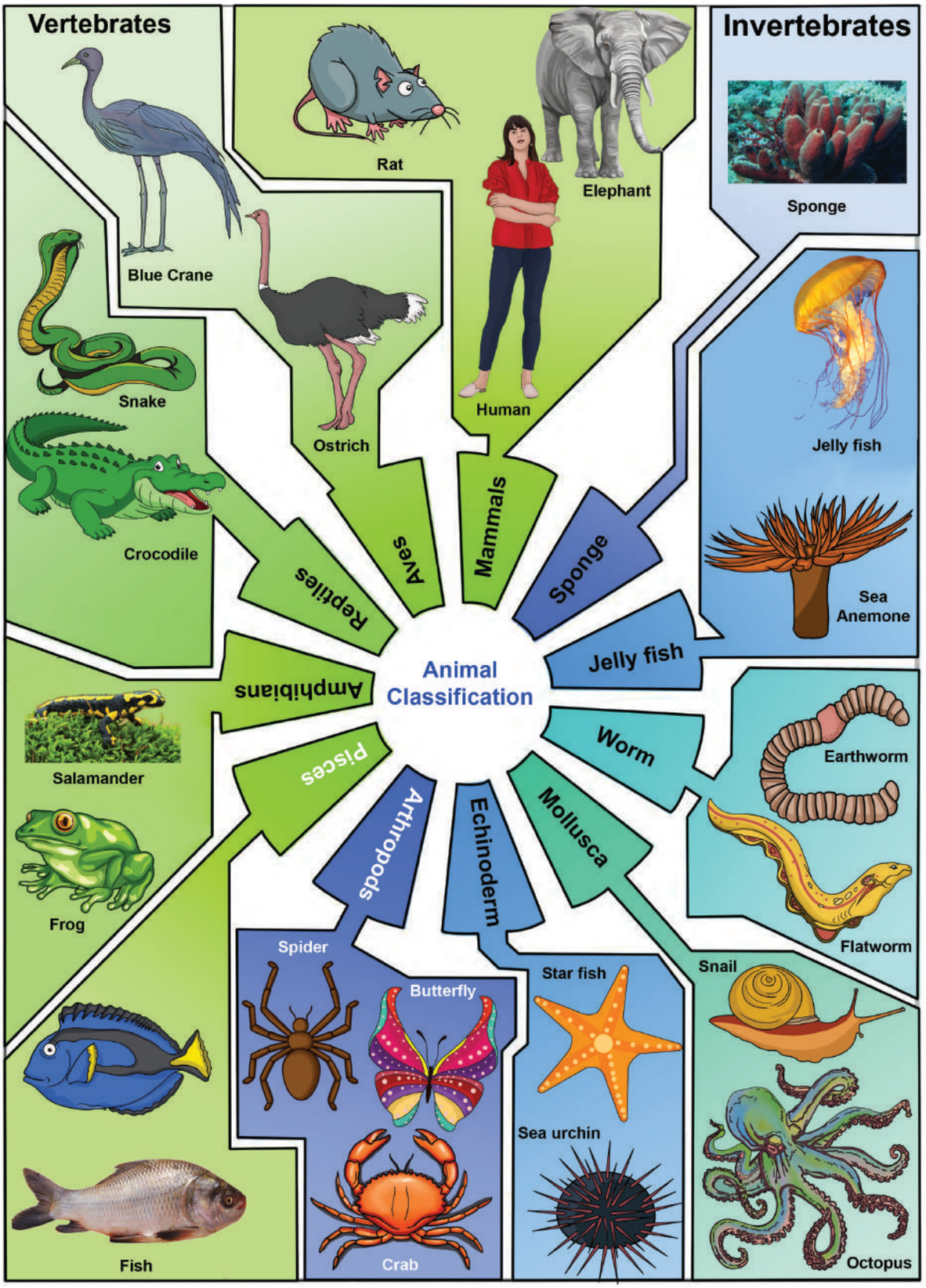
6. Name the invertebrates with Jointed legs _____, _____ .

7. Name the warm blooded vertebrates _____

8. Name the cold blooded vertebrates _____.

9. Name the vertebrates with lungs respiration _____, _____.

10. Name the animal with beak _____.



ACTIVITY 3

Given table shows the name of the phylum and its characteristic features. Write name of the animals belonging to the respective phylum.

Phylum	Characters	Example
Porifera	Pore bearers	
Coelenterata	Gastro vascular cavity	
Platyhelminthes	Flame cells	
Aschelminthes	Thread like worms	
Annelida	Body is segmented	
Arthropoda	Have jointed legs	
Mollusca	Soft bodied with shells	
Echinodermata	Spines on the skin	
Chordata	Have back bone	

5.2. Classification of Plants

Based on dichotomy, plants also can be classified into two main groups – Flowering and Non – flowering. Non – flowering plants do not produce seeds and flowering plants produce seeds. Based on their nature of plant body, Non – flowering plants are classified into three types: algae, mosses and ferns. Based on their fruit body, flowering plants are classified into two types: gymnosperms and angiosperms.

Algae

- Plant is thallus, not well-differentiated into root, stem, and leaves.
- They are predominantly aquatic.
- They are unicellular or multicellular - filamentous. Example - Chara

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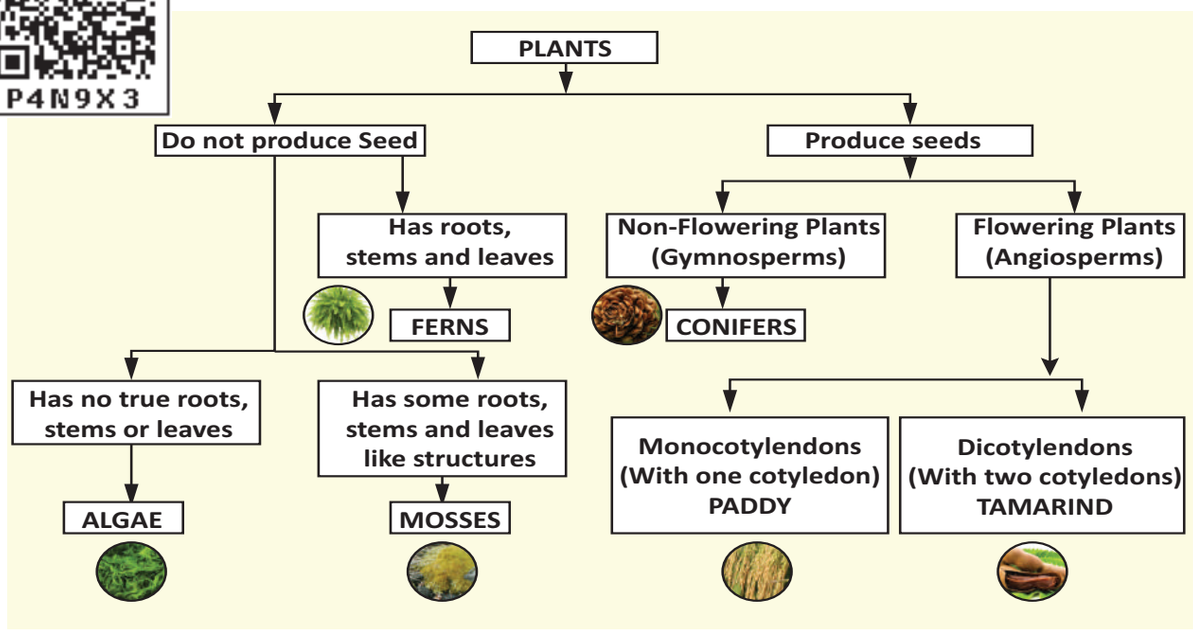


Chara

Mosses

- Plant body is not differentiated into true root, stem and leaves.
- They are water living plants, needs moisture to complete its life cycle. Hence they are referred to as amphibious plants.
- They do not have any specialized vascular tissues for conduction of water and food. Examples: *Funaria*

Ferns

- Plant body is well-differentiated into root, stem, and leaves. Leaves may be large or small.
- Specialized vascular tissues are found for the conduction of water and food.
- Basically they are the first land plants which grows well in shady, moist, and cool places. (Examples: *Adiantum*)

Adiantum

Gymnosperms

- Plants are perennial, woody, evergreen with true root, stem and leaves.
- They possess vascular tissues, xylem without vessels and phloem without companion cells.
- Ovules are naked, without ovary. Hence they do not produce fruits. Seed are naked. (Examples: ***Pinus, Cycas***)

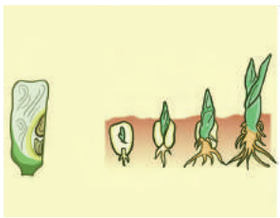
Pinus

Angiosperms

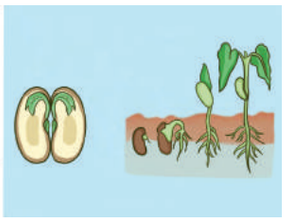
- Plant body is well differentiated into true root, stem, and leaves.
- They produce flower with four whorls (calyx, corolla, androecium and gynoecium), hence known as flowering plants.
- Female reproductive organ, ovary is present inside the flower which develops into fruit and ovule develops into seed.
- Plant possess well developed vascular system with xylem vessels and phloem – companion cells.

Angiosperms are the dominant plant forms of present day. Based on the number of cotyledons, angiosperms are broadly divided into two groups. **a) monocotyledons b) dicotyledons**. Plant seeds which have only one

cotyledon are said to be monocots. Plant seeds which have two cotyledons are known as dicots. Example- Paddy (monocot), tamarind (dicot).



Paddy



Tamarind

Monocotyledon

Dicotyledon

5.3 The Five Kingdom Classification

The five kingdom classification was proposed by **R.H. Whittaker** in 1969. Five kingdoms were formed on the basis of characteristics such as cell structure, mode of nutrition, source of nutrition and body organization.

Monera

Kingdom Monera - Bacteria

All prokaryotes belong to the Kingdom Monera, which do not posses true nucleus. Cells of prokaryotes do not have a nuclear membrane and any membrane bound organelles. Most of

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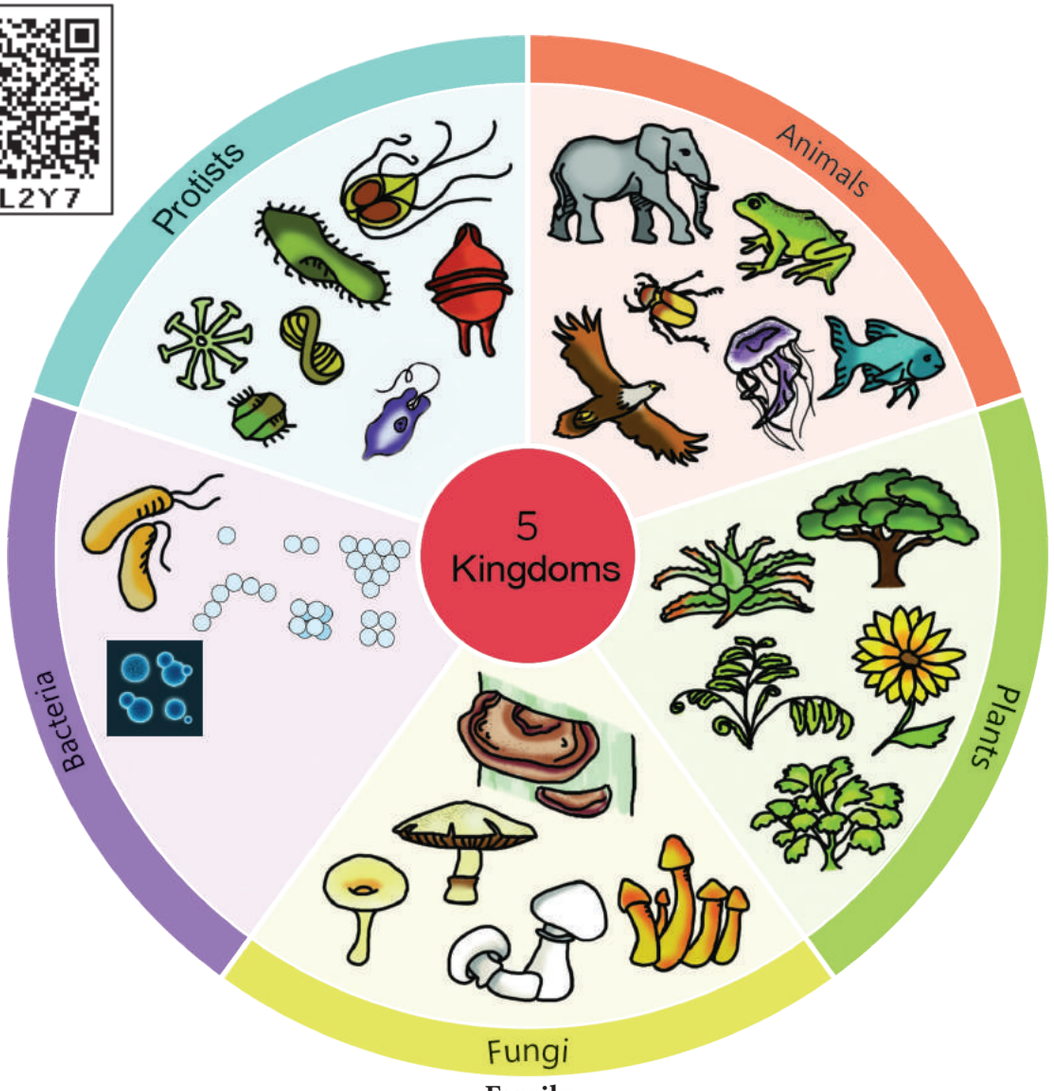
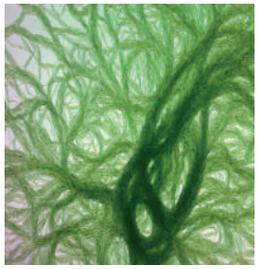


Family

the bacteria are heterotrophic, but some are autotrophs. Bacteria and Blue green algae are examples for monera.

Bacteria

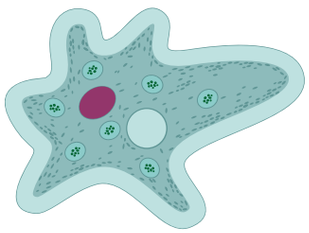


Blue green alge

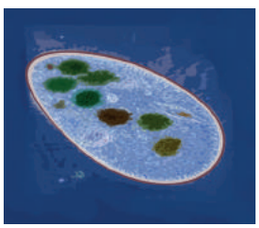
Kingdom Protista:

The Kingdom Protista includes unicellular and a few simple multicellular eukaryotes.

There are two main groups of protists. The plant like protists are photosynthetic and are commonly called algae. Algae include unicellular and multicellular types. Animals like protists are often called **protozoans**. They include *amoeba* and *paramecium*.



Amoeba

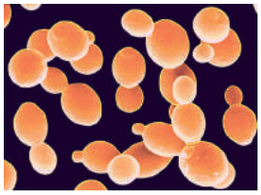


Paramecium

Kingdom Fungi:

Fungi are eukaryotic, and mostly are multicellular. They secrete enzymes to digest the food and absorb the food after digested by the enzymes. Fungi saprophytes as decomposers (decay –causing organisms) or as parasites. Kingdom Fungi includes molds, mildews, mushrooms and yeast.

Mushroom



Yeast

Kingdom Plantae:

Planatae (plants) are multicellular eukaryotes that carry out photosynthesis. Reserve food materials are starch and lipids in the form of oil or fat. Plant cells have cell wall and specialized functions, such as photosynthesis, transport of materials and support. Kingdom Plantae includes ferns, cone bearing plants and flowering plants.

Ferns

Cone bearing plants

Flowering plants

Kingdom Animalia:

Animalia (animals) are multicellular, eukaryotic and heterotrophic animals. Cells have no cell wall. Most members of the animal kingdom can move from place to place. Eg. Invertebrates like sponges, hydra, flatworms round worms, insects, snails, starfishes. Vertebrates like Fish, amphibians, reptiles, birds, and mammals including human beings belong to the kingdom Animalia.

Fish (Pisces)

Frog (Amphibian)

Crocodile (Reptiles)

Cow (Mammals)

Bird (Aves)

IMPORTANT CHARACTERISTICS OF FIVE KINGDOMS

Characteristics	Monera	Protista	Fungi	Plantae	Animalia
1. Cell Type	Unicellular, Prokaryotic.	Unicellular, Eukaryotic.	Multicellular, Non – green and Eukaryotic.	Multicellular, Eukaryotic.	Multicellular, Eukaryotic.
2. Nucleus	Absent.	Present.	Present.	Present.	Present.
3. Body Organisation	Cellular level of organization	Cellular level of organization is	Multi cellular with loose tissue.	Tissue level and organ level.	Tissue, organ and organ system.
4. Mode of Nutrition	Auto (or) Heterotrophic.	Auto (or) Heterotrophic.	Saprophytic, parasitic sometime symbiotic	Autotrophic.	Heterotrophic.
5. Example	Bacteria and Blue green algae.	Spirogyra and Chlamydomonas.	Rhizopus and Agaricus.	Herb, Shrub and Trees.	Fish, frog, crocodile, Birds and human being

Merits of five Kingdom Classification

- ❖ This system of classification is more scientific and natural.
- ❖ This system of classification clearly indicates the cellular organization, mode of nutrition, and characters for early evolution of life.
- ❖ It is the most accepted system of modern classification as the different groups of organisms are placed phylogenetically.
- ❖ It indicates gradual evolution of complex organisms from simpler one.

Demerits of five Kingdom Classifications

- ❖ In this system of classification of viruses have not been given a proper place.
- ❖ Multicellular organisms have originated several times from protists.

- ❖ This type of classification has drawn back with reference to the lower forms of life.
- ❖ Some organisms included under protista are not eukaryotic.

5.4. Binomial Nomenclature

Gaspard Bauhin in 1623, introduced naming of organisms with two names which is known as Binomial nomenclature, and it was implemented by **Carolus Linnaeas** in 1753. He is known as **'Father of Modern Taxonomy'.**

Binomial nomenclature is an universal system of naming organisms. As per this system, each organism has two names – the first is the **Genus** name and the second is the **Species** name. Genus name begins with a capital letter and Species name begins with a small letter.

Example: The nomenclature for onion is ***Allium sativam***. Genus name is ***Allium***, species name is ***sativam.***

Vernacular name is a local name that is familiar for a particular place. Binomial name is an universal name which never changes. Binomial nomenclature and classification helps scientists to identify any organisms and to place them at a particular hierarchy.

ACTIVITY 4

Field trip to sanctuaries / zoo should be arranged. Students are guided to observe the animals and explain about the feature of animals how they are protected and maintained in the zoo. Note the displayed names of the plants and animals. Discuss your observation in the class

Scientific Names of Some Organisms

S.No	Common Name	Scientific Name
1.	Human being	*Homo sapiens*
2.	Onion	*Allium sativum*
3.	Rat	*Rattus rattus*
4.	Pigeon	*Columba livia*
5.	Tamarind	*Tamirindus indica*
6.	Lime	*Citrus aurantifolia*
7.	Neem Tree	*Azadirachta indica*
8.	Frog	*Rana hexadactyla*
9.	Coconut	*Cocos nucifera*
10.	Paddy	*Oryza sativa*
11.	Fish	*Catla catla*
12.	Orange	*Citrus sinensis*
13.	Ginger	*Zingiber officinale*
14.	Papaya	*Carica papaya*
15.	Date	*Phoenix dactylifera*

POINTS TO REMEMBER

- ❖ Classification of living organisms is made on the basis of their characteristics, similarities and differences.
- ❖ Classification is needful to identify living organisms and to study about them conveniently
- ❖ Kingdom is the largest division of the living world and species is the basic unit of classification.
- ❖ Kingdom Animalia is divided into 2 sub kingdoms.
  - Invertebrates (Animals without back bone)
  - Vertebrates (Animals with back bone)
- ❖ Invertebrates are classified into nine phyla
- ❖ Vertebrates are classified into five classes

- Plants are classified into flowering and non – flowering plants and further classified into groups based on their nature of plant body and fruiting body.
- In 1969, R.H. Whittakar proposed a five kingdom classification of living organisms.
- The Five kingdom classification includes five kingdom namely – Monera, Protista, Fungi, Plantae and Animalia.
- Gaspard Bauhin is 1623, introduced the binomial nomenclature and it was implemented by Carolus Linnaeus in 1753.
- Binomial nomenclature is an universal system of naming organisms. It contain two names
- The first name of binomial is genus name and the second name is species name
- Carolus Linnaeus is known as Father of Modern Taxonomy

Evaluation

X9F5T6

I. Choose the correct answer.

1. The following characteristics are essential for classification.
   (a) Similarities (b) Differences
   (c) Both of them (d) None of them
2. Approximately _____ species of living organisms found in the earth.
   (a) 8.7 million (b) 8.6 million
   (c) 8.5 million (d) 8.8 million
3. The largest division of the living world is _____
   (a) Order (b) Kingdom
   (c) Phylum (d) Family
4. Who proposed the five kingdom of classification?
   (a) Aristotle (b) Linnaeus
   (c) Whittakar (d) Plato
5. The binomial name of pigeon is _____
   (a) *Homo sapiens* (b) *Rattus rattus*
   (c) *Mangifera indica* (d) *Columbo livia*

II. Fill in the blanks.

1. _____ in 1623, introduced the binomial nomenclature.
2. Species is the _____unit of classification.
3. _____ are non- green and non-photosynthetic in nature.
4. The binomial name of onion is _____
5. Carolus Linnaeus is known as the Father of _____

III. True (or) False. If false write the correct answer.

1. Classification helps to know the origin and evolution of an organism.
2. Fishes are aquatic vertebrates.
3. In the year 1979, Five kingdom classification was proposed.
4. True nucleus is seen in prokaryotic cell.
5. Animal cells have cell wall.

IV. Match the following.

1.	Monera	–	Moulds
2.	Protista	–	Bacteria
3.	Fungi	–	Neem
4.	Plantae	–	Butter fly
5.	Animalia	–	Euglena

V. Assertion and Reason Questions

1. **Assertion:** Binomial name is the universal name and contains two names.

Reason : It was first introduced by Carolus Linnaeus

   a. Assertion is correct, Reasoning is correct
   b. Assertion is correct, Reasoning is incorrect
   c. Assertion is incorrect Reasoning is correct
   d. Assertion and Reasoning are incorrect

2. **Assertion: I**dentification, assortment and grouping are essential for classification

Reason : These are basic steps of taxonomy

   a. Assertion is correct, Reasoning is correct
   b. Assertion is correct, Reasoning is incorrect
   c. Assertion is incorrect Reasoning is correct
   d. Assertion & Reasoning is incorrect

VI. Give very short answer

1. What is classification?
2. List out the five kingdoms classification
3. Define – dichotomous key
4. Write two examples of Monera.
5. What is binomial nomenclature?
6. Write the binomial name of a) Human being b) Paddy
7. Write two features of protista

VII. Give short answer

1. Write the levels of classification.
2. Differentiate plantae and animalia
3. Write any two merits of Five Kingdom classification.

VIII. Give answer in Detail

1. Explain about five kingdom classification
2. Write short notes on – Binomial Nomenclature.
3. Give an account on the classification of invertebrates with few general features and examples.

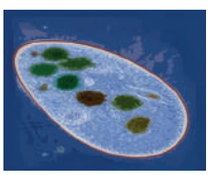
IX.HOTS

Which kingdom has saprophytic, parasitic and symbiotic nutrition. Why?

X. See the Diagram and write the kingdom :

Pictures of some living organisms are given below. Identify the kingdom to which each of these belong and write the kingdom name in the blanks provided.

(a) _____



(b) _____

(c) _____

(d) _____

(e) _____

ICT CORNER

CLASSIFICATION

This activity enables the students to identify vertebrates And invertebrates.

PROCEDURE :

Step 1: Type the URL link given below in the browser or scan the QR code. A page opens with tinytap and "PLAY" button

Step 2: Click it it opens into another page

Step 3: The page shows animals with the words "Invertebrate or vertebrate" in a box near the animal

Step 4: When you click the correct option vertebrate or invertebrate it goes to next picture

Step 1

Step 2

Classification URL:

https://www.tinytap.it/activities/g1fca/play/vertebrates-and-invertebrates

*Pictures are indicative only

*If browser requires, allow Flash Player or Java Script to load the page.

B351_7_SCIENCE_EM

Unit 6

Digital Painting

Learning Objectives

After learning this lesson, the students will be able to

- ❖ know how to draw a picture through the software Tux Paint
- ❖ explore their creative thinking
- ❖ learn arithmetic calculations through the software Tux Math

M2J7J1

In this chapter, the students will learn to use the software Tux Paint and Tux Math.

What is Tux Paint?

Tux Paint is a free drawing program designed for young children. It has a simple, easy-to-use interface, fun sound effects, and an encouraging cartoon mascot which helps to guide children as they use the program.

Choose a Tool from the options on the left side of the screen. Then, make choices from the right side of the screen. Directions are provided at the bottom of the screen.

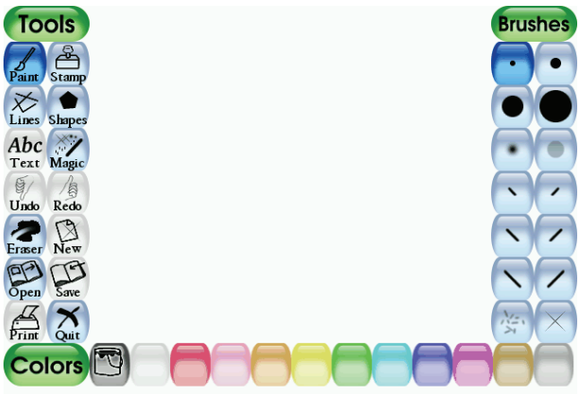
Title Screen

When Tux Paint first loads, a title/credits screen will appear.

Once loading is complete, press a key or click on the mouse to continue. (Or, after about 30 seconds, the title screen will go away automatically.)

Main Screen

The main screen is divided into following sections:



Left Side: Toolbar

This toolbar has the control options to draw and to edit images.

Middle: Drawing Canvas

This is the largest part of the screen dedicated to draw and edit images.

Right Side: Selector

When a tool is selected from the left side tool bar, the right side bar will display the options associated with the specific tool. (E.g.- When the line tool is selected, the right side bar shows the various lines available. When the shape tool is selected, different shape options can be seen on the right side.)

Lower: Colors

A palette of available colors are shown near the bottom of the screen.

Bottom: Help Area

At the very bottom of the screen, Tux, the Linux Penguin, provides tips and other information while you draw.

Tools Icons

The Paint Brush tool lets you draw freehand, using various brushes (chosen in the Selector on the right) and colors.

The Stamp tool is like a set of rubber stamps or stickers (images).

Use the Left and Right arrows to cycle through the collections.

This tool is used to draw Lines.

This tool is lets you draw some simple filled, and un-filled shapes.

This tool is used to type texts.

Magic tool is a set of special tools, selecting one of the 'magic' effects from the selector situated in the right side. This tool provides countless number of special visual effects if it is used in various combination with other tools. This tool can be used either by clicking or by dragging the effect directly on to the image to apply it.

This tool is appears similar to the Paint Brush, but it is used to erase the picture.

This tool is used to cancel a command given earlier.

This tool is used to reverse the action of Undo.

Clicking the "New" button will start a new drawing.

This tool is used to open are existing file.

This tool is used to save your current picture.

This tool is used to print your current picture.

This tool is used to close Tux Paint window.

Shortcut Keys

Tool Name	Keyboard Shortcut Key
New	Ctrl+N
Open	Ctrl+O
Save	Ctrl + S
Print	Ctrl+P
Quit	Esc
Undo	Ctrl + Z
Redo	Ctrl+Y

Tux Math

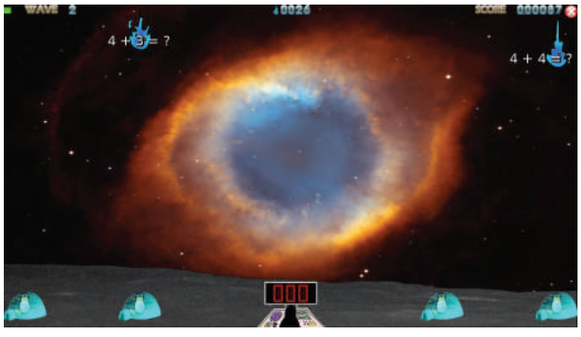
Tux Math is an open source arcade – style video game for learning arithmetic. The main goal is to make learning effective and fun.

Tittle Screen

Math Command Training Academy: choose this to go to a list of over fifty prepared lessons, starting with simple typing

of single digit numbers, and progressing to multiplication and division involving negatives and "missing number" questions (e.g. "-17 x ? = 119"). The player wins if the question list is completed successfully. Successfully completed lessons are indicated with a flashing gold star.

Play Arcade Game: This option can be used to select and play one of the four open-ended "arcade style" games, meaning the game gets faster and faster as long as the player can keep up, with the goal to get the highest score possible.



The options include:

- Space Cadet - simple addition.
- Scout - addition and subtraction to ten.
- Ranger - addition, subtraction, multiplication and division to ten.
- Ace - all four operations with operands to 20, including negative numbers and "missing number" type questions.

Play Custom Game: This option can be used to play a game based on the config file in the player's home directory.

More Options - These options have "Demo" mode as well as credits and project information.

Keys

- Use the [UP] and [DOWN] arrow keys to select what you wish to do, and then press [ENTER / RETURN / SPACEBAR]. Or, use the mouse to click the menu item.
- Pressing [ESCAPE] will quit the program.

Evaluation

I. Choose the correct answer.

I. Tux paint software is used to……
a) Paint b) Program
b) Scan c) PDF

2. Which toolbar is used for drawing and editing controls in tux paint software?
a) Left Side: Toolbar
b) Right side : Toolbar
c) Middle : Tool bar
d) Bottom : Tool bar

M4M9X7

3. What is the shortcut key for undo option?
a) Ctrl + Z b) Ctrl + R
c) Ctrl + Y d) Ctrl +N

4. Tux Math software helps in learning the _____

a) Painting
b) Arithmetic
c) Programming
d) Graphics

5. In Tux Math, Space cadet option is used for ……

a) Simple addition
b) Division
c) Drawing
d) Multiplication

Answer the following Questions

1. What is Tux Paint ?
2. What is the use of Text Tool ?
3. What is the Shortcut key for Save option?
4. What is Tux Math?
5. What is the use of Ranger ?

Animal Cell	–	விலங்கு செல்
Battery	–	மின்கல அடுக்கு
Binomial	–	இருசொல் பெயர்
Boiling	–	கொதித்தல்
Cell	–	மின்கலன்
Conventional current	–	மரபுமின்னோட்டம்
Conductors	–	கடத்திகள்
Conductivity	–	கடத்துத்திறன்
Corals	–	பவளங்கள்
Classification	–	வகைப்பாடு
Chloroplast	–	பசுங்கணிகம்
Chromoplast	–	வண்ணக்கணிகம்
Cell wall	–	செல் சுவர்
Contraction	–	சுருங்குதல்
Condensation	–	ஆவி சுருங்குதல்
Crystallization	–	படிகமாக்கல்
Curdling	–	பால் உறைந்து தயிராதல்
Diaphragm	–	உதரவிதானம்
Dry cell	–	உலர்மின்கலன்
Dicotyledons	–	இரு வித்திலைத் தாவரங்கள்
Electric current	–	மின்னோட்டம்
Electrical circuit	–	மின்சுற்று
Endoplasmic reticulum	–	எண்டோபிளாச வலைப்பின்னல்
Expension	–	விரிவடைதல்
Fuse	–	மின்உருகி
Flame cells	–	சுடர் செல்கள்
Freezing	–	உறைதல்
Fermentation	–	நொதித்தல்
Green gland	–	பச்சை சுரப்பி
Heating effect	–	வெப்பவிளைவு

Insulator	–	காப்பான்கள்
Identification	–	இனங்காணல்
Invertebrates	–	முதுகெலும்பற்றவை
Leucoplast	–	வெளிர்கணிகம்
Magnetic effect	–	மின்காந்தவிளைவு
Monocotyledons	–	ஒரு வித்திலைத் தாவரங்கள்
Malpighian tubules	–	மல்பீஜியன் நுண் குழல்கள்
Microscope	–	நுண்ணோக்கி
Malleability	–	தகடாகும் தன்மை
Million	–	பத்து லட்சம்
Nephridia	–	நெஃப்ரீடியா
Nucleus	–	உட் கரு
Non – periodic change	–	கால ஒழுங்கற்ற மாற்றம்
Oyster	–	முத்துசிப்பி (கிளிஞ்சல்)
Oviparous	–	முட்டையிடுபவை
Organelle	–	நுண் உறுப்பு
Parallel circuit	–	பக்கஇணைப்பு
Parental care	–	பெற்றோர் பாதுகாப்பு
Plant Cell	–	தாவர செல்
Plastids	–	கணிகங்கள்
Plasmodesmata	–	செல்களின் இணைப்புச் சவ்வு
Periodic change	–	கால ஒழுங்கு மாற்றம்
Resistivity	–	மின்தடை
Rusting	–	துருப்பிடித்தல்
Series circuit	–	தொடர்இணைப்பு
Short circuit	–	குறுக்குசுற்று
Specific resistance	–	தன்மின்தடை
Solenoid	–	கம்பிச்சுருள்
Spicules	–	முட்கள்
Stem cell	–	மூலச்செல்
Taxonomy	–	வகைப்பட்டியல்
UniCellular organisms	–	ஒரு செல் உயிரினங்கள்
Viviparous	–	குட்டிஈனுபவை
Vernacular Name	–	வட்டார பெயர்
Vertebrates	–	முதுகெலும்புள்ளவை
Viscosity	–	பாகுத்தன்மை
Vapourization	–	ஆவியாதல்
Water vascular system	–	நீர்க்குழல் மண்டலம்

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STANDARD SEVEN

TERM - II

VOLUME - 3

HISTORY

CONTENTS

K2K8I8

E - Book

H3F1C9

Assessment

B352_7_SOCIAL_EM

Digi - links

QR GUIDE

Let's use the QR code in the text books!

- Download DIKSHA app from the Google Play Store.
- Tap the QR code icon to scan QR codes in the textbook.
- Point the device and focus on the QR code.
- On successful scan, content linked to the QR code gets listed.
- Note: For ICT corner, Digi Links QR codes use any other QR scanner.

Unit -1

Vijayanagar and Bahmani Kingdoms

Learning Objectives

- To know the circumstances that led to the rise and expansion of Vijayanagar and Bahmani kingdoms
- To familiarise ourselves with the administration, military organisation and the economic life during the time of their reign
- To know the contribution of Vijayanagar and Bahmani rulers to literature art and architecture

B1G8B9

Introduction

The political condition of India in the fourteenth century provided great opportunities for the rise of new kingdoms in the south. The repressive measures of the temperamental Muslim king Muhammad-bin-Tughlaq led to the rise of many new independent states. In the south, Vijayanagar and Gulbarga or Bahmani emerged as two great kingdoms. The Bahmani kingdom spread all over the Maharashtra region and partly over Karnataka. Ruled by 18 monarchs, it lasted for nearly 180 years. Early in the sixteenth century, it collapsed and split into five sultanates – Bijapur, Ahmednagar, Golconda, Bidar and Berar. The state of Vijayanagar continued to flourish for nearly 200 years. Ultimately Vijayanagar's wealth and prosperity induced the Muslim Deccan kingdoms to launch a combined war against it. In 1565, the battle of Talikota, finally they could succeed in crushing Vijayanagar Empire.

Foundation of Vijayanagar Empire

Vijayanagara, the 'city of victory', was established in southern Karnataka by two brothers named Harihara and Bukka. According to one tradition, Vidyaranya, head of the Saivite Sringeri mutt, instructed them to abandon their service to the Tughluqs and rescue the country from Muslim authority. The new kingdom was called Vidyanagara for a time in honour of the spiritual teacher Vidyaranya, before it came to be called Vijayanagara. Four dynasties, namely