Chapter 5

Diversity in Living Organism

There are so many plants and animals around us. We know very little about them. Most of them belong to a world not visible to the unaided eye, as you have already studied in the chapter on, 'Microbial World'. The types of organisms that we have studied so far are also in lakhs! Existing from mountain peaks to deserts and to the deep oceans, from extreme cold conditions to extreme hot ones and many more, such diversity is the symbol of nature.

Studying about diversity as it is, would be a very chaotic and difficult task. Moreover describing and naming each organism individually without knowing the organisms that might be sharing common characteristics would be insignificant. Thus people who have tried to study diverse organisms in nature have tried to make groups of them on the basis of differences and similarities found among them. This helped to identify largely varied and closely related groups of organisms.

Thus our knowledge of the entire living world depends on first making meaningful groups to carry out our study in a systematic manner.

In this lesson we will try to study the diversity present among several living organisms, classify and appreciate natures' miracle.

Diversity in plants

Activity-1

Observation of plants

Collect leaves from different plants. Observe them carefully and fill the table.

S.No.	Name of the plant (the leaf of which is taken)	Length of the leaf	Width of the leaf	Colour of the leaf	Shape/Size of the leaf	Margin of the leaf	Venation of the leaf

- Could you find any two leaves which are similar with respect to any of the characters, size, shape, colour or any other as mentioned in the table?
- Note down the differences you observed in the sample of leaves collected by you. Write two such characters that differed most.
- To study more about such characters let us do another activity.

Activity-2

Observation of external characters of plants (monocot and dicot)

Collect at least five different plants (at least two must be either grass, maize, paddy etc. plants) with flowers from your surroundings. Observe their external characters carefully. Draw the following table in your notebook and note down your findings. You can also do this with as many flowering plants as possible.

S. No.	Name of the plant	Length of the Stem	Length between nodes	Leaf venation	Flower Single/ born in group	No. of petals	No. of sepals	Taproot/ fibrous root

- Which characters given above varied most?
- Select a character mentioned above which shows minimum diversity.
- Did you find any similarities? What were they?
- Did you find patterns like –plants with fibrous roots had flowers borne in groups? Note some other patterns that you may have observed.
- Carefully observe the plants collected by you and note down some other characters not mentioned in the table.
- Did you notice any two plants which were alike with regard to the above characteristics? If not, note down what differences you found?
- Note down some similar characters that you have observed.

We can see that there are several characters that we can choose to make groups of plants, some groups would have

many plants taken in our sample, while some would have just a few.

So far we have discussed about plants and their leaves but what about their seeds?

You know that seeds look different. But if we open them would they show similar structural make up or completely different ones?

To find out more about this let us do the following activity.

Activity-3

Observation of seeds

Collect some seeds from the plants of green gram, red gram, Bengal gram, wheat, paddy, groundnut, maize. Soak them for a day and observe them carefully. Take a maize seed and press it between your fingers . Does a small whitish structure come out? Actually maize seeds from fresh soft corn cobs would easily let this structure out. Observe it carefully. It is the baby plant /embryo. The portion left in your hand within the seed coat has a single cotyledon(or seed leaf). Repeat the activity with soaked whole grains of wheat and rice and the other seeds as well.

Use a hand lense for your careful and close observations. Make a table like the one given below in your copy and note down your observations in the table.

S. No.	Name	Colour	Shape/size	No. of cotyledons(seed leaves)	Others
1.					
2.					
3.					
4.					
5.					

- In case you do not know names write a number or give name on your own.

Note down what differences that you observed.

Name any character as mentioned in the table that helped you to roughly divide the sample of seeds into two groups.

The following activity leads us into the systematic way of grouping. You will again need the soaked and softened seeds for this purpose.

Open the given seeds. When you try to do this with peanut seeds, two thick portions come out which are its cotyledons. See if you find such structures in other seeds taken by you. If needed, you can take help of hand lens as well.

Activity-4

Observation of different characters in monocot and dicot plants

Collect the plants or pictures of the whole plants to complete the following table(you can take the help of annexure to this chapter as well)

S. No.	Name of the plant	Leaf venation	No.of cotyledons / seed leaves	Tap root system or fibrous root system
1.	Maize			
2.	Paddy			
3.	Grass			
4.	Beans			
5.	Green gram			
6.	Ground nut			

Here as we finish our activity we would have established some common characteristics of land plants- those having two seed leaves are called dicotyledons, while those having single seed leaf are called monocotyledons.

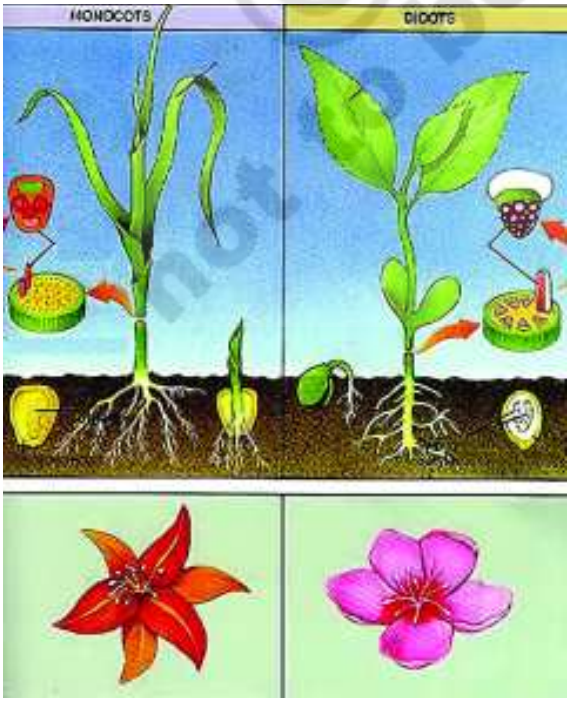


Fig-1

They share some common characteristics like venation (dicots have reticulate/branched, while monocots have parallel venation).

By doing the above activity we can understand how grouping is done in biology by observing the similarities and differences among diverse groups in the sample under study. We will do some similar exercises with animals now.

Diversity in animals

Activity-5

Observation of external characters of insects

Collect housefly, mosquito, ant, dung beetle, butterfly, moth and cockroach from your surroundings. Observe them carefully. Take the help of a magnifying glass to get a closer view.

- Are all insects of the same size or shape?

S. No.	Name of the Insect	No. of Legs	No. of Wings	Colour	Shape/Size	body parts (Segmentation)	Other characters

- What differences did you observe with regard to legs?
- What differences did you observe with regard to wings?
- Is there any relationship between the number of wings and legs?

Did you find any two insects with same characters? If yes, display in the class. If no, note down the differences in your note book.

Even though all these are insects and you see that they show several differences. Can you find at least one character that is similar to the whole group, what is it?

How would you group insects? Would it be based on number of body segments or number of legs they have?

The examples of insects given above are of different species. Hence they show a lot of difference and we say they are diverse. If we were to compare insects of the same type that is to say two houseflies we would perhaps still find some differences(try it out yourself) and these would be variations.

Let us see some variations that are present in human populations

Variations in humans

Activity-6

Variation in animals (external characters)

Do this activity in a group of atleast 10 children. Draw the table in your notebook and fill it.

S. No.	Name of the Student	Height	Weight	Lenth of fore finger	Thumb Impression	Palm	
						Length	Width

After observing the table try to answer the following questions.

Which character helps you to make the maximum number of groups?

Which character helps you to have just a single individual in a group?

Compare your group table with that of other groups and note down the differences you found.

Did you find same observations of any two students in your class?

You might have observed that no two thumb impressions are alike. It is a very specific character of an individual.

Is there any other structure in the human body that is as unique as the thumb impression? What is it?

We have seen variations in animals let us see how we could study the same in plants.

Variations in plants

Activity-7

Variation in two different neem plants

Collect two small almost equal sized neem plants from your surroundings observe them carefully and fill the table.

S. No.	Name of the Plant	Length of the stem	No. of Leaves	Size / Shape of the Leaves	Colour of the Leaves	Margin	Venation
1.	Neemplant -1						
2.	Neemplant -2						

- What differences could you find in the similar looking neem plants?
- Why do you think such differences are present in nature?

So far we have done some activities to study, appreciate and group living organisms on the basis of the diversity and variations present in nature. Several exercises have been done to select characters to group organisms on the basis of similarities and differences between them. The presence of differences between organisms of the same species is called variation.

Variation between different species is always greater than the variation within a species. As we have observed so far, variation forms a basis for selection of characters to group organisms. Grouping organisms on the basis of certain characters which vary over populations indicating some common lineage of each varied group , or the way in which the organism may have evolved is classification. Thus classification in biology is the systematic study of organisms present in nature with respect to their evolution.

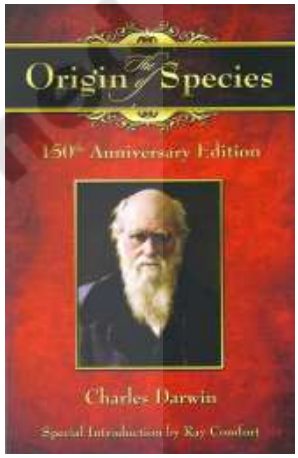
What is the need of classification?

- It gives better knowledge and better understanding of organisms that are studied.
- It helps to study the organisms in a proper and systematic manner.
- It helps to make comparison in an easier way.
- It helps in understanding the relationship among the organisms and their interdependence.
- Classification makes our study more focused and helps us to handle huge population of organisms.
- It gives us an idea of evolution (How organisms have evolved in nature?).

Classification and evolution

All living things are identified and categorized on the basis of their their structure and function. Some characteristics are likely to make more wide-ranging changes in body design than others. There is a role of time in this as well. So, once a certain body design comes into existence, it will shape the effects of all other subsequent design changes, simply because it already exists. In other words, characteristics that came into existence earlier are likely to be more basic than characteristics that have come into existence later.

This means that the classification of life forms are closely related to their evolution. Evolution is the process of acquiring change. Most life forms that we see today had variations that accumulated over years to allow the organism possessing them to survive better. Charles Darwin first wrote about this in his book, "The Origin of Species"in 1859. When we connect the idea of evolution to classification we find in some groups of organisms, the body designs have not changed over the years while several organisms have acquired body designs relatively recently. Since complexity of design has increased over the years and is yet to increase, we may say that older organisms are simpler as compared to the younger.



Charless Darwin

History of classification

In India, classification had been the basis of studies in medicines and dates back to first and second century A.D. Charak and Sushrut had classified the plants on the basis of their medical importance. There after Parasar in his book 'Vrikshyurveda' (The science of life of trees) documented the classification system for several land plants for the first time. This classification mainly deals with the structure of the flowers

Let us study how biologist from 16th century have been trying to classify diverse organisms so far.

Classification done by biologists till date:

The following table shows how different biologists have gone about forming the first category in classification..

<table>
<tr><td>Linnaeus
1735</td><td>Haeckel
1866</td><td>Chatton
1925</td><td>Copeland
1938</td><td>Whittaker
1969</td><td>Woese et al.
1990</td><td>Cavalier-Smith
1998</td></tr>
<tr><td>2 kingdoms</td><td>3kingdoms</td><td>2empires</td><td>4 kingdoms</td><td>5 kingdoms</td><td>3 domains</td><td>6 kingdoms</td></tr>
<tr><td rowspan="2">(not treated)</td><td rowspan="2">Protista</td><td>Prokaryota</td><td>Monera</td><td>Monera</td><td>Bacteria</td><td rowspan="2">Bacteria</td></tr>
<tr><td rowspan="5">Eukaryota</td><td rowspan="2"></td><td rowspan="2"></td><td>Archaea</td></tr>
<tr><td>Protoctista</td><td>Protista</td><td rowspan="5">Eukarya</td><td>Protozoa</td></tr>
<tr><td rowspan="2">Vegetabilia</td><td rowspan="2">Plantae</td><td rowspan="2">Plantae</td><td rowspan="2">Plantae</td><td>Chromista</td></tr>
<tr><td>Plantae</td><td>Plantae</td></tr>
<tr><td>Fungi</td><td>Fungi</td></tr>
<tr><td>Animalia</td><td>Animalia</td><td>Animalia</td><td>Animalia</td><td>Animalia</td></tr>
</table>

Although biologists in the 16th and seventeenth centuries did not recognize that the similarities and differences among organisms were consequences of evolutionary mechanisms, they still sought a means to organize biological diversity. In 1758 Carl Linneaus proposed a system that has dominated classification for centuries. Linnaeus gave each organism two names, denoting genus and species such as Homo sapiens(the former representing genus while the latter representing species). He then grouped genera(several genus) into families, families into orders, orders into classes, classes into phyla, and phyla into kingdoms. Linnaeus identified two kingdoms: Animalia (animals) and Plantae (plants). All the terms like species, genus, family, order, class, phyla etc were defined by Linneaus on the basis of the similarities and differences studied by him in groups of organisms.

Carl VanLinneaus

The first major break from the Linnaean model came from Thomas Whittaker. In 1969 Whittaker proposed a "five kingdom" system in which three kingdoms were added to the animals and plants: Monera (bacteria), Protista, and Fungi. Whittaker defined the kingdoms by a number of special characteristics. First, he specified whether the organisms possessed a true

nucleus (eukaryotic) or not (prokaryotic). The eukaryotic unicellular organisms were placed into the kingdom Protista. The rest were three multicellular eukaryotic kingdoms that distinguish themselves by the general manner in which they acquire food. Plants are generally autotrophs and use photosynthetic systems to capture energy from sunlight. Animals are heterotrophs and acquire nutrients by ingesting plants or other animals, and then digesting those materials. Fungi are also heterotrophs but, unlike animals, they generally break down large organic molecules in their environment and live on them.

The five kingdom system was certainly an advance over the previous system because it captured the diversity of life in a better way. Three groups bacteria, fungi, and protists - did not fit well into either the animal or plant category. Moreover, each of these three groups appeared to possess diversity comparable to that of animals or plants. Thus, the designation of each as a kingdom seemed fitting.

In the years since Whittaker's system was developed, however, new evidence and new methods have shown that the five-kingdom system also fails to adequately capture what we now know about the diversity of life. Microbial biologists became aware of these limitations as they discovered unicellular organisms that appeared to be prokaryotic, but were extremely distinct in their internal structure and other characteristics from the traditional bacteria. Some of these unusual prokaryotes lived in hot springs and other places where the temperatures were near or even above the boiling point of water (the thermophiles). Others, the extreme halophiles, were able to tolerate very high salt concentrations. Other techniques like DNA (the chemical of design of life) sequence data also increasingly suggested that these prokaryotes were most unlike the traditional bacteria. Thus other modifications in the classification scheme came into existence.

Do you know?

There are various hypotheses as to the origin of prokaryotic and eukaryotic cells. Because all cells are similar in nature, it is generally thought that all cells came from a common ancestor cell termed the Last Universal Common Ancestor (LUCA). These LUCA eventually evolved into three different cell types, each representing a domain. The three domains are the Archaea, the Bacteria, and the Eukarya (a classification as suggested by Woese).

Archaea and bacteria are prokaryotic cells that is they do not have a membrane bound nucleus, the nuclear material is present dispersed in cytoplasm.

The cell walls of bacteria unlike the archaea contain a fat like chemical peptidoglycan..

Eukarya have eukaryotic cells or cells having a membrane bound nucleus.

The hierarchy of classification

Classification is done starting from grouping living organisms into domains for

example prokaryota, eukaryota, archaea which form the largest categories with several dissimilar and few similar characters to species forming the smallest category with several similar and few dissimilar characters. Broadly, a species includes all organisms that are similar enough to interbreed and perpetuate or even individually reproduce

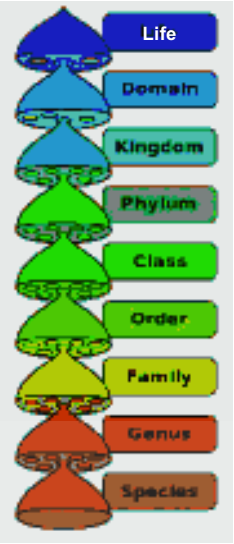


Fig-2 Heirarchy

- Why do you think classification system has undergone changes over the years?
- If you were asked to classify organisms what would be your basis of classification?

Now let us study some of the characters that have been considered to classify organisms under the five kingdoms of classification.

Monera

Observe the given slides carefully and say

- How many cells are found in the organism?
- Do you find any nucleus in the middle of the cell?
- Are there any other cell organelles found in the cell?

By observing the above characteristics we conclude that Monerans are

A. One-celled organisms
B. Cells have no membrane bound nucleus
C. Reproduce by splitting in two
D. Absorb nutrients from outside their bodies
E. They move with the help of locomotory organs like flagella, cilia or hair like structures present on them.
F. Some monerans cause diseases, but others are helpful to people.
G. Examples: bacteria

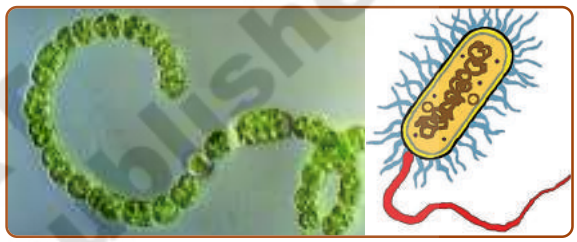


Fig-3 Bacteria

Three major groups of organisms come under this group. They are archaebacteria (ancient bacteria present till date, some species found in hot springs come under this), eubacteria (streptococcus, rhizobium, e.coli etc) and cyanobacteria which are also called blue green bacteria as they appear similar to blue green algae externally but internally are more like bacteria(but they are not bacteria).

Protista (protoctista)

Observe the given slides carefully and say

- How many cells are found in the organism?
- Do you find any nucleus in the middle of the cell?
- Are there any other cell organelles found in the cell?

- Are there any locomotory organs in them?

Characteristics of protists

A. Most are one-celled (unicellular), but some have many cells.
B. Cells have a membrane around the nucleus.
C. Some get nutrients and energy by eating other organisms.
D. Some get energy from the sun, and nutrients from the water around them.
E. These live either solitary or in a colony.
F. Some of the cell organelles are present inside the cell.
G. Most reproduce by splitting in two.
H. Examples are paramecium, amoeba, algae, kelp etc.

Fig-4 Aemoeba, Euglena, Paramecium

Fungi

Observe the specimen and diagrams given below and answer the following questions.

- What is the colour? Can they prepare their own food as green plants?

Make a sketch of the main parts of the body.

- Do you find root like structures? Guess why?

Characteristics of fungi

A. Most are many-celled(multicellular) and some are one-celled organisms.
B. Eukaryotes with well defined prominent head (you usually see them propping out from the ground or on barks of trees during rainy season).
C. Get nutrients and energy by absorbing/ digesting the surface they live on through root like structures which are fine thread like parts of their body.
D. Most of these reproduce by spores.
E. Examples are yeast, mushrooms, bread moulds, and lichens.

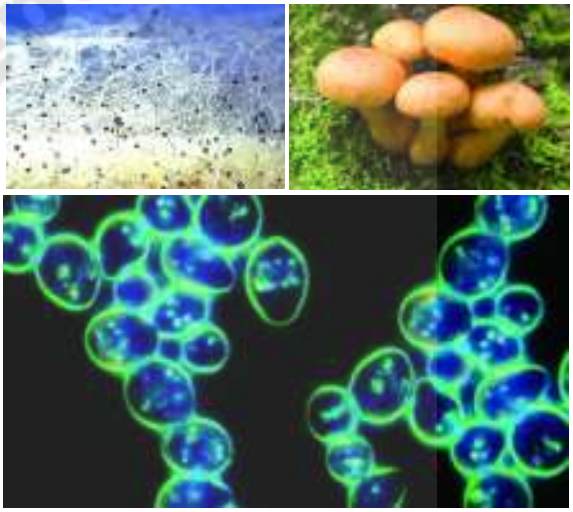


Fig-5 Bread mould, Mashroom, Yeast

Plantae

- Several plants grow around you. Do all of them produce seeds?
- Think if grass produces seeds(hint:compare with rice plants and think).
- Name some plants that produce seeds.

- Which part of the plant produces seeds? Where is it located?(recall structure of plant parts studied in earlier classes)
- Do all plants have a definite structure to produce seeds?

Plants are diverse in nature. The basis of classifying them is the way they acquire their food, the type of reproductive structures they have and the way they reproduce. They are multicellular, eukaryotic with cell walls. They are usually autotrophs and use mainly chlorophyll for photosynthesis.

The first level of classification among plants depends on whether the plant body has well differentiated, distinct parts.

The next level of classification is based on whether the differentiated plant body has special tissues (vascular tissues) for the transport of water and other substances within it. Further classification looks at the ability to bear seeds and whether the seeds are enclosed within fruits.

Lets look at some plants like moss and ferns more closely.

Activity-8

Observation of moss plants through hand lens.

You can collect mosses from the greenish velvety growth on bricks during the rainy season. Scrap a bit of this greenish growth over a slide and observe with a hand lens or under a dissection microscope. You may find structures like that shown in the fig-5.

Fig-6 Mass

These are not exactly flowers but structures that contain seed like structures called spores. Spores contain very little food while the seed stores a lot of it. Moreover where seeds are produced from ovule of flower, spores are produced within structures called as sporangium in a different manner.

If you get a fern to observe, try to see the brownish or blackish dot like structures. These are the spore bearing bodies.

Fig-7 Sporangium

Plants like moss and fern which do not produce flowers and have sporangium as reproductive structures are called non-flowering plants or cryptogams, those that

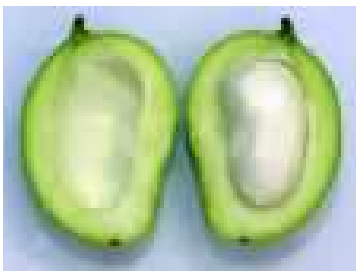


Fig-8 Mango seed

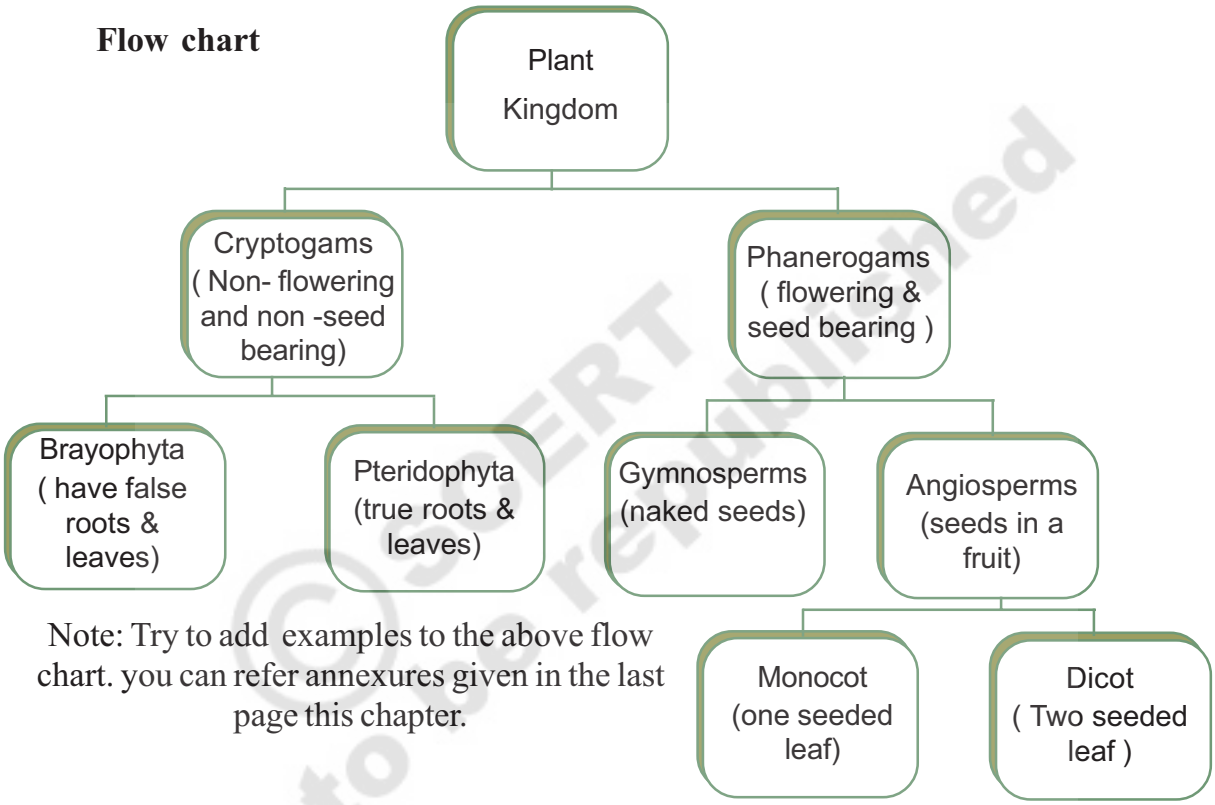
produce flowers are phanerogams like pine, cycas, neem, mango etc.

Among flowering plants those having seeds enclosed within fruits are angiosperms (e.g. mango) and those without it are gymnosperms (e.g. pine).The following pictures will help you see this.

Fig-9 Pine

- Write down the characteristic features of dicot and monocot plants that you have studied in earlier sections of this chapter.

Flow chart



Note: Try to add examples to the above flow chart. you can refer annexures given in the last page this chapter.

Classification of Animals

These are organisms which are eukaryotic, multicellular and heterotrophic. Their cells do not have cell-walls. Most animals are mobile. They are further classified based on the extent and type of the body design differentiation found.

Major groups are:

Porifera

The word Porifera means organisms with holes. These are non-motile animals attached to some solid support. There are holes or 'pores', all over the body. These lead to a canal system that helps in circulating water throughout the body to bring in food and oxygen. These animals are covered with a hard outside layer or skeleton. The body design involves very minimal differentiation and division into tissues. They are commonly called sponges, and are

Fig-10 Sycon

mainly found in marine habitats. Some examples are Euplectelea, Sycon, spongilla etc.

Coelenterata/Cnidarians

Fig-11 Hydra

These are aquatic forms showing more body design differentiation as compared to poriferans. There is a cavity in the body. The body is made up of two layers of cells: one forming the outer layers while the other forming the inner layers. Some live in colonies ,like the corals that are tiny (nearly 3 to 56 mm) but their colonies where we may find several types of them are as huge as say an island (1800 sqkm), while others like hydra, jellyfish and sea anemones are common examples.

Platyhelminthes

Fig-12 Tape worm

The body of animals in this group is far more complexly designed than in the two other groups we have considered so far. The body is bilaterally symmetrical, meaning that the left and the right halves of the body have the same design. There are three layers of cells from which differentiated tissues can be made, which is why such animals are called triploblastic. This allows outside and inside body linings as well as some organs to be made. There is thus some degree of tissue formation. However, there is no true internal body cavity or coelom, in which welldeveloped organs can be accommodated. The body is flattened dorsoventrally, meaning from top to bottom, that is why these animals are called flatworms. They are either freeliving or parasitic. Some examples of freeliving animals like planarians, or parasitic animals like liverflukes and tapeworms.

Nematoda

The nematode body is also bilaterally symmetrical and triploblastic. However, the body is cylindrical rather than flattened. There are tissues, but no real organs, although a sort of body cavity or a pseudocoelom is present. These are very familiar as parasitic worms causing diseases, such as the worms causing elephantiasis (filarial worms) or the worms in the intestines(roundworm or pinworms).

Fig-13 Round worm

Annelida

Annelid animals are also bilaterally symmetrical and triploblastic, but in addition they have a true body cavity. This allows true organs to be protected in the body structure.

There is, thus, extensive organ differentiation.This differentiation occurs in a segmental fashion, with the segments lined up one after the other from head to tail. These animals are found in a variety of habitats– fresh water,marine water as well as land. Earthworms and leeches are familiar examples (see Fig.16)

Fig-14 Earthworm

Arthropoda

This is probably the largest group of animals. These animals are bilaterally symmetrical and segmented. There is an open circulatory system, and so the blood does not flow in well defined blood vessels. The coelomic cavity is blood-filled. They have jointed legs (the word 'arthropod' means 'jointed legs'). Some familiar examples are prawns, butterflies, cockroaches, houseflies, spiders, scorpions and crabs (see Fig-17).

Fig-15

Mollusca

Fig-16 Snail

In the animals of this group, there is bilateral symmetry. The coelomic cavity is reduced. There is little segmentation. They have an open circulatory system and kidney-like organs for excretion. There is a foot that is used for moving around. Examples are snails and mussels.

Echinodermata

Fig-17 Sea star

In Greek, echinos means hedgehog, and derma means skin. Thus, these are spiny skinned organisms. These are exclusively free-living marine animals. They are triploblastic and have a coelomic cavity. They also have a peculiar water-driven tube system that they use for moving around. They have hard calcium carbonate structures that they use as a skeleton. Examples are starfish and sea urchins.

Protochordata

These animals are bilaterally symmetrical, triploblastic and have a coelom. In addition, they show a new feature of body design, namely a notochord, at least at some stages during their lives. The notochord is a long rod-like support structure (chord=string) that runs

along the back of the animal separating the nervous tissue from the gut. It provides a place for muscles to attach for ease of movement. Protochordates may not have a proper notochord present at all stages in their lives or for the entire length of the animal.

Protochordates are marine animals.

Examples are Balanoglossus, Herdmania and Amphioxus

Fig-18 Herdmania and Amphioxus

Vertebrata

These animals have a true vertebral column and internal skeleton, allowing a completely different distribution of muscle attachment points to be used for movement. Vertebrates are bilaterally symmetrical, triploblastic, coelomic and segmented, with complex differentiation of body tissues and organs. All chordates possess the following features:

(i) have a notochord
(ii) have a dorsal nerve cord
(iii) are triploblastic
(iv) have paired gill pouches
(v) are coelomate.

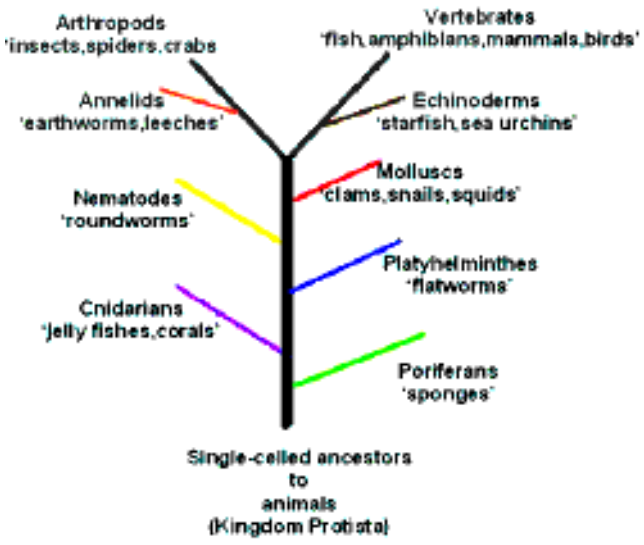
Vertebrates are grouped into five classes.

1. Pisces
2. Amphibians
3. Reptiles
4. Birds / Aves
5. Mammals

Do you know?

Fishes are cold blooded animals. They can change their body temperature according to their surroundings. Most of the fishes are oviparous but some give birth to young ones. We do not call them fishes which give birth to young ones. We call them aquatic mammals. e.g.Dolphin and whales. Hippocampus (Seahorse) is another fish like animal in which males carry babies as our mothers do. Sea horses are used in Chinese medicine. Seahorse population are thought to have been endangered in recent year by overfishing and habitat destruction.

Hippocampus



Vertebrates

Animals with Notochord (Notochord replaced by vertebral column in adults)

<table>
<tr><th colspan="5">5</th><th>4</th><th>3</th><th>2</th><th>1</th></tr>
<tr>
<td colspan="5">Mammals
Suckle young (feed babies with milk, skin covered by hair/fur breathe air give birth to fully formed young once)</td>
<td rowspan="2">Birds (Aves)
feathers, tow wings, claws, lay eggs.
Warm blooded animals, four chambered hearts.
  </td>
<td rowspan="2">Reptiles
have dry skin and scales, lay eggs, breath air, Cold blooded animals, most of them have a three chambered heart, but crocodiles have four heart
  </td>
<td rowspan="2">Amphibia
young live in water, but adults live on land, smooth slimy skin, lay eggs.
First vertebrates, can live both in water and land, Poikilothermic, hibernate during winter, aestivate during summer, Heart is three chambered.
  </td>
<td rowspan="2">Fish (Pisces)
have fins and tails, breath underwater using gills, Cold blooded animals and hearts have only two chambers.
  </td>
</tr>
<tr>
<td colspan="3">Land Mammals Mammalia
Outer ears four limbs (arms / legs)</td>
<td rowspan="2">Marines Mammals
Animals which grow and live in the water, some only have sparse covering of hair.
  </td>
<td rowspan="2">Flying Mammals
use echolocation, nocturnal, roots in trees or caves, under roots.
  </td>
</tr>
<tr>
<td>Marsupials
Care for and feed their young in their sacks.
  </td>
<td>Primates
Well developed hands / feet with fingers / toes, can judge distance, very intelligent social animals/ form bonds with family friends.
  </td>
<td>Rodents
Gnawing animal, large incisor teeth (two parts) use like chisels to gnaw on hard foods.
  </td>
</tr>
</table>

Lab Activity

Observe in your School Lab the Slide of a hydra (whole mount)/ picture of a hydra

- Is the body made of a single cell or a group of cells?
- Did you find any hollow structure inside the body?
- Did you find any other characters in it?

If you find any characters note down in your note book. Also draw a diagram of the given specimen.

The hollow structure found inside the body is called Coelom or body cavity.

Observe in your school Lab Specimen of a tape worm

Carefully observe the given specimen and note, the external characters you found, in your note book.

- How does the body look like?
- Did you see a body cavity in it?
- How does the head and tail look like?

The organisms which have flat body are called as flat worms, (platy-flat, Hilmenthes- worms), hence they are included in the name Platyhelminthes.

Observe in your School Lab the Specimen of a round worm (Ascaris)

Observe the given specimen and note down the characters what you found / observed in it.

- Does the body look same as in the Platyhelminthes?
- What are the differences you observed between tape worm and round worm?
- How does the head and tail look like in the specimen?

These animals are round shaped and depend on others for food (parasites). You cannot find true body cavity in these animals (pseudo coelomates).

Both platy and nematy helminthes are together called Helminthes.

Observe in your School Lab the Specimen of Earthworm

Collect a big earth worm from your surroundings without causing any harm to it.

- Touch the skin of the earthworm and say how do you feel?
- What is the colour ?
- Are there any differences you observed in its body colour and among the body parts?
- How does it move?
- Are there any ring like structures seen in its body?
- Draw a diagram of an earth worm in your note book and show all the characters you observed in it.

The body of earthworm is made of several ring-like structures. (annulus: rings, edios: form)

Hence they are included under Anneldians. Body cavity is clearly visible in it.

Observe in your School Lab the Specimen of a Cockroach.

Collect a cockroach or any insect and observe it carefully.

- How does the skin look like?
- Did you observe any hard layer on the skin?
- How many parts is the body divided into?
- Observe the legs and says how does it look like?
- Name some more animals whose legs are jointed as seen in the cockroach?

These are included in Arthropoda (Arthro-jointed, pod-legs) as they have jointed legs. Most of the animals in this group are the insects. Body is divided into three parts. Head, thorax and abdomen.

Observe in your School Lab the Specimen of Snail.

Observe a snail collected from a pond and keep inside a glass beaker.

Observe against sunlight.

Note down its characters you observed in your note book.

- How does the outer body look like?
- Keep the snail unmoved for some time and when it starts moving observe its body.
- Is the body soft or hard?
- Did you find any antennae like structure in it?

These animals whose body is soft and enclosed in a hard shell is called Molluscs.

Pearls are produced from a mollusc called oyster.

Observe in your School Lab the Specimen of starfish.

Collect a star fish when you visit a nearby sea beach. And observe its external characters carefully. If not possible, go to your school lab and observe the specimen of star fish. Note down your observations in your note book.

- What do you find on the skin of the star fish?
- Are there any arms and ray shaped structure in it?
- Did you find a small hole in the middle of the star fish?

These are exclusively marine living and spine skinned animals. (echino: spines, derm: skin)

All echinoderms are marine; they cannot live in freshwater or on land.

They are bottom dwellers and benthic.

Most are pentamemal, it means that they have fivefold symmetry with rays of arms in fives or multiples of five.

Ask your teacher and write five examples of echinoderms and draw diagrams in your note book.

Observe fish in your school lab.

Collect a fish from a fish monger and observe its external characters. You might have seen a long spine inside the body of a fish. This is the back bone of the fish. From fishonwards, all animals possess back bones and they are termed as Vertebrates (animals that have ventebral columns).

- Observe the skin of the fish. How does it look like?
- Write the body parts of the fish where scales are not present?
- Open the mouth of the fish. What is seen in it?
- Open side part of the fish where usually ears are located. What did you see there?

Cut open the fish and observe its heart. How many chambers are seen in its heart?

What will happen if you keep a small fish out of water for some time? Think, why?

Fishes are the first organisms possessing back bones. Body is covered with scales. Heart is two chambered. These are aquatic animals and cannot survive on land. There are specialized organs called Gills useful for its respiration.

(You need not complete all the activities in a single Lab period. You must be catious while observing the specimens to find out its characters.)

Nomenclature

- Why do we need to give universally accepted names to organisms?

Think , discuss with your friends and write on this.

Let us see what happens when we go about using local names.

- Do you know the common names of potato in different languages?
- Suppose you used the name batata where people knew only English, would you get your potatoes?

We see that local names may create a lot of confusion. This would hinder study about an organism as talking about it in one place would not match with the other.

Common Name	Telugu Name	Hindi Name	Tamil Name	Marathi Name	Odia Name
Potato	Bangala Dumpa	Aloo	Urulakkiz Hangu	Batata	Bilati Aloo

This problem was resolved by scientists by agreeing upon a scientific name for organisms in the same manner that chemical symbols and formulae for various substances are used over the world. Naming of organisms with a distinctive scientific name is called Nomenclature. It is unique and can be used to identify organisms anywhere in the world.

Certain norms are followed while writing scientific names. They are-

- Genus should begin with a capital letter.
- Species should begin with a small letter.
- When printed, the scientific name should be in italics.
- When written by hand, the genus name and the species name have to be underlined separately.

For example, the scientific name of a Mango tree is Mangifera indica and a Human being is Homo sapiens.

Activity-9

Try to find out the scientific names of at least 10 organisms that you see around you.

To classify just keep the following points in mind

Procedure

- Observe, make a labeled sketch of the organism (use dissecting microscope as necessary)
- Write a brief description of the organism, focusing on the characteristics that distinguish it as a member of its group.
- Select a criteria for classification for example "body structure".
- Research the classification of the organism as done by other scientists
- Try to findout answers for these questions

1. Is the organism prokaryotic or eukaryotic?
2. Is the organism unicellular, multicellular, or colonial?
3. How does the organism reproduce?
4. What are the sources of energy and carbon for the organism?

Key words

Flora, fauna, diversity, variation, classification, evolution, kingdom, domain, phylum, class, order, family, genus, species, nomenclature

What we have learnt?

- Diversity is the hallmark of nature. Variation among the organisms leads to evolution and growth of diversity.
- Scientists started classification of organisms depending upon the similarities and differences in them (sample under study).
- Differences that are observed in very closely related populations are called variation.
- In nature no two organisms are identical.
- Classification helps us in exploring the diversity of life forms.
- Classification is the systematic study of organisms present in nature.
- Classification of life forms is closely related to their evolution.
- The major characteristics considered for classifying all organisms into five major kingdom are:

  i. Whether they are made of prokaryotic or eukaryotic cells.

  ii. Whether the cells live solitarily or in colonies.

  iii. Whether the cells have a cell wall and whether they prepare their own food.

  According to Whittaker, all living organisms are divided into five kingdoms, namely:

  1. Monera 2. Protista
  3. Fungi 4. Plantae 5. Animalia

- Plantae and animalia are further divided into subdivisions on the basis of increasing complexity of body design of organisms.
- Recently Cavalier-Smith classified the organisms into six kingdoms as

  1. Bacteria, 2. Protozoa 3. Chromista 4. Plantae 5.Fungi
  6. Animalia.
- Naming of organisms with a distinctive scientific name is called Nomenclature.
- Nomenclature provides a uniform way of identification of the vast diversity of life around us.
- Carolus Linnaeus introduced Binomial nomenclature by which an organism is named by two words- a generic name and a specific name.

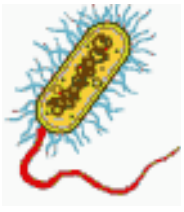
Improve your learning

1. Variations in organisms lead to diversity in living organisms? State reasons (AS1)
2. What was the basis of early classifications? (AS1)
3. What are the advantages of classifying organisms? (AS1)
4. What is the need of classification? What questions you will ask for this? (AS 2)
5. How do monocots differ from dicots? (AS1)
6. One day Kavitha soaked seeds of green grams, wheat, maize, peas and tamarind. After they became tender, she tried to split the seed. Name which would split, which would not and identify them according to the characters. (AS 4)

Sl. NO.	Name of the seed	Split into half (y)/ does not Split (N)	Monocot (M)	Dicot (D)
1 2 3 4				

7. Make a flow chart of invertebrates in the kingdom Animalia, based upon their characteristic features. (AS 5)
8. Write some common characters of Pisces, Reptilia and Aves. (AS 1)
9. Name the kingdom to which these organisms belong according to Whittaker.(AS1)

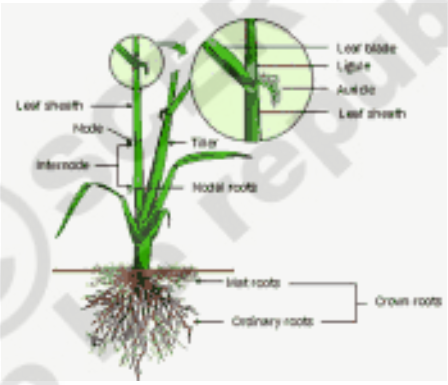


10. Explain how animals in vertebrata are classified into further subgroups.(AS1)
11. Platypus or Echidna is a group that forms a link between reptiles and mammals. Think and write about some characteristic features that these would have. (AS 4)
12. Sujata says Bat is not a bird but a mammal. How can you support Sujata's statement?
13. Which phylum do I belong to (AS1)
    a) My body is made of pores. I live in water. I do not have back bone also …….
    b) I am an insect. I have jointed legs . …….
    c) I am a marine living animal with spiny skin. My body is radially symmetrical …….
14. How can you appreciate the effort of scientists in classifying a wide range of organisms? (AS 6)

ANNEXURE-1

Maize plant



Rice plant

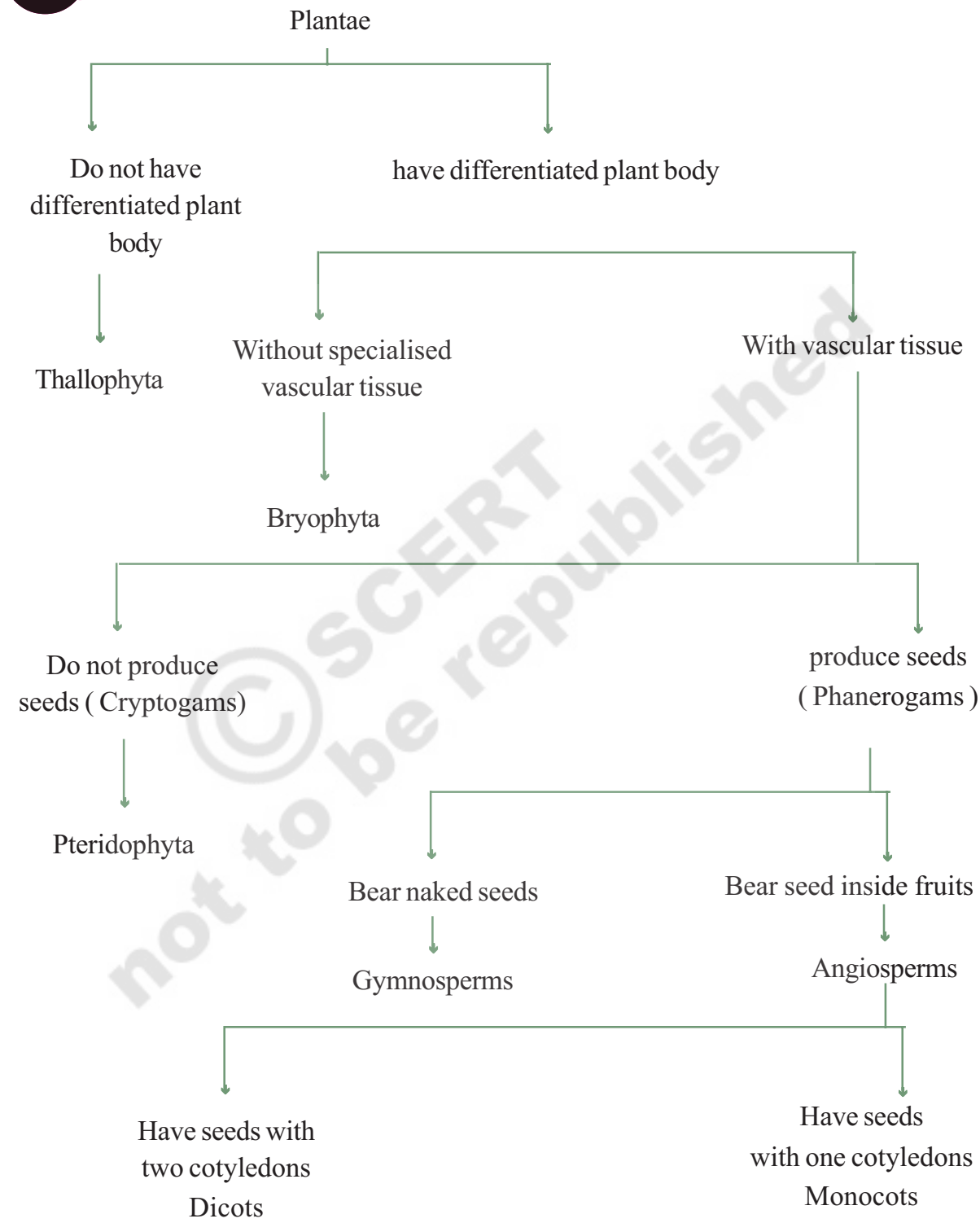
Grass plant

Bean Plant

Green gram plant

ground nut plant

ANNEXURE-2



ANNEXURE-3