

## Diversity in Living Organisms

Curriculum: CBSE

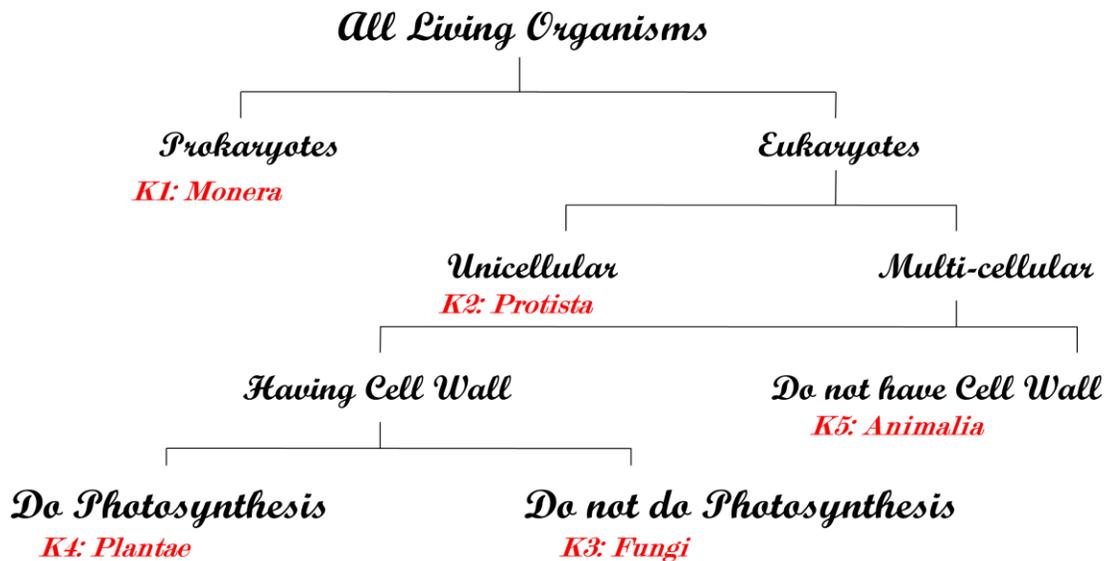
- ✓ The region between the tropic of Cancer and tropic of Capricorn is known as Region of Mega Biodiversity because more than 50% of species are found in this region
- ✓ Taxonomy is the branch of Science that labels different kind of organisms and group them together
- ✓ Evolution is the basic change in which life has been evolved or changes are happened in them over time which helps the organism to adapt the changing environment



**Fig.1**

- ✓ On this basis all living organisms are grouped together
- ✓ As we go from up to down in this fig.1 similarities between two species increases
- ✓ Two individual belongs to the same species if they can interbreed and produce a fertile offspring
- ✓ There is a system of Binomial Nomenclature which is used for naming species in scientific way so that every where scientific name for an organism should be same
- ✓ Certain Rules for that are as follows
  - First Genus name should be written followed by species name
  - First letter of Genus must be capital however species first letter should not be capitalized

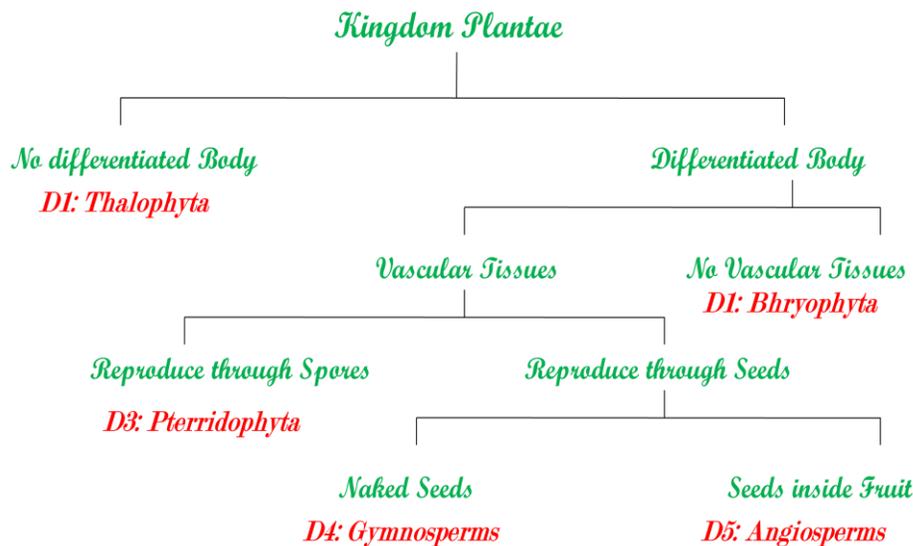
- When typed it should be in *italics*
- When written genus and species name should be underlined
- ✓ Let's see the flow chart show that you can understand on what basis the classification has been done:



- ✓ So, All living organisms are categorized into 5 basic types i.e.
  - *Monera*
  - *Protista*
  - *Fungi*
  - *Plantae*
  - *Animalia*
- ✓ So, The classification is done of all living organisms on the basis of:
- ✓ Complexity of Cell: There are two types of cells i.e. Prokaryotic and Eukaryotic Cells
- ✓ Number of Cells: There may be one cell(Unicellular) or more than one (Multi-cellular) cells in the body of an organisms
- ✓ Presence/Absence of Cell Wall: Classification is also done on the basis of Presence/Absence of Cell wall in a cell
- ✓ Can/Cannot do Photosynthesis: Classification is also done on the ability of a cell to perform photosynthesis or not
- ✓ Monera have 2 sub-types: Archaea or Bacteria, So let's start
- ✓ Archaea are the most ancient form of life that exists 3.8 billion years ago. Archaea are super adaptable as it can be found in the most extreme climatic conditions. Most of the scientist believe that most

complex organisms that we can see today has evolved from the Archaea (Prokaryotic Organisms)

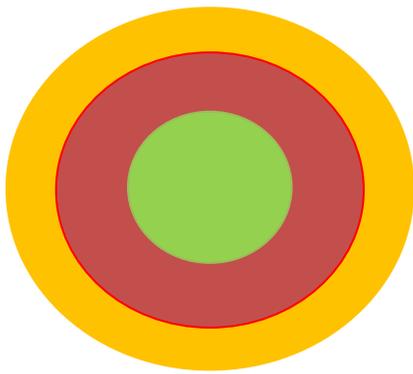
- ✓ Bacteria are also prokaryotic but not as ancient as Archaea they are also super adaptable to extreme conditions.
- ✓ Monera are Hetero-trophs (Except Cyanobacteria: Auto-trophs) and they are always unicellular
- ✓ E.g. Cyanobacteria, Anabaena, Bacteria etc
- ✓ Protista: Protista are eukaryotic and unicellular organisms. They are the most primitive form of organisms as some of them are animal like, some are plant like and some are fungi like.
- ✓ For e.g. Slime Moulds, Algae, Protozoans
- ✓ Fungi: Fungi are multi-cellular, eukaryotic and hetero-trophs and their cell wall are made of the same substance that covers all arthropods like cockroaches called chitin. Some fungi are saprophytic while some are parasitic and others are showing symbiotic relationship
- ✓ Symbiotic Relationship means the relation which two organisms show together for benefit of one or both
- ✓ Kingdom Plantae consist of organisms which are made of Eukaryotic, Multi-cellular, Having Cell Wall and Do Photosynthesis. It is also divided into many divisions let's see the flow chart to understand it even better



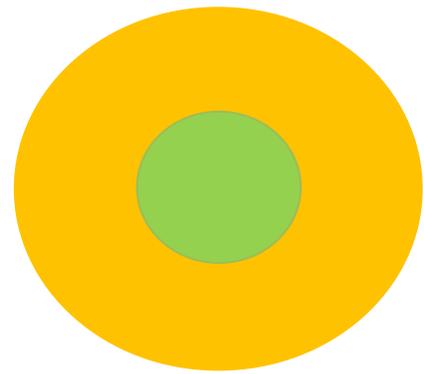
- ✓ Kingdom Plantae is classified based on following things, some of them are as follows
- ✓ Whether the plant body have differentiated body structures or not
- ✓ Whether the plant body have special conduction pathway for food and water called Vascular Tissues

- ✓ Whether the plant reproduce through seeds or spores
- ✓ Whether the seed is naked or covered by fruit
- ✓ Thalophyta are the plants which do not have differentiated body structures, mostly aquatic, do not have vascular tissues and Thalophyta are also called algae
- ✓ For e.g. Ulva, Spirogyra, Ulothrix, Cladophora and Chara
- ✓ Bryophyta have differentiated body structures (Leaves and stem) but do not have special conduction pathway for food and minerals and they are also called amphibious plants as they live on both land and water
- ✓ For e.g. Liverworts, Mosses and Hornwort
- ✓ Pteridophyta have differentiated body structures, have special conduction pathway for food and water but reproduce through spores
- ✓ For e.g. Marsilea, Horsetails and Ferns
- ✓ The organisms that reproduce through spores are called Cryptogamae and those reproduce through seeds are called Phanerogamae
- ✓ Thalophyta, Bryophyta and pteridophyta are Cryptogamae as they reproduce through spores
- ✓ Gymnosperms have differentiated body structure, have special conduction pathway, reproduce through seeds but seeds are naked as they are not covered through fruits, most of the plants falling in this category are perennial, evergreen and woody
- ✓ For e.g. Pines, Ginkgo and Cycas
- ✓ Angiosperms have differentiated body structures, special conduction pathway for food and water, they are flower and fruit bearing plants so angiosperms are also called fruit-bearing plants
- ✓ Angiosperms have two sub-types depending on the number of cotyledons present in them
- ✓ They are monocots ( One Cotyledon) or dicots (Two Cotyledons)
- ✓ The plants that reproduce through seeds are called Phanerogamae
- ✓ Gymnosperms and Angiosperms are Phanerogamae Plants
- ✓ Before starting with the most complex Kingdom called Animalia let's see some important terms which would be require to study Animalia Kingdom
- ✓ Symmetry: If you draw a line from the centre, it will divide the organism in two equal halves this is called symmetry. There are two types of Symmetry i.e. Bilateral symmetry and Radial Symmetry
- ✓ Bilaterally Symmetrical means there is only one point from where if you divide the organism then it will divide into two identical halves

- ✓ Radial Symmetry means you can draw any line passing from the centre then it will divide the organism into two equal halves
- ✓ Germ Layer: When the organism is in its embryonic phase that time it will have two or three layers called diploblastic or triploblastic organisms respectively
  - Endoderm: it form digestive system when develop into an organism
  - Mesoderm: It forms heart, lungs, kidney etc when develop into an organism
  - Ectoderm forms all the exterior structures of an organisms



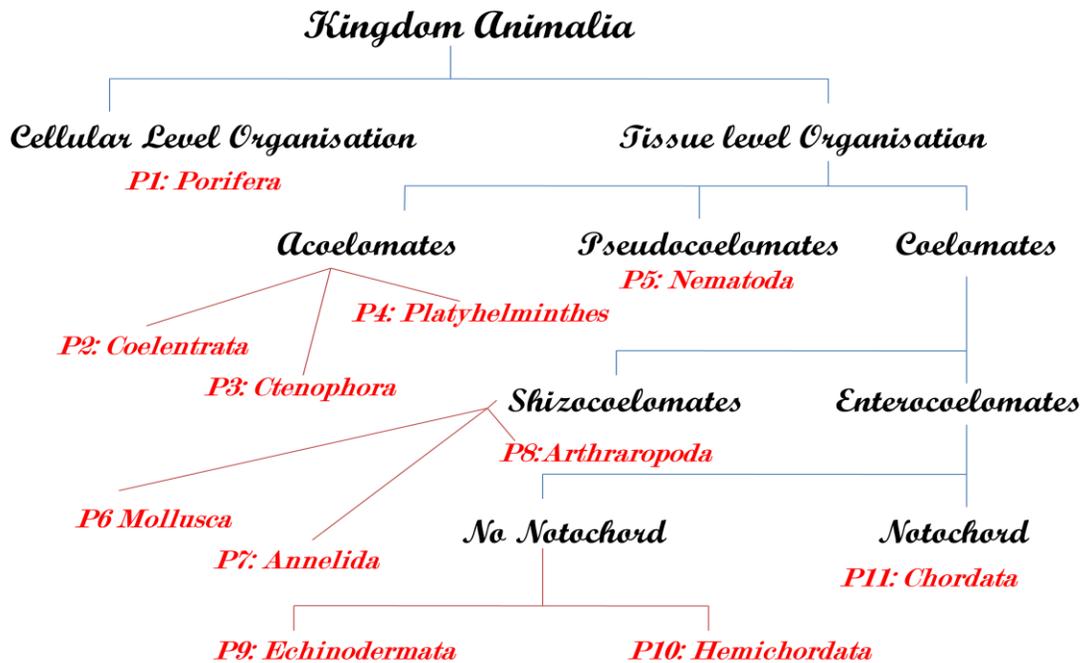
**Triploblastic Embryo**



**Diploblastic Embryo**

- ✓ Coelom is also very important which refers to empty cavity in the body of an organism. This Coelom is seen from its embryonic phase and Coelom is formed only in sometimes in Triploblastic organisms and never can be found in Diploblastic Organisms because Mesoderm layer is absent in Diploblastic organisms
- ✓ There are two ways in which Coelom can be formed:
  - Coelom form due to splitting of Mesoderm. This organisms are called Shizocoelomates
  - Coelom form due to pouches of Mesoderm pinned off from Endoderm. This organisms are called Enterocoelomates
- ✓ The organisms those who have Coelom are called Coelomates
- ✓ The organisms those do not have Coelom are called Acoelomates
- ✓ The organisms those who have false Coelom are called Pseudocoelomates
- ✓ Notochord is also very important in the body of an organisms, it is the rod like structure which is placed between the nervous tissues and guts it provides place for muscles for attach and to ease the movement

- ✓ There are three types of organisms: Those who have notochord, those who don't have notochord and those who have notochord only in embryonic phase but later change into Vertebrate column
- ✓ So, Based on this important terms let's classify all the organisms in Kingdom Animalia and understand its features but before that let's see the flow chart and understand on what basis all phylum in the Animalia are classified

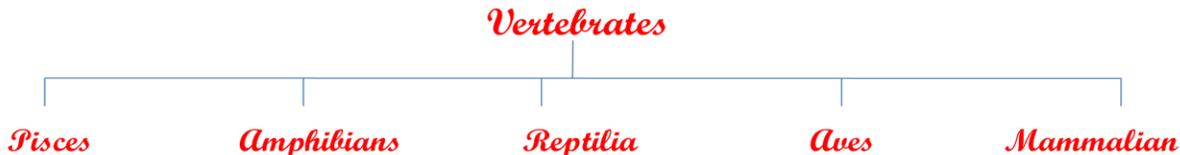


- ✓ Porifera are the most basic organisms as they have only cellular level organisms. These organism are also called sponges, they are non motile animals (means they cannot move) with holes on body with canal system which helps to circulate food and water through the body. They are aquatic and has skeleton which is hard layer formed outside the body
- ✓ For e.g. Euplentelia, Spongilla, Sycon etc
- ✓ Coelentrata are diploblastic, shows radial symmetry and has no Coelom, they have hollow gut and are aquatic
- ✓ For e.g. Jelly Fish, Hydra etc
- ✓ Ctenophora are Diploblastic, aquatic show radial symmetry and has no Coelom, they have comb-plates for loco-motion or movement
- ✓ For e.g. Peurobrachia
- ✓ Platyhelmenthis are also called flatworm as they are flat. They are Triploblastic, Bilaterally Symmetrical, do not have Coelom. It may be

free-living or parasites. They have only one opening which work as both mouth and anus

- ✓ For e.g. Tape worm, Liverfluke, Planeria etc
- ✓ Nematoda are Triploblastic, bilaterally symmetrical, have false Coelom, are cylindrical in shape and many of them are parasitic
- ✓ For e.g. Ascaries, Wuchereria etc.
- ✓ Mollusca are Triploblastic, have Coelom and soft body, generally not segmented, do not have any appendages, have muscular foot for movements and generally its soft body is covered with shell. It has kidney like organ for excretion
- ✓ For e.g. Chiton, Pilia, Octopus and Urion
- ✓ Annelida have Coelom, they are bilaterally symmetrical and Triploblastic, its body is generally segmented. They are found both in land and water and have organ system. It is the second largest phylum in Kingdom Animalia
- ✓ Arthropoda is the largest Phylum as more than 80% of the species) are coming in Phylum Arthropoda. They are bilaterally symmetrical, triploblastic and have Coelom. Its body is segmented and is made of tough exo-skeleton called Chitin (Same substance by which cell wall of fungus made of) and has joint appendages
- ✓ For e.g. Cockroaches, Prawn, Scorpion, Butterflies, Moths, House-fly etc
- ✓ Echinodermata have Coelom, Triploblastic, Bilaterally Symmetrical before birth but shows radial symmetry after birth, spiny skin, endo-skeleton made of calcium carbonate ( $\text{CaCO}_3$ ), have water vascular system for locomotion
- ✓ For e.g. Echinus, Antedon, Star-fish, sea-cucumber etc
- ✓ Hemichordata are small cluster of aquatic animals, they are cylindrical, bilaterally symmetrical, Triploblastic and have Coelom and Gills for respiration (Generally Gills help to respire in Water)
- ✓ For e.g. Balanoglossus
- ✓ Chordate are bilaterally Symmetrical, Triploblastic, have notochord, gills, dorsal nerve chord and postanal tail
- ✓ For e.g. Human, Dogs, Parrots etc
- ✓ Chordates are also divided into Prochordates and Vertebrates
- ✓ Prochordates are those which has Notochords while Vertebrates are those whose Notochord changes over time as transform into Vertebrate column
- ✓ E.g. of Prochordates are Herdmania, Amphioxus etc.
- ✓ Let's look Vertebrates in some more details

- ✓ Vertebrates have 2,3,4 chambered heart, consist of organs like kidney for excretion and have paired appendages
- ✓ Vertebrates are also classified into many Classes



- ✓ Pisces are the aquatic animals which have gills, two chambered heart, they are cold blooded animals which lay eggs and their skin s covered with scales. It also sometimes classified based on their endo-skeleton as some of them has bony-skeleton while others have cartilage skeleton. For e.g. Dog fish, Flying fish, *Rohu*, Anglier Fish etc
- ✓ Amphibians are the organisms that can live both in land and water and it has both gills and lungs together, they have 3 chambered blood. They are cold blooded animals and they lay eggs in water. They have mucus glands. For e.g. Salamander, common frog, hyla etc
- ✓ Reptilia can also live in both land and water and they have lungs for respiration. They have 3 chambered heart, they lay eggs on land. They have scales on their body. For e.g. Cobra (Snake), Lizards, Turtle etc
- ✓ Aves can live in Water/ Air/Land. They have lungs for breathing. Aves have 4 chambered heart. These are warm blooded animals and lay eggs and they have feathers on body. For e.g. Pigeons, Crow, Ostrich etc
- ✓ Mammals may live in Water or Land. They have lungs for breathing and 4 chambered heart. These are warm blooded animals and directly give birth to young ones and their body is covered with Hair, sweat and oil glands. For e.g. Humans, Lion, Cats etc



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