

BRILLIANT PUBLIC SCHOOL, SITAMARHI

(Affiliated up to +2 level to C.B.S.E., New Delhi)



IX Biology Chapter Notes

Session: 2014-15

**Office: Rajopatti, Dumra Road, Sitamarhi (Bihar), Pin-843301
Ph.06226-252314 , Mobile:9431636758, 9931610902
Website: www.brilliantpublicschool.com; E-mail: brilliantpublic@yahoo.com**

Class IX: Biology
Chapter 5: The fundamental unit of life.

Chapter Notes

Key learnings:

- 1) In 1665, Robert Hooke first discovered and named the cells.
- 2) Cell is the structural and functional unit of all living organisms.
- 3) Organisms may be unicellular or multicellular. A single cell constitutes the unicellular organism whereas many cells coordinately function in case of multicellular organism.
- 4) The size, shape and volume of the cell are related to the specific function that they perform.
- 5) A cell generally shows plasma membrane, nucleus and cytoplasm
- 6) Plasma membrane is a thin, selectively permeable membrane, covering the cell and is made up of lipids and proteins.
- 7) Functions of plasma membrane :
 - i) It separates the contents of a cell from its outside environment.
 - ii) It regulates the flow of substances to and from the cell through diffusion, facilitated diffusion, active transport and endocytosis.
- 8) Osmosis is diffusion of water through a selectively permeable membrane.
- 9) A cell placed in different solutions:
 - i. hypotonic solution : A cell placed in it will gain water.
 - ii. hypertonic solution: A cell placed in it will lose water: Also known as plasmolysis.
 - iii. isotonic solution: A cell placed in it will neither gain nor lose water
- 10)

Cells of Plants, fungi & bacteria: Contain both plasma membrane & cell wall. Cell wall is rigid, non-living & outer most covering, composed mainly of cellulose.
- 11) When placed in hypertonic solution, a living plant cell shows plasmolysis
- 12) Cell wall provides mechanical strength to the cell. It permits the cell to withstand huge changes in the surrounding medium.

13) Nucleus is an important, spherical, usually centrally located constituent of the cell and is bounded by double layered nuclear envelope.

14) The nucleus of a dividing cell shows rod-shaped chromosomes, made up of DNA and proteins. In a non-dividing cell, the chromosomes elongate and take the form of thread-like chromatin.

15) DNA molecules are responsible for transmitting hereditary information from one generation to the next.

16) Nucleus controls all metabolic activities of the cell.

17) Depending on the presence or absence of nucleus, cells may be prokaryotic or eukaryotic.

i) Prokaryotic cells lack a well-defined nucleus and instead show nucleoid, an undefined nuclear region containing the genetic material.

ii) Eukaryotic cells possess a proper nucleus with nuclear membrane.

18) Cytoplasm is the fluid content of the cell, occurring between nucleus and plasma membrane. It stores several vital chemicals and is the site of certain important metabolic pathways.

19) Several specialized cell organelles are present in the cytoplasm. These organelles perform different kinds of metabolic activities and are kept separate from each other.

20) The various cell organelles include endoplasmic reticulum, Golgi apparatus, lysosomes, mitochondria, plastids, vacuoles and centrosome.

21) Endoplasmic reticulum (ER) is an extensive, interconnected, membrane-bound network of tubes and sheets.

22) Ribosomes are attached to the surface of Rough Endoplasmic Reticulum (RER) and are absent in Smooth Endoplasmic Reticulum (SER)

23) Functions of ER :

i) It synthesizes important proteins (RER) and lipids (SER).

ii) It provides a pathway for intracellular transport of materials.

iii) SER of liver cells is important for detoxification.

24) Golgi apparatus is a network of stacked, flattened, membrane bound sacs and vesicles.

25) Golgi apparatus carries out the storage, modification and packaging of substances manufactured in the cell and is also involved in lysosome formation.

26) The spherical, sac-like lysosomes contain powerful digestive enzymes and form the waste disposal system of the cell. They are also known as 'suicide bags'.

27) Mitochondria and plastids are each covered by 2 membranes and possess their own DNA and ribosomes.

28) Mitochondria are the 'powerhouses of the cell', providing energy for various metabolic activities.

29) Chromoplasts and leucoplasts are the 2 types of plastids present in plant cells.

30) Chloroplasts are chromoplasts containing chlorophyll and carry out photosynthesis in plants.

31) Leucoplasts store starch, oil and protein granules.

32) The large central vacuole of mature plant cells provides turgidity to the cell and also stores important substances.

33) In unicellular organisms, vacuoles play important roles in nutrition and osmoregulation.

34) Ribosomes are sites of protein synthesis.

35) Centrosome is found only in animal cells and consists of 2 centrioles. Centrosome helps in cell division.

37) The membrane-bound cell organelles are absent in prokaryotic cells.

38) Differences between plant cell and animal cell.

	Plant cell	Animal cell
1	Plant cells are generally large in size.	Animal cells are smaller than plant cells.
2	Plant cells possess plastids.	Animal cells lack plastids.
3	Cell wall is present	Cell wall is absent.
4	Mature plant cells possess a large, central and permanent vacuole.	Animal cells possess many small and temporary vacuoles.
5	Centrosome and centrioles are absent in plant cells.	Centrosome and centrioles are present in animal cells.

39) The basic structural organization of the cell helps it to perform important functions like respiration, nutrition, excretion and protein synthesis.

Top definitions

- 1) Cell - An autonomous self-replicating structure that forms the structural, functional and biological unit of all living organisms.
- 2) Prokaryotic cell – A cell characterized by the absence of a distinct, membrane-bound nucleus or membrane-bound organelles, and by DNA that is not organized into chromosomes.
- 2) Nucleoid – An undefined nuclear region of the prokaryotic cell, containing the genetic material (nucleic acids).
- 3) Eukaryotic cell – A cell containing a membrane-bounded nucleus and membrane-bounded organelles.
- 4) Unicellular organism – Organism having only one cell.
- 5) Multicellular organism - Organism consisting of more than one cell, wherein the differentiated cells perform specialized functions in the organism.
- 6) Diffusion – The spontaneous movement of a substance from a region of its higher concentration to a region of its lower concentration.
- 7) Osmosis – The movement of water through a semi-permeable membrane from a region of high water concentration to a region of low water concentration.
- 8) Hypertonic solution - A solution that has a higher solute concentration than the one to which it is compared (eg - some kind of cell).
- 9) Hypotonic solution - A solution that has a lower solute concentration than the one to which it is compared (eg - some kind of cell).
- 10) Isotonic solution - A solution that has the same tonicity as another solution with which it is compared.
- 11) Plasmolysis - Shrinkage or contraction of the protoplasm away from the wall of a living plant or bacterial cell, caused by loss of water through osmosis.
- 12) Cell organelle – A specialized subunit within a cell that has a specific function, and is usually separately enclosed within its own membrane.
- 13) Genes - A hereditary unit consisting of a sequence of DNA that occupies a specific location on a chromosome and determines a particular characteristic in an organism.

14) Membrane biogenesis – The process of synthesizing the biological membranes.

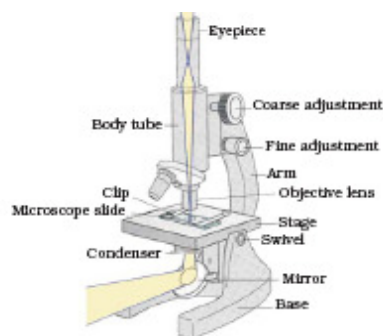
15) Plasma membrane – The thin, selectively permeable membrane composed of lipids and proteins which surrounds an entire cell and regulates the flow of substances to and from the cell.

16) Cell wall – The rigid, non-living, outer covering of certain cells (like plant and bacteria), composed mainly of cellulose and providing the cell with structural support and protection.

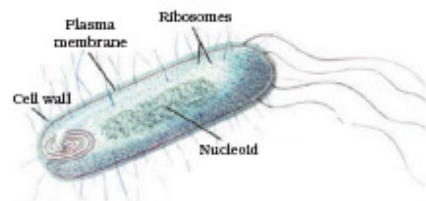
17) Cytoplasm - The jellylike material of a cell that is enclosed within the plasma membrane, except the nucleus and contains the cell organelles.

18) Chloroplasts – The plastids containing chlorophyll which are capable of carrying out photosynthesis in plants.

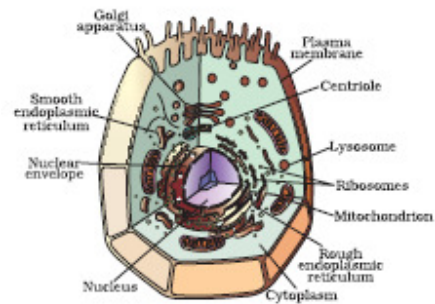
Top diagrams



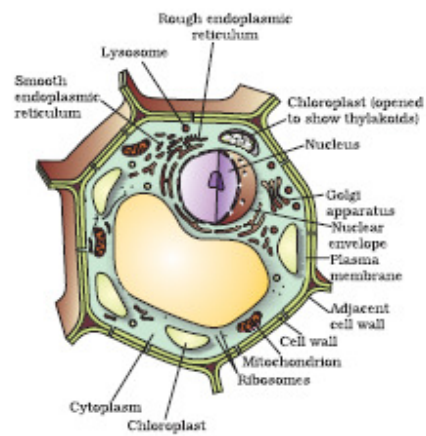
Compound microscope



Prokaryotic cell

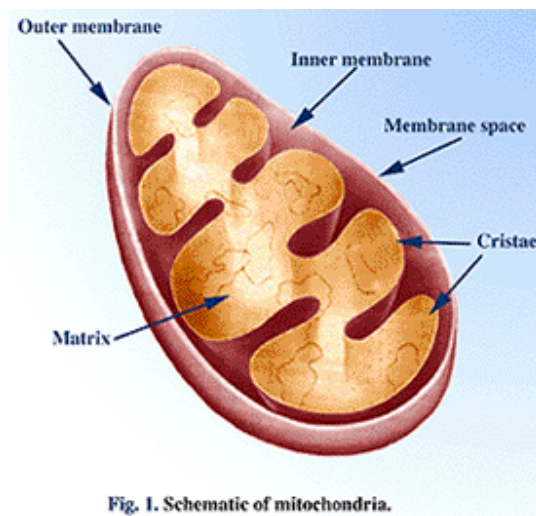
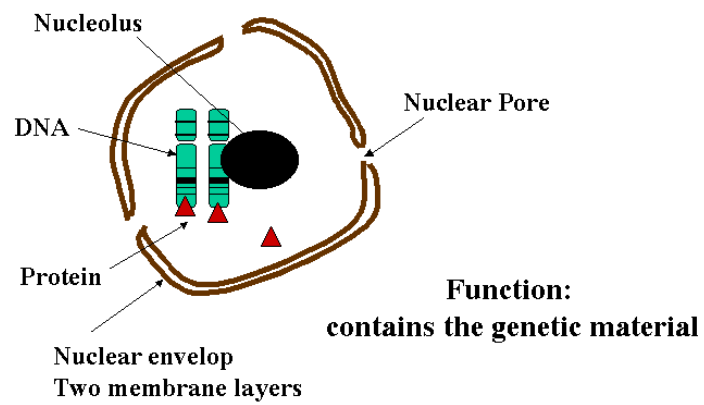


Animal cell



Plant cell

The nucleus



Class IX : Biology

Ch 6 : Tissues

Chapter Notes

Key learnings:

- 1) Tissue is a group of specialized cells with similar structure and performing a common function.
- 2) Tissues ensure division of labour in multi-cellular organisms.
- 3) The tissues present in plants and animals are different owing to variations in their body organization and mode of living.
- 4) Plants show two main types of tissues – meristematic tissues and permanent tissues.
- 5) Meristematic tissues may be apical, lateral or intercalary, depending on their location in the plant.
- 6) Permanent tissues are classified into simple and complex tissues.
Simple tissue shows only one type of cells whereas complex tissue consists of more than one type of cells, functioning as a unit.
- 7) Three types of simple permanent tissues are parenchyma, collenchyma and sclerenchyma.
- 8) Parenchyma is a supporting and storing tissue, composed of unspecialized, thin-walled cells with large intercellular spaces.

- 9) Collenchyma cells are elongated, with irregularly thickened cell walls. It provides mechanical support and elasticity to the plant.
- 10) The main supporting tissue, sclerenchyma, consists of long and narrow cells with thick, lignified cell walls.
- 11) Parenchyma and collenchyma are living tissues whereas sclerenchyma is a dead tissue.
- 12) Epidermis is the outer protective covering of the plant and is usually layered by cuticle.
- 13) Stomatal pores, present in the epidermis, are essential for transpiration and gaseous exchange.
- 14) In older plants, many layered cork is seen, made up of dead and compactly arranged cells.
- 15) Xylem and phloem are important types of complex tissues in plants.
- 16) Xylem is composed of tracheids, vessels, xylem parenchyma and xylem fibres. It conducts water and minerals from roots to aerial parts of the plant.
- 17) Phloem consists of sieve tubes, companion cells, phloem fibres and phloem parenchyma. It transports food from leaves and storage organs to all other parts of the plant.
- 18) Animal tissues are grouped into 4 basic types – epithelial, connective, muscular and nervous tissue.

19) Epithelial tissues are the covering or protective tissues which act as a barrier between the various systems of the body. It rests on a basement membrane and is composed of tightly packed cells.

20) Based on the shape and function of its cells, epithelial tissue is subdivided further into squamous, cuboidal, columnar, ciliated and glandular.

Epithelium type	Shape of cells	Function
Squamous	Thin and flat	Protection
Cuboidal	Cubical	Absorption, secretion and mechanical support
Columnar	Elongated	Absorption and secretion
Ciliated	Cubical or columnar cells with cilia.	Moving materials, like mucus, forward.
Glandular	Glands formed from cuboidal or columnar cells.	Secretion

21) Connective tissue is the binding and supporting tissue of the animal body. Matrix forms the main bulk of this tissue, whereas the cells are loosely spaced and less in number.

22) Blood, bone, ligament, tendon, cartilage, areolar tissue and adipose tissue are important connective tissues present in our body.

23) Blood is a fluid connective tissue, composed of plasma and cells, and plays a significant role in the process of transportation.

- 24) Functions of protection, providing skeletal framework and anchoring are carried out by the strong and hard bone tissue.
- 25) Ligaments connect bones to bones whereas tendons connect bones to muscles.
- 26) Cartilage provides support and flexibility to the body parts.
- 27) Areolar tissue repairs the injured tissues and fills spaces within organs.
- 28) Adipose tissue serves as a fat reservoir and also carries out the function of insulation.
- 29) All movements in our body are brought about by the muscular tissue through the contraction and relaxation of their contractile proteins.
- 30) Depending on their structure and function, the muscles may be striated, smooth or cardiac muscles.

	Striated	Smooth	Cardiac
Shape of cells	Long, cylindrical, unbranched	Spindle-shaped	Cylindrical, branched
Striations	Present	Absent	Present
Control	Voluntary	Involuntary	Involuntary
Number and position of nuclei	Multinucleate and peripheral	Uninucleate and central	Uninucleate and central

- 31) Nervous tissue is present in the brain, spinal cord and nerves.
- 32) Neuron is made up of cell body, dendrites and axon.

- 33) Neurons are specialized to receive and conduct impulses rapidly.

Top definitions

- 1) Tissues - A group of specialized cells with similar structure, working together to perform a common function.
- 2) Meristematic tissue – Tissue made up of actively dividing cells, present in the growing areas of the plant body.
- 3) Apical meristem – Meristem present at the growing tips of stem and root that causes the stem and root to increase in length.
- 4) Lateral meristem – Meristem located on the lateral portion of the plant and responsible for increasing the girth of its stem and root.
- 5) Intercalary meristem – Meristem found between already differentiated tissues, in locations such as the base of leaves or internode.
- 6) Permanent tissue – A well-differentiated plant tissue derived from meristematic tissue, which has lost its ability to divide.
- 7) Differentiation – The process by which a cell attains a permanent shape, size and function.

- 8) Simple permanent tissue – A permanent tissue composed of only one cell type.
- 9) Complex permanent tissue – A permanent tissue composed of more than one type of cells which coordinate to perform a common function.
- 10) Chlorenchyma - Parenchyma whose cells contain chloroplasts and hence performs photosynthesis.
- 11) Aerenchyma - Parenchyma containing large air cavities, providing buoyancy to aquatic plants and allowing the circulation of gases.
- 12) Xylem – The complex tissue that conducts water and minerals in vascular plants and composed of tracheids, vessels, fibers, and parenchyma.
- 13) Phloem – The food-conducting tissue of vascular plants, consisting of sieve tubes, companion cells, fibers and parenchyma.
- 14) Epidermis - The outermost, protective layer of cells covering the surface of a plant.
- 15) Stratified epithelium - An epithelium composed of multiple layers of cells, with only the basal layer being in contact with the basement membrane.
- 16) Ligament – A fibrous connective tissue that connects (or binds) bones to bones.

- 17) Tendon – A fibrous connective tissue that connects bones to muscles.
- 18) Voluntary muscles – Muscles which can be controlled according to our will.
- 19) Involuntary muscles – Muscles which are not under the control of the will.
- 20) Multinucleate cell – Cell containing more than one nucleus.
- 21) Uninucleate cell – Cell containing only one nucleus.
- 22) Neuron – A cell of the nervous system specialized to conduct nerve impulses and made up of cell body, axon and dendrites.
- 23) Impulse – An electrical signal transmitted along a nerve fibre in response to a stimulus.

Top diagrams

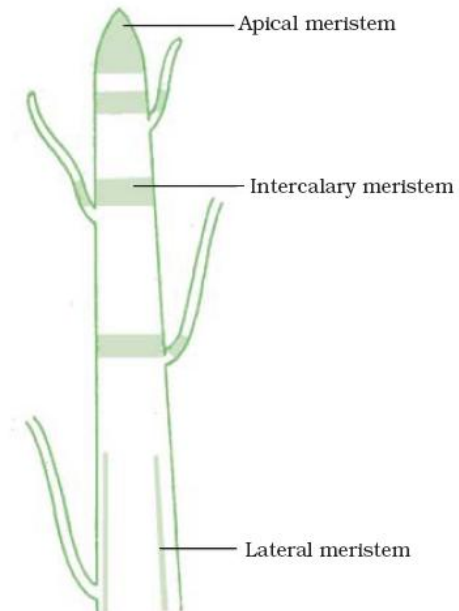


Fig: Location of meristematic tissues in plant body

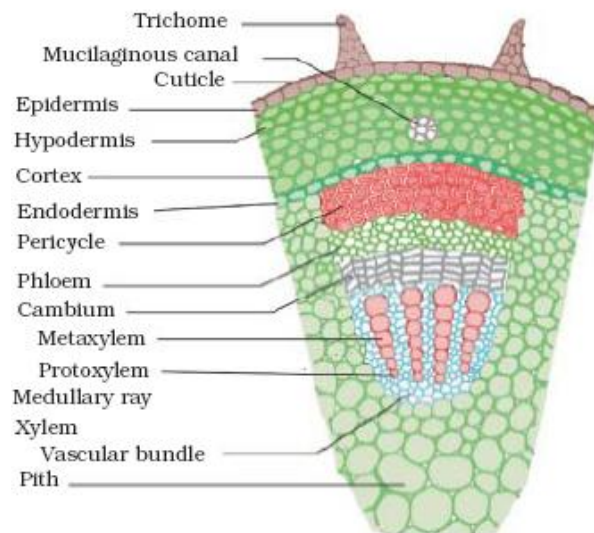


Fig: Section of stem

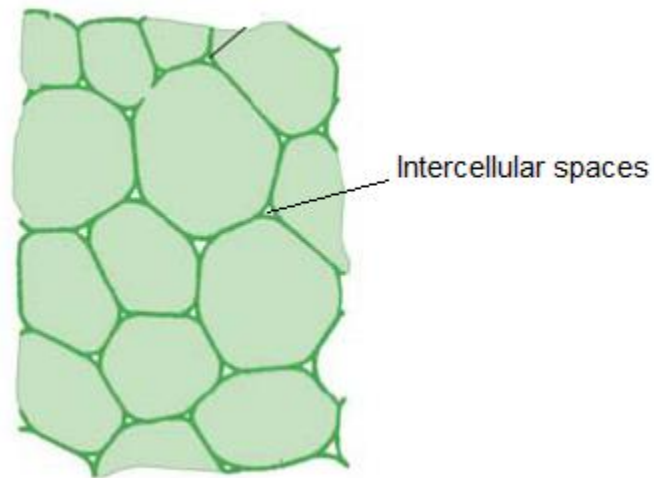


Fig: Transverse section of parenchyma tissue

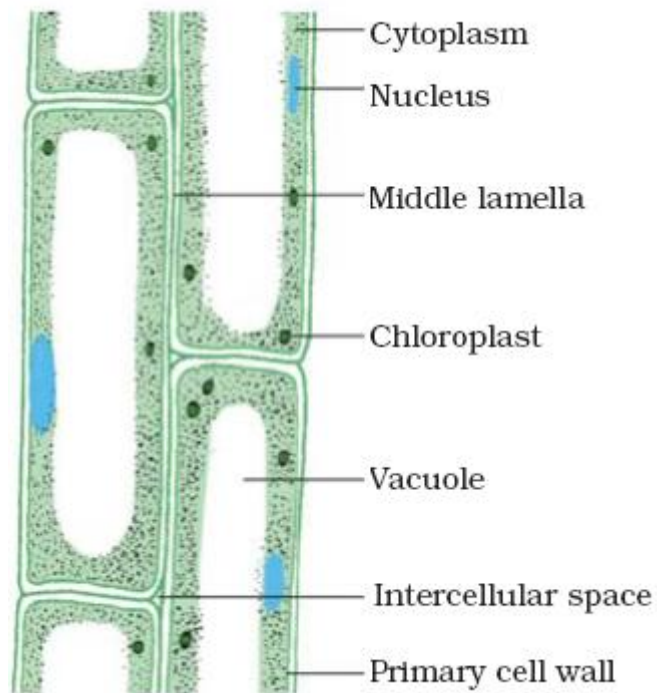


Fig: Longitudinal section of Parenchyma tissue

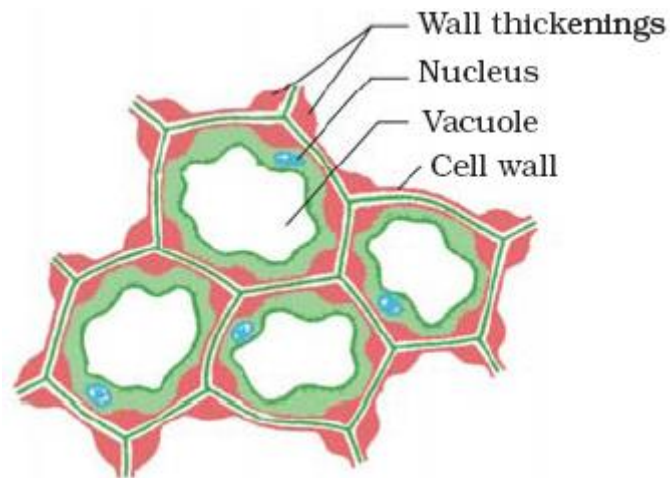


Fig: Transverse section of Collenchyma Tissue

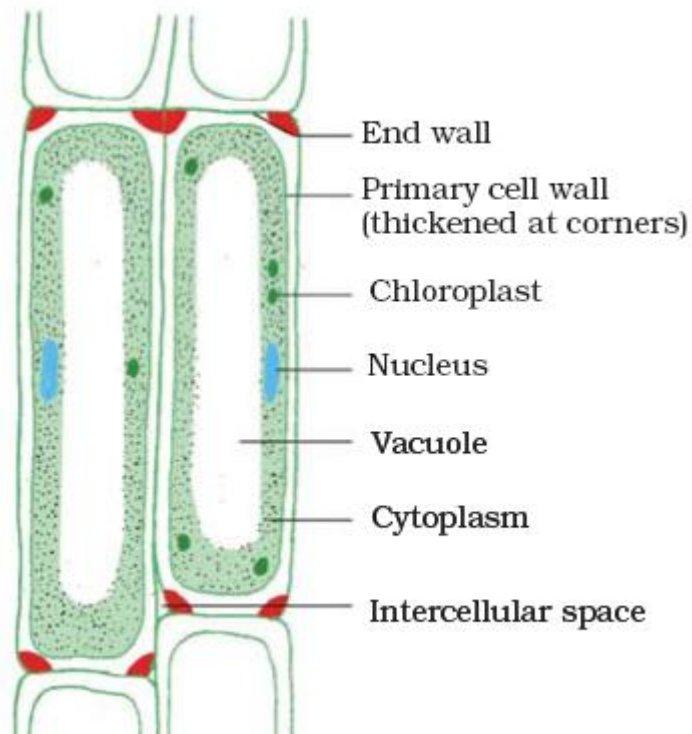


Fig: Longitudinal section of Collenchyma

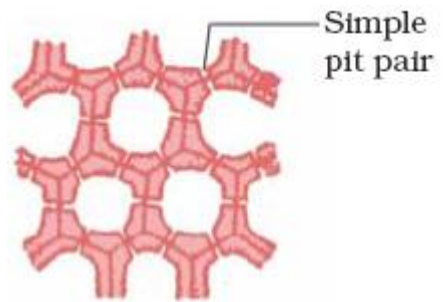


Fig: Transverse section of Sclerenchyma tissue

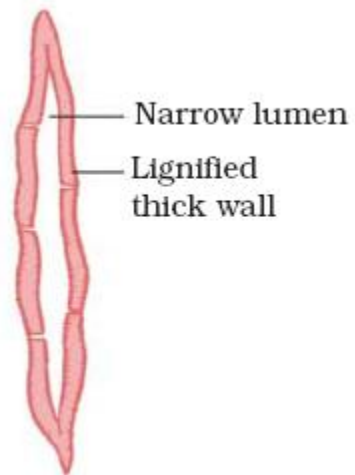


Fig: Longitudinal section of Sclerenchyma tissue

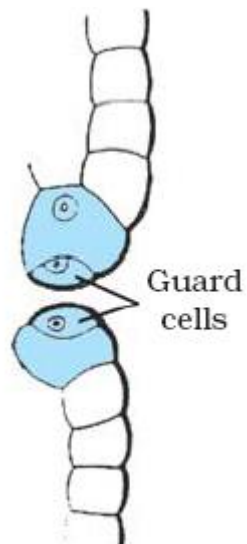


Fig: Lateral view of Guard cells

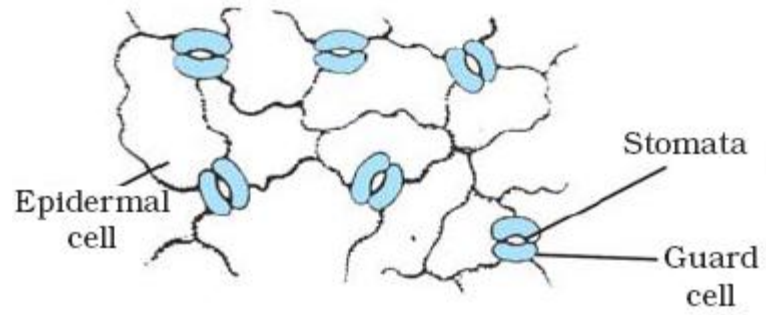


Fig: Surface view of Guard & Epidermal cells

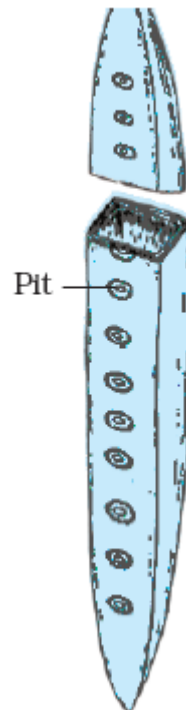


Fig: Tracheid

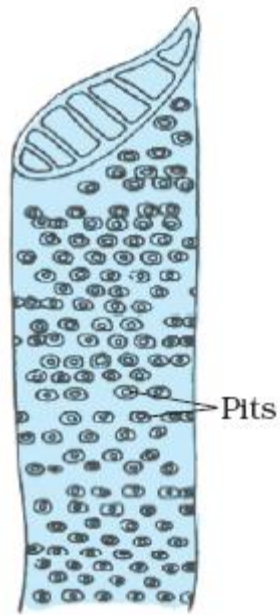


Fig: Vessel

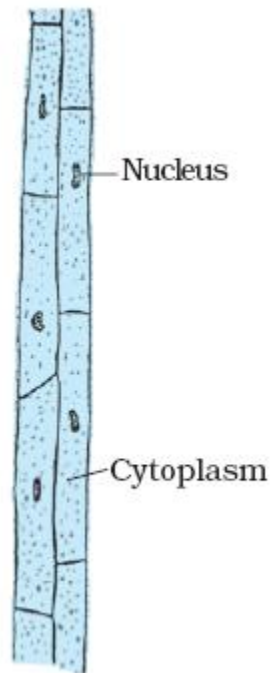


Fig: Xylem parenchyma

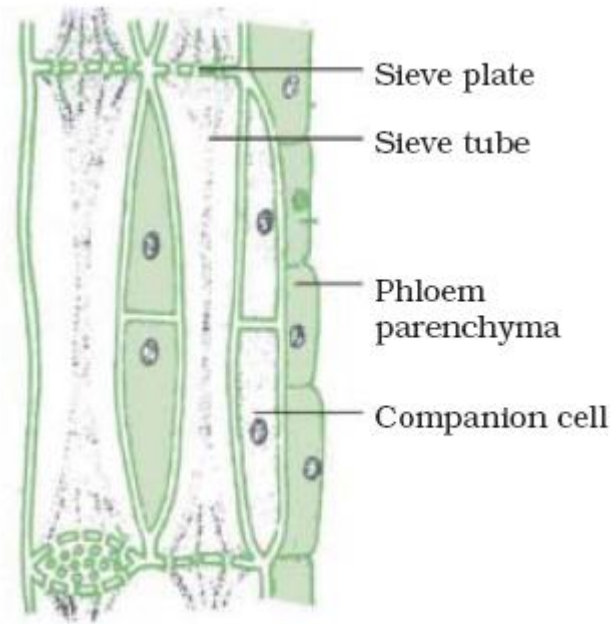


Fig: Section of Phloem

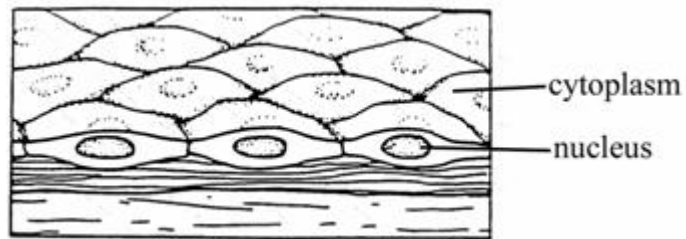


Fig: Squamous epithelium

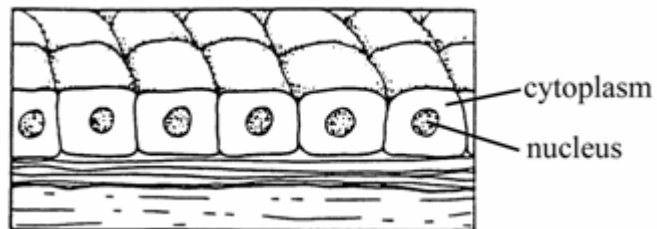


Fig: Cuboidal epithelium

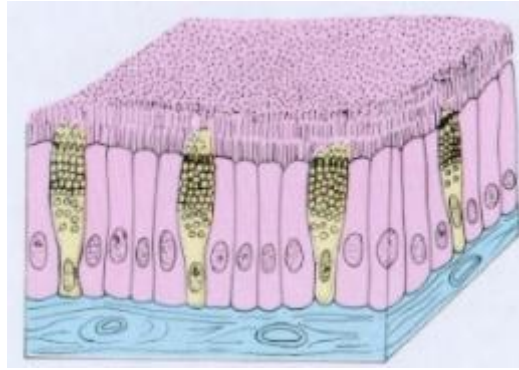


Fig: Columnar (Ciliated) epithelium

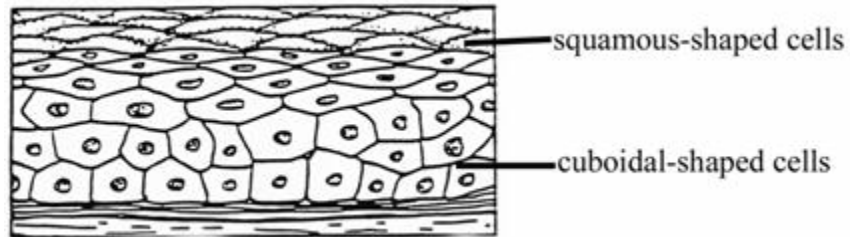


Fig: Stratified squamous epithelium

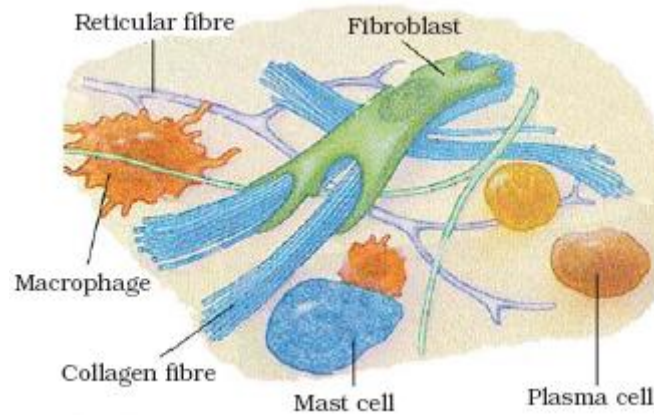


Fig: Areolar connective tissue

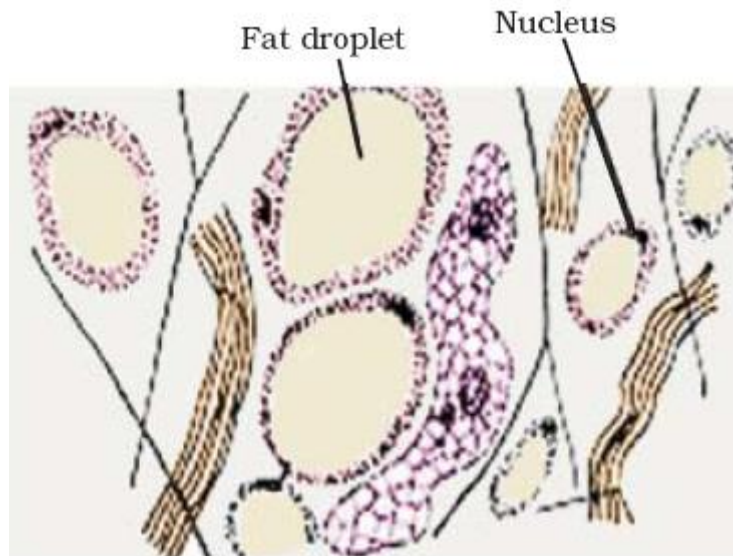


Fig: Adipose tissue

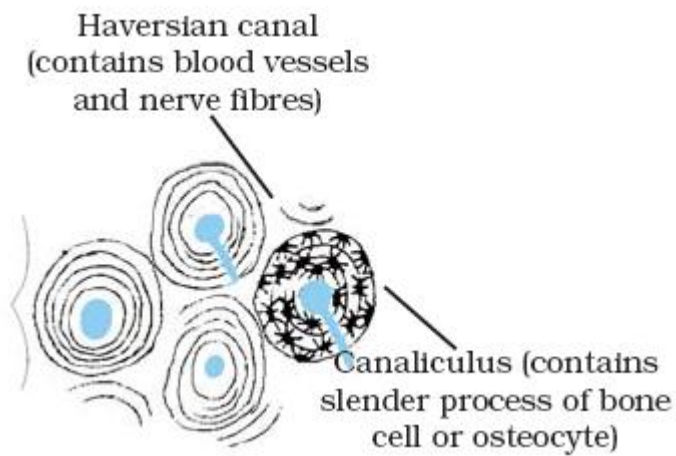


Fig: Compact bone tissue

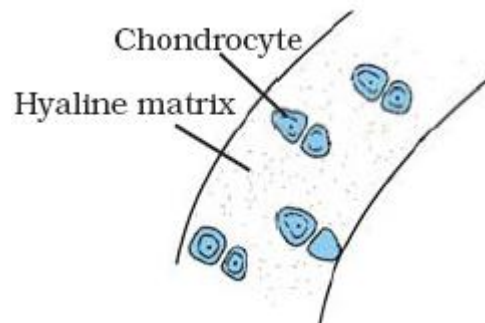


Fig: Hyaline cartilage

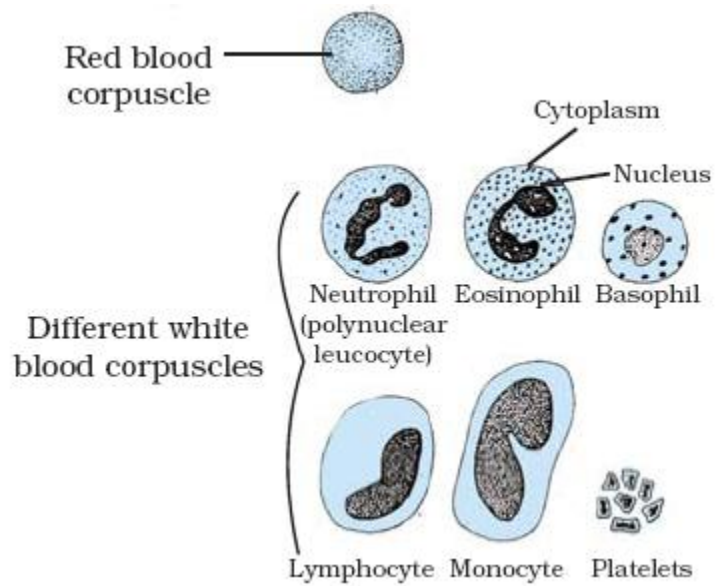


Fig: Types of blood cells

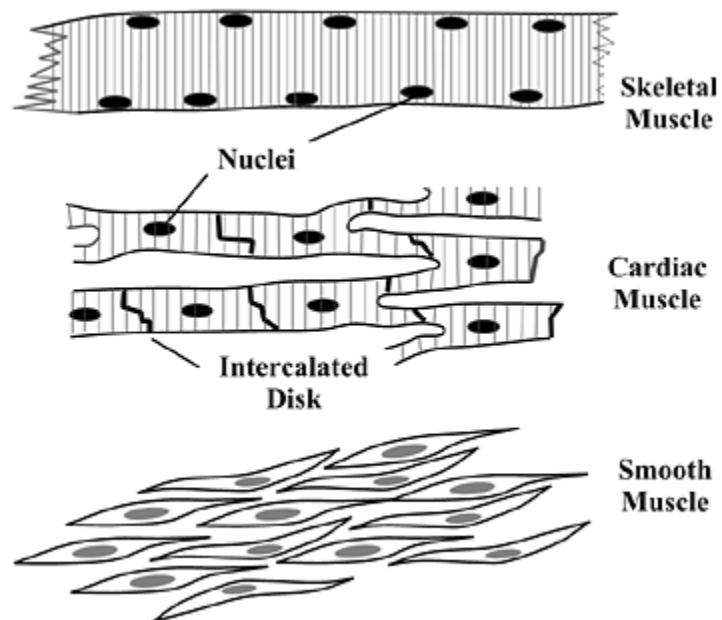


Fig: Types of muscle fibres

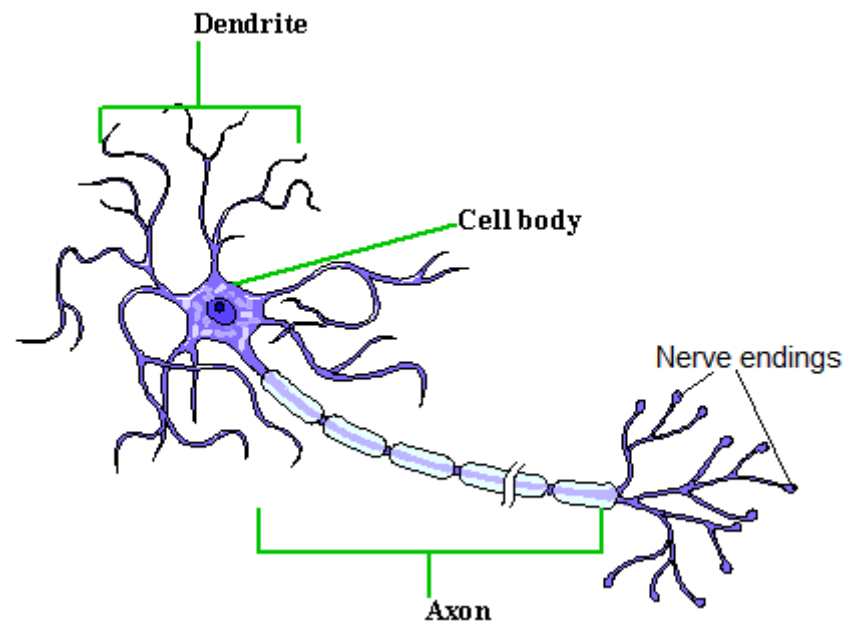


Fig: Neuron

Class IX: Biology
Chapter 7: Diversity in living organisms

Chapter Notes

Key learning:

- 1) Every living organism is unique and this uniqueness is the basis of the vast diversity displayed by the organisms in our world.
- 2) This huge diversity is the result of evolution, which has occurred over millions of years.
- 3) The massive biological diversity can only be studied by classification i.e. arranging organisms into groups based on their similarities and differences.
- 4) Different characteristics are used to determine the hierarchy of classification.
- 5) The primary characteristics that determine the broadest divisions in classification are independent of any other characteristics. The secondary characteristics depend on the primary ones.
- 6) Prokaryotic or eukaryotic cell organization is the primary characteristic of classification, since this feature influences every detail of cell design and capacity to undertake specialized functions.
- 7) Being a unicellular or multicellular organism forms the next basic feature of classification and causes huge differences in the body design of organisms.
- 8) The next level of classification depends on whether the organism is autotrophic or heterotrophic. Further classification depends on the various levels of organization of the bodies of these organisms.
- 9) The evolution of organisms greatly determines their classification.
- 10) The organisms who evolved much earlier have simple and ancient body designs whereas the recently evolved younger organisms have complex body designs.
- 11) Older organisms are also referred to as primitive or lower organisms whereas the younger organisms are also referred to as advanced or higher organisms.

- 12) The diversity of life forms found in a region is biodiversity.
- 13) The region of megadiversity is found in the warm and humid tropical regions of the Earth.
- 14) Aristotle classified organisms depending on their habitat.
- 15) Robert Whittaker proposed the five-kingdom scheme of classification, based on the cell structure, nutrition and body organization of the organisms.
- 16) The main characteristics considered in the five-kingdom scheme of classification are:
 - i) Presence of prokaryotic or eukaryotic cells
 - ii) If eukaryote, whether the organism is unicellular or multicellular.
 - iii) Whether the cells possess or lack cell wall and whether they can prepare their own food.
- 17) The categories or taxa used in the classification of organisms are kingdom, phylum/division, class, order, family, genus and species. The smallest unit of classification is species whereas the highest unit is kingdom.
- 18) The 5 kingdoms proposed by Whittaker are Monera, Protista, Fungi, Plantae and Animalia. Carl Woese further divided Monera into Archaeobacteria and Eubacteria.
- 19) Prokaryotic one-celled organisms such as bacteria, cyanobacteria and mycoplasma are included in Monera.
- 20) Monerans show either autotrophic or heterotrophic nutrition. Cell wall may be present or absent.
- 21) Unicellular eukaryotic organisms such as protozoans, unicellular algae and diatoms are grouped under Protista. They may be autotrophic or heterotrophic and may use appendages for locomotion.
- 22) Fungi, such as yeast and mushrooms, include heterotrophic, eukaryotic organisms, which are normally saprophytes. Their cell walls are composed of chitin.
- 23) Lichens are symbiotic associations of certain fungi with blue green algae.
- 24) Multicellular, autotrophic eukaryotes possessing cell wall are included under kingdom Plantae.
- 25) Classification of plants is done at three levels on the basis of
 - i) Presence or absence of well-differentiated body

- ii) Presence or absence of vascular tissue
- iii) Ability to bear seeds, which could be naked or enclosed in fruits.

- 26) The important divisions of Plantae are Thallophyta, Bryophyta, Pteridophyta, Gymnospermae and Angiospermae.
- 27) Thallophytes, Bryophytes and Pteridophytes possess inconspicuous reproductive organs and are called Cryptogams. Gymnosperms and Angiosperms are grouped under Phanerogamae, since they possess well-differentiated, seed producing reproductive tissues.
- 28) Thallophytes (or algae) are the simplest plants lacking well-differentiated body design. E.g. – *Spirogyra*.
- 29) Bryophytes, such as moss and *Riccia*, show differentiated plant body lacking vascular tissue.
- 30) Plants grouped under Pteridophyta show well-differentiated plant body with vascular tissues for conduction. E.g. Ferns.
- 31) Gymnosperms, for e.g. pines and deodar, are phanerogams bearing naked seeds.
- 32) In Angiosperms/flowering plants, the seeds are enclosed in fruits.
- 33) Cotyledons are present in the embryos of seeds.
- 34) Monocot plants possess seeds with single cotyledons whereas dicots are plants with 2 cotyledons in seeds.
- 35) Monocots show fibrous root system, parallel venation of leaves and flowers with three (or multiple of three) petals.
- 36) Tap root system, reticulate venation of leaves and flowers with five (or multiple of five) petals are features of dicots.
- 37) Organisms grouped under Animalia are eukaryotic, multicellular, heterotrophic and lacking cell walls.
- 38) Animals are further divided into ten groups – Porifera, Coelenterata, Platyhelminthes, Nematoda, Annelida, Arthropoda, Mollusca, Echinodermata, Protochordata and Vertebrata.
- 39) In Porifera, also called sponges, the body is perforated by numerous pores and shows cellular level of organization. In addition, a hard exoskeleton and canal system are present. Sponges are non-motile. E.g. – *Sycon*.

- 40) Coelenterates are radially symmetrical and show a cavity called coelenteron between epidermis and gastrodermis. Some like *Hydra* are solitary forms whereas others like corals live in colonies.
- 41) Platyhelminthes includes the flat worms which are bilaterally symmetrical, dorsoventrally flattened, triploblastic and acoelomate. They may be free-living (e.g. *Planaria*) or parasitic (e.g. tape worm).
- 42) The body of nematode worms is cylindrical, bilaterally symmetrical, triploblastic and pseudocoelomate. They are usually parasitic. E.g. *Ascaris*.
- 43) Annelids are triploblastic, bilaterally symmetrical with true coelom and found in diverse habitats. Segmentation and extensive organ differentiation is seen. E.g. Earthworm and *Nereis*.
- 44) The largest phylum of animal kingdom, Arthropoda, contains triploblastic, bilaterally symmetrical and segmented animals. These animals possess jointed legs and open circulatory system. E.g. Butterfly, centipede, crab, spider.
- 45) In phylum Mollusca, (e.g. snail and *Octopus*) organisms show bilateral symmetry, soft body, open circulatory system and reduced coelom.
- 46) Echinodermata includes spiny skinned organisms with calcareous skeleton. They are triploblastic, coelomate, marine and free-living. Water vascular system is an important feature. Starfish and *Holothuria* are examples of this phylum.
- 47) All chordates have a notochord, dorsal nerve cord and paired pharyngeal gill slits/pouches. Also they are triploblastic, coelomic and bilaterally symmetrical.
- 48) Vertebrates and Protochordates are grouped under Chordata.
- 49) The Protochordates possess notochord at some or the other stage of their life. E.g. *Balanoglossus*, *Amphioxus*.
- 50) Vertebrates show true vertebral column and endoskeleton. Complex body organization and differentiation is seen.
- 51) The five classes of vertebrates are Pisces, Amphibia, Reptilia, Aves and Mammalia.

	Pisces	Amphibia	Reptilia	Aves	Mammalia
Habitat	Aquatic	Both land and water	Some terrestrial, others aquatic	Terrestrial (aerial)	Usually terrestrial, few aquatic.

Skin	Covered with scales/plates	Smooth skin with mucus glands and lacking scales	Water-proof skin with scales	Mostly covered with feathers	Covered with hair and contains sweat and oil glands.
Control of body temperature	Cold-blooded	Cold-blooded	Cold-blooded	Warm-blooded	Warm-blooded
No. of heart chambers	2	3	3(except crocodiles)	4	4
Respiration	Gills	Gills, lungs or skin	Lungs	Lungs	Lungs
Mode of reproduction	Oviparous	Oviparous	Oviparous	Oviparous	Viviparous
Locomotion	Tail and fins	Limbs	Limbs	Wings	Limbs
Examples	Rohu, shark, sea-horse, sting ray	Frog, salamander, toad	Crocodile, snake, turtle, lizard	Pigeon, ostrich, hen, duck	Human, whale, bat, lion

- 52) The endoskeleton in fish may be cartilaginous or bony.
- 53) Mammary glands produce milk in mammals to nourish the young ones.
- 54) Binomial nomenclature, developed by Carolus Linnaeus, uses two names to identify an organism. The first name is the generic name beginning with a capital letter whereas the second name is the species name which begins with a small letter.
- 55) Binomial nomenclature makes it possible to identify every species of organisms in the astounding diversity of life present in our planet.

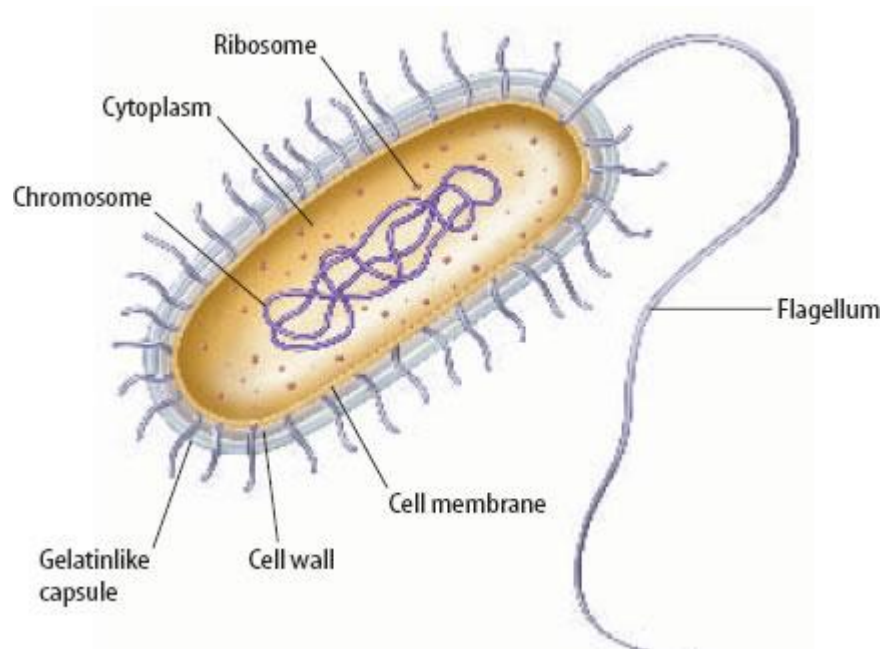
Top definitions

- 1) Classification – The method of arranging organisms into groups on the basis of similarities and differences.
- 2) Characteristic – A distinguishing feature of an individual or group.
- 3) Evolution – A gradual and continuing process of change in body design of organisms, occurring over a period of time due to various factors, which leads to better survival of organisms as well as development of new species.
- 4) Biodiversity – The variety of life forms found in a particular region.
- 5) Regions of megadiversity – Regions rich in diversity of plant and animal life.
- 6) Habitat – The natural abode of an animal or plant.
- 7) Species – It refers to all organisms that are similar enough to breed and perpetuate.
- 8) Saprophytes – Organisms obtaining their nourishment from dead and decaying organic material.
- 9) Lichens - Symbiotic associations of certain fungi with blue-green algae.
- 10) Cotyledon - Embryonic leaf in seed-bearing plants.
- 11) Monocots – Plants with seeds having a single cotyledon.
- 12) Dicots - Plants with seeds having two cotyledons.
- 13) Bilateral symmetry- Symmetrical arrangement of an organism along a central axis, so that the body is divided into equivalent right and left halves by only one plane.
- 14) Radial symmetry –A type of symmetry having only one body axis, through which the body can be divided in multiple planes to give mirror image halves
OR
A form of symmetry, in which dividing the animal's body in any direction along the central axis would always result in 2 identical halves being obtained.
- 15) Notochord - A long flexible rod-shaped support structure that runs along the back of the animal separating the nervous tissue from the gut.
- 16) Nerve cord - A dorsal tubular cord of nervous tissue above the notochord of a chordate.

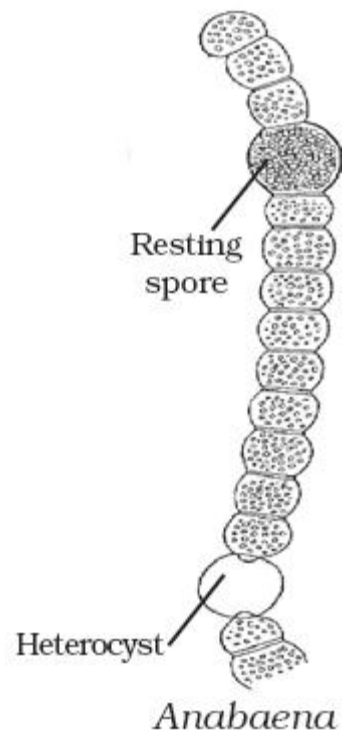
- 17) Diploblastic animals - Animals having 2 primary germ layers i.e. ectoderm and endoderm in the embryo.
- 18) Triploblastic animals - Animals having 3 primary germ layers i.e. ectoderm, mesoderm and endoderm in the embryo.
- 19) Ectoderm - The outermost germ layer of multicellular animals that develops into skin and nervous tissue.
- 20) Endoderm - The innermost germ layer of multicellular animals that develops into the lining of the digestive and respiratory systems.
- 21) Mesoderm - The middle germ layer that develops into muscle and bone and cartilage and blood and connective tissue.
- 22) Acoelomates - Animals lacking a body cavity between their gut and body wall.
- 23) Coelom - A fluid filled cavity formed within the mesoderm, in which well-developed organs can be accommodated.
- 24) Pseudocoelom - An internal body cavity of some primitive invertebrates, similar to a coelom but lacking a mesodermal lining.
- 25) Coelenteron - The central gastrovascular cavity of a coelenterate animal.
- 26) Cold-blooded organisms - Organisms whose body temperature varies according to the external environmental temperature.
- 27) Warm-blooded organisms - Organisms whose internal body temperature is dependent upon its metabolic processes and is maintained at a constant level.
- 28) Oviparous animals - Animals that lay eggs.
- 29) Viviparous animals - Animals giving birth to live young ones.
- 30) Binomial nomenclature - The scientific system of naming each species of organism with two names, a genus name and a species name.

Top diagrams

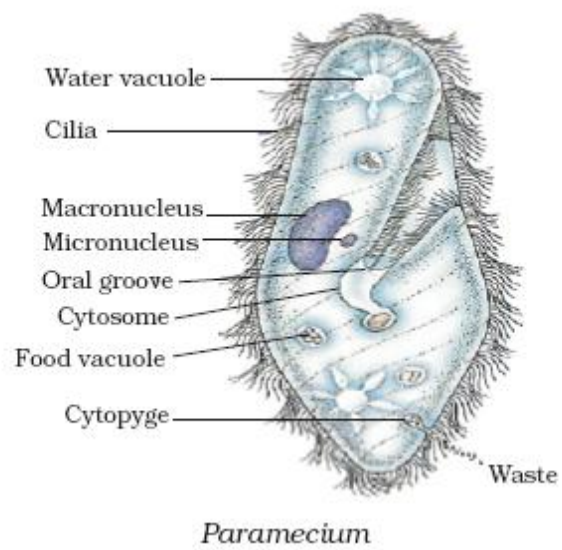
A) Kingdom Monera

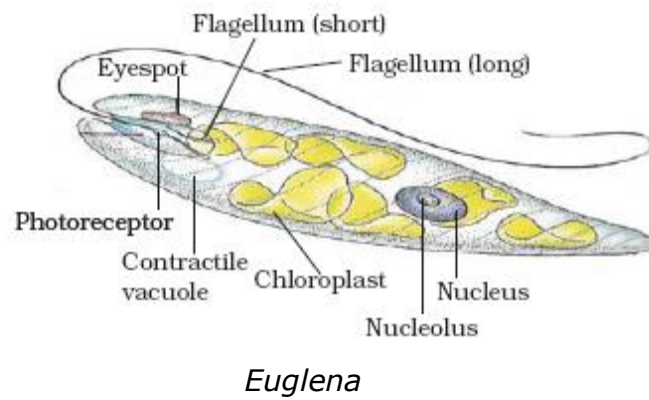
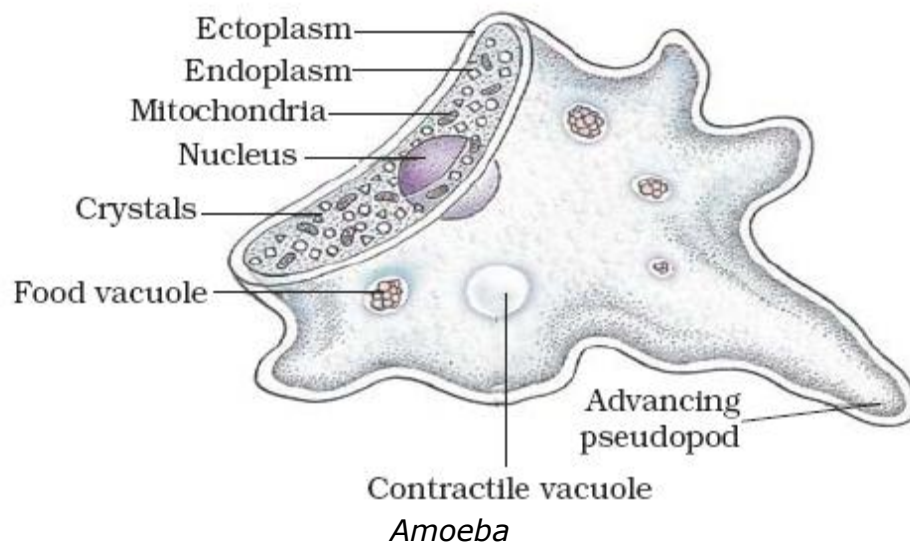


Bacteria

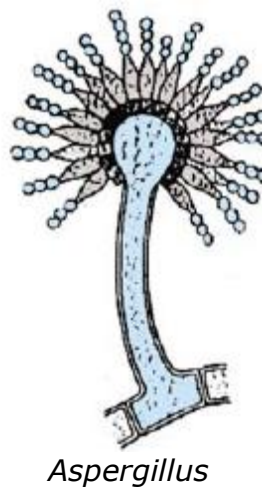


B) Kingdom Protista





C) Kingdom Fungi





Penicillium

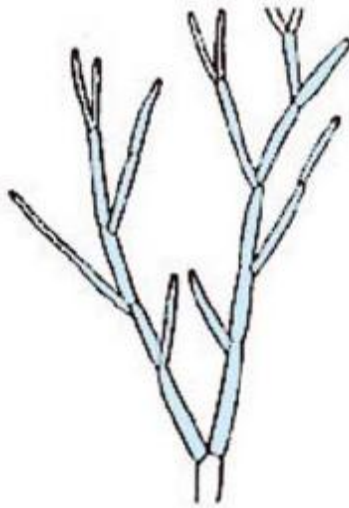


Agaricus

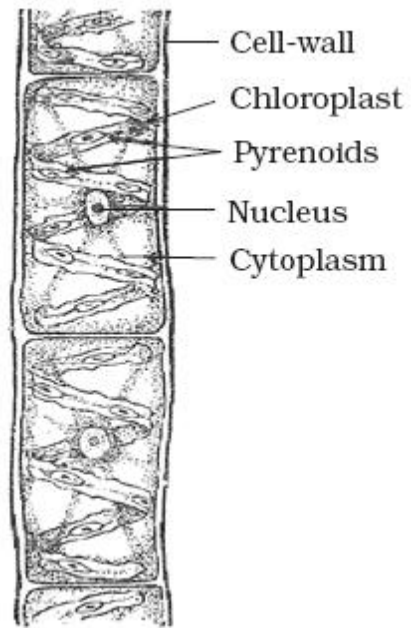
- D) Kingdom Plantae**
i) Division Thallophyta



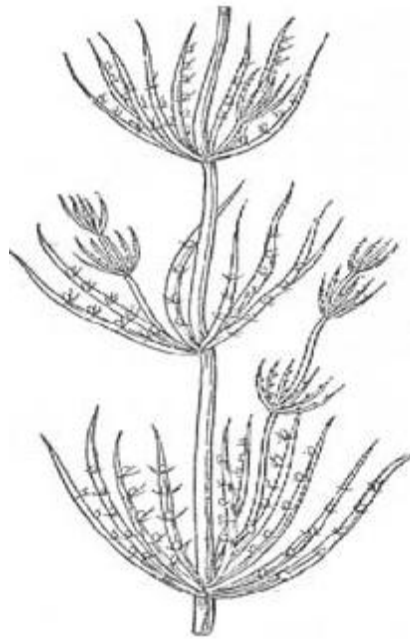
Ulothrix



Cladophora

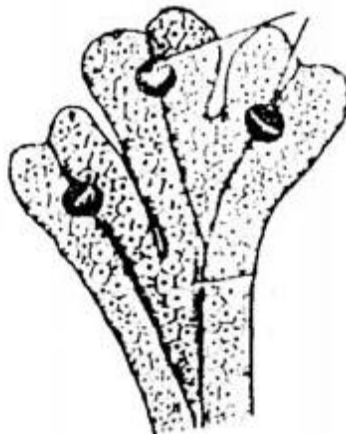


Spirogyra

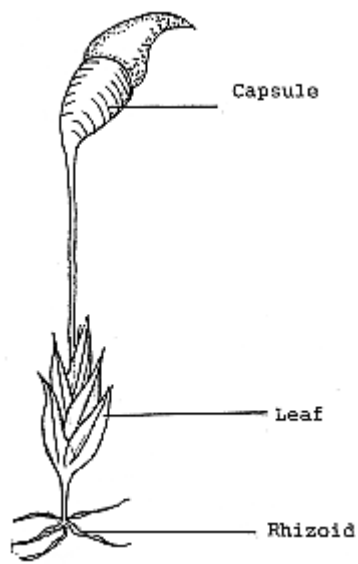


Chara

ii) Division Bryophyta

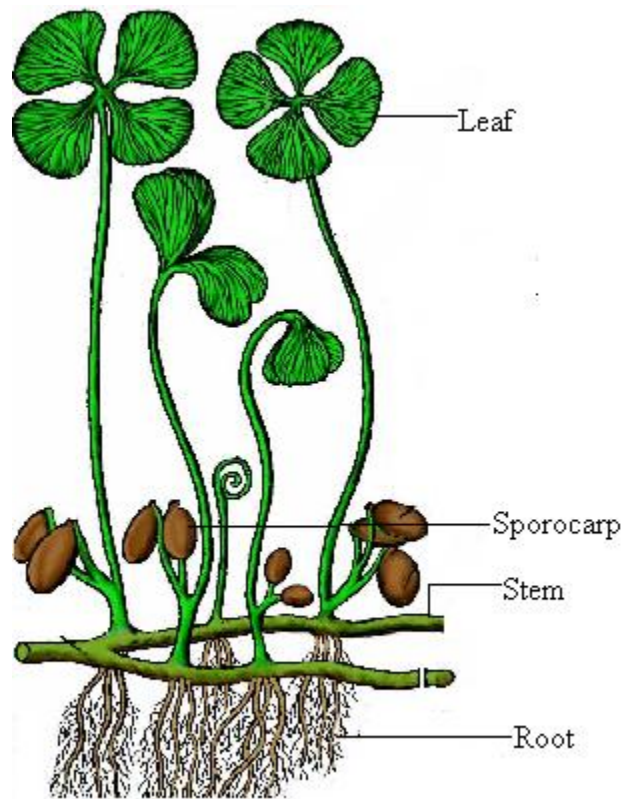


Marchantia



Funaria

iii) **Division Pteridophyta**

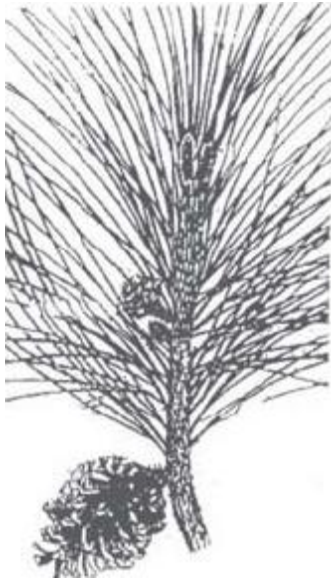


Marsilea



Fern

iv) Division Gymnospermae



Pinus



Cycas

v) **Division Angiospermae**

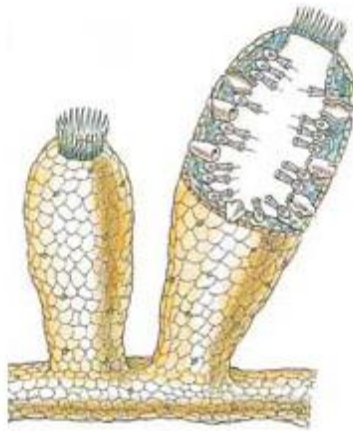


Ipomoea

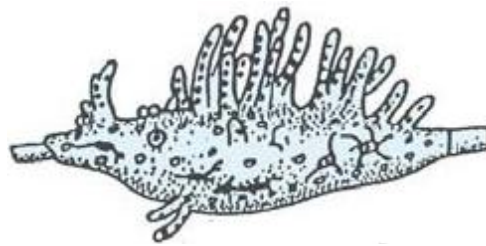
E) Kingdom Animalia
i) Phylum Parazoa



Euplectella

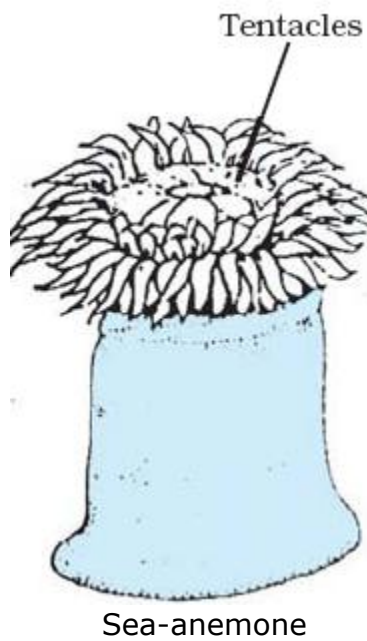
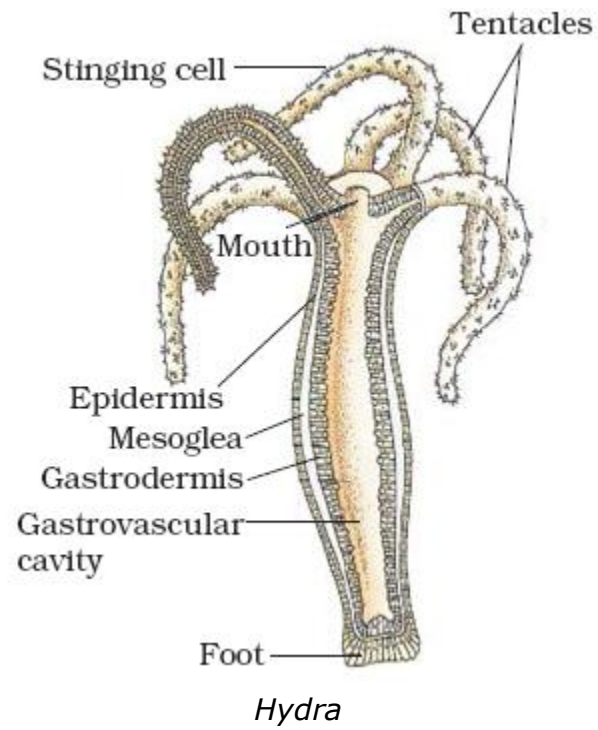


Sycon

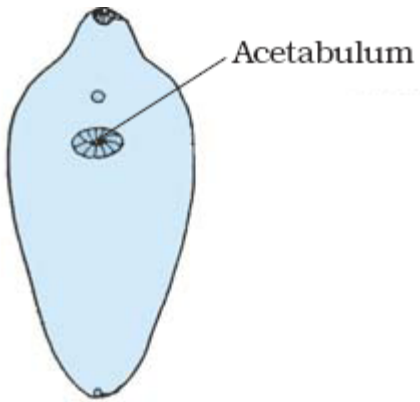


Spongilla

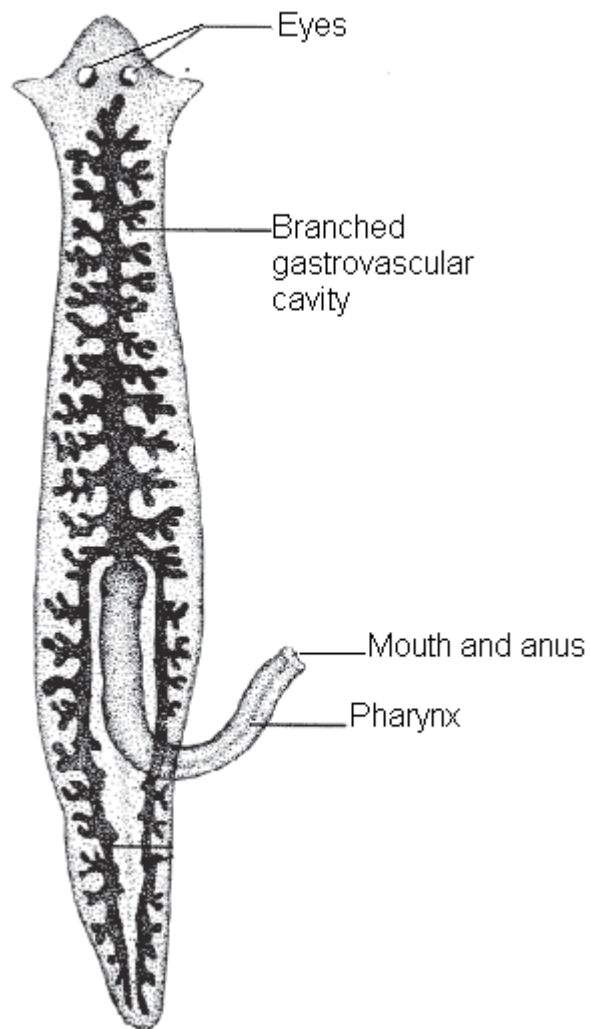
ii) **Phylum Coelenterata**



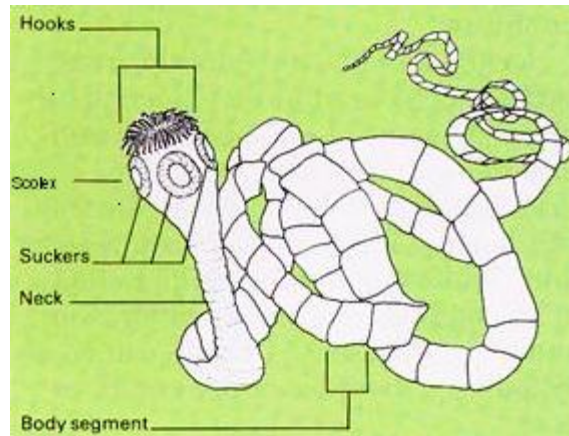
iii) **Phylum Platyhelminthes**



Liver-fluke

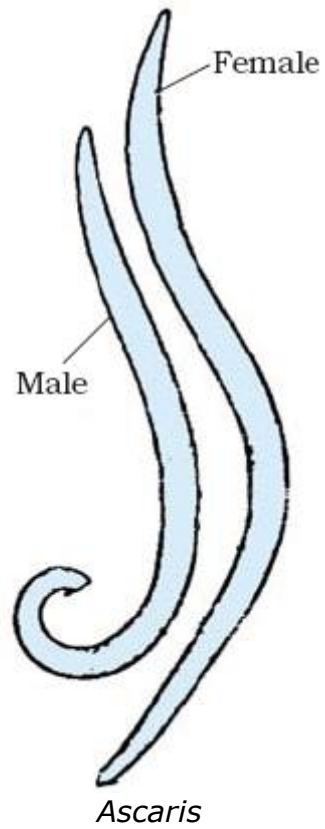


Planaria

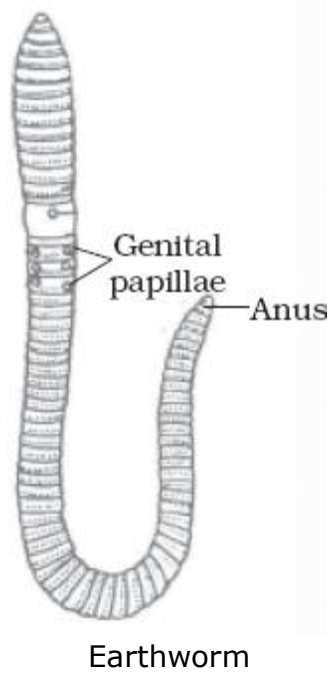
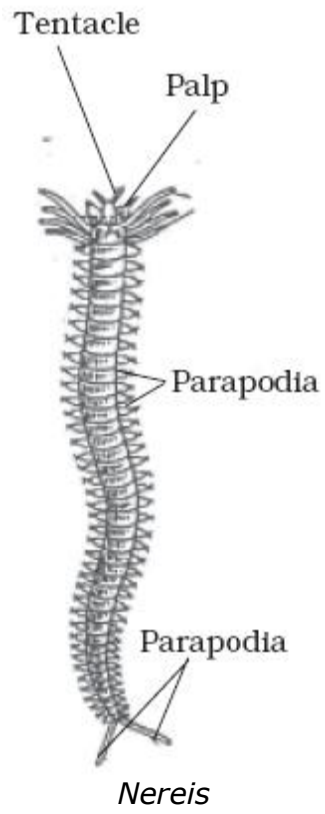


Tapeworm

iv) Phylum Nematoda



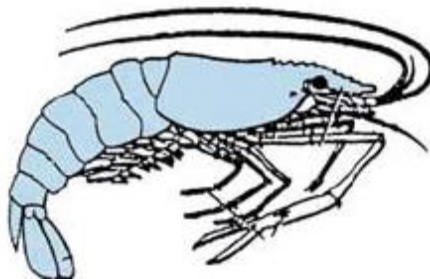
v) Phylum Annelida



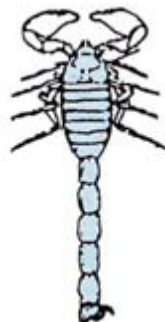


Leech

vi) Phylum Arthropoda



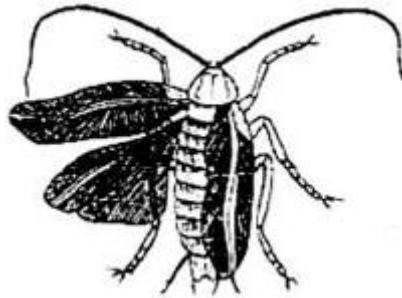
Palaemon (prawn)



Palamnaeus (scorpion)



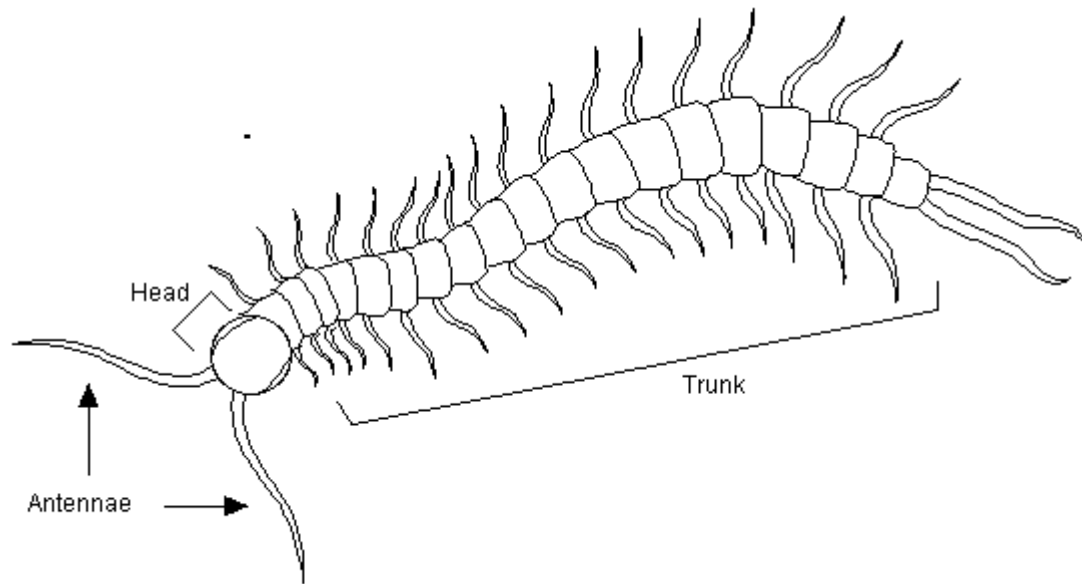
Aranea (spider)



Periplaneta (cockroach)

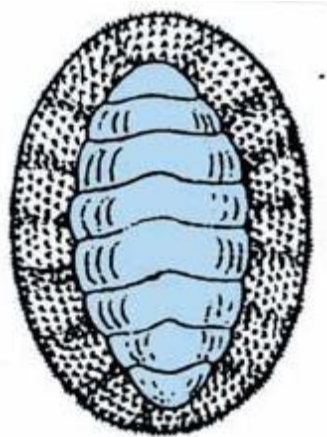


Butterfly (*Pieris*)



Centipede

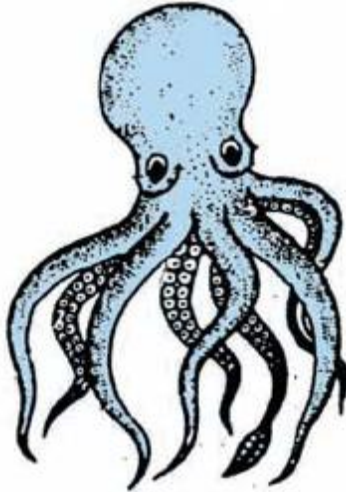
vii) Phylum Mollusca



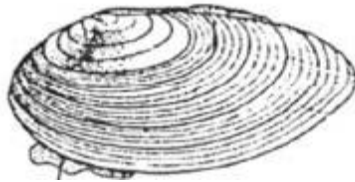
Chiton



Pila

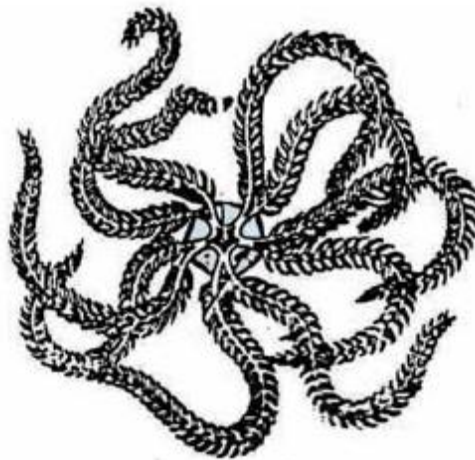


Octopus



Unio

viii) Phylum Echinodermata



Antedon(feather-star)

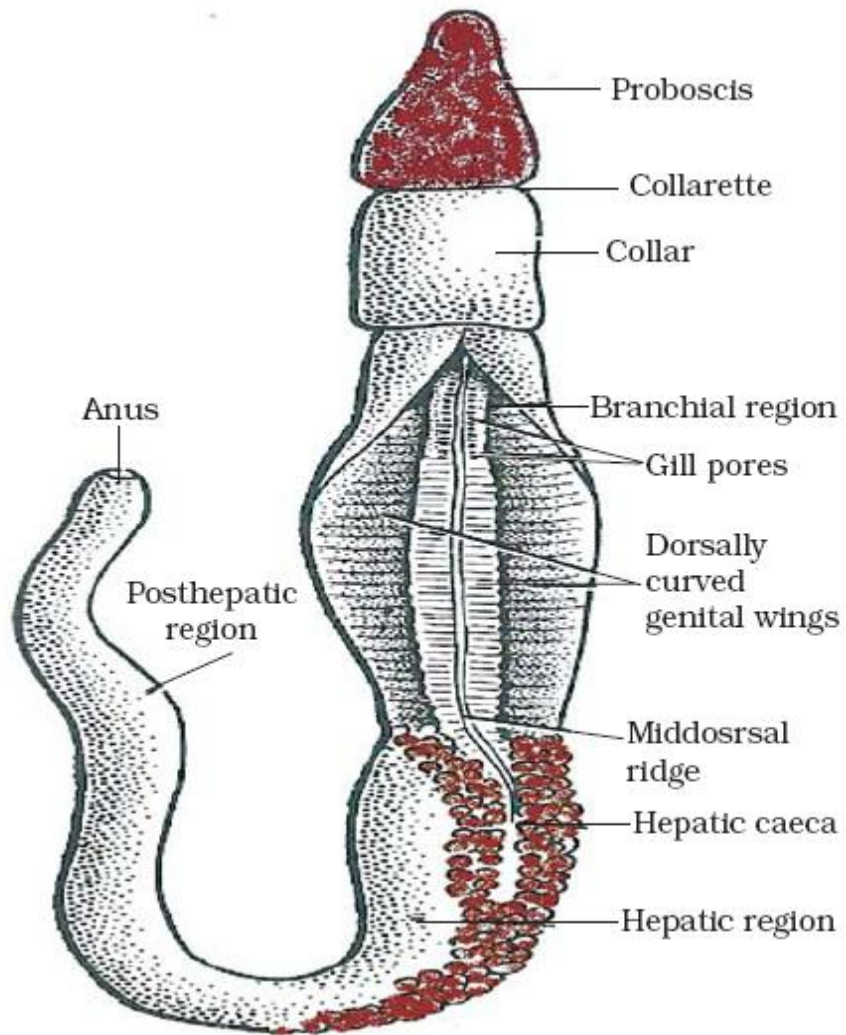


Holothuria (sea cucumber)



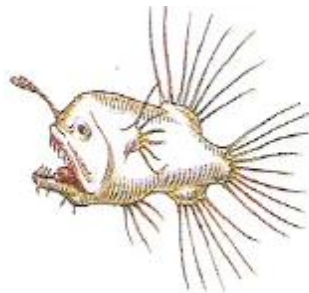
Asterias (star fish)

ix) Protochordata

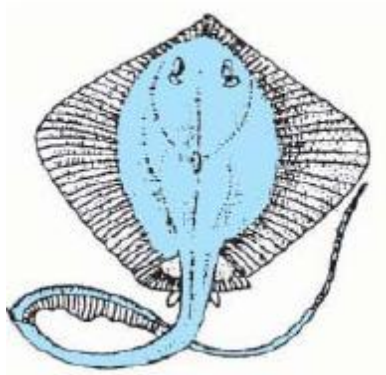


Balanoglossus (A Protochordata)

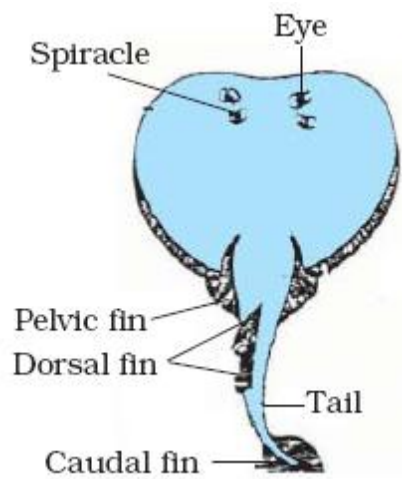
x) **Vertebrata**



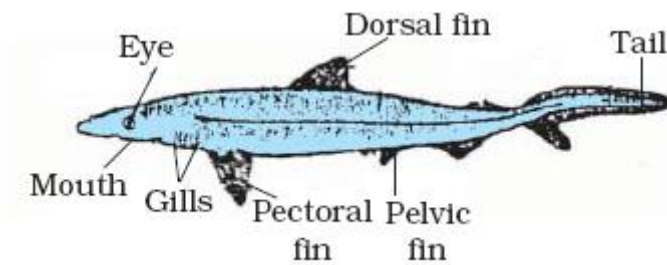
Caulophryne jordani (Angler fish)



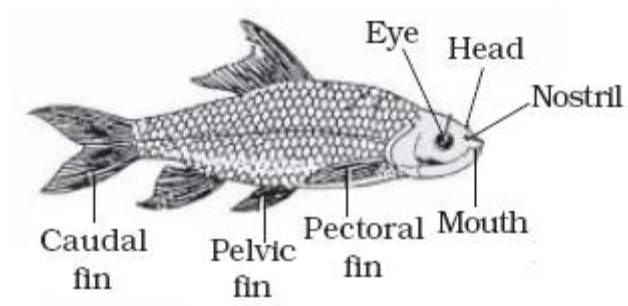
Sting ray



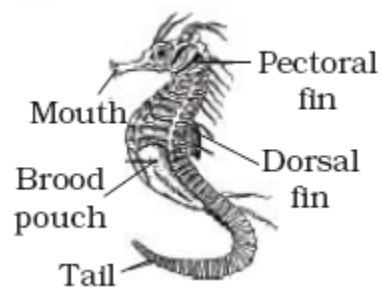
Torpedo (Electric ray)



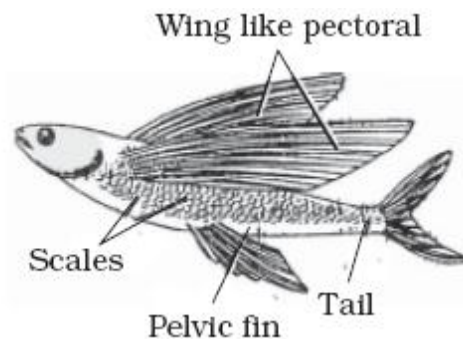
Scoliodon (Dog fish)



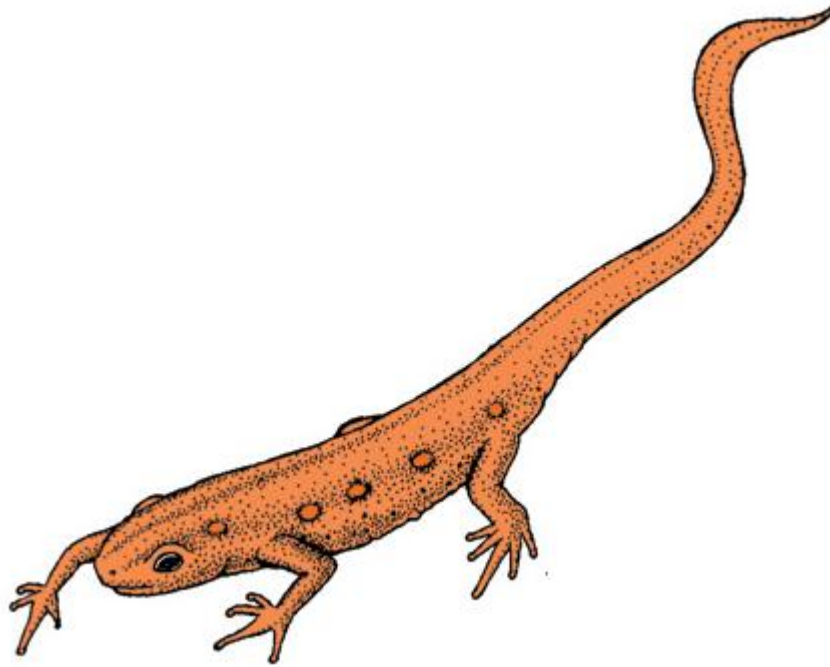
Labeo rohita (Rohu)



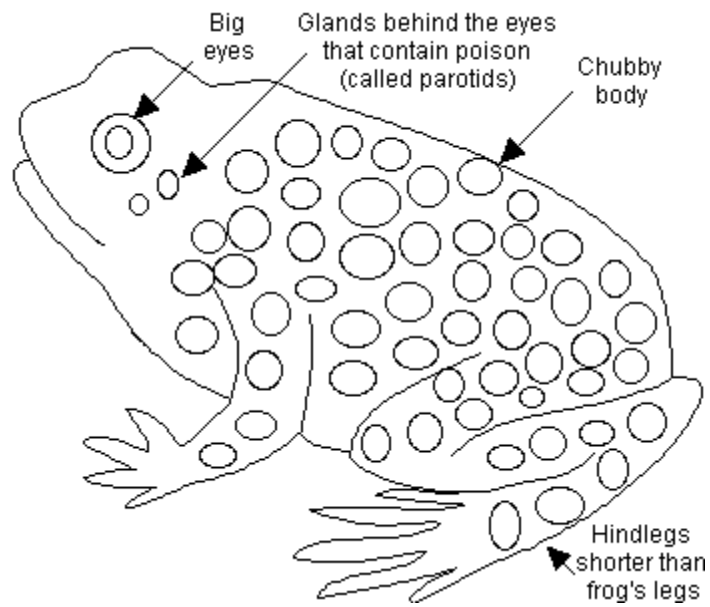
Hippocampus – male (sea horse)



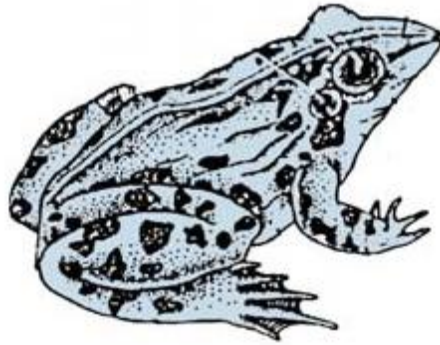
Exocoetis (Flying fish)



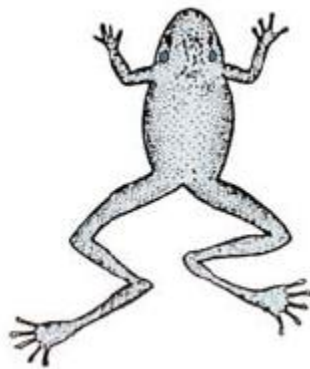
Salamander



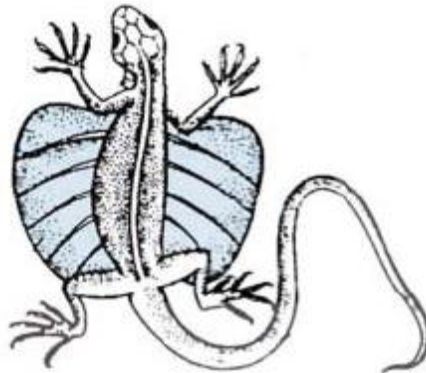
Toad



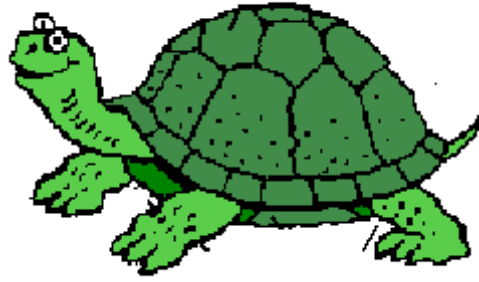
Rana tigrina (Common frog)



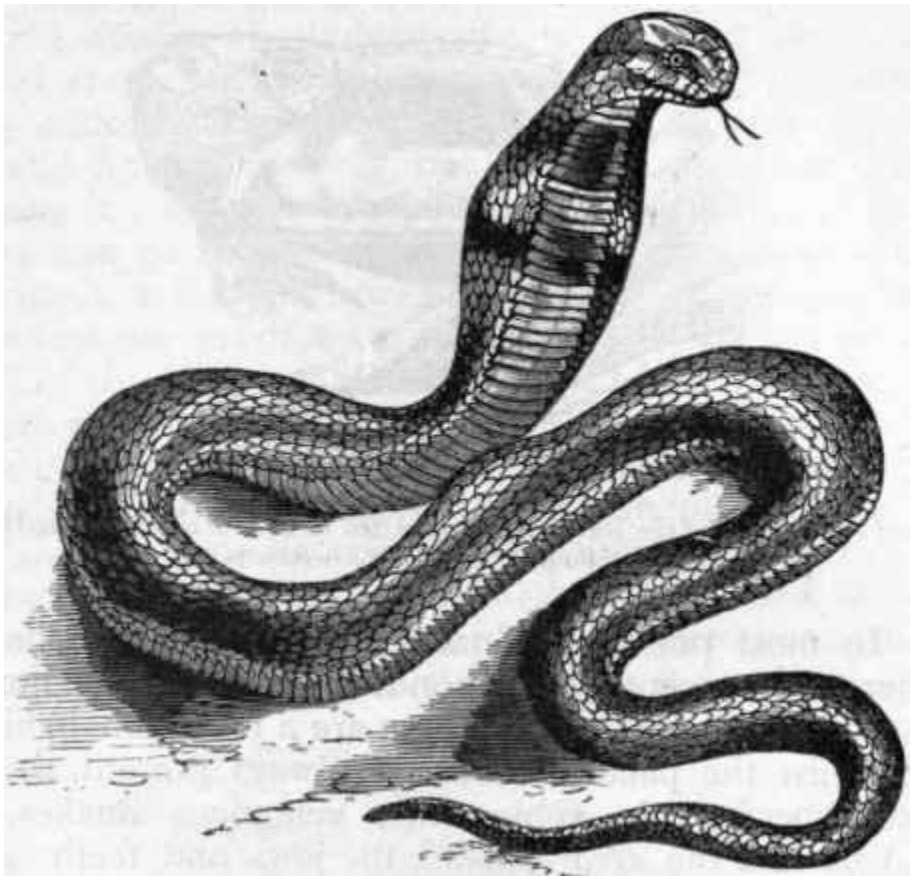
Hyla (Tree frog)



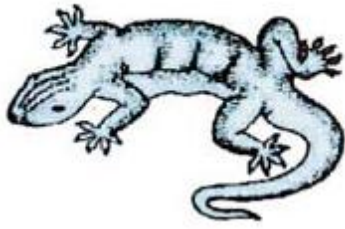
Draco (flying lizard)



Turtle



Snake



Hemidactylus (House wall lizard)



Pigeon



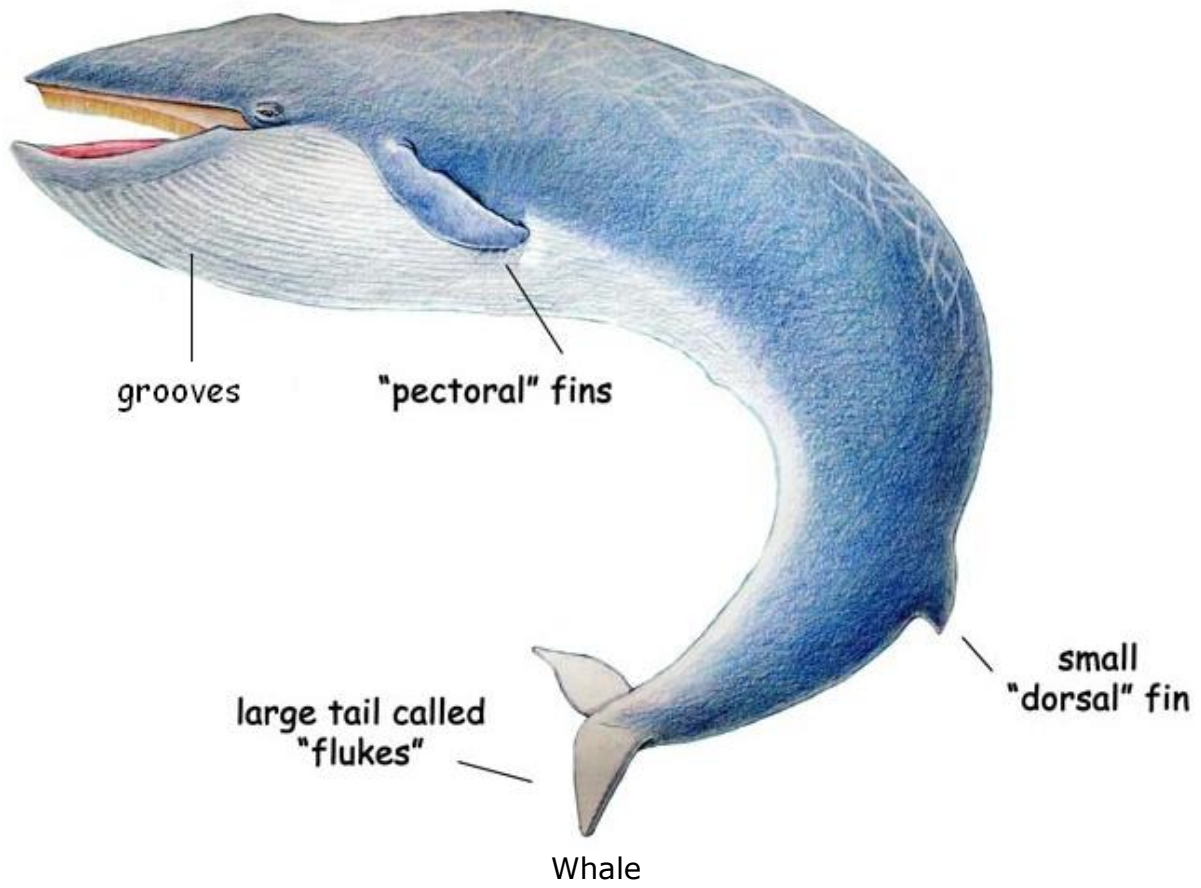
Crow



Ciconia ciconia (White stork)



Struthio camelus (Ostrich)



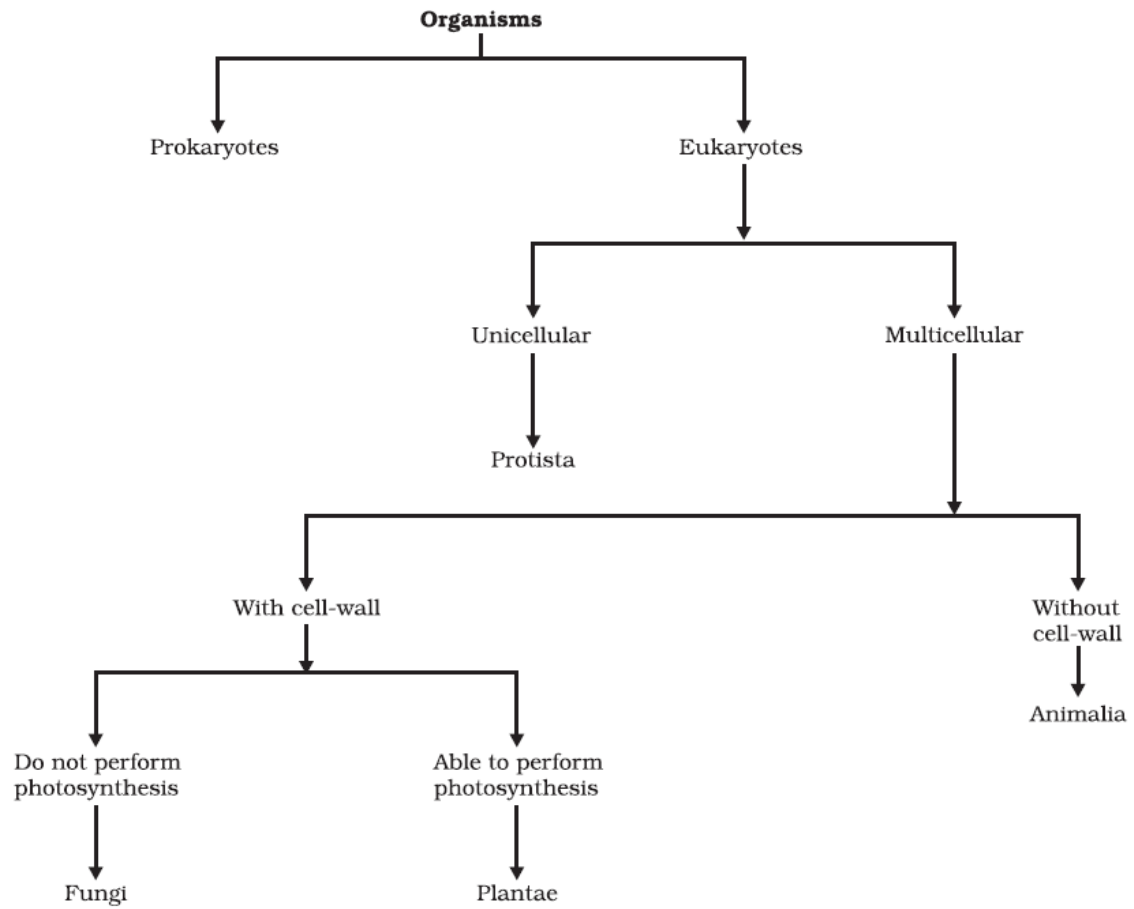


Rat

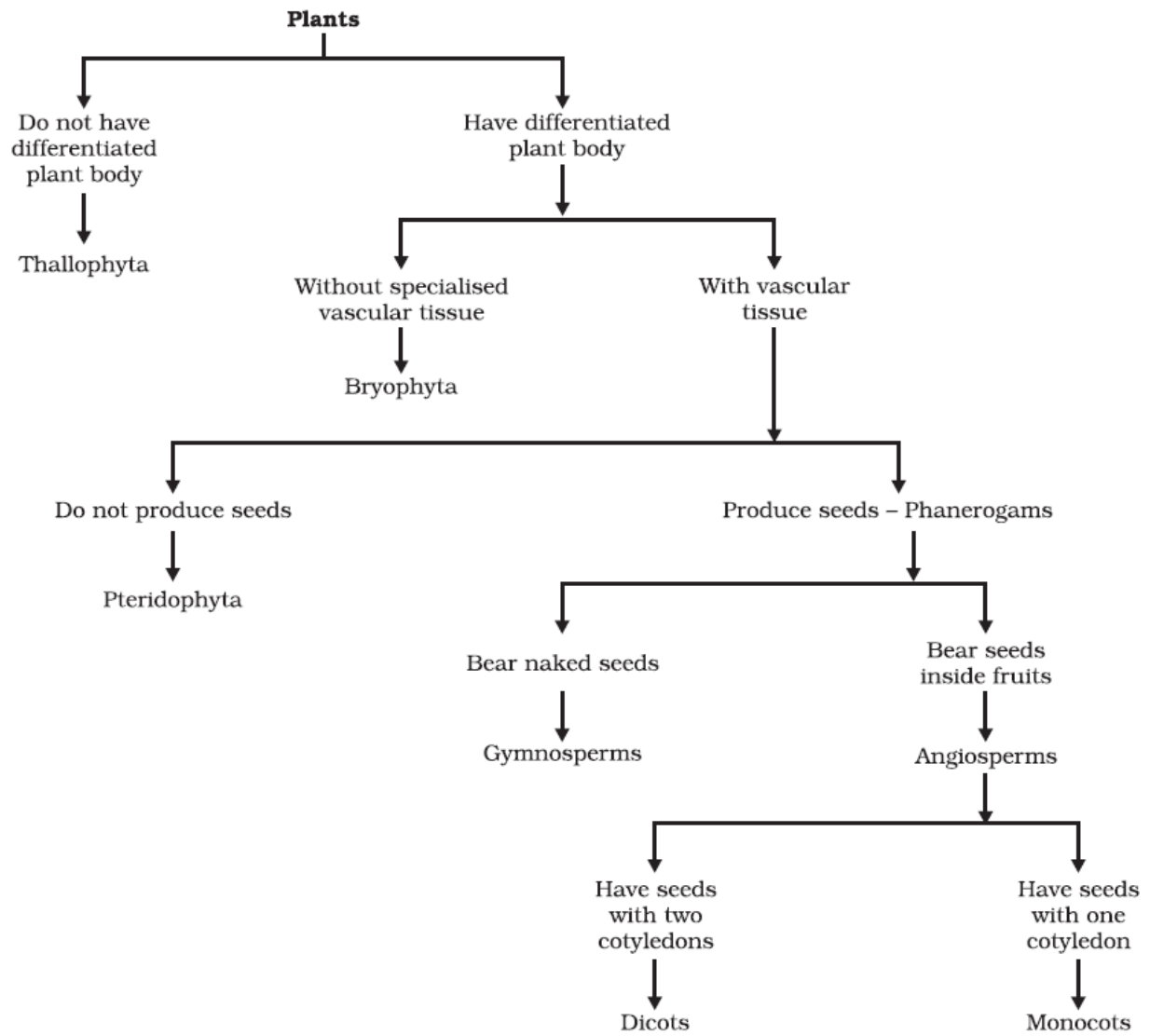


Bat

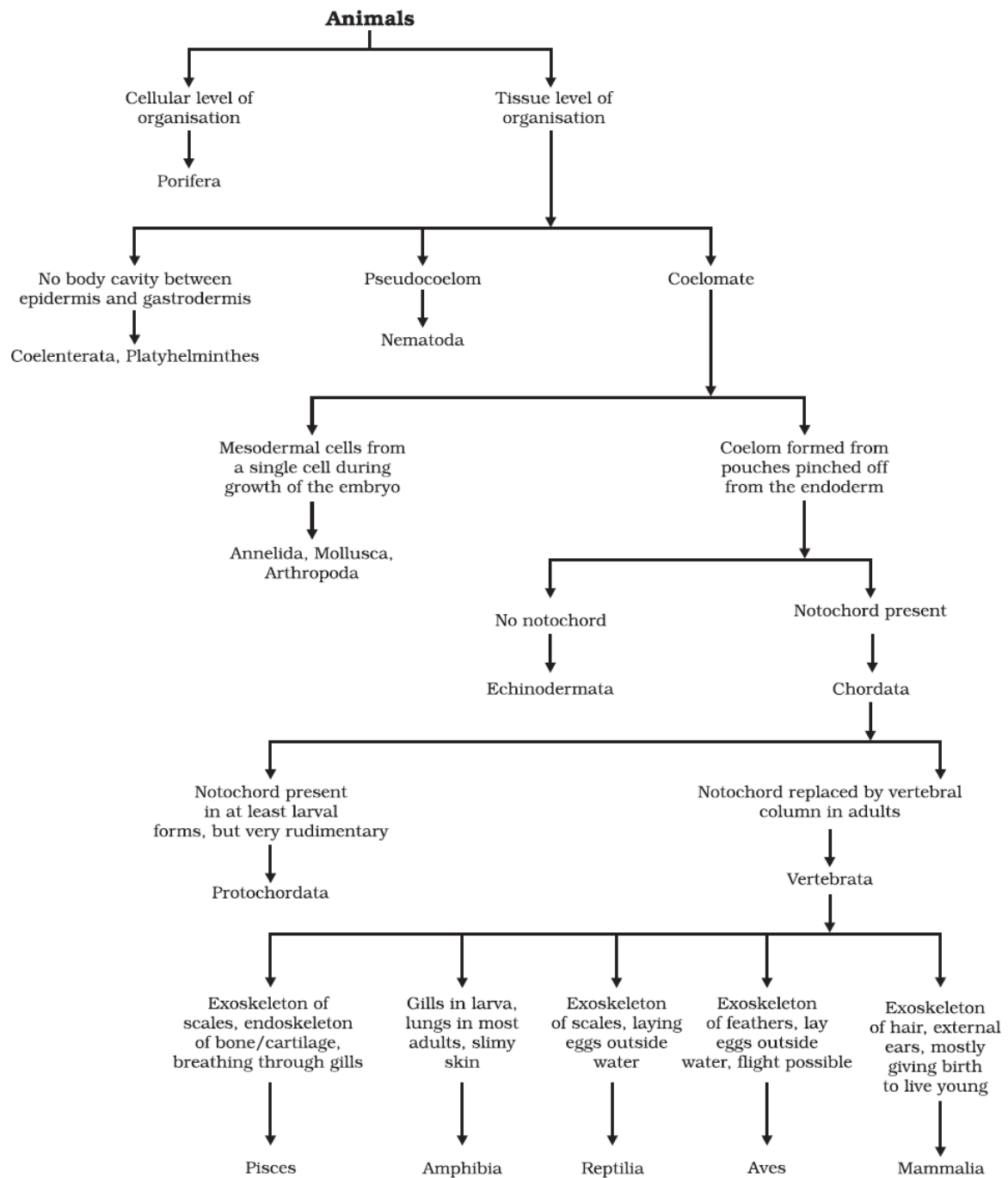
Top flow-charts



Basis of five-kingdom classification.



Classification of plants



Classification of animals

Class IX: Biology
Chapter: Why do we fall ill

Chapter Notes

Key learnings:

- 1) Our body's well-being is dependent on the proper functioning of its cells and tissues.
- 2) All our body parts and activities are greatly interconnected. Hence dysfunction of any body part will affect the entire body.
- 3) When we are healthy, we are able to perform our physical, mental and social functions well.
- 4) Our physical and social environment plays an important role in maintaining good health.
- 5) In addition to personal hygiene, public cleanliness should also be maintained for ensuring that we remain healthy.
- 6) Many other factors like financial conditions, availability of nutritious food and social equality also influence the health of an individual.
- 7) A person suffering from a disease is in a state of discomfort.
- 8) Being in poor health is different from being diseased.
- 9) Symptoms and signs of the disease appear as a result of dysfunction of the affected body parts. These help to identify the disease that a person is suffering from.
- 10) Depending on their duration, diseases may be classified as acute or chronic.
- 11) Acute diseases last for a short time and do not cause major health effects. E.g. Common cold. On the other hand chronic diseases persist for a long time and hence cause prolonged ill health. E.g. TB of lungs.

- 12) Causes of diseases may be immediate (first level cause) or contributory. For e.g. – The immediate cause of a person suffering from diarrhoea is the causative agent. The contributory causes could be
i) lack of good nourishment or genetic difference (second level cause),
ii) poverty or lack of public services (third level cause)
- 13) Diseases may be infectious or non-infectious. Infectious diseases are caused by microbes or other infectious agents (e.g. Malaria) whereas non-infectious diseases have internal, non-infectious causes (e.g. High blood pressure).
- 14) The infectious agents may be viruses, bacteria, fungi, protozoans or multicellular organisms like worms.

Category of infectious agent	Examples of diseases caused
Virus	Common cold, influenza, Dengue fever, AIDS
Bacteria	Typhoid, cholera, tuberculosis, anthrax
Fungi	Skin infections
Protozoans	Malaria, kala-azar
Worms	Intestinal worm infections, elephantiasis

- 15) The type of treatment of a disease depends on the category of the infectious agent.
- 16) Organisms belonging to one category will share several important life processes, which will be different from those of organisms belonging to other categories.
- 17) Drugs working by interfering with life processes of one category of organisms will not be effective against members of another category. E.g. Antibiotics act against bacteria, but not viruses, since viruses do not share bacterial pathways.
- 18) Penicillin interferes with bacterial cell wall production, thus killing the bacteria. Due to lack of cell walls, penicillin does not affect human cells.
- 19) Many infectious diseases are called 'communicable diseases' since they can spread from one person to another.
- 20) Communicable diseases can spread through air, water, food, sexual contact or vectors.
- 21) The droplets released during coughing or sneezing of an infected person causes the spread of air-borne diseases like common cold, pneumonia, tuberculosis etc.

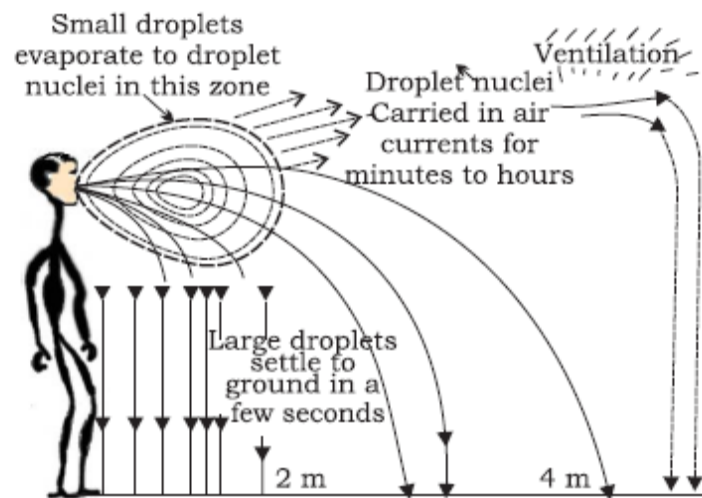
- 22) Air-borne diseases spread quickly in overcrowded and poorly ventilated living conditions.
- 23) Water-borne diseases like cholera spread when drinking water gets contaminated with the infectious agents.
- 24) Sexual contact causes the spread of diseases like AIDS and syphilis from the infected person to a healthy one. AIDS virus can also spread through blood transfusions, use of infected needles or during pregnancy and breast-feeding by an infected mother.
- 25) Vectors are intermediate animals causing the spread of disease causing agents from an infected person to a healthy person. For example – Female mosquitoes transmit many diseases like malaria when they feed on the blood of animals and humans.
- 26) On entering the body, the infectious agents reach their specific target organs. In certain cases the target organ is related to their point of entry. For e.g. – Typhoid causing bacteria enter through mouth and reside in gut lining.
- 27) In other instances, the target organ of the microbe has no relation to their point of entry. For e.g. HIV enters through the sexual organs but spreads to all the lymph nodes.
- 28) The symptoms of a disease depend on the target organ infected by the microbe. For e.g. cough and breathing problems are seen when lungs are infected. So based on the signs and symptoms of a disease, we can get an idea of the target organ of the microbe.
- 29) During infection, the body's activated immune system sends specialized cells to destroy the microbes, causing inflammation, with associated local effects.
- 30) The AIDS causing virus destroys the functioning of the immune system, due to which the body becomes unable to fight even minor infections. Ultimately the patient succumbs to such infections.
- 31) The severity of a disease is directly proportional to the number of infectious agents present in body.
- 32) An infectious disease can be treated in 2 ways:
 - i) Reduce the symptoms of the disease by providing treatment
 - ii) Kill the infectious agent causing the disease.
- 33) Medicines used in killing an infectious agent aim to disrupt some pathway of a vital life function peculiar to that group of organisms. These pathways are not present in other microbial groups or in humans.

- 34) On entering human cells, viruses use our cellular machinery for carrying out all their life processes. There are very few virus-specific biochemical pathways that can be targeted to produce anti-viral drugs.
- 35) The approach of treatment of an infectious disease has three drawbacks:
- i) Recovery of the patient may not be complete in certain cases.
 - ii) Treatment requires time; hence the patient suffers from the disease and may be bedridden.
 - iii) The patient serves as the source of spread of infection to others.
- 36) It is desirable to prevent a disease than to treat it completely.
- 37) There are general and specific ways of preventing diseases.
- 38) Infectious diseases can be generally prevented by public health hygiene methods, which aim to reduce exposure to infectious microbes. Public hygiene measures include providing safe drinking water, clean environments and adequately spacious conditions for living.
- 39) Another general method of preventing infectious diseases requires the availability of sufficient and balanced diet for the proper functioning of the immune system. The immune system ensures that we do not develop a disease each time we are exposed to an infectious agent, by destroying the agent before it multiplies greatly.
- 40) During smallpox epidemics, it was noted that people who survived after suffering from smallpox, did not get infected with it again. Such observations led to the birth of immunization, which is a specific method of preventing infectious diseases.
- 41) The principle of immunization is based on the memory of the immune system on encountering an infectious agent. On subsequent encounters with the same or related microbe, the response of the immune system is multiplied greatly, leading to quick elimination of the infection.
- 42) During immunization, a vaccine (containing weakened or killed pathogen or a specific part of the pathogen) is introduced into the body to fool the immune system into remembering a particular infection. Hence the body does not suffer even on further exposures to that pathogen or its close relatives.
- 43) Nowadays, vaccines preventing many infectious diseases like tetanus, polio and measles are used extensively especially in child health immunization programmes.
- 44) Everyone in the community should have access to public hygiene and immunization for effective prevention of infectious diseases.

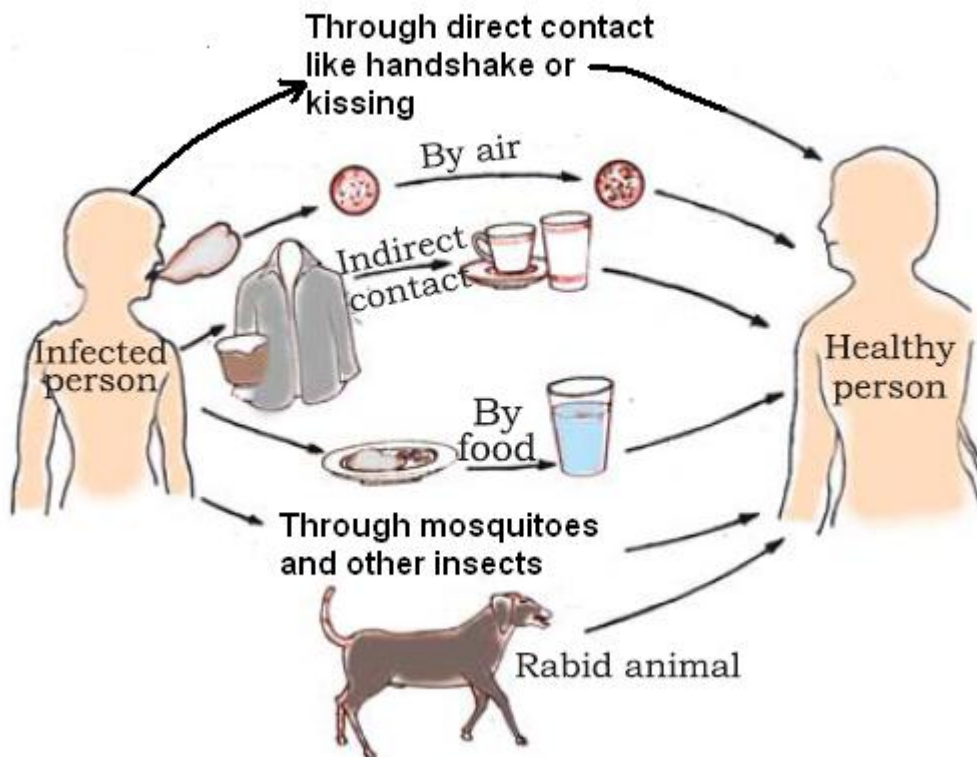
Top definitions

- 1) Health – A state of being well enough to function well physically, mentally and socially.
- 2) Disease - Lack of a feeling of ease due to impairment of health or a condition of abnormal functioning.
- 3) Acute disease – Disease lasting for a short period of time.
- 4) Chronic disease – Disease lasting for a long time, even as much as a lifetime.
- 5) Vectors – The intermediate animals causing the spread of infecting agents from a sick person to another potential host.
- 6) Infectious diseases – Disease where microbes are the immediate causes.
- 7) Communicable disease - A disease capable of being transmitted from an infected person to a healthy person.
- 8) Immediate cause of disease - The cause which immediately kindles a disease into action, when there occurs a predisposition towards it.
- 9) Contributory cause of disease – A cause or condition whose presence makes it more probable that a particular disorder will occur, but that cause is neither necessary nor sufficient for the occurrence of the disease.
- 10) Antibiotics - A substance produced by bacteria or fungi that destroys or prevents the growth of bacteria and other microorganisms.
- 11) Immunisation - The process of inducing immunity by administering a vaccine to allow the immune system to prevent infection or illness when it subsequently encounters the infectious agent.
- 12) Vaccine – A preparation of a weakened or killed pathogen or of a portion of the pathogen's structure that upon administration stimulates the immune system to fight against the pathogen but is incapable of causing severe infection.
- 13) Pathogen - Any disease-producing agent such as a virus or bacterium or other microorganism.

Top diagrams



Transmission of air-borne diseases



Common methods of transmission of diseases

Class IX: Biology
Chapter 14: Natural resources

Points to remember

Key learning:

- 1) All life-forms on Earth require Sun's energy as well as the resources on Earth like land, water and air to survive.
- 2) Life is possible only in the biosphere, where the atmosphere, lithosphere and hydrosphere interact.
- 3) Biosphere comprises of biotic and abiotic factors, which interact with each other and maintains a balance.
- 4) Life on Earth is responsible for the present atmosphere of Earth, consisting of gases like nitrogen, oxygen, carbon dioxide and water vapour.
- 5) Atmosphere plays a significant role in climate control. It prevents undue fluctuations in temperature during day and night as well as throughout the year.
- 6) Formation of winds occurs as follows:
 - i) As the Sun unevenly heats the various regions on the Earth's surface, air expands and rises over the hotter regions; and condenses and sinks over the cooler regions.
 - ii) During daytime, air above land gets heated faster than air above water; whereas during night, air above land cools faster than air above water.
 - iii) This results in formation of regions of low and high pressure.
 - iv) Air moves from the high pressure region to the low pressure region to balance the differences in pressure, thereby resulting in wind formation.
- 7) Evaporation of water from water bodies followed by condensation of the vapours results in rain formation, the steps of which are as follows:
Sun's heat → Evaporation of water from water bodies → Rising of hot air carrying water vapour → Expansion and subsequent cooling of air → Condensation of water vapour as droplets on condensation nuclei → Increase in size of water droplets → Formation of rain

- 8) The wind patterns in a particular region direct the rainfall patterns of that region.
- 9) Burning of fossil fuels releases harmful oxides of sulphur and nitrogen, which gives rise to acid rain.
- 10) Increased suspended particles in atmosphere released due to fossil fuel burning causes reduced visibility, smog (in cold weather) and health hazards.
- 11) Water exists in solid, liquid and gaseous forms. It occurs in atmosphere, on land surface as well as underground.
- 12) Water is important to living organisms because:
 - i) All cellular processes require an aqueous medium.
 - ii) Dissolved substances are needed for body reactions as well as for transportation.
- 13) Osmoregulation is carried out by all organisms to sustain life.
- 14) There is direct relationship between availability of water and the species richness as well as number of members of each species present in a given region.
- 15) Water pollution is caused by addition of following to water bodies:
 - i) Fertilizers and pesticides
 - ii) Sewage
 - iii) Waste from factories
 - iv) Heated water from factories
 - v) Cold water from dams
- 16) Both addition of undesirable substances to as well as removal of desirable substances from water bodies constitutes water pollution.
- 17) Reducing the dissolved oxygen and nutrients from water bodies is harmful for the aquatic organisms.
- 18) Aquatic organisms survive best in their optimum temperatures; hence significant sudden changes in water temperatures can disrupt their life processes and / or breeding activities.
- 19) Weathering of rocks due to physical, chemical and biological processes finally produces the fine particles of soil over long periods of time.
- 20) The continuous, uneven expansion and contraction of different parts of the rocks during day and night leads to crack formation, followed by breakdown of the large rock pieces into smaller ones.

- 21) Freezing of water in cracks of rocks causes widening of the cracks.
- 22) Continuous friction between the various rock pieces carried by flowing water also results in soil formation.
- 23) Strong wind is another factor resulting in soil formation.
- 24) Both water and wind deposits soil away from the parent rocks.
- 25) Soil formation is also carried out by living organisms. Materials released by lichens growing on rock surface powder down the surface, forming soil. Further breakdown of rocks is caused by growth of other small plants in such soil as well as the entry of tree roots into the cracks of rocks.
- 26) Soil is a mixture of rock particles, humus and microscopic and small organisms.
- 27) Humus aerates the soil and keeps it porous.
- 28) The nutrient and humus content of the topsoil influences the biodiversity of a region.
- 29) An important cause of soil pollution is the recent agricultural methods, which destroys soil structure by killing the nutrient recycling soil microorganisms as well as the earthworms.
- 30) Trees and other plants prevent soil erosion and helps in deep percolation of water. Hence deforestation accelerates soil erosion greatly.
- 31) Biogeochemical cycles make possible the transfer of energy and matter amid the various components of the biosphere, leading to a balance between them.
- 32) In addition to evaporation of water from water bodies, water is also added to atmosphere through transpiration and respiration carried out by living organisms.
- 33) Condensation of atmospheric water leads to rain and snow.
- 34) Underground water comes to surface through springs, wells and tube wells.
- 35) Flowing water transport nutrients from one place to another and eventually to the sea.
- 36) Nitrogen is a vital element found in all living organisms.

- 37) Most life forms cannot use atmospheric oxygen directly, except a few nitrogen fixing bacteria found mainly in root nodules of leguminous plants.
- 38) Combination of lightning and rain also creates usable forms of nitrogen.
- 39) Plants utilise nitrates and nitrites to produce proteins, nucleic acids and vitamins, which are then passed on to the consumers.
- 40) Certain soil bacteria convert the nitrogen compounds of dead organisms into nitrites and nitrates.
- 41) Denitrification, carried out by certain bacteria, releases nitrogen back to atmosphere.
- 42) Carbon occurs in elemental form as well as in organic and inorganic compounds. The basic structure of all life molecules like carbohydrates, proteins, fats, nucleic acids and vitamins is composed of carbon.
- 43) Carbon dioxide is fixed by green plants during photosynthesis as well as by marine animals during shell formation.
- 44) Photosynthesis converts carbon dioxide to glucose, which is converted back to carbon dioxide through respiration.
- 45) Combustion of fuels also releases carbon dioxide to atmosphere.
- 46) Carbon dioxide is an important green house gas that prevents the escape of heat from Earth and causes global warming.
- 47) Oxygen exists on Earth in elemental form as well as in combined form.
- 48) Vital life molecules like proteins, lipids, carbohydrates and nucleic acids are also composed of oxygen.
- 49) The process of respiration, combustion and formation of nitrogen oxides utilizes atmospheric oxygen.
- 50) Photosynthesis returns oxygen back to atmosphere.
- 51) Ozone is present in the upper atmospheric strata and contains 3 atoms of oxygen.
- 52) The ozone layer absorbs the Sun's harmful ultraviolet radiations, thus preventing them from reaching the Earth's surface and damaging life.
- 53) CFCs and other man-made compounds react with the ozone molecules and causes ozone layer depletion.

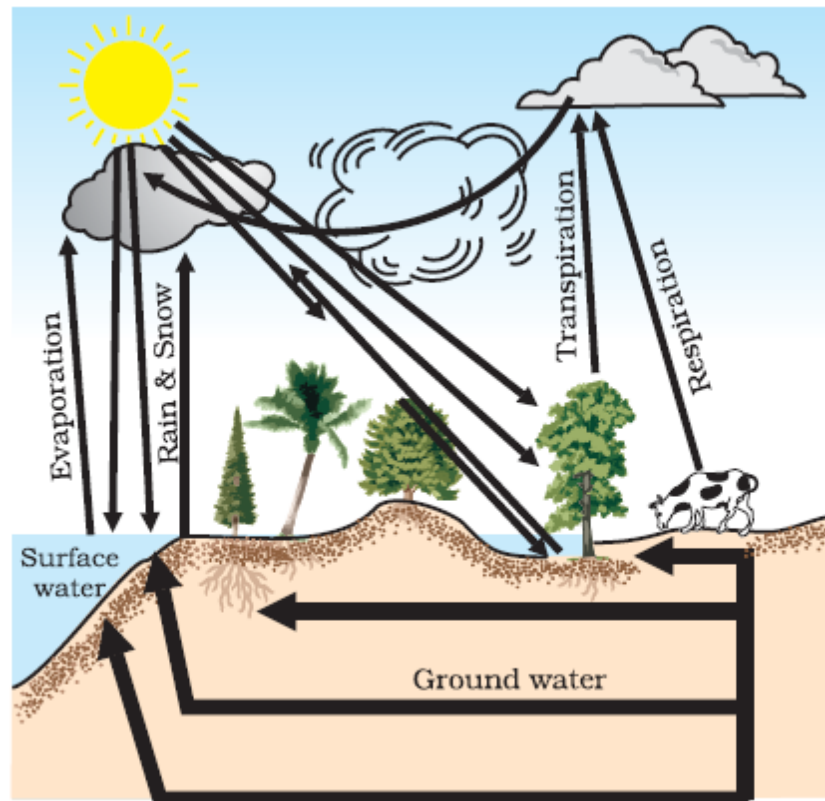
- 54) We should work towards preventing ozone layer depletion.
- 55) Our natural resources should be used in a sustainable manner so as to prevent their depletion and pollution.

Top definitions

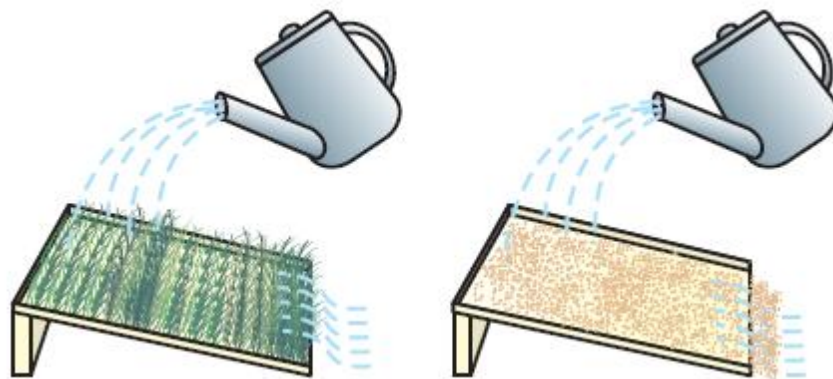
- 1) Lithosphere – The outer crust of the Earth.
- 2) Hydrosphere – The region which includes all the earth's liquid water, frozen water and small amounts of water vapor in the earth's atmosphere.
- 3) Atmosphere – The mass of air surrounding the Earth.
- 4) Biosphere – The life-supporting zone of the Earth where the atmosphere, hydrosphere and lithosphere interact and make life possible.
- 5) Biotic factors – The living components of the environment.
- 6) Abiotic factors – The non-living components of the environment.
- 7) Wind – Movement of air from an area of high pressure to an area of low pressure.
- 8) Air pollution - The presence of particulates, noxious gases, or other impurities in the air that harm human or environmental health.
- 9) Smog – The combination of smoke particles with the tiny droplets of fog.
- 10) Acid rain - Rain that has become acidic due to mixing with acids like sulphuric and nitric acid that are released into the atmosphere by the burning of fossil fuels.
- 11) Osmoregulation - Control of water and electrolyte balance in the body.

- 12) Humus – The highly decomposed residue of living materials that is a part of soil.
- 13) Topsoil – The topmost layer of soil that contains humus and living organisms in addition to soil particles.
- 14) Soil pollution- Removal of useful soil components and addition of substances which adversely affect the soil fertility and harm the biodiversity living in it.
- 15) Biogeochemical cycle – The cyclic transformation of chemicals through interacting biological, geological and chemical processes that causes transfer of energy and matter amid the various components of the biosphere, leading to a balance between them.
- 16) Water cycle – The whole process in which water evaporates and falls on the land as rain and later flows back into the sea via rivers.
- 17) Nitrification – The process of converting reduced nitrogen (as ammonia or ammonium) to its more oxidized forms (nitrite or nitrate ions).
- 18) Denitrification – A process in which anaerobic bacteria convert nitrate ions into nitrogen gas.
- 19) Ammonification – The process in which organic forms of nitrogen are converted into ammonia or ammonium ion by heterotrophic bacteria.
- 20) Green house effect – The process in which green house gases like carbon dioxide, cause thermal radiation emitted by the Earth's surface to be reflected back down, therefore causing the increase in worldwide average temperatures.
- 21) Global warming - An increase in the average temperature of the earth's atmosphere, brought about by the enhanced greenhouse effect.

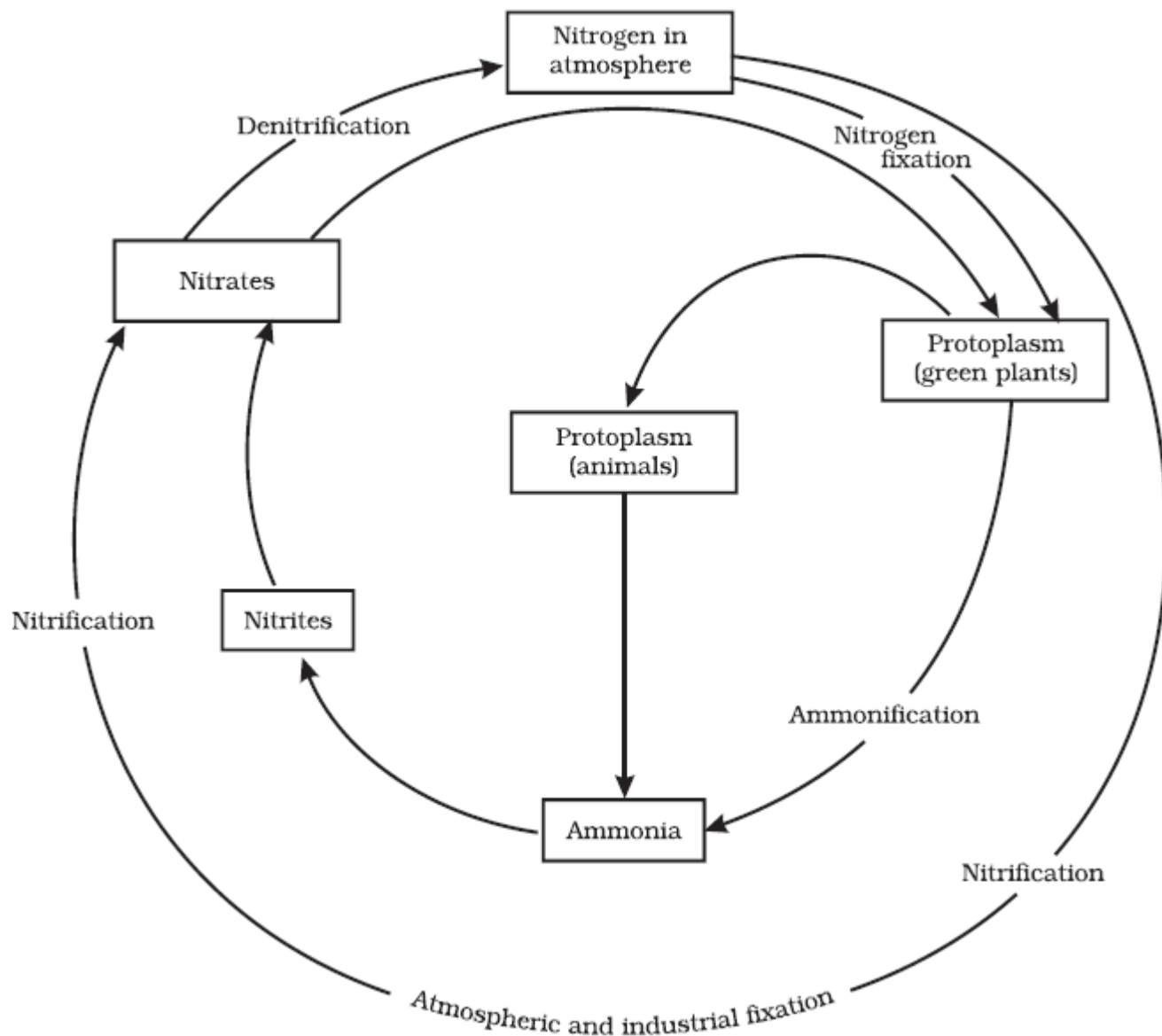
Top diagrams



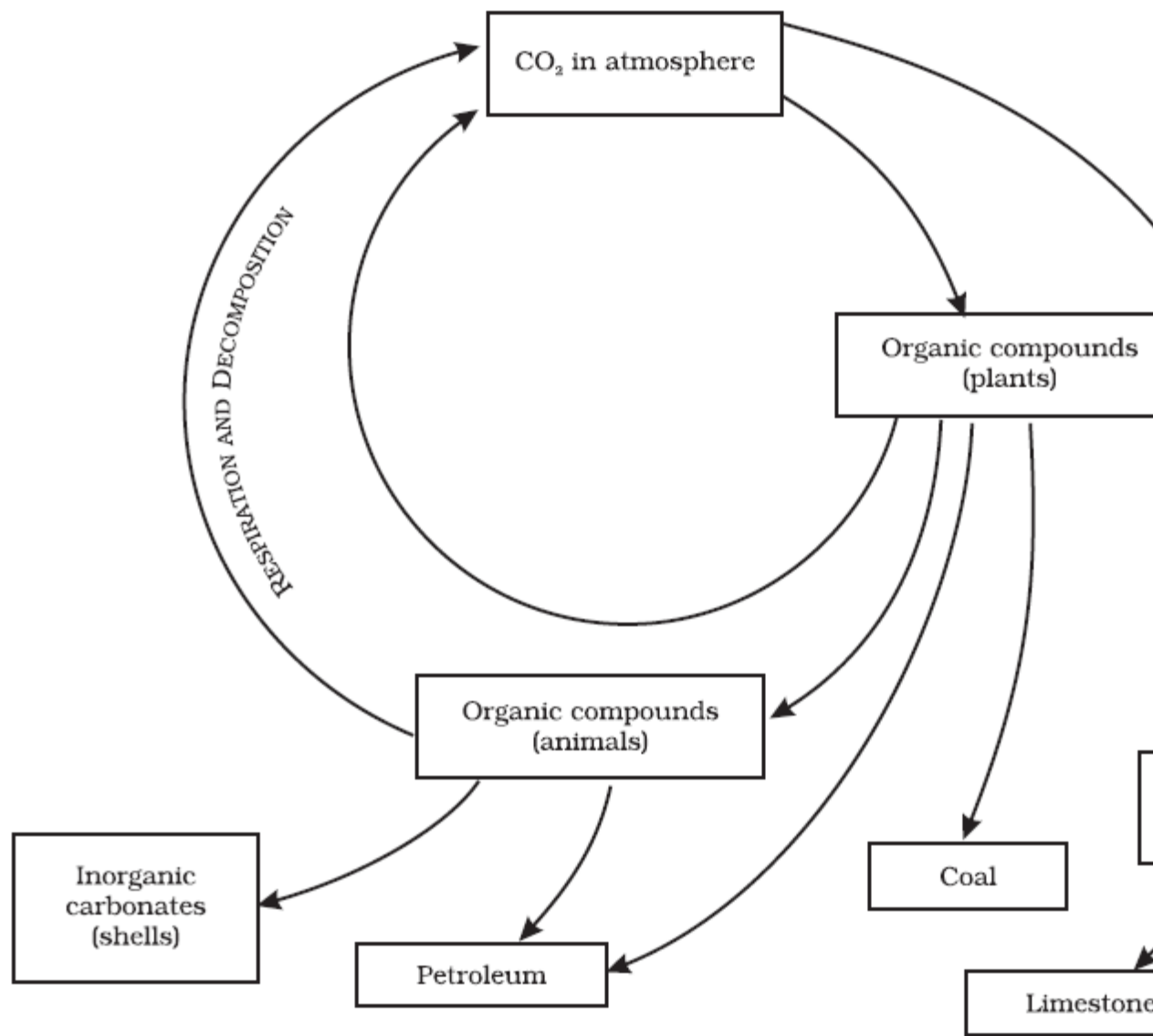
Water-cycle in nature



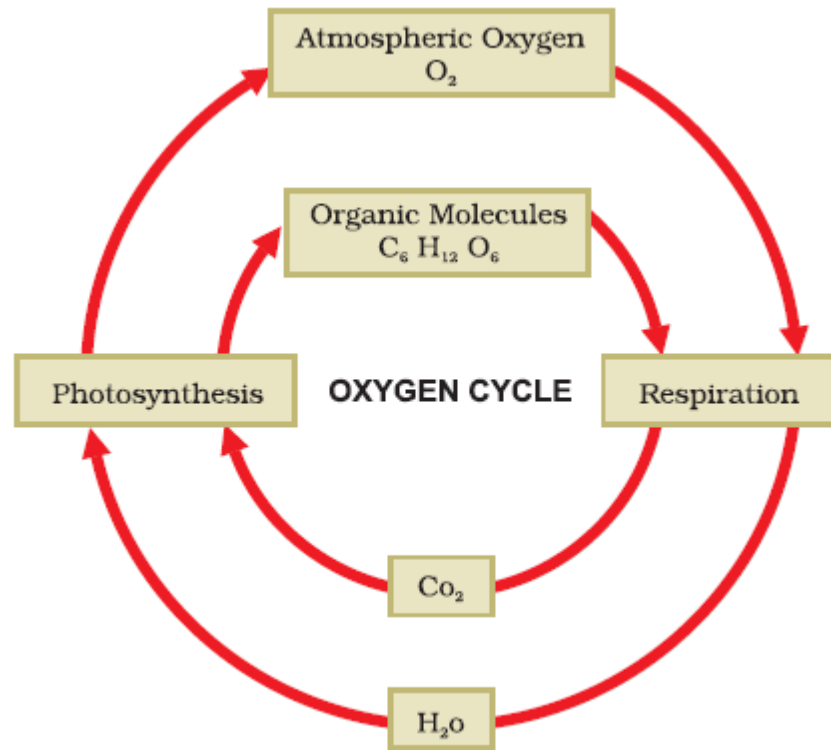
Effect of flowing water on the topsoil



Nitrogen-cycle in nature



Carbon-cycle in nature



Oxygen-cycle in nature

Class IX: Biology
Chapter 15: Improvement in food resources

Points to remember

Key learning:

- 1) Agriculture and animal husbandry provide us with all our animal and plant food.
- 2) For feeding the ever increasing Indian population, our capacity of manufacturing crop plants and livestock should be increased through various efforts like green revolution and white revolution. But this should be done in a sustainable manner without destroying our environment.
- 3) Improving the financial status of people, especially those involved in agricultural practices is essential to provide food security to everyone.
- 4) Different crops provide us with different types of nutrients.

Crops	Nutrients
Carbohydrates	Cereals
Proteins	Pulses
Fats	Oil seeds
Vitamins and minerals	Vegetables, spices and fruits

- 5) The optimum requirement of temperature, water, light and other conditions vary for different crops.
- 6) Kharif crops like paddy and cotton are grown in rainy season whereas rabbi crops like wheat and mustard are grown in winter season.
- 7) Crop variety improvement, crop production improvement and crop protection management helps to increase the crop yields.
- 8) A crop variety possessing several desirable characteristics should be selected to produce a good yield.
- 9) Hybridisation and genetic modification techniques introduce the useful characters into crop plants.

10) It is desirable to develop crops that can survive and give good yields in different climatic conditions and areas.

11) The characteristics desirable in crop plants are

- i) Increased yield
 - ii) Improved quality (particular to the crop plant)
 - iii) Resistance to biotic and abiotic factors, especially those harming the plant.
 - iv) Reduction in duration of plant maturity.
 - v) Broad range adaptability of the crop plant under various environmental conditions.
 - vi) Desired agronomic characteristics particular to a plant.
- Variety improvement may be done for one or several of these characteristics.

12) In India, the land holding, financial conditions and use of modern technologies varies among different farmers. Hence the inputs of farmers are also different, leading to differing production practices and yields.

13) The sixteen nutrients required by plants are obtained through air, water and soil.

Source of nutrients	Nutrients required by plants
Air	Carbon, oxygen
Water	Hydrogen, oxygen
Soil	i) Macronutrients: Nitrogen, phosphorus, potassium, calcium, magnesium, sulphur ii) Micronutrients: Iron, manganese, boron, zinc, copper, molybdenum, chlorine

14) Manures and fertilizers supplement the soil with the required nutrients and thus increase crop yield.

15) Manures contain decomposed animal and plant wastes and increases soil nutrition and fertility.

16) The bulk organic matter present in manure improves soil structure.

17) In composting, the biological waste material is decomposed in pits. Composting done using earthworms is called vermi-composting.

18) In green manuring, green crops are grown, mulched by ploughing and mixed with soil to improve soil structure and fertility.

19) The commercially produced fertilizers provide macronutrients like N, K and P and ensure healthy growth of plants.

- 20) Excessive use of fertilizers causes water pollution and loss of soil fertility.
- 21) Best crop yields is obtained by a balance between the use of fertilizers and manures.
- 22) In organic farming, use of chemicals is discouraged whereas use of organic manures, bio-agents and healthy cropping systems is encouraged.
- 23) Irrigation is essential to ensure agricultural success in India since our agriculture is mainly rain-fed.
- 24) Wells, canals, rivers and tanks are some important irrigation systems in our country.
- 25) The source of wells is underground water whereas canals get water from rivers or reservoirs. River lift systems draw water directly from rivers.
- 26) Rainwater harvesting and watershed management increases storage of rain water for later use in agriculture.
- 27) Risk of crop failure is reduced in mixed cropping wherein two or more crops are grown together on the same field.
- 28) Two or more crops with different nutritional requirements are grown on the same farm in inter-cropping so as to utilize maximum nutrients and prevent spread of diseases and pests.
- 29) In crop rotation, different crop combinations are grown on the same field in a pre-planned succession so as to get maximum returns.
- 30) Weeds, pests and diseases can destroy large amounts of crop plants.
- 31) Weed removal from crop fields is essential since they use up the requirements of crop plants like food, space, light etc.
- 32) Insect pests and plant pathogens attack different parts of the plant and thus reduce crop yields.
- 33) Pesticides are used to control weeds, insects and diseases, but they should be used only as much as needed to avoid environmental pollution and health hazards.
- 34) Several preventive methods can be adopted to carry out pest and weed control.
- 35) Biotic and abiotic factors can cause huge storage losses of food grains and can be taken care of by proper treatment.

- 36) It is better to use preventive and control methods for protecting crops such as proper cleaning and drying of the crops followed by fumigation, rather than treatment measures.
- 37) Due to the food needs of the ever increasing human population, animal husbandry, especially of cattle, goat, sheep, poultry and fish, is gaining a lot of importance.
- 38) In India, cows and buffaloes are used for draught labour and producing milk and are called draught animals and milch animals respectively.
- 39) Long lactation period is a desirable quality in milch animals.
- 40) Exotic breeds showing long lactation is cross bred with local breeds showing resistance to diseases to obtain high quality breeds.
- 41) For good health and milk production, proper cattle management is required such as shelter, feeding, breeding and disease control.
- 42) The cattle shelter should be well-ventilated, hygienic and dry.
- 43) Cattle food should include roughage and concentrates in balanced amounts and are required for the healthy maintenance as well as milk production of the cattle.
- 44) Cattle diseases are caused by external and internal parasites as well as by bacteria and viruses. These affect the health as well as milk production of the animals and can be largely controlled through vaccinations.
- 45) Poultry farming targets egg production and broiler production for chicken meat.
- 46) Cross-breeding is done between the Indian and foreign breeds of poultry to obtain improved varieties containing desirable traits such as tolerance to high temperature, dwarf broiler parent, low maintenance requirements and reduction in size of the layers.
- 47) The shelter, feeding and other requirements of broilers and layers differ from each other.
- 48) The diet of broilers is planned with the aim of achieving good growth rate and quality of carcass whereas the diet of layers is aimed to achieve large number and high quality of eggs.
- 49) Broiler diet is rich in proteins and vitamins, along with the required amount of fat.

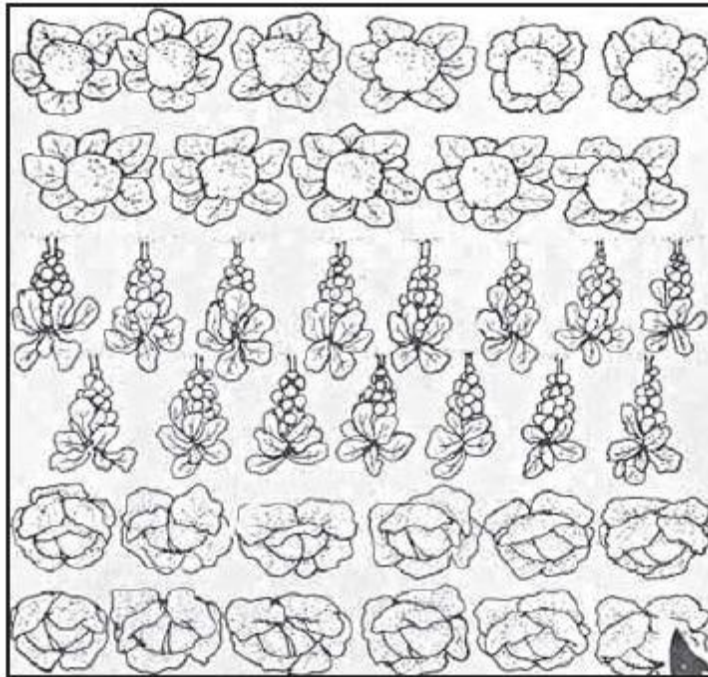
- 50) The poultry shelter should be hygienic, well-lighted and maintained at appropriate temperatures.
- 51) Poultry need to be protected from various diseases caused by bacteria, fungi, viruses, parasites and nutritional deficiencies, through proper treatment, sanitation and vaccination.
- 52) In fish production, both the finned true fish as well as shellfish are obtained from marine or fresh water through capture fishing or culture fishery.
- 53) India's marine fishery resources are the vast coastlines and extensive seas; the freshwater resources are canals, ponds, reservoirs and rivers whereas the brackish water fishery resources are estuaries and lagoons.
- 54) In India, marine fishes such as pomphret, tuna, mackerel and sardines are located through satellites and echo sounders and captured using fishing nets.
- 55) Marine fish farming of high economic value fishes like mullets, oysters and prawns are done in sea water.
- 56) Fresh water fish production is mainly carried out through aquaculture.
- 57) Composite fish culture system is used commonly for fresh water fish farming. In this system, five or six fish species with different food habits are farmed together in a single pond, so as to increase the yield of fish.
- 58) Since high quality fish seed is not always available, fish are nowadays bred using hormonal stimulation, thus ensuring continuous supply of the seed.
- 59) Bee-keeping is a low investment activity carried out by farmers to obtain honey and wax.
- 60) *Apis cerana indica*, *Apis dorsata* and *Apis florea* are the Indian bee varieties whereas *Apis mellifera* is an Italian variety used for commercially producing honey.
- 61) The availability of sufficient amount of pasturage as well as the type of flowers decides the quality of honey.

Top definitions

- 1) Hybridisation – Crossing between genetically dissimilar plants.
- 2) Intervarietal hybridization – Hybridisation between different varieties of plants.
- 3) Interspecific hybridization – Hybridisation between plants belonging to two different species of the same genus.
- 4) Intergeneric hybridization - Hybridisation between plants of different genera.
- 5) Macronutrients – Nutrients required by plants in large quantities.
- 6) Micronutrients – Nutrients required by plants in small quantities.
- 7) Composting – The process in which farm waste material like livestock excreta, vegetable waste, animal refuse, domestic waste, sewage waste etc is decomposed in pits.
- 8) Vermi-compost – Compost prepared by using earthworms to hasten the decomposition process of plant and animal refuse.
- 9) Manure - Organic substances of animal or plant origin that is added to the soil to increase its fertility and structure.
- 10) Fertiliser – Commercially produced plant nutrients that enriches the soil fertility and increases the crop yield.
- 11) Organic farming – A farming system with minimal or no use of chemicals as fertilizers, pesticides etc. and with a maximum input of organic manures, recycled farm-wastes, along with use of bio-agents and healthy cropping systems.
- 12) Mixed cropping – The practice of growing two or more crops simultaneously on the same field.
- 13) Inter-cropping – The practice of growing two or more crops simultaneously on the same field in a definite pattern.
- 14) Crop rotation – The growing of different crops on a piece of land in a pre-planned succession.
- 15) Weeds – Unwanted plants in the cultivated field.

- 16) Animal husbandry – The scientific management of animal livestock.
- 17) Milch cattle – Milk-producing females of cattle.
- 18) Draught cattle – Cattle used for farm labour.
- 19) Layer – Egg laying poultry.
- 20) Broiler – Poultry reared for obtaining meat.
- 21) Capture fishing – Obtaining fish from natural resources
- 22) Culture fishery – Obtaining fish by fish farming.
- 23) Mariculture - The farming of finfish or shellfish in marine water.
- 24) Aquaculture - The farming of freshwater or marine organisms for human use, by proper utilization of available waters in the country.
- 25) Beekeeping – The cultivation of bees on a commercial scale for the production of honey and beeswax.

Top diagrams



Intercropping