

Diversity of Living Organism

Diversity & Classification

- Diversity means variety. Different places on the earth have their own typical kinds of living beings. This gives rise to the need of classification. So, "Diversity is the need of classification."

- Classification is the arrangement of organisms into sets or groups according to the similarities and dissimilarities present between them.

(a) Advantages/ Significance of classification

- It establishes hierarchy of groups of organisms on the basis of their common features.
- It makes the systematic study easier.

(b) Taxonomic Hierarchy:

It is framework by which taxonomic groups are arranged in definite order from higher to lower categories. The hierarchial order of classifying organisms is:

Kingdom → Phylum → Class → Order → Family
Genus → Species

(i) Taxon: It refers to any rank or category in the hierarachial order of classification. e.g. Kingdom, phylum etc. the highest taxon is kingdom while the lowest taxon is species.

(ii) Species: These are the groups of organisms having similar morphological characters which can freely interbreed & produce their own kind. It is the basic unit of classification.

(c) Nomenclature:

It is the system of naming an individual. Nomenclature is done on the basis of a set of rules stated in the ICN i.e. International Code of Nomenclature.

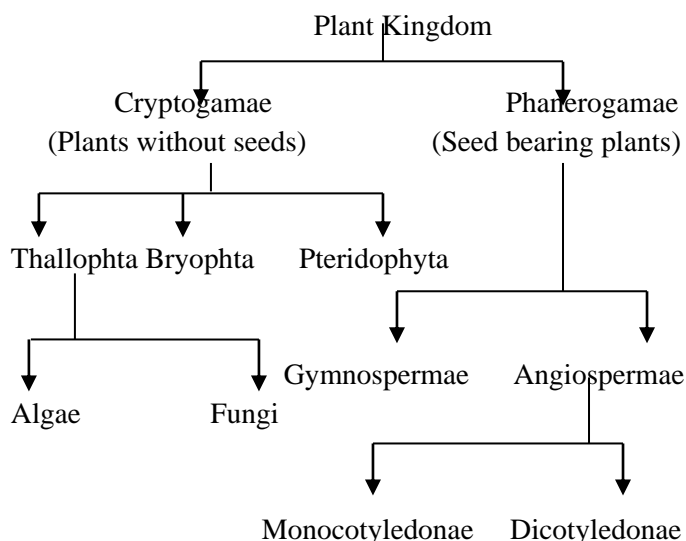
(i) Binomial nomenclature: It is a system of naming the organisms in such a way that each of their names contain two components, first is genus and the second is species. E.g. Scientific name of human is *Homo sapiens*. Scientific name of crow is *Corvus Splendus* this system was introduced by Carolus Linnaeus in his bood *Systema Naturae*. Who is also called Father of Taxonomy.

- Five kingdom system: It was given by Robert Whittaker. According to him organisms were divided into five kingdoms.

- (A) Kingdom Monera: Unicellular, prokaryotic, microscopic, most ancient, can live in deep oceans, hot springs, desserts, high salt concentrations etc. They include bacteria, filamentous and photosynthetic blue green algae etc.
- (B) Kingdom Protista: Unicellular, Colonial, eukaryotic. They include photosynthetic algae, decomposers (slime moulds) and protozoa (predators) etc.
- (C) Kingdom fungi: Unicellular or multicellular eukaryotic organisms, They are heterotrophic, parasitic or saprotrophic.
- (D) Kingdom plantae: They are multicellular, eukaryotic, autotrophic (photosynthetic), some are heterotrophic & parasitic. They include photosynthetic algae, green plants etc.
- (E) Kingdom Animals: Multicellular, eukaryotic, heterophic.

Basis of Classification

- Complexity of structure
- Mode of nutrition
- Level of organization
- Plant kingdom was divided in two sub kingdoms



(a) Sub kingdom cryptogamae:

(Cryptos= hidden, gamous= marriage):

- These are also called as lower plants, flowerless or seedless plants.
- Their reproductive organs are hidden.

(i) Division Thallophyta:

- Thallus: Undifferentiated plant body, i.e., absence of root, stem & leaves.
- There is no vascular system.
- Three classes of thallophyta are:

(A) Class Algae:

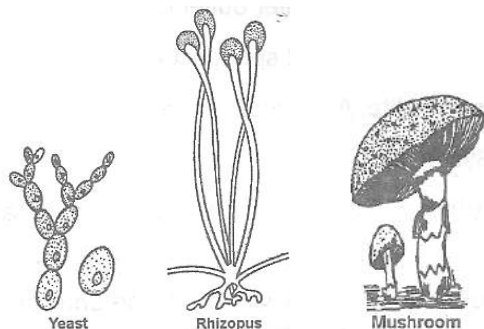
Charaters:

- These are aquatic or terrestrial, fresh water or marine. Autotrophic, photosynthetic containing various pigments like chlorophyll, carotenoids, xanthophylls etc.
- Unicellular, colonial, filamentous.
- Cell wall of cellulose,
- E.g. Blue green algae (Nostoc), Green algae (Ulothrix, Spirogyra), Brown algae, red algae etc.



(b) Class Fungi:

- These are heterotrophic.
- They lack chlorophyll but have cell wall of chitin (fungus cellulose).
- They can be parasitic or saprotrophic
- Their body is filamentous called as mycelium.
- Reserve food material consists of glycogen. E.g. Moulds (Rhizopus), Yeasts (Saccharomyces), Mushroom (Agaricus).



Lichen:

- It is a symbiotic relationship between algae and fungi.

- Algal part is phycobiont and fungal part is mycobiont.
- They grow on rocks, tree trunks, grounds etc.
- E.g. Parmellia, Alectoria etc.



(ii) Division Bryophyta:

- Bryophytes are called terrestrial amphibians (amphibians of plant kingdom) because they require moist soil surface for swimming of their sperm & supply of water to all parts.
- They are the first amongst land plants which occur in damp & shady habitat.



e.g. Liverworts (Riccia, Marchantia), Hornworts (Anthoceros) and mosses (Funaria).

(iii) Division pteridophyta:

- They are seedless vascular plants. Primitive tracheophytes or vascular cryptogams.
- Plant body is differentiated into true stem, Leaves & roots.
- Vascular tissues are present.

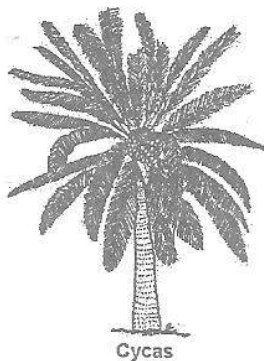


Equisetum (Horsetail)

e.g. Ferns (Dryopteris, Pteris), club moss (Lycopodium), Horsetail (Equisetum).

(b) Sub Kingdom: Phanerogamae: (Phaneros = visible, gamous = marriage.)

- These are higher plants having both flowers and seeds.
- Body differentiated into true stem, leaves and root.
- Vascular system is well developed.
- It is divided into two divisions:



Cycas

(i) Division Gymnospermae:

- Seeds are not enclosed in fruits. These are naked seeded.
- They have well developed vascular system but xylem lacks vessels and phloem lacks companion cells.
- They occupy a intermediate position between the pteridohytes and the angiosperms.
- The flowers are represented by unisexual cones, often both being present on the same plant.
- E.g. Cycas, Pinus (Commonly known as pine)

(ii) Division: Angiospermae:

- These are seed bearing.

- These are represented by trees, herbs, shrubs.
- Body well differentiated into root, stem and leaves.
- They have highly developed vascular system. Seeds remain enclosed in ovary.
- It is divided into two classes on the basis of number of cotyledons.

(A) Class: Dicotyledonae:

- Their seeds have 2 cotyledons in the embryo.
- Tap root is present. E.g. Neem, Peepal, Mango, Pea, Mustard.

(B) Class: Monocotyledonae:

- Their seeds have one cotyledon in embryo.
- Fibrous root system is present, e.g. Wheat, Maize, Onion.

Animal Kingdom

(a) Basis of classification:

- Organization and differentiation of cells to form tissues and organs.
- Body symmetry.
- Formation of body cavities and blood vascular system.
- Features of embryonic development.
- Animal Kingdom is divided into following Phyla:

(a) Phylum Protozoa:

- They are unicellular, eukaryotes. Their body organization is of “protoplasmic Level”.



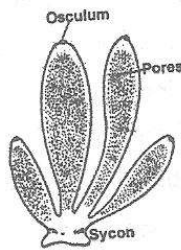
Amoeba

- Nutrition is of different types like holozoic, holophytic, mixotrophic.
- Digestion is intracellular & it takes place in food vacuole.
- Excretion & respiration occurs through general body surface by the process of simple diffusion.

- E.g., Amoeba, Entamoeba, Plasmodium, Euglena, Paramecium.

(b) Phylum Porifera:

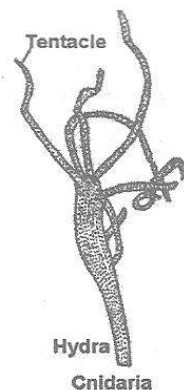
- These are pore bearing organisms i.e. with porous body.
- Also called as sponges.
- Aquatic, mostly marine.



- Body perforated by numerous pores called ostia which opens into a canal system having canals and chambers lined with choanocytes (flagellated) and have a large sized water outlet called oscula.
- Their cavity is called spongocoel.
- Hermaphrodite, Asexual reproduction by budding.
- E.g. Sycon, Spongilla, Euplectella.

(c) Phylum- Coelenterata or Cnidaria:

- These are sac like structures. They have a body cavity called gastrovascular cavity or coelenteron. It has single opening for both ingestion and egestion.
- Aquatic, mostly marine



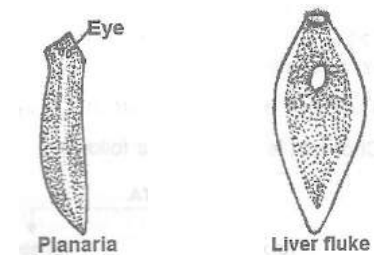
- Multicellular, diploblastic, radially symmetrical.
- They have special organs called tentacles, cnidoblast or nematocyst cells. They are specialized for stinging. They paralyse the prey by releasing poison.

- Some of them have exoskeleton of CaCO_3 . They are called Corals, they live in colonies and when they die they form coral reefs, or islands. E.g. Hydra, Jelly fish.

(d) Phylum Platyhelminthes:

(plat = Flat; helminth = worm)

- Bilaterally symmetrical, triploblastic, dorsoventrally flattened.
- Acoelomates.
- Their digestive cavity has a single opening with mouth only and anus is absent.
- They possess hooks and suckers.
- They have flame cells or protonephridia for excretion.
- These are hermaphrodite. E.g. Planaria, Fasciola (liver fluke)



(e) Phylum- Nematoda (Aschelminthes):

- Also called as roundworms.
- Bilaterally symmetrical, unsegmented triploblastic,
- These are pseudocoelomic.
- Their alimentary canal is tubular having both mouth and anus.

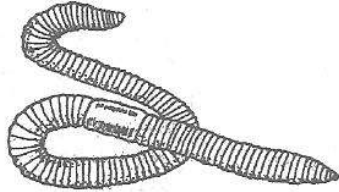


- Some are parasites on plants & animals.
- Reproduction is sexual and sexes are separate. E.g. Ascaris (round worm), Filarial worm.

(f) Phylum: Annelida (Annulus = ring; segments)

Characters:

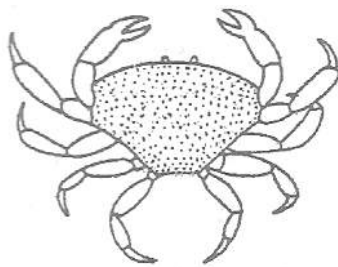
- Their body is triploblastic, bilaterally symmetrical, soft, elongated, vermiform, cylindrical & dorsoventrally flattened.

**Earthworm**

- Eucoelomate i.e. they have true body cavity which first appeared in this phylum.
- Well developed alimentary canal is present.
- Locomotion is with the help of chitinous projections called chaetae (setae).
- Excretion by nephridia. E.g. Earthworm, Leech.

(g) Phylum: Arthropoda (Arthros → Jointed, poda = legs)

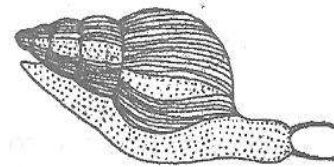
- These are the organisms with jointed appendages.
- This is the largest phylum in animal kingdom.
- They have a complete alimentary canal with mouth & anus.
- Respiration occurs through general body surface, gills, trachea and book lungs.
- They have open circulatory system with dorsal heart & arteries.

**Crab**

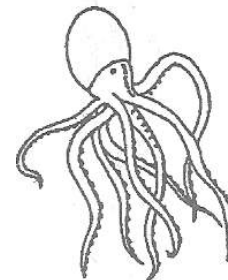
- Excretion by coelomducts, malpighian tubules, green glands, coxal glands.
- E.g. Palaemon (prawn), Cancer (crab), Periplaneta (cockroach), Anopheles (mosquito) & aranea (spider) etc.

(h) Phylum Mollusca:

- It is second largest group of animals, body soft, unsegmented, bilaterally symmetrical and without appendages.

**Snail**

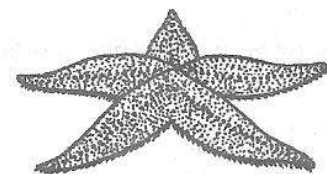
- Body divided into a head, foot and visceral mass.
- Body cavity is haemocoel.
- Respiration by gills.
- For ingestion they have tongue like structure “radula”

**Octopus**

- Excretion by metanephridia present near heart.
- E.g. pila, Melix (torsion univalve), Dentalium (Tusk like shell), Unio, Octopus.

(i) Phylum Echinoderms:

- These are marine animals, their body is triploblastic, eucoelomata, unsegmented.
- Their body has spines arising from exoskeleton of calcium.
- Adults are radially symmetrical while larvae are bilaterally symmetrical.
- Head is absent, oral and aboral surfaces have five radial ambulacra.
- Excretory organs are absent.

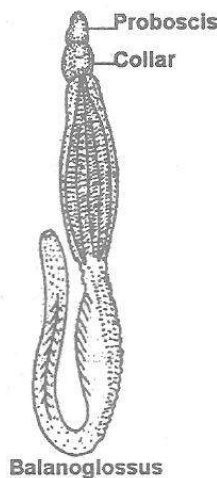
**Starfish**

Water vascular system is present. From this tube like structure arise, these tubes look like feet and are called as tube feet that helps in locomotion.

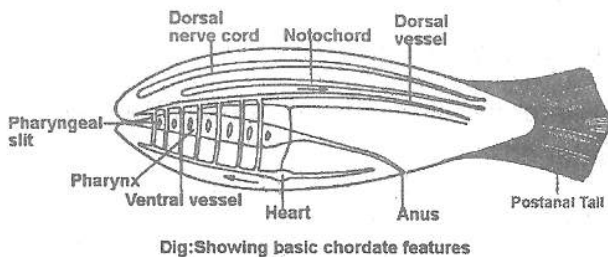
- E.g. Asterias (star fish), Echinus (sea urchin), Holothuria (Sea cucumber), Antedon (feather star).

Phylum Hemichordata

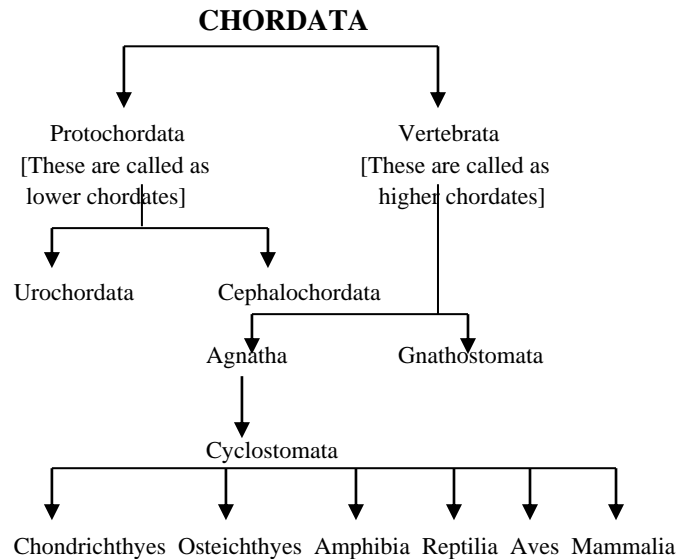
- They are placed in between no chordates and chordates as they possess some characters of both.
- They include worm like, unsegmented, bilaterally symmetrical animals.
- Their body is divided into three regions proboscis, collar & trunk.
- They possess gill slit or gill cleft which is meant for respiration.
- They possess nerve cord in collar region but it is not a true dorsal nerve cord. E.g. Balanoglossus (tongue worm).



Phylum Chordata



- Notochord is present at some stages of life, supported by a tubular hollow dorsal nerve cord.
- In higher chordates i.e. vertebrates, the notochord is replaced by vertebral column.
- A set of gill slits is also present at certain stage of life, also called as pharyngeal gill clefts.
- Tail is also present behind the anal aperture that is post anal tail.
- They also possess a proper circulatory system.
- Chordata is further divided as follows.

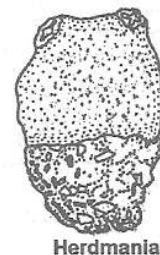


(a) Protochordata:

- They are termed as lower chordates.
- They do not possess brain, cranium, vertebral column, jaw and paired appendages.
- Notochord is present atleast in some stage along with other diagnostic chordate characters (dorsal hollow nerve cord, gill slits, post anal tail).
- They are triploblastic, bilaterally symmetrical, enterocoelomic, organ system level of organization.
- Protochordates are further divided into two groups:

(i) Subphylum: Urochordata

- They are commonly known as tunicates.
- The notochord is present in the tail of the larva and disappears in the adult.
- The pharynx has gill slits.



- The larva (tadpole) undergoes retrogressive metamorphosis, i.e., changes from a better developed larva to a less developed adult. E.g. Herdmania (sea squirt), Dotiolum, Pyrosoma.

(i) Subphylum: Cephalochordata.

- Animals are fish like without a head.
- Animals possess all the characters of chordates i.e.,
- A nerve cord (without a distinct brain).
- Numerous well developed gill slits.

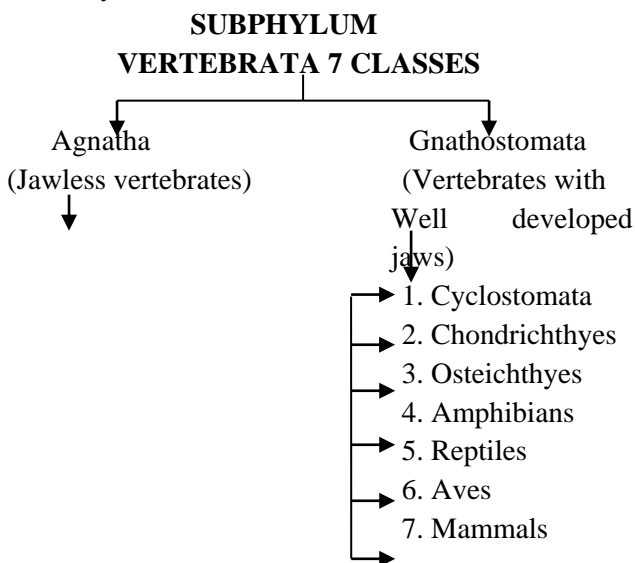


Amphioxus

- A post anal tail throughout life e.g. Branchiostoma (Amphioxus; Lancelet.)

Subphylum: Vertebrata or Craniata

- They are advanced animals, having a cranium (brain box) around the brain. Nervous system is well developed.
- Notochord is replaced by a vertebral column (backbone) in the adults. Endoskeleton is highly developed.
- The heart is situated ventrally. The circulatory system is closed consisting of blood vascular system and lymphatic system.
- Respiratory organs may be gills (in aquatic animals), skin, buccopharyngeal cavity (in amphibians) or lungs (in land animals).
- Excretion occurs through kidneys.
- This subphylum is subdivided into seven classes. They are:

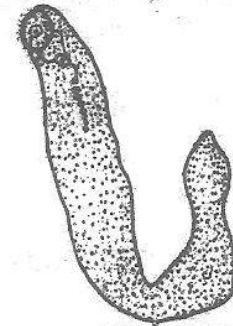


(a) Class Cyclostomata:

(Gr. Cyclos = circular, Stome = mouth; the circular mouthed fishes).

These are the most primitive vertebrates.

- Animals are jawless and possess a circular mouth.
- Notochord is present in the form of a cylindrical rod.



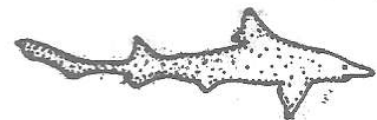
Petromyzon

- Head and brain are poorly developed.
- Respiration occurs through gills contained in pouches.
- Heart is two-chambered consisting of one auricle and one ventricle.
- Gonad is single and fertilization is external. E.g. petromyzon (lamprey), myxine (hag fish).

(b) Class Chondrichthyes:

(Gr. Chondros = cartilage; ichthys = fish, the cartilaginous fish).

- Skeleton is cartilaginous, hence the name chondrichthyes is given.
- Mouth is ventral in position on the head.
- Jaw are well- developed.



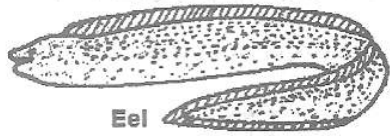
Shark

- Respiration occurs through gills.
- The skin is covered with placoid scales (exoskeleton).
- Heart is two chambered, consisting of an auricle and a ventricle.
- Lung or air bladder is absent.
- They reproduce by laying eggs (oviparous) or produce eggs which hatch inside the mother's body (ovoviviparous).
- Fertilization is internal.
- Mostly marine and large in size (upto 10-20 meters long).
- E.g. sharks, rays and skates, Scoliodon (Indian shark, dog fish), Torpedo (electric ray), Trygon (sting ray), Rhinobatus (guitar fish).

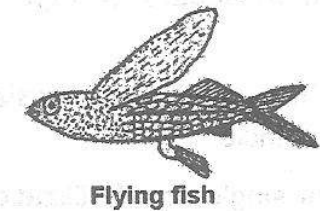
(c) Class Osteichthyes:

Bony endoskeleton is also present.

- The exoskeleton, if present, consists of cycloid or ctenoid scales.



- The mouth is terminal (anterior) on the head.
- Gills are covered by bony flap called as the operculum.
- A swim bladder (or air bladder) is usually present. It helps in floating.
- Heart is two chambered.
- Fertilization is mostly external.



- E.g. Labeo, Hippocampus (sea horse), Anabas (climbing perch), Muraena (eel), Protopterus (Lung Fish).

(d) Class Amphibia:

(Gr. Amphi=both, bios=life, the vertebrates leading two lives/ dual life)

- The amphibians are the first land vertebrates, Amphibious partly terrestrial and partly aquatic.
- Skin is smooth or rough, rich in glands which keep it moist; Skin with pigmented cells, i.e. chromatophores.
- Limbs tetrapods (four-limbed), pentadactyl type (five-fingered).
- Respiration occurs by lungs, skin or buccal lining, gills are present at least during larval stage for respiration.
- Heart three chambered with two auricles and a ventricle, red blood corpuscles are large. Biconvex, oval and nucleated.
- Brain is not much developed, cranial nerves are 10 pairs.
i.e., dioecious, male without copulatory organ.
- Fertilization is external.
- Development is indirect with a tadpole larva which undergoes metamorphosis to become adult.

- E.g. Salamanders, newts, frogs and toads. Salamandra (Salamander), Necturus (mud puppy), Triturus (newt), Rana (frog), Bufo (toad).

(e) Class Reptilia:

(L.reptare = to creep: creeping vertebrates).

- These are first truly terrestrial animals living in warmer regions.
- Body is divisible into head, neck and trunk. Tail is well developed in some, while it is reduced in others.
- Two pairs of pentadactyl limbs are present; but in snakes limbs are reduced or absent.
- Respiration takes place by lungs only. Gills are absent.
- Heart is incompletely four – chambered, having two auricles and incompletely divided ventricle. In crocodile, heart is completely four chambered.
- Sexes are separate.
- Fertilization is internal (characteristics of land animals).
- The embryo always lies in a fluid filled sac called amnion.
- E.g. testudo (tortoise), Chelone (turtle) Draco (flying lizard), Chameleon, Hemidactylus (wall lizard), Naja (cobra) etc.

(f) Class Aves: (L. Aves = birds)

- The birds are described as 'feathered reptiles' that have developed the power of flight.
- The body is divisible into head, neck, trunk and tail.
- Jaws are modified to form a strong beak.
- Respiration is by lungs only. Lungs have additional bag like membranous extensions called as air sacs.
- Heart is completely four chambered.
- Sexes are separate.
- Birds are oviparous, i.e. egg laying.
- Fertilization is internal. Fertilized eggs are laid with a yolk (stored food) and with a hard calcareous shell.
- E.g. Columba (pigeon), Pavo (peacock), Corvus (crow), Passer (sparrow). Struthio (ostrich), Kiwi and Penguin are flightless (birds).

(g) Class Mammalia:

(L.mamma= breast; the mammals)

- Mammalis is the most evolved group of organisms and are found in diverse habitats ranging from deserts, polar ice caps, oceans, mountains, forests and grasslands.
- They are named mammals as all of them possess mammary glands (milk producing glands). Mammals are the only animals which feed their young ones with milk.
- Skin is covered with an exoskeleton of hair. Hair are provided with sweat glands which help in the regulation of body temperature.
- The body cavity is unequally into two parts by a muscular partition called as diaphragm.
- Teeth are of different types (heterodont).
- Respiration occurs by lungs.
- Heart is four chambered.
- Fertilization is internal.
- They give birth to living young ones and are called as viviparous. The young ones are fed on milk from mammary glands.

(h) Important Groups Mammals:

Mammals are divided into three main groups.

- (i) Egg-laying mammals (monotremes):** These mammals show characters of both reptiles and mammals. They lay hard shelled eggs (oviparous)
 - E.g. Spiny and eater, Duck-billed platypus
- (ii) Marsupial mammals (pouched mammals):** Pouched or marsupial mammals (Latin marsupium = pouch) they are viviparous. The young ones, when born, are only three cm. Long. Hence they are cared in pouch called marsupium present on the mother's abdomen. In the pouch, they feed on the mother milk
 - E.g. kangaroo (Macropus), Koala bear.
- (iii) Placental mammals (true mammals):** These mammals with true placenta. The embryo is retained in the uterus. These are the very successful group of land animals, occurring in diverse climatic conditions.
 - E.g. mole bat, lion, tiger, camel giraffe, whale, dolphin, monkey, humans etc.

EXERCISE

1. Basic unit of classification is-
 - (a) Species

- (b) genus
 - (c) family
 - (d) phylum
2. Development of mouth later than anus is the condition called
 - (a) Branschiostomatic
 - (b) Schizostomatic
 - (c) Deuterostomatic
 - (d) Protostomatic
 3. The science of diversity of organisms is
 - (a) Taxonomy
 - (b) systematics
 - (c) Evolution
 - (d) paleontology
 4. Five kingdom system of classification was given by.
 - (a) Copeland
 - (b) Haeckel
 - (c) Whittaker
 - (d) Flemming
 5. Naked seed plants are
 - (a) Gymnosperms
 - (b) angiosperms
 - (c) pteridophyta
 - (d) bryophyte
 6. Multicellular, Multinucleated eukaryotic organism is-
 - (a) Fungi
 - (b) Monera
 - (c) protista
 - (d) plantae
 7. Which are the amphibians in plant kingdom?
 - (a) Tracheophyta
 - (b) Bryophyta
 - (c) pteridophyta
 - (d) Thallophyta
 8. Algae differ from bryophyte in possessing
 - (a) Naked sex organs
 - (b) Sex organs covered with sterile covering
 - (c) Chlorophyll a and b
 - (d) Aerobic respiration
 9. The cell wall of diatoms are rich in
 - (a) Calcium
 - (b) lignin
 - (c) silica
 - (d) carbonate
 10. All chordates possess
 - (a) Exoskeleton
 - (b) Limbs
 - (c) Skull
 - (d) Axial skeletal rod of notochord
 11. Liver fluke obtains its food from the host by
 - (a) Sucking
 - (b) Scraping
 - (c) absorption
 - (d) autotrophic
 12. Oculum occurs in-
 - (a) Star fish
 - (b) Ray fish
 - (c) Hydra
 - (d) autotrophic
 13. Four chambered heart occurs in
 - (a) Amphibia
 - (b) crocodile
 - (c) bird
 - (d) both B and C

- 14.** Which of the following is a protozoan?
 (a) Amoeba (b) Plasmodium
 (c) Euglena (d) All of above
- 15.** Contractile vacuole is present in

- (a) Amoeba (b) Euglena
 (c) Paramecium (d) All of the above

ANSWER - KEY

DIVERSITY OF LIVING ORGANISMS

Q.	1	2	3	4	5	6	7	8	9	10
A.	A	C	B	C	A	A	B	A	C	D
Q.	11	12	13	14	15					
A.	C	D	D	D	D					