

**TTWRDC (G) JANAGAON**  
**ACADEMIC YEAR 2023-2024**  
**BRIDGE COURSE IN ZOOLOGY**

Course Coordinator-K.Aruna kumari &G.Manjula

**CONTENTS:**

I. WHAT IS LIFE SCIENCE

i.Branches in life science

II. ZOOLOGY

i.History &scope of zoology

ii .Branches in zoology

iii .Terms in zoology

III. KINGDOM ANIMALIA

IV. BASICS OFANIMAL KINGDOM

V. TYPES OF KINGDOM ANIMALIA

NON-CHORDATES

CHORDATES

## 1) What is Life science:

The sciences concerned with the study of living organisms, including biology, botany, zoology, microbiology, physiology, biochemistry, and related subjects.

(Or)

Life sciences or biological sciences comprised branches of science that involve scientific study of life and organisms such as micro-organisms, plants and animals including human beings.

Biology is the overall natural science that studies life with the other life sciences as its sub discipline's.

## Branches of life sciences:

**Biology** – scientific study of life.

**Anatomy** – study of form and function, in plants, animals, and other organisms, or specifically in humans.

**Astrobiology** – the study of the formation and presence of life in the universe.

**Bacteriology** – study of bacteria.

**Biotechnology** – study of combination of both the living organism and technology.

**Biochemistry** – study of the chemical reactions required for life to exist and function, usually a focus on the cellular level.

**Bioinformatics** – developing of methods or software tools for storing, retrieving, organizing and analyzing biological data to generate useful biological knowledge.

**Biolinguistics** – the study of the biology and evolution of language.

**Biological anthropology** – the study of humans, non-human primates, and hominids. Also known as physical anthropology.

**Biological oceanography**- the study of life in the oceans and their interaction with the environment.

**Biomechanics** – the study of the mechanics of living beings.

**Biophysics** – study of biological processes by applying the theories and methods that have been traditionally used in the physical sciences.

**Botany** – study of plants (cytology) – study of the cell as a complete unit, and the molecular and chemical interactions that occur within a living cell.

**Developmental biology** – the study of the processes through which an organism forms, from zygote to full structure.

**Ecology** – study of the interactions of living organisms with one another and with the non-living elements of their environment.

**Enzymology** – study of enzymes.

**Ethology** – study of behavior.

**Evolutionary biology** – study of the origin and descent of species over time.

**Evolutionary developmental biology** – the study of the evolution of development including its molecular control.

**Genetics** – the study of genes and heredity.

**Histology** – the study of tissues.

**Immunology** – the study of the immune system.

**Microbiology** – the study of microscopic organisms (microorganisms) and their interactions with other living organisms.

**Molecular biology** – the study of biology and biological functions at the molecular level, some cross over with biochemistry, genetics, and microbiology.

**Mycology** – the study of fungi.

**Neuroscience** – the study of the nervous system.

**Paleontology** – the study of prehistoric organisms.

**Pathology** - the study of the causes and effects of disease or injury.

**Pharmacology** – the study of drug action.

**Phycology** – the study of algae.

**Physiology** – the study of the functioning of living organisms and the organs and parts of living organisms.

**Population biology** – the study of groups of conspecific organisms.

## BRIDGE COURSE IN ZOOLOGY

**Quantum biology** – the study of [quantum](#) phenomena in organisms.

**Structural biology** – a branch of [molecular biology](#), [biochemistry](#), and [biophysics](#) concerned with the molecular structure of biological macro-molecules.

**Synthetic biology** – the design and construction of new biological entities such as enzymes, genetic circuits and cells, or the redesign of existing biological systems (LY).

**Systems biology** – the study of the integration and dependencies of various components within a biological system, with particular focus upon the role of [metabolic pathways](#) and [cell-signaling](#) strategies in physiology.

**Theoretical biology** – the use of abstractions and mathematical models to study biological phenomena.

**Toxicology** – the nature, effects, and detection of poisons.

**Virology** - the study of viruses like submicroscopic, parasitic particles of genetic material contained in a protein coat – and virus-like agents.

**Zoology** - the study of animals.

## ZOOLOGY

Zoology is a branch of science that studies the animal kingdom, including the structure, embryology, evolution, classification, habits, distribution of all animals, , both living and extinct and how they interact with their ecosystem. The term zoology is derived from ancient Greek “Zoion,” animal,” and logia, “study.”

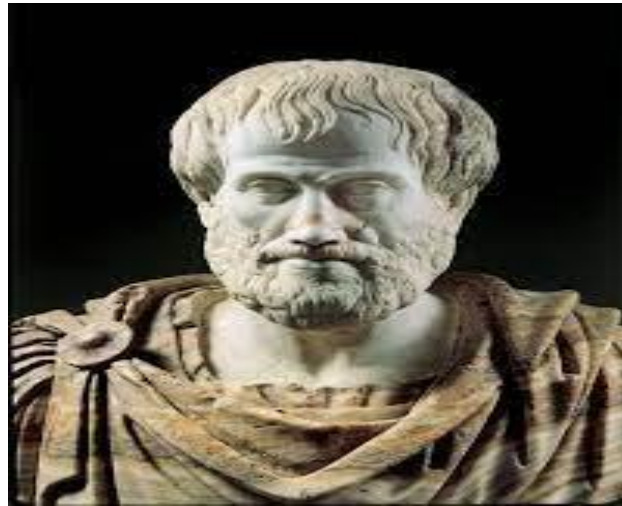
### History & Scope of zoology:

#### History of zoology:

The **history of zoology** before [Charles Darwin's 1859 theory of evolution](#) traces the organized study of the [animal kingdom](#) from [ancient](#) to [modern](#) times. Although the concept of [zoology](#) as a single coherent field arose much later, systematic study of zoology is seen in the works of [Aristotle](#) and [Galen](#) in the ancient [Greco-Roman world](#). This work was developed in the Middle Ages by [Islamic medicine](#) and scholarship, and in turn their work was extended by European scholars such as [Albertus Magnus](#).

Over the 18th and 19th centuries, zoology became increasingly professional [scientific disciplines](#). Explorer-naturalists such as [Alexander von Humboldt](#) investigated the interaction between organisms and their environment, and the ways this relationship depends on geography—laying the foundations for [biogeography](#), [ecology](#) and [ethology](#). Naturalists began

to reject essentialism and consider the importance of extinction and the mutability of species. Cell theory provided a new perspective on the fundamental basis of life. These developments, as well as the results from embryology and paleontology, were synthesized in Charles Darwin's theory of evolution by natural selection. In 1859, Darwin placed the theory of organic evolution on a new footing, by his discovery of a process by which organic evolution can occur, and provided observational evidence that it had done so.



Father of zoology, **Aristotle**

### **Scope zoology of ZOOLOGY:**

Studying Zoology can provide self employment opportunities and you can become an entrepreneur. Economic Zoology is a branch of science that deals with economically useful animals. It involves the study of application of animals for human welfare.

The need of Zoology is not just to improve our economic condition but also to provide food security and provide employment opportunities. Based on the economic importance, animals can be categorized as:

- ❖ Animals for food and food product
- ❖ Economically beneficial animals
- ❖ Animals of aesthetic importance
- ❖ Animals for scientific research

Zoology offers immense scope to a candidate who has done master's degree in the subject. They can work as Animal Behaviourist, Conservationist, Wildlife Biologist, Zoo Curator, Wildlife Educator, Zoology faculty, Forensic experts, lab technicians, and Veterinarians.

## **BRANCHES IN ZOOLOGY**

The study of animal life is ancient, but its scientific incarnation is relatively modern. Until the comparative anatomical study on morphographs by Hunter and Cuvier, the modern areas of zoological investigations have occurred. Gradually zoology expanded behind the comparative anatomy to include the following sub-disciplines:

### **Anthrozoology**

Anthrozoology is a study of interaction between humans and other animals. This sub-discipline of zoology overlaps with [anthropology](#), veterinary medicine, ethnology and zoology.

### **Arachnology**

Arachnology is a branch of zoology that deals with the study of spiders and related species known as arachnids (such as scorpions, harvestmen, etc).

### **Archaeozoology**

Archaeozoology is the study of dead animals (faunal remains) that includes their bones, shells and other body parts. It is also known as zooarchaeology.

### **Bionics**

Bionics is the study of mechanical systems that function like living organisms or parts of living organisms. It is the concept of applying biological methods and systems found in nature to the study/design of engineering systems and modern technology.

### **Cetology**

Cetology is a branch of zoology that deals with the study of marine mammals that include whales, dolphins, porpoise, etc.

### **Embryology**

The branch of zoology that studies the prenatal development of gametes (also known as sex cells), fertilization, and development of embryos and fetuses.

### **Entomology**

Entomology is the study of insects. The following is the list of sub-branches of Entomology that specializes in different types of insects.

### **Coleopterology (Beetles)**

Coleopterology is the Entomology sub-branch that concerns with the study of beetles.

### **Dipterology (Flies)**

Dipterology is the sub-discipline of Entomology that studies all types of flies.

### **Hemipterology (True Bugs)**

Hemipterology is the sub-division of Entomology that studies true bugs or hemiptera.

### **Isopterology (Termites)**

Isopterology is the study of termites.

### **Lepidopterology (Butterflies)**

Lepidopterology is a branch of Entomology that covers the study of butterflies and moths.

### **Melittology (Bees)**

Melittology is the study of bees. It is also known as *Apiology*.

### **Myrmecology (Ants)**

Myrmecology is a sub-discipline of Entomology which focuses on the study of ants.

### **Orthopterology (Grasshoppers)**

Orthopterology is a sub-discipline of Entomology which handles the study of grasshoppers, [crickets](#), etc.

### **Trichopterology (Caddis Flies)**

Trichopterology is a sub-branch of Entomology focusing on the study of caddis flies.

### **Vespology (Wasps)**

Vespology is a sub-discipline of Entomology which specializes in the study of [wasps](#).

### **Ethology**

Ethology is a branch of zoology that deals with animal behaviour under their natural habitats and studying their behavior as an adaptive trait in evolution.

## **Helminthology**

Helminthology is the study of parasitic worms (helminths) and deals with taxonomy of helminth and the effect on their hosts.

## **Herpetology**

Herpetology is the study of reptiles and amphibians.

## **Batrachology (Amphibians)**

Batrachology is a branch of Herpetology concerns with the study of amphibians alone.

## **Ophiology (Snakes)**

Ophiology or Ophidiology is a sub-division of Herpetology which deals with the study of ophidians or snakes.

## **Histology**

Histology is the study of microscopic anatomy of cells and tissues of animals and plants.

## **Ichthyology**

Ichthyology is a branch of zoology that covers the study of fish (also known as fish science).

## **Malacology**

Malacology is the study of Mollusca such as [snails](#), [slugs](#), [octopus](#), clams, and all animals that live in water with shells.

## **Conchology (Mollusc Shells)**

Conchology is a sub discipline of malacology that deals with the study of mollusc shells only.

## **Mammalogy**

Mammalogy is the study of mammals and their characteristics. Mammalogy is also referred as *Mastology*, *Theriology* or *Therology*.

## **Morphology**

Morphology is a branch of zoology dealing with the study of the form and structure of organisms and their specific structural features.



## **Nematology**

Nematology is a sub-discipline of zoology that studies roundworms (nematodes).

## **Ornithology**

Ornithology is a branch of zoology that deals with the study of birds. Check out the most [colorful birds](#) in the world.

## **Paleozoology**

Paleozoology is a branch of zoology that deals with the study of fossil animals to identify multi-cellular animals from geological perspective to establish prehistoric environments and their ecosystems.

## **Pathology**

Pathology is the study of bodily fluids in laboratory such as blood, urine or tissues to diagnose a disease. It further narrows down to plant pathology (for plants) and veterinary pathology (for animals).

## **Primatology**

Primatology is a study of living and extinct primates ([monkeys](#), apes, and prosimians).

## **Protozoology**

Protozoology is a branch of zoology that deals with the study of Protozoa (which are unicellular organisms such as amoeba, etc.).

## **Taxonomy**

Taxonomy is a study that defines groups of biological organisms on the basis of shared characteristics and giving names to those groups. Check out the [levels of biological organization](#) in detail.

## **Zoogeography**

Zoogeography is the scientific study of geographical distribution of animal species (both historic and contemporary) in the world.

## **Zoography**

Zoography is study of animals and their habitats (also known as descriptive zoology).

## Zoometry

Zoometry is a sub-division of zoology that deals with measurements (length or size) of animal parts.

## Zootomy

Human Anatomy is the study of the structure of humans and their various parts whereas Zootomy specifically refers to animal anatomy.



Basic terms in zoology

**abomasum:**

It is a the fourth or digestive stomach of a ruminant, which leads from the third stomach omasum.

**Adrenal gland:**

It is the pair of important glands present by the side of the kidneys in higher animals.

**Acquired Immune Deficiency Syndrome:**

AIDS is a disease caused by a virus which inactivates the: immune system in the body.

**Albinism:**

It is a condition in which the normal skin colour is absent. It is caused by reduction or total lack of the pigment Melanin

**Albumin:**

It is one of a group of simple water-soluble globular proteins present widely in milk.

**Alimentary canal:**

It is a tube in multicellular animals through which food is taken into the body, digested and absorbed by the cells.

**Allergy:**

It is hypersensitivity.

**Amoeba:**

It is a unicellular fresh water organism, it is a simple Protozoan and has no definite shape.

**Amphibia:**

It is the class of back-boned land-animals like frogs, toads, newts and salamander. They are the first vertebrates that colonized land and can stay in water as well as on land

**Anaemia:**

It is a condition marked by low haemoglobin content of the blood.

**Androgen:**

It is a class of male sex hormones chiefly produced in the testis.

**Anthropology:**

It is the study of human species in all its aspects including evolution, culture and population dynamics.

**Antibodies:**

It is a group of specific Proteins produced by mammals to defend themselves from foreign organisms or chemicals

**Anticoagulant:**

It is a chemical that can prevent blood from clotting for example heparin.

**Antiemetic:**

It is a substance which inhibits vomiting.

**Antigen:**

It is a foreign substance, usually proteins in nature, which elicits the formation of specific antibodies within an organism.

**Annelida:**

It is a group of invertebrates like earthworms, which have long, cylindrical, segmented bodies.

**Aorta:**

It is the main artery leading out of heart carrying oxygenated blood.

**Appendicitis:**

It is the inflammation of the appendix.

**Arboreal:**

These are the organisms that spend most or all of their lives among the branches of trees.

**Artery:**

It is the blood vessel carrying blood away from the heart.

**Arthritis:**

It is the painful inflammation of bone joints.

**Autograft:**

It is grafting of one tissue to another tissue of the same organisms.

**Bacteria:**

It is a class of extremely small relatively simple micro-organism.

**Bile:**

It is a secretion the liver in animals. It is an alkaline fluid that helps in digestion and absorption of fats.

<b>Blood Clotting:</b>	It is the solidification of blood.
<b>Blood pressure:</b>	It is the pressure exerted by blood on the walls of blood vessels, especially the main arteries. It is due to the pumping action of the heart.
<b>Capillary:</b>	The smallest tubes or vessels which form the connecting link between the circulatory and lymphatic system. Usually the walls are single layer thick.
<b>Carbohydrate:</b>	It is a group of organic compounds like sugars, starches and cellulose composed entirely of Carbon, Hydrogen and Oxygen. They form the main source of energy for the human body.
<b>Carcinogen:</b>	Any substance or agent capable of causing cancer.
<b>Carnivorous:</b>	It is a mode of living by which animals and plants survive by eating the flesh of other animals .
<b>Chromosome:</b>	It is a complex thread-like structure seen in plant and animal cells at the time of cell division. They are the carriers of the genetic material DNA.
<b>Chyme:</b>	It is the partially digested food after leaving the stomach.
<b>Circumcision:</b>	It is the surgical removal or excision of the foreskin covering the male or female genital organs.
<b>Cirrhosis:</b>	It is a progressively inflammation disease of the live in which the liver cells are destroyed.
<b>Clone:</b>	It is parthenogenetic or asexual descendants from a single individual, all having the same genetic constitution.

- Colon:** It is a portion of the large intestine of humans extending from the caecum to the rectum. The inflammation of the colon in humans is called colitis.
- Contagious disease:** It is an infectious disease communicable by contact with one suffering from it, with his bodily discharges, or with an object touched by him for example, cholera and chicken pox.
- Convulsion:** It is a violent, uncontrolled muscle spasm, or a series of them, sometimes repeated rapidly and accompanied by unconsciousness.
- Cretin:** Victim of severe congenital thyroid deficiency, causing physical and mental retardation.
- Eczema:** It is a non-specific term used to denote skin disorders characterized by redness, thickening, oozing blisters and occasional formation of fissures and cracks.
- Elephantiasis:** It is a diseased state which constitutes one of the manifestations of filariasis.
- Embryo:** It is a developing fertilized egg during the early period. An unborn human being is called an embryo for the first two months of its period of development in the womb.
- Encephalitis:** It is inflammation of the brain.
- Endocrine glands:** These are ductless glands which produce hormones which pass directly into the blood.
- Endocrinology:** It is the study of endocrine glands and their products.
- Endoscope:** It is a tubular instrument which has a light source and a viewing optical system. This may be inserted into the organs.

<b>Enterovirus:</b>	It is a group of viruses that enter the body via the alimentary tract and tend to invade the central nervous system.
<b>Entomology:</b>	It is the study of insects.
<b>Epidemic:</b>	the term is used to describe a disease which spread quickly to affect a large proportion of the population.
<b>Epilepsy:</b>	It is recurrent disorder of the brain function characterized by clouding of convulsions due to an abnormal discharge of nerve impulses in the brain.
<b>Ergonomics:</b>	It is the study relating to efficient use of human energy.
<b>Estrogen:</b>	It is any of a group of steroid hormones containing 18 carbon atoms produced chiefly by the ovary and placenta but also by the testis and adrenal gland of all vertebrates.
<b>Ethnology:</b>	It is the science dealing with the various races of mankind, their distribution, relationship, culture and activities.
<b>Eugenics:</b>	It is the science dealing with the selective genetic improvement of the human race.
<b>Euthanasia:</b>	It is painless killing of a person or animal suffering from an incurable disease.
<b>Expectorants:</b>	The drugs which promote or increase the elimination of secretion from the respiratory tract by coughing.
<b>Filariasis:</b>	It is an infestation with parasitic thread-like worms.
<b>Foetus:</b>	It is a mammalian embryo on its late stages when the main features are clearly recognizable
<b>Gall bladder:</b>	It is a small pouch-like organ that stores bile secreted from liver. Most vertebrates have gall bladders.

- Gall stone:** It is an insoluble deposit precipitated from the bile, when bile stagnates in the gall bladder, it becomes excessively concentrated and gall stones form.
- Gangrene:** It is death of body tissues from lack of oxygen caused by a loss of blood supply to those areas of the body, often hands of feet.
- It is the basic unit of inheritance.
- Gene:** A gene is a short length of a chromosome made of DNA which influences a particular set of characters in a particular way.
- Genetic code:** It is a sequence of bases along the DNA molecule.
- Genetic engineering:** It is a technique of altering the genetic makeup of an organism to suit a specific purpose.
- Genetics:** It is the scientific study of heredity, that is, the passing on of characteristics from parents to their offspring.
- Genome:** It is the complete set of chromosomes found in each nucleus of a given species, which contains the entire genetic material.
- Gerontology:** It is the scientific study of aging.
- Gestation period:** It is the period during which an embryo develops in the uterus of a mammal, from the time, of conception to birth.
- Gland:** It is an organ which secretes specific chemical compounds such as enzymes or hormones.
- Glaucoma:** It is an eye disease characterized by increased pressure of the fluid within the eye.



- Goitre:** It is an enlargement of all or part of the thyroid gland, which appears as a smooth swelling at the front of the neck. Goitre generally occurs due to iodine deficiency.
- Gonad:** It is the organs which produce gametes in animals and in some produce hormones too. The female gonad is called ovary and male gonad is called testis.
- Gout:** It is a chronic disease that can produce severe swelling of the joints.
- Gynaecology:** It is the branch of medical science dealing with diseases of women, particularly those affecting reproductive organs.
- Haematology:** It is the science dealing with the formation, composition, functions and disease of blood.
- Haemoglobin:** It is the iron-containing, red, respiratory pigment of vertebrates and a few invertebrates that transports oxygen.
- Haemophilia:** It is an inherited disease in which the blood fails to clot.
- Hay fever:** It is a form of allergy that affects the nose and throat due to sensitivity to certain plant pollens.
- Heat stroke:** A condition caused by overexposure to the sun.
- Hepatitis:** It is an acute or chronic viral inflammation of the liver.
- Herbivore:** It is a plant-eating organism.
- Herpes:** It is a group of closely related viruses that cause various diseases which include herpes simplex, herpes zoster and chicken pox.
- Hibernation:** It is a condition of dormancy in animals to protect themselves against cold and food scarcity during winter.

## BRIDGE COURSE IN ZOOLOGY

- Histology:** It is the biological science that deals with the study of structure of tissues.
- Human Immuno Deficiency Virus (HIV):** It is a virus that causes AIDS.
- Homo sapiens:** It is the term in Greek means 'wise man' and refers to the genus and species to which all modern human beings belong.
- Homograft:** It is a tissue or organ which is transplanted from one individual to another of the same species.
- Hormone:** It is a chemical messenger produced by endocrine glands in animals and secreted directly into the bloodstream.
- Hybrid:** It is the offspring of parents of different races, varieties or species.
- Hymen:** It is a fold of mucous membrane which normally partially covers the entrance to the vagina.
- Hypersensitivity:** It is an exaggerated reaction of the body's defence system to basically harmless substances which may have been inhaled, eaten, drunk, injected or just been in contact with the skin.
- Hypnosis:** It is a temporary condition of altered attention in an individual.
- Hysteria:** It is a psychological disorder, in which a person has physical complaints when no physical cause can be found.
- Id:** It is a part of human personality that relates to the primitive instinct of the body, notably sex and aggression.
- Immunity:** It is an inbuilt defence mechanism by which vertebrates can resist infection caused by parasitic microorganisms or their products.
- Inbreeding:** It is reproduction by the mating of closely related individuals.

- Incubation:** It is the act of providing proper physical conditions for the development of the young ones of certain organisms. Commonly it is the hatching of eggs by means of heat natural or artificial.
- Incubation period:** It is the interval between exposure to a disease and its appearance.
- Insemination:** It is the introduction of semen or spermatozoa into the female genital tract.
- Insulin:** It is a protein. Hormone produced by the Islets of Langerhans, a part of the endocrine gland pancreas.
- Invertebrate:** It is a collective terms for all animals which do not have a backbone or vertebral column.
- Jaundice:** It is a condition characterised by yellowness of the skin, whites of eyes, mucous membranes and body fluids.
- Keratitis:** It is any inflammation involving the cornea of the eyes.
- Lactation:** It is the process by which milk secretion in the breasts is initiated and maintained and milk is delivered to the suckling infant.
- Leukemia:** It is a kind of cancer in which certain white blood cells grow in an uncontrollable manner.
- Lipid:** It is one of a large group of oily or fatty substances essential for good health.
- Mammal:** It is an animal.
- Mastectomy:** It is surgical removal of the breast. Usually carried out in the case of patients suffering from breast cancer.

- Melanin:** It is a polymeric pigment responsible for colouring of eyes, skin and hair. Melanins are produced by epidermal cells called melanocytes.
- Membrane:** It is a sheetlike tissue covering biological cells.
- Meningitis:** It is an inflammation of the protective tissue surrounding the brain and spinal cord. It is characterised by high fever, severe headache, aversion to strong light and neck stiffness.
- Metamorphosis:** It describes a change in an animal.
- Motor nerve:** It is nerve which conveys an impulse directly to a muscle and causes it to contract.
- Muscular dystrophy:** It is a hereditary disease which progressively damages muscle fibres and eventually destroys them.
- Necrosis:** These are changes in the tissue brought about by the local death of cells.
- Nematode:** It is a class of elongated roundworms.
- Neuron:** It is an elongated greyish or reddish cell that is the basic functional unit of the nervous system.
- Neurosis:** It is emotional disturbance that adversely affects thinking and judgement. A person suffering from neurosis shows constant anxiety about something or other.
- Nocturnal:** It is active at night e.g. bats.
- Obesity:** It is overweight of the body due to excessive accumulates in body tissues causing overall swelling.
- Odontology:** It is a branch of science dealing with the study of teeth.
- Oedema:** It is a condition in which excess of fluid accumulates in body tissues causing overall swelling.

- Oedipus complex:** It is an abnormal both plant and animal material.
- Omnivore:** It is an organism that can eat both plant and animal material.
- Orgasm:** It is a state of highly emotional excitement that occurs at the climax of sexual intercourse.
- Ornithology:** It is the branch of zoology dealing with the study of life or birds, including their identification and behavioural patterns.
- Oral Rehydration Solution:** It is prepared by dissolving a pinch of salt and a little sugar in a glass of clean water.
- Orthopaedics:** It is the branch of surgery dealing with the diagnosis and treatment of injuries, deformities and diseases of bones, joints ligaments and muscles.
- Ossification:** It is the process of bone formation.
- Osteoporosis:** It is a condition in which bones become thin and brittle due to loss of calcium.
- Ovary:** It is an oval-shaped female sex gland that produces the ova, or egg cells and secreted hormones like oestrogen and progesterone.
- Ovulation:** It is the release of a mature egg from the ovary during the menstrual cycle.
- Pancreas:** It is a tongue-shaped organ that lies behind the stomach and produces two types of secretions.
- Paralysis:** Any condition in which the ability to control the movement of a limb or a muscles is lost.
- Pasteurization:** It is a technique of making milk safe for drinking by killing off any disease-causing bacteria present in it.

- Pathogen:** Any micro-organism that causes disease.
- Pathology:** It is the scientific study of the changes in tissue or body organs brought about by a disease or a physiological disorder. It is now used for diagnostic purposes.
- Pharynx:** It is the cavity between the back of the mouth and the wind-pipe or food pipe in speech production.
- Phobia:** It is a form of anxiety or irrational and intense fear triggered off by a specific, often harmless, situation or object.
- Pituitary gland:** It is a pea-sized endocrine gland attached to the base of the brain below the hypothalamus by a short stalk. It is one of the most important glands of the body and secretes a number of important hormones which influence the activity of several other endocrine glands such as the adrenals and the thyroid.
- Plasma:** It is the liquid part of body fluids such as lymph and blood. Blood plasma is a straw coloured fluid containing proteins and inorganic materials.
- Platelet:** It is a tiny, disc-shaped body present in blood which plays an important role in blood clotting.
- Puberty:** It is the period of life when the gonads become functional i.e. an individual becomes sexually mature.
- Prostate gland:** It is a gland of the male reproductive system of mammals. It secretes a fluid into the semen that activates the sperms and prevents them from clumping together.
- Protoplasm:** It is the living material within a cell including the Mitochondria, ribosomes and chromosomes.
- Protozoa:** It is a group of single celled organisms ranging from the amoeba to the lungs. It is the only artery that carries oxygen depleted blood.

- Pulmonary artery:** It is the blood vessel that carries deoxygenated blood from the heart to the lungs. It is the only artery that carries oxygen depleted blood.
- Pulmonary vein:** It is the blood vessel that carries oxygenated blood from lungs to the heart. It is the only vein in the body that carries oxygenated blood.
- Ruminants:** These are grazing mammals that chew cud and have split hoofs, for example, ox, sheep, cow, camel and goat.
- Scabies:** It is a contagious skin disease caused by a microscopic mite *Sarcoptes scabiei*.
- Schizophrenia:** It is a severe mental disease characterised by unpredictable disturbances in thinking where the individual withdraws from reality and begins thinking in illogical and confused patterns.
- Scurvy:** It is a disease caused by lack of vitamin C in the diet. The symptoms include slow healing of wounds, mouth and gums become sore.
- Senescence:** It is the process of growing old; the period of old age.
- Serum:** It is liquid portion that remains after blood clots, and the blood cells and clotting elements are removed by centrifugation.
- Sex chromosomes:** It is one of a pair of chromosomes or one of several chromosomes that determine the genetic gender of its bearer. In humans the gender determining chromosomes are x and y chromosomes.
- Silicosis:** It is a lung disease caused by inhalation of crystalline silica dust.
- Spinal cord:** It is that portion of the central nervous system behind or below the brain and beyond the confines of the skull.
- Sterile:** It is a word which describes something that is completely free from bacteria and other micro-organisms.

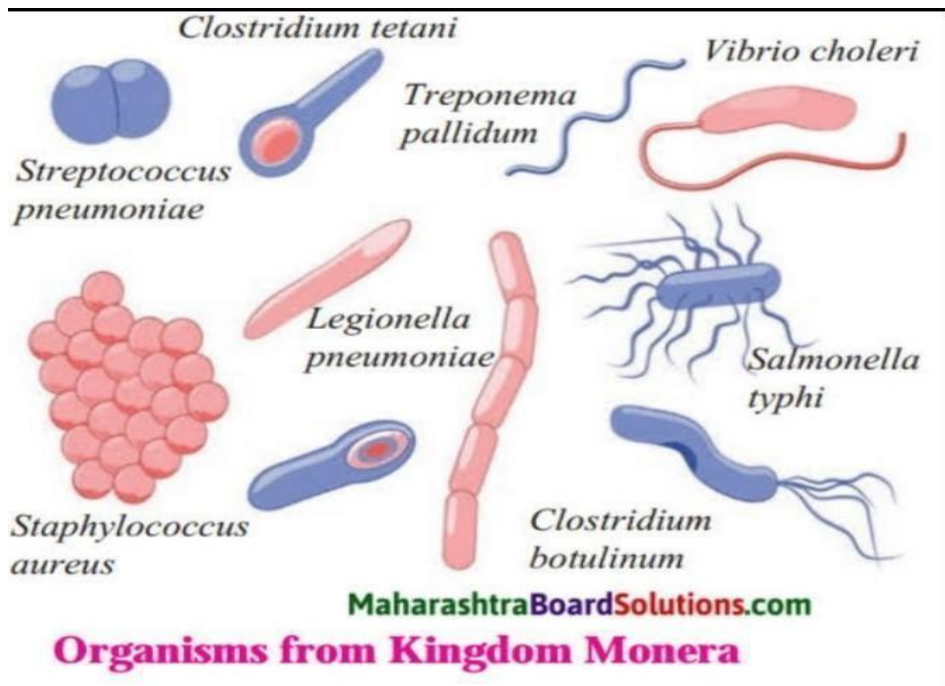
- Thrombosis:** It is the formation of a solid mass of blood, often called “clot” or “thrombus”, in a blood vessel, which leads to partial or complete blockage of blood circulation in the area.
- Thyroid:** It is the ductless gland found on both sides of the windpipe, It secretes the hormone thyroxine, a compound of iodine and tyrosine which controls the rate of metabolism in the body affecting its growth and activity.
- Tonsils:** These are two small glands, about the shape and size of an almond at either side of the back of the mouth. They are lymphoid tissues which protect the body from infections by filtering out germs. They also aid in the production of white blood cells.
- Toxicology:** It is the scientific study of poisons. It also deals with the technology required for their study, detection and counteraction.
- Transfusion:** It is the transfer of blood or plasma from one individual to another.
- Tuberculosis:** It is commonly known as T.B., It is an infectious, inflammatory and contagious disease caused by Mycobacterium tuberculosis.
- Tumour:** It is an uncontrolled growth of cells resulting in a large mass.
- Typhoid:** It is an infectious gastrointestinal disease that causes fever. It often spreads by contamination of food, milk or water with Salmonella typhi bacteria.
- Umbilical cord:** It is a connective cord that links the unborn infant or foetus with the mother.
- Uterus:** Hollow organs of the female reproductive system in which an unborn baby develops. It is located near the base of the abdomen.
- Vasectomy:** It is a surgical operation for closing up of vas deferens, the tube which carries sperms from the testis to the prostate gland from where they are carried outside along with other secretions.
- Vector:** It is an agent which carries infectious organisms from an infected individual to another.



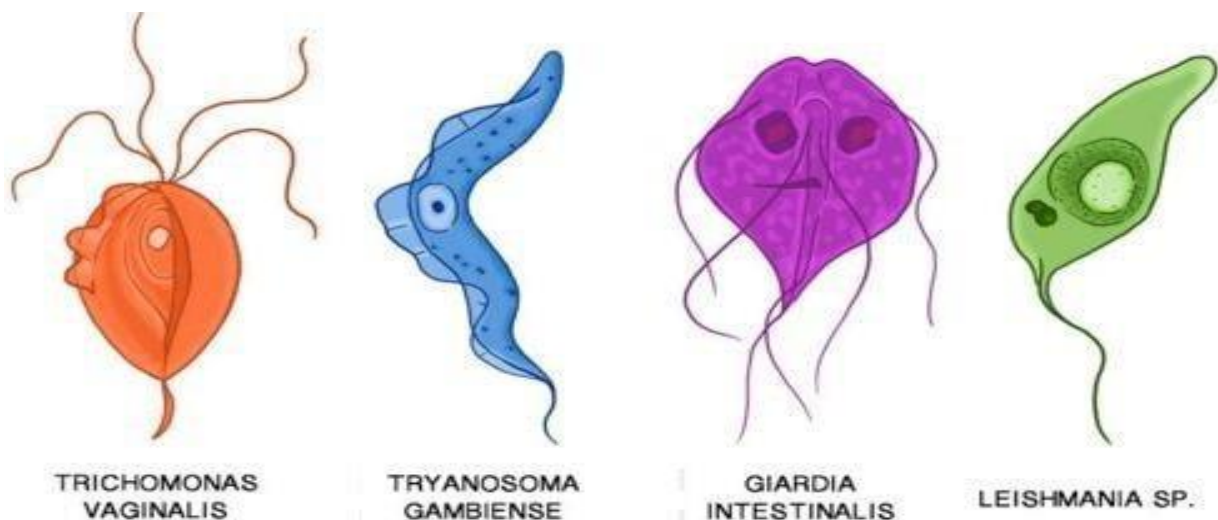
- Vein:** It is a blood vessel which carries blood from different parts of the body to the heart. All veins except the pulmonary veins carry oxygenated blood from lungs to the heart.
- Vertebrate:** Any animal having a backbone or vertebral column.
- Vestigial organs:** It is a small imperfectly developed organ which may have lost or changed its function in the course of evolution e.g. vermiform appendix of man.
- Virus:** It is an extremely small obligate parasite which can multiply only in a living cell of a plant or an animal.
- Vitamins:** These are organic compounds that are essential but required in small quantities for the normal growth and proper nourishment of the body.
- X-chromosome:** It is one of the sex determining chromosomes. In humans it is this chromosome that carries the genes for maleness. A human male only when it carries an XY chromosomal set up.
- Yeast:** It is a collective name for unicellular fungi.
- Zygote:** It is the fusion product of an egg and a male gamete (sperm), i.e. a fertilized egg or ovum.

➤ **R.H. Whittaker organized organisms into five kingdoms. He classified organisms based on cell structure, mode and source of nutrition and body design. The five kingdoms proposed by Whittaker are Monera, Protista, Fungi, Plantae And Animalia.**

1) **MONERA** - Kingdom Monera belongs to the prokaryote family. The organisms belonging to this kingdom do not contain a true nucleus. These are the oldest known microorganisms on earth. Their DNA is not enclosed within the nucleus.



2) **PROTISTA** - Protists are simple eukaryotic organisms that are neither plants nor animals or fungi. Protists are unicellular in nature but can also be found as a colony of cells. Most protists live in water, damp terrestrial environments or even as parasites.



3) **FUNGI** - Fungi are eukaryotic organisms that include microorganisms such as yeasts, moulds and mushrooms. These organisms are classified under kingdom fungi.



4) **PLANTAE** - Kingdom Plantae includes all the plants. They are eukaryotic, multicellular and autotrophic organisms. The plant cell contains a rigid cell wall. Plants have chloroplast and chlorophyll pigment, which is required for photosynthesis.



5) **Animal kingdom** – kingdom animalia includes all the animals

## KINGDOM ANIMALIA

### INTRODUCTION :

The word animal is derived from Latin word animalis (having breath). The major groups of animals are classified under the kingdom animalia, also known as metazoans, which are characterized by eukaryotic and heterotrophic organisms, they are multicellular, without cell wall and their nutrition is holozoic; by ingestion of food which is digested in their internal cavity and food reserves are stored as glycogen(or)fat. Reproduction is mostly sexual and embryological development is present in them.

There are around 9-10 million species of animals and about 800000 species are identified. Fossil records of animals were found in the era of the Cambrian explosion, about 540 million years ago. Animals are divided into sub groups, biologists have identified about 36 phyla within the animal kingdom including birds, mammals, reptiles, fish and amphibians etc...

### **Basics of animal kingdom classification:**

Classification of animal kingdom is based on various fundamental features like-

#### **1) Levels of organisation:**

The patterns of organization of cells vary in animals in spite of their multicellular nature. The Patterns of cellular organization is seen in animals are:

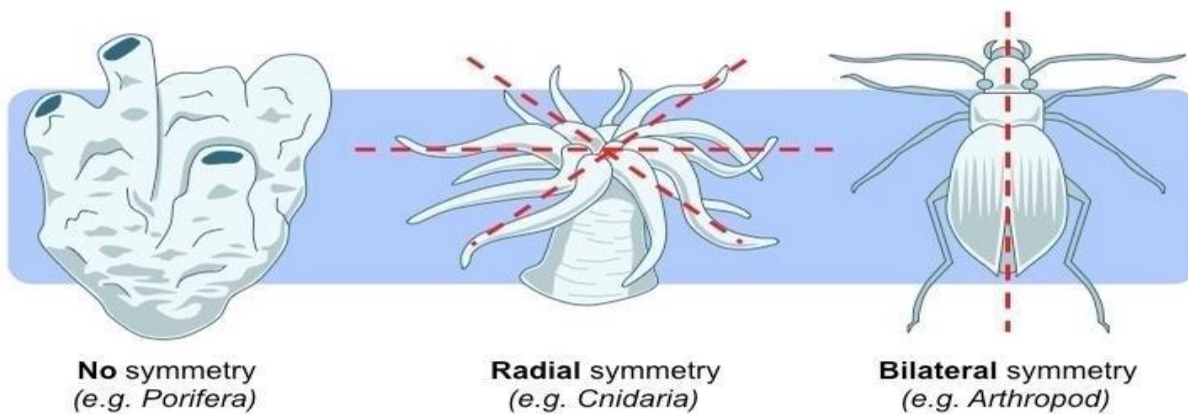
- **a)cellular level of organization-** in this animals the cells of the body form loose aggregates  
Ex: sponges
- **b)Tissue level of organisation:** in this animals, cells of the animals are carrying out same function are arranged in tissues. Ex: coelenterates
- **c)organ system level of organization-** in this animals tissue are grouped together to form organs each specialised for a particular function. Ex: Platyhelminthes & other higher phyla

#### **2) Body symmetry:**

The arrangement of body parts around the central point or line determines symmetry; Some animals are **asymmetrical** which cannot be divided into two equal halves along any plane passing through the centre. **Ex: sponges;**

Some exhibit **radial symmetry** were the animal can be divided into two equal halves along any plane passing through the central axis. Ex: Coelenterates, ctenophores & echinoderms.

Other animals exhibit **bilateral symmetry** were the body can be divided into identical left & right halves along only one plane. Ex: Annelids, arthropods etc..



**No symmetry**  
(e.g. *Porifera*)

**Radial symmetry**  
(e.g. *Cnidaria*)

**Bilateral symmetry**  
(e.g. *Arthropod*)

### 3) **Body coelom:**

The coelom is one of the characteristic features of metazoans. The true coelom is a body cavity formed during embryo development from the three germinal layers. The body cavity meaning a fluid filled space that can accommodate organs. The coelom is lined by mesodermal epithelium cells. Presence or absence of coelom is one of the criteria for classifying animals.

The animal kingdom is divided into three groups on the basis of the nature of coelom

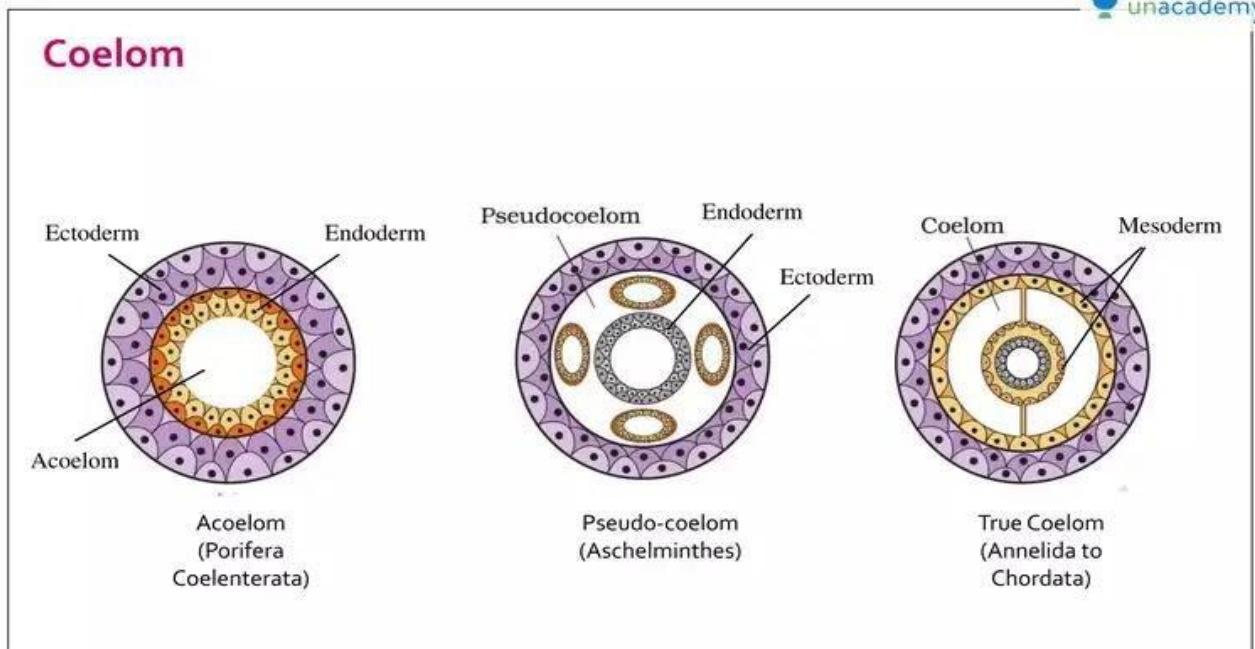
#### **Coelom Definition**

*“The coelom is the fluid-filled body cavity present between the alimentary canal and the body wall.”*

The true coelom has a mesodermal origin. It is lined by mesoderm. The peritoneal cavity present in the abdomen and similar spaces around other organs such as lungs, heart are parts of the coelom. Coelom differs in its structure and formation process.

#### **Structure, Formation and Types of Coelom**

There are three types of structural body formation present in animals related to coelom:



### 1. Acoelomate:

Coelom is absent. The blastocoel is completely occupied by mesoderm. E.g. Porifera, Coelenterata and Flatworms (Platyhelminthes). There is only spongocoel or coelenteron present.

### 2. Pseudocoelomate:

True coelom is not present. The blastocoel is partly filled by mesodermal cells. The body cavity is lined by mesoderm only towards the body wall and mesoderm is not present towards the gut. E.g. Roundworms (Aschelminthes)

### 3. Eucoelomate:

Animals that have a true coelom. The coelom is lined by mesoderm on both the sides, towards the body wall and towards the gut. The blastocoel present in the gastrula gets completely replaced by a true coelom. The body organs are suspended in the coelom by mesenteries. E.g. from the phylum Annelida to Chordata.

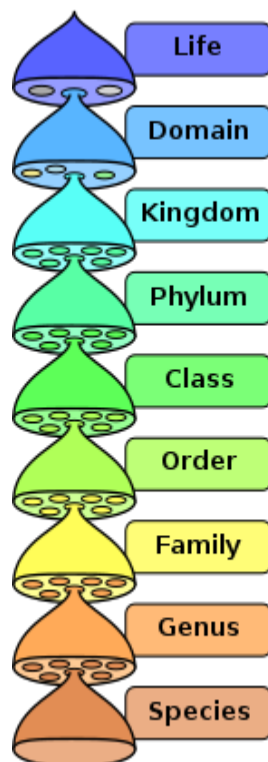
**Eucoelomates** are further divided into **Protostomes and Deuterostomes** on the basis of different embryonic development. The process of coelom formation in protostomes and deuterostomes is different. The coelom is categorised into two types on the basis of formation, namely, **Schizocoelom and Enterocoelom**.

### 4) Body segmentation:

**Segmentation** in biology is the division of some [animal](#) and [plant body plans](#) into a series of repetitive segments. This article focuses on the segmentation of [animal](#) body plans, specifically using the examples of the taxa [Arthropoda](#), [Chordata](#), and [Annelida](#). These three groups form segments by

using a "growth zone" to direct and define the segments. While all three have a generally segmented body plan and use a growth zone, they use different mechanisms for generating this patterning. Even within these groups, different organisms have different mechanisms for segmenting the body. Segmentation of the body plan is important for allowing free movement and development of certain body parts. It also allows for regeneration in specific individuals.

**Kingdom animalia classified into phylum, subphylum, order, family, genus, and species.**



**Domain** -Domain is the highest taxonomic rank in the hierarchical biological classification system, above the kingdom level.

**Kingdom** - A kingdom (Latin: *regnum*, plural *regna*) is the second highest taxonomic rank, just below domain. Kingdoms are divided into smaller groups called phyla.

**Phylum** - a major taxonomic division of living organisms that contain one or more classes. An example is the phylum Arthropoda (insects, crustaceans, arachnids, etc, and myriapods)

**Class** -A class is the taxonomic rank in the scientific classification of organisms in biology below phylum and above order. For example, **Mammalia is the class used in the classification of dogs**, whose phylum is Chordata (animals with notochords) and order is Carnivora (mammals that eat meat)

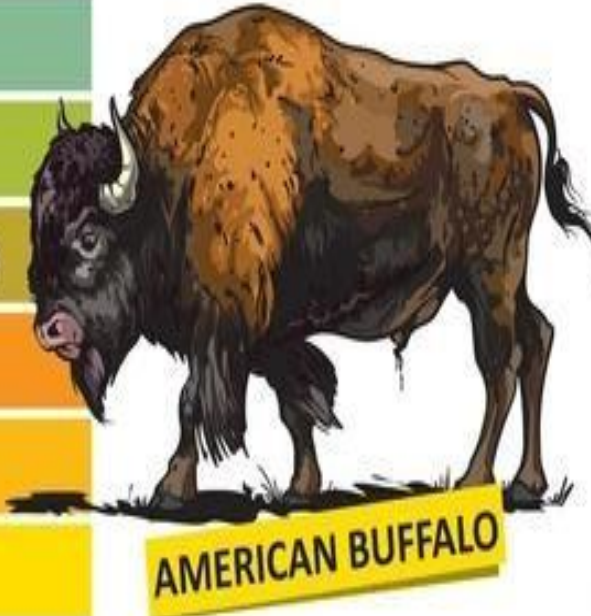
**Order-** taxonomic category of related organisms ranking below a suborder and above a family or superfamily.

**Family-** A family is a **taxonomic rank, or a taxon at that rank**. Each family contains one or more genera. The next important rank is that of order. Usually, the name of the family ends with a "idae" for animals, and "aceae" for plant

**Genus -**A group of related living things (as plants or animals) that ranks below the family in scientific classification and is made up of one or more species. genus.

**Species -** classification comprising related organisms that share common characteristics and are capable of interbreeding.

DOMAIN	Eukarya
KINGDOM	Animalia
PHYLUM	Chordata
CLASS	Mammalia
ORDER	Artiodactyla
FAMILY	Bovidae
GENUS	<i>Bison</i>
SPECIES	<i>Bison bison</i>



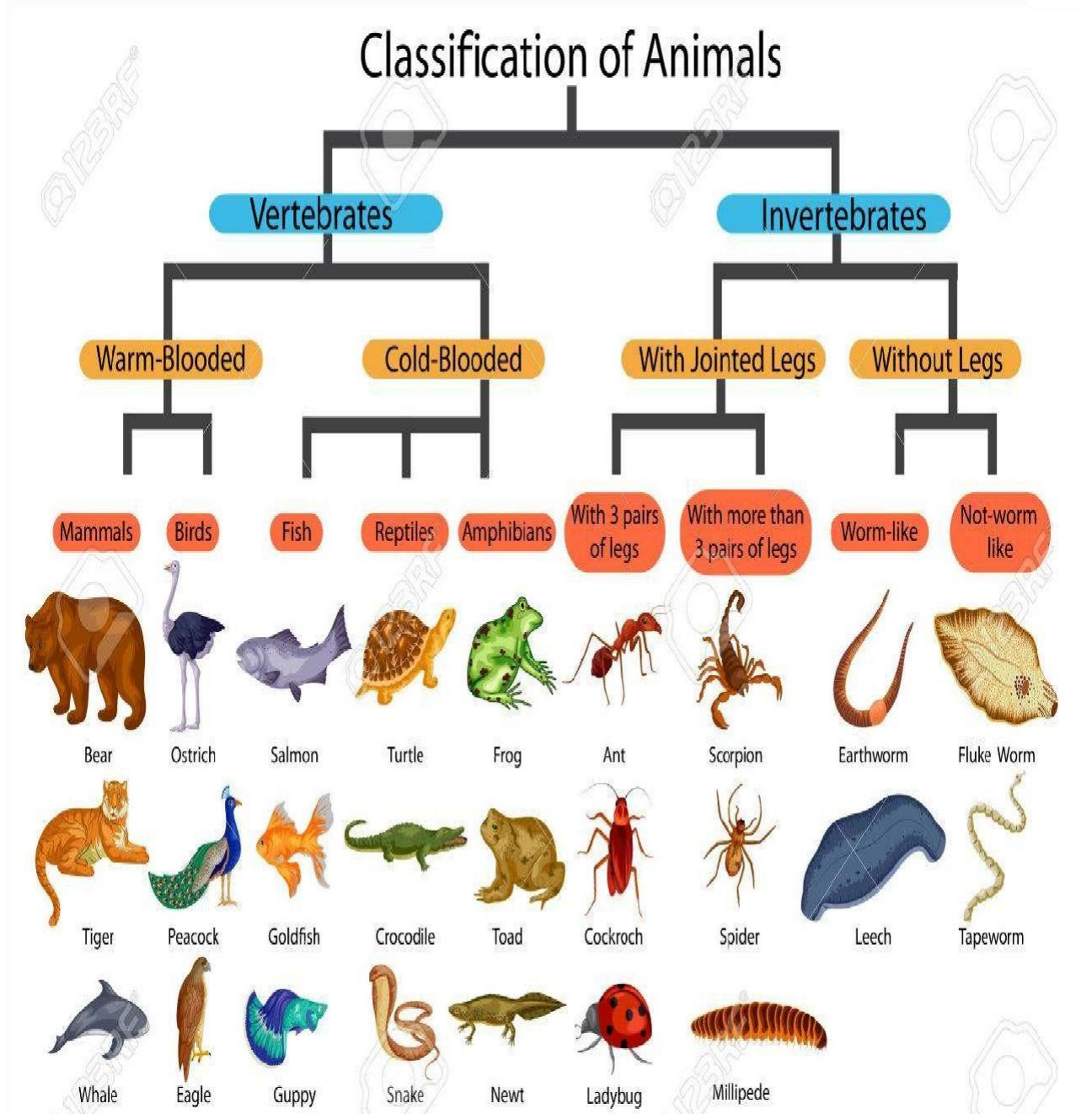
shutterstock.com • 2038899074



**KINGDOM ANIMALIA DIVIDED INTO TWO MAIN GROUPS**

I) Non- chordates or In-Vertebrates

II) Chordates or vertebrates



## Non-chordates (or) in-vertebrates:

Invertebrates are animals that neither possess nor develop a **vertebral column**, derived from the notochord. These include all animals apart from the subphylum Vertebrata.

Invertebrates are animals with no **backbone**. More than 90% of the animals are invertebrates among the estimated 15-30 million animal species.

## characteristics of Invertebrates

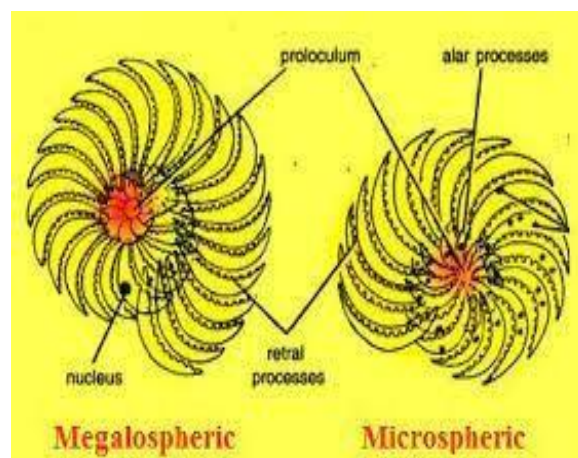
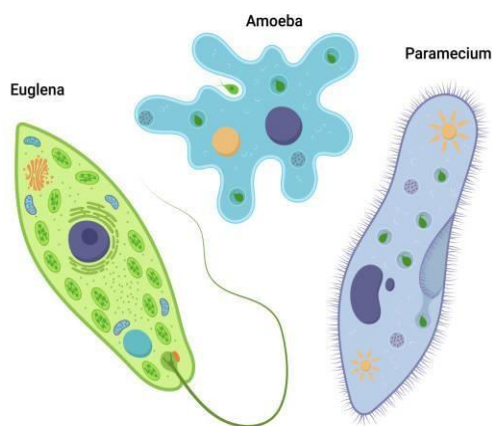
By now as you know what invertebrates are, let's get to know about their characteristics.

- All invertebrates do not have a spinal cord or vertebral column, instead, most of them possess an exoskeleton that encompasses the entire body.
- Normally, these are tiny and don't grow very large.
- Do not possess lungs since they respire through their skin.
- Since they cannot produce their own food, Invertebrates are heterotrophic.
- Reproduction occurs through fission of gametes.

## Invertebrates includes 9 major phyla's:

**1)Protozoa:** Protozoans are simplest, unicellular, microscopic, most primitive animals and are cosmopolitan in distribution. They are present in habitats like sea water, fresh water and moist places. Most of them are free living and some are parasitic on other organisms.

**Ex: amoeba, euglena, Elphidium, paramecium**



**2)Porifera:** The term porifera was coined by Robert grant and it means “pore bearers” due to the presence of tiny pores on their body. Phylum porifera includes all species of sponges.

The study of porifera or sponges is called as **parazology**. There are about 5000 animal species, mostly marine, but include about 150 fresh water inhabitants also. They found all seas, rocks, shells and corals.

**Ex: Sycon, euspongia, cliona, hyalonema**



**3) Cnidaria: Formerly known as coelenterate.** The name cnidaria comes from the Greek word “Cnidos”, which means stinging nettle. They popularly called as stinging animalcules. The phylum cnidaria is the simplest metazoan which do not even possesses organs. The phylum cynidaria includes more than 9000 species worlds widely. These are aquatic, mostly marine and few are freshwater.

**Ex: Hydra, Jelly fish, sea anemones and corals**



**Hydra**

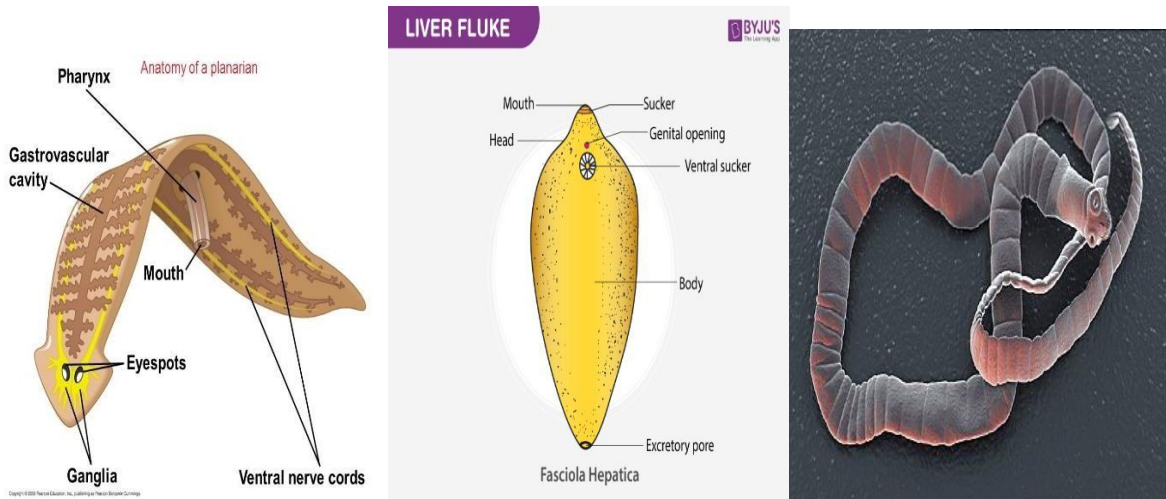
**jelly fish**

**sea anemone**

**4) Platyhelminthes:** Platyhelminthes (Gr. platys = Flat + helminths =worms) are commonly called flat worms. The body is dorsoventrally flattened, soft & worm like. In this phylum many organisms are parasites (except planarians). Some of which are extremely damaging human

population. They exhibit a very high degree of morphological adaptation to parasitism. Most of them are hermaphrodites or monocious (except schistosomes). This phylum includes about 20000 species.

**Ex: planarians, flukes and tapeworms**

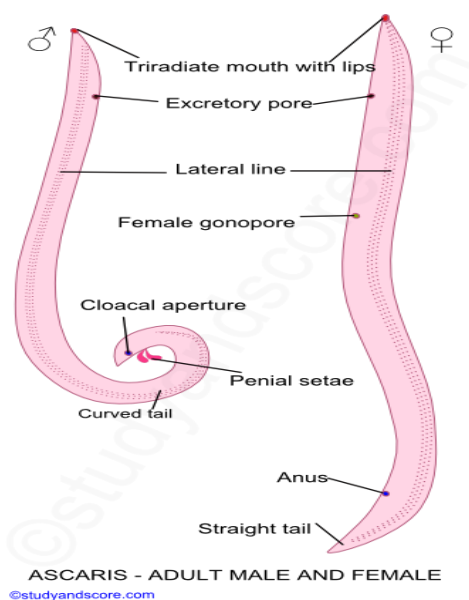


**5) Nematelminths:** This phylum includes both free living and parasitic worms usually small, even microscopic. Body is unsegmented and vermiform. Nematelminths comprises of animals commonly called nematodes or round worms and thread worms. It includes 12000 species

**Ex: dracunculus, ascaris and enterobius**



**dracunculus**



**ASCARIS - ADULT MALE AND FEMALE**  
©studyscore.com

**6) Annelida:** Animals with small annuls (segments) called annelids. This phylum includes both sluggish and very active animals and some ectoparasites. In this group 8800 animal are

identified. These are with organ system level of body organisation. Among all annelid's economic importance if earthworms and leeches worth mentioning.

**Ex: Neries, chaetopterus, hirudinaria granulosa etc....**



**Leech**



**Nereis**

**7) Arthropoda:** Arthropoda (arthos = joint, podos = foot) animals are most successful animals. This phylum is first largest phylum in the animal kingdom. This phylum includes 70% of animals of total animal kingdom which includes 1000000 species. Among arthropods insect alone contributes 8,70000 population. This group lives in all habitat's freshwater lakes, streams, ponds, brackish or salt water. Some lives in plant and animal bodies and also inside as parasites' this group also beneficial to human and harmful also. Hormones are identified in this animal which conduct moulting, colouration, reproduction, metabolic processes in a sequence.

**Ex: Prawn, cyclops, julus, scolopendra, termites, silverfish, pediculus, apisindica, Musca domestica, dragon fly etc...**



**Prawn**



**silverfish**



**Musca domestica**



**pediculus**



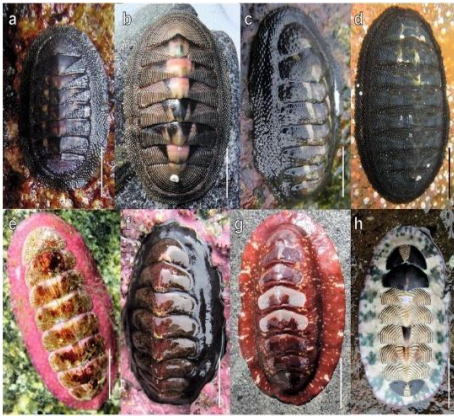
**julus**



**scolopendra**

**8) Mollusca:** The name mollusc is derived from mollis- soft body. It is second largest phylum. The main character of the molluscs is the possession of the shell, which protect the body having architectural and ornamental value. The study of molluscs is called as **malacology** and the study of shell is called as **conchology**. They are aquatic soft bodied.

**Ex: chiton, unio, sepia, loligo, octopus, pila globose**



**Chiton**



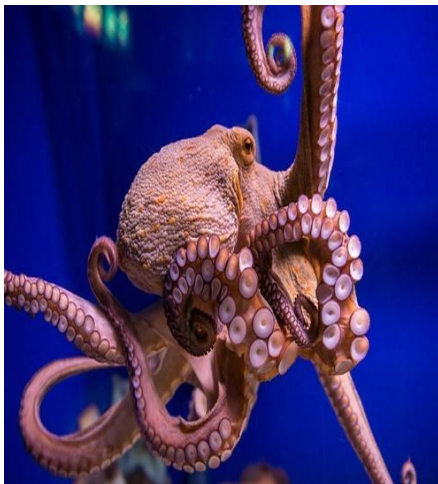
**Unio**



**Sepia**



**Loligo**



**Octopus**



**Pilaglobosa**

**9) Echinodermata:** the Echinodermata (Gr. Echinus: hedgehog(spiny)+derma: skin) are spiny skinned animals. Echinoderms are small to large animals mostly free living. These are exclusively marine animals.

Ex: Asterias(Starfish), Echinus , ophiothrix, lorenia



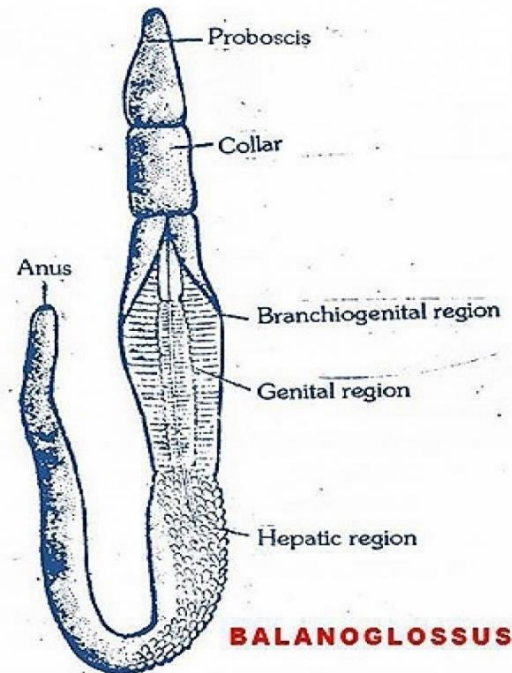
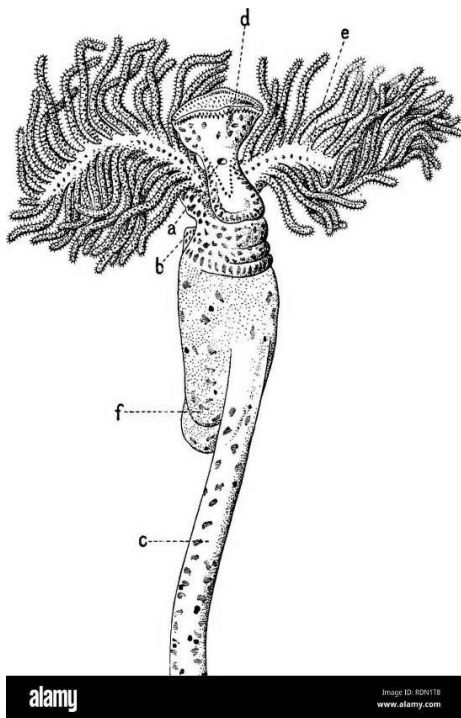
Asterias(Starfish)



ophiothrix, lorenia

**Phylum Hemichordata:** In phylum hemichordate has been removed from phylum chordate, and was given status of an independent phylum among invertebrates. These are exclusively marine forms. The hemichordates are solitary or colonial. The solitary forms are more or less vermiform with body divided into three unequal regions proboscis, collar and trunk. Phylum hemichordates includes 100 known species.

Ex: Balanoglossus, Rhabdopleurus, cephalodiscus etc....





## Chordates (or) vertebrates:

The phylum of the vertebrate is chordate, the chordate derived from Greek word the "chordae means a string or cord" and "ata means bearing. Thus, the animals having a cord i.e.; notochord a stiff supporting rod like structure along the back of an animal.

Vertebrates originated about 530 million years ago during the **Cambrian explosion**. The word vertebrates derived from Latin word vertebrates(pliny) meaning **joint of the spine** Vertebrates are chordates with vertebral column and endoskeleton of cartilage and bone. Numerical strength: nearly 49000 species of chordates are recorded whose number is even less than half of their living species of Mollusca and less than 1\10 of Arthropoda. These are derived into proto chordates (includes urochordates and cephalochordates) and vertebrates.

## Phylum chordate(49000species) it includes (3 subphylums) namely:

### I) Subphylum Urochordata

II) subphylum cephalochordates-urochordate and cephalochordates together constituted as protochordates it includes 2500 species.

III) subphylum vertebrate - includes 5 classes

- fishes-25000species
- amphibians -2500species
- reptiles -6000 species
- birds -9000species
- Mammals- 4500species

## FUNDAMENTAL CHORDATE CHARACTERS:

All the chordates exhibit four fundamental characters namely notochord, dorsal tubular nerve cord, pharyngeal gill slits and post anal tail, at least at some stage of their life.

- 1) **Notochord:** Notochord (Noton=back, chorda=cord) is a firm and flexible rod like structure present between the gut and dorsal nerve cord along the mid dorsal line of the body. It develops from chorda mesoderm. Notochord is retained throughout the life in cephalochordates, lampreys and in some fishes. In urochordates and vertebrates, it is present in larval stages only.
- 2) **Dorsal tubular nerve cord:** dorsal nerve cord is tubular, fluid filled structure present above the notochord along the length in the mid dorsal line. It develops from neural ectoderm. In higher chordates, anterior part of dorsal tubular nerve cord becomes brain( in the head)ane the posterior part become spinal cord. In urochordates, dorsal nerve cord is confined to larvae only. In adults it is degenerated and represented as a nerve ganglion. In cephalochordates it is present throughout life.
- 3) **Pharyngeal gill slits:** Gill slits are a series of paired, lateral perforations communicating the pharynx to exterior, gill slits are formed by the invagination of surface ectoderm and evagination of pharyngeal endoderm. In proto chordates gill slits are primarily useful in filter feeding. In some chordates, the lining of gill slits becomes

folded, acquires rich network of blood capillaries and forms gills. Such gills help in respiration. Number of gill slits varies from one to many.

- 4) **Post anal tail:** Behind the anus\cloaca, chordates have a muscular tail. It may be reduced or absent in certain chordates in their adult stage. Tail lacks coelom, but contains muscles, nerve cord, notochord\vertebral column.

### **Subphylum urochordates:**

These animals are known as 'sea squirt'. The life-history of urochordates passes through a dramatic change. Their chordate characters are more pronounced during larval period. While in adults they are more like invertebrates than chordates. Therefore, the characters are described in two heads — larval characters

#### **Larval characters of Urochordates:**

1. Elongated larva of Urochordata is known as ascidian tadpole larva. Adult emerges from the larva by the process of metamorphosis.
2. Notochord restricted at the caudal end, hence name Urochordata.
3. Dorsal hollow nerve chord spreads end to end.
4. Pharyngeal gill slits are present.
5. Highly active post anal tail is prominent.

#### **Adult characters of Urochordata:**

1. The body of the adult is covered by a tunic (hence named Tunicata). The tunic is composed of a protein tunicin and a polysaccharide similar to plant cellulose.
2. Adults are sessile and attached to the substratum of the sea.
3. Incurrent branchial siphon, and ex-current atrial siphon, form entrance and exit portals for the water that circulates through the body.
4. Branchial siphon opens into a branchial basket, i.e. pharynx.
5. Tiny finger-like sensory tentacles encircle the incurrent siphon to examine the incoming water and prevent large particles from entering.

6. These are hermaphrodite animals; reproduce both sexually and asexually.

Ex: Ciona, Herdmania, Doliolum, salpa, Oikopleura.



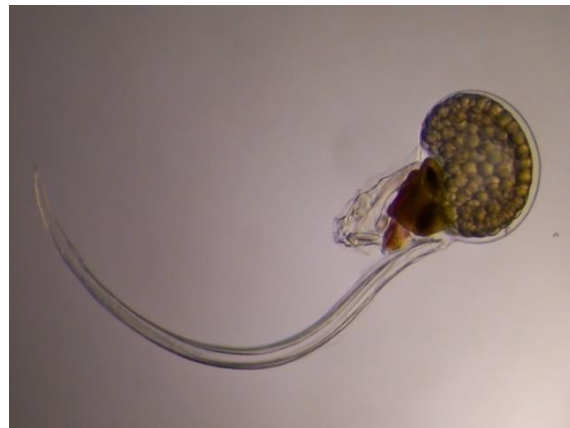
Ciona



Herdmania



Doliolum



Oikopleura

**Subphylum cephalochordate:**

Cephalochordates are small fish like animals which show Chordate characters. The notochord extends the entire length of the body. They show a dorsal, tubular neural tube without a definite brain.

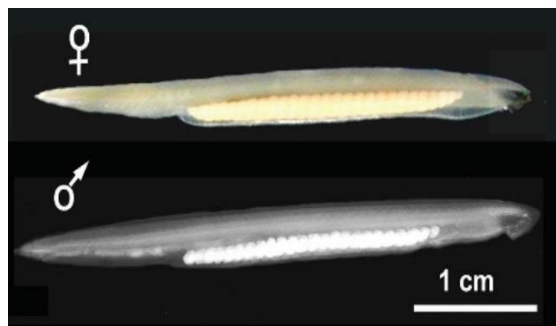
1. Body is fish -like and is useful for burrowing and swimming.
2. It has a head.
3. It shows a tail.
4. Appendages are absent.
5. Dorsal, caudal and ventral fins are present.
6. Body- wall shows one- cell thick, non-ciliated epidermis, dermis, connective tissue, striated muscle and parietal peritoneum.

7. It has no exoskeleton.
8. Notochord extends from the anterior end to posterior end.
9. Enterocoelic coelom is present. However, reduced in the pharyngeal region by atrium.
10. Alimentary canal is long. It includes a large pharynx with many gill-slits ciliary mode of feeding is developed.
11. Gills will perform respiration.
12. Circulatory system is closed.
13. Heart and respiratory pigments are absent.
14. Hepatic portal system is present.
15. Excretory system shows paired protonephridia with solenocytes.
16. Brain is not present
17. Two pairs of cerebral and several pairs of spinal nerves are present.
18. Sexes are separate. Gonads are metamerically arranged and without gonoducts.
19. Asexual reproduction will not take place.
20. Fertilization is external

Ex: Branchiostoma (Amphioxus), Asymmetron



Branchiostoma (Amphioxus)



Asymmetron

## Subphylum Vertebrates includes 2 super classes:

### 1. Super class Pisces:

Pisces are permanently **aquatic vertebrates** that has gills for respiration. They are devoid of the true spine. Fishes may be present in fresh, marine, and brackish water. The organs for locomotion in fishes are **fins**. However, fins are sometimes paired or unpaired. The study of fishes is **ichthyology**.

- They have a streamlined body.
- The circulatory system is of close type.

- The body has three regions- head, trunk, and tail.
- The skeleton can be **bony or cartilaginous**.
- The sexes are separate.
- A well-developed digestive system is present.
- No extraembryonic membranes.
- Fertilization either internal or external.
- The body consists of scales, which acts as an external covering.
- They can be herbivorous, carnivorous, or omnivorous.

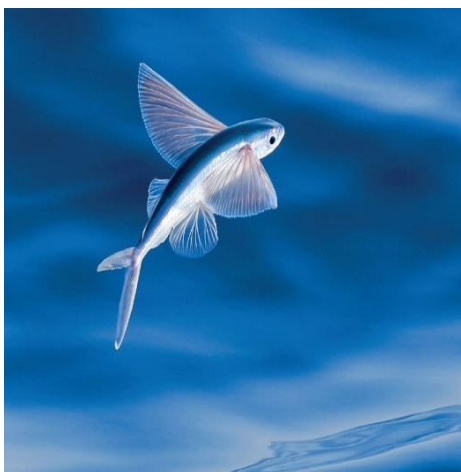
Pisces includes two classes (a) **Bony fishes (Osteichthyes)** ex: latimeria chalumnea, Protopterus, Acipencer, Amia, exocoetus, Hippocampus and Anguilla and (b) **cartilaginous fishes (Chondrichthyes)** ex: Scoliodon, Rhino don, Torpedo



Rhinodon (Guitar fish)



Scoliodon(Dog fish)



Exocoetus(flying fish)



Himpcampus(sea horse)

## 2) **Super class: Tetrapod's (tetra= Four; Podos= Foot)**

Tetrapoda includes four footed animals. It includes four classes:

**A) Class: Amphibians:**

The organisms belonging to the class Amphibia fall under the Chordata phylum of the kingdom Animalia. These are multicellular vertebrates that live both on **land and water**. This class includes about **3000 species**. They are the **first cold-blooded** animals to have appeared on land.

1. These can live both on land and in water.
2. They are ectothermic animals, found in a warm environment.
3. Their body is divided into head and trunk. The tail may or may not be present.
4. The skin is smooth and rough without any scales, but with glands that make it moist.
5. They have no paired fins. Unpaired fins might be present.
6. They have two pairs of limbs for locomotion.
7. They respire through the lungs and skin. Gills might be present externally in some adults.
8. The heart is three chambered.
9. The kidneys are mesonephric. The excretory material includes ammonia and urea.
10. They possess ten pairs of cranial nerves.
11. The lateral line is present during their development.
12. The sexes are separate and fertilization is usually external. However, in salamanders, the fertilization is internal.
13. Development is indirect with metamorphosis.
14. Breeding occurs in water. The copulatory organs are absent in males.
15. **Ex: Frogs, toads and Salamanders.**



**Salamander**



**American Toad**



Frog : **Rana tigrina**



**Hyla**

### b) Class: Reptiles

These were the first class of organisms to adapt to life on land. They are believed to have evolved from the amphibians millions of years ago. There are about 10000 different species of reptiles on earth. They are cold-blooded animals belonging to the phylum Chordata of Animal kingdom.

1. These are creeping and burrowing terrestrial animals with scales on their body.
2. They are cold-blooded animals found in most of the warmer regions of the world.
3. Their skin is dry, and rough, without any glands.
4. The body is divided into head, neck, trunk, and tail.
5. Few of these shed the scales on their skin as skin cast.
6. The respiration takes place with the help of the lungs.
7. The skull is monocondylic.
8. Limbs may or may not be present. If they have limbs, they are two pairs of pentadactyl limbs, each bearing claws. Snakes do not have limbs.
9. The heart is 3 chambered. However, crocodiles have a 4-chambered heart.
10. The nervous system comprises 12 pairs of cranial nerves.
11. Reptiles do not have external ear openings. Tympanum represents ear
12. They possess a typical cloaca.
13. Reptiles are generally uricotelic. They mostly excrete nitrogenous wastes as uric acid.
14. Fertilisation is internal.
15. They are oviparous and the eggs are very yolky. Development is direct.

**Ex: Snakes, Turtles, Lizards, Crocodiles.**



### c) Class: Aves

The Aves belong to the phylum Chordata of the animal kingdom. It has about **9,000** species. Aves are adapted to fly. All the birds come in the class Aves. They show courtship, parental care, nest building, and territorial behaviour. Study of birds is called as **ornithology**.

1. Birds are warm-blooded animals.
2. Their forelimbs are modified into **wings**.
3. They have well-developed flight muscles that help during the flight.
4. Their hind limbs are adapted for walking, hopping, perching, grasping, wading and swimming.
5. There are epidermal scales on their legs.
6. The endoskeleton is bony with long hollow bones filled with air cavities. known as **pneumatic bones**.
7. Their spindle-shaped body minimizes resistance of the wind.
8. The feathers help in preventing heat loss and reduce air friction by providing passage to the air.

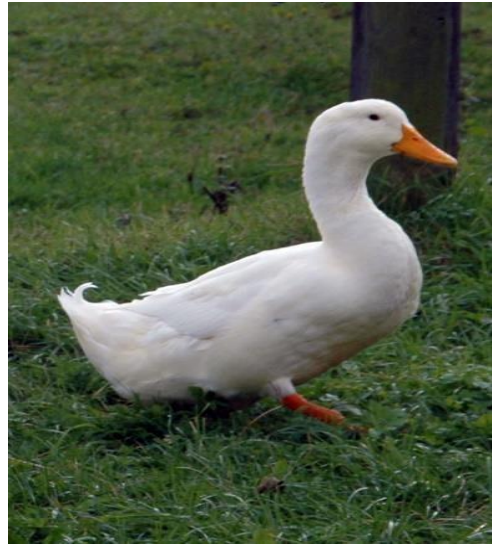


9. There is no skin gland except the oil gland.
10. The lower and upper jaws are modified into **a beak**.
11. They have no teeth.
12. They have sharp eyesight.
13. The alimentary canal has a crop and a gizzard. The crops help in softening food, and the gizzard helps in crushing the food.
14. Pigeons and other seed-eating birds lack a gall bladder.
15. They have spongy and elastic lungs for respiration.
16. The special vocal organ called **syrinx** is present at the base of trachea.
17. Their heart is four-chambered.
18. RBCs are oval, nucleated and biconvex.
19. 12 pairs of cranial nerves are present.
20. They have a single ovary and oviduct on the left side
21. All the birds are oviparous and exhibit sexual dimorphism. The eggs have four embryonic membranes- **amnion, chorion, allantois, and yolk sac**.

**Ex: Penguin, Grey Heron, Kingfisher, Duck, etc.**



**Penguin**



**Duck**



**Grey heron**



**Kingfisher**

#### **d) Class: Mammals**

**mammal**, (class Mammalia), any member of the group of vertebrate animals in which the young are nourished with milk from special **mammary glands** of the mother. In addition to these characteristic milk glands, mammals are distinguished by several other unique features.

1. Body of mammals is covered by epidermal hair.
2. Integumentary glands are — sweat (sudoriferous), sebaceous (oil), scent (odoriferous) glands.
3. Mammary glands are present to supply milk for the nourishment of suckling young.
4. External fleshy pinna is present in mammals.
5. Eyes with upper and lower eyelids and often with eyelashes.
6. Nictitating membrane is translucent and hairless; it is vestigial in higher mammals.
7. A muscular diaphragm is present in between the thoracic and abdominal cavities.
8. Endo-thermal homoeotherm animals.
9. RBCs are non-nucleated, biconcave and usually circular in form.
10. The four-chambered heart is highly powerful.
11. Only left aortic arch is present in the arterial system.
12. Cerebral hemispheres are very large and highly convoluted.
13. Cerebellum is large, complex and solid in mammals.
14. There is a single urinary bladder in mammals.
15. Testes remain in scrotal sacs.
16. Small eggs are devoid of yolk. Fertilisation is internal.
17. Mammals are viviparous animals.

18. The skull has double occipital condyles. Quadrate absent.
19. A bony palate is formed by the union of premaxillae, maxillae and palatines that separates the nasal passage from the buccal cavity.
20. The lower jaw is composed of a pair of bones — the dentaries.
21. Vertebrae are acoelous type.
22. Ribs are double-headed — capitulum and tuberculum.
23. The teeth are heterodont, thecodont and diphyodont type.
24. Molars are tribosphenic (three-cusped).
25. Paired forelimbs and hind limbs are present in mammals.
26. The digits of the limbs are provided with either claw or nail or hoof.
27. Cranial nerves twelve pairs.
28. Kidneys are metanephric type.

**Ex: Rabbit, Dog, Cat, Horse, Human beings, apes, monkeys, kangaroos**



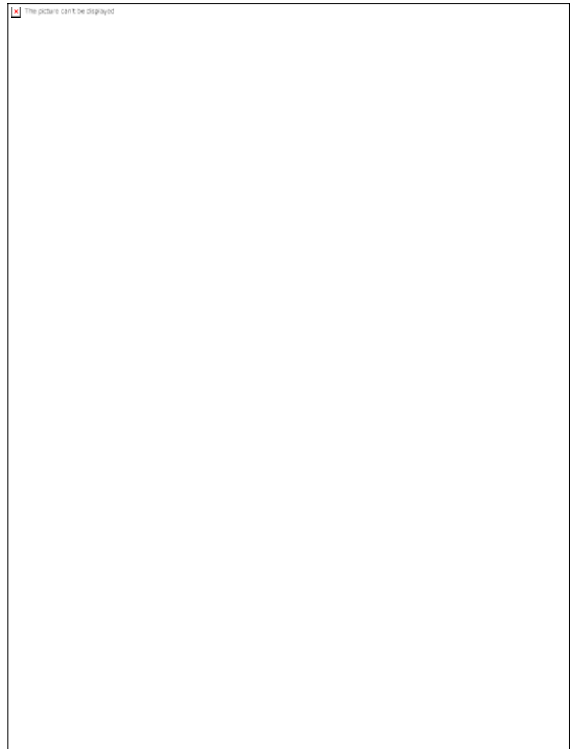
Rabbit



Kangaroo



**Ape**



**Monkey**

**OBJECTIVES/ CAREER IN ZOOLOGY:**

Zoologists are scientists who study animals, observing them both in the laboratory and in their natural habitat. They study the origin and development of species, their habits, behaviour and interaction also research the development of animal diseases. This is a great career interest for people who are fascinated with nature and would not mind spending time understanding it. There are several specializations that the students pursuing the field can venture into. There is physiology that study the metabolic processes of animals, then there are taxonomists who deal with the naming and the classification of the animal species, one can think of becoming embryologist whose only job is to study and focus on the early stages of the animal's life. So similarly, there are many such options that one can venture into depending on his/her capabilities and interests.

On choosing this career, the person specialization in the field will be referred to as a zoologist.

**CONCLUSION:**

Zoology (also known as science) is the branch of biology devoted to the study of animal life. It covers areas ranging from the structure of the organisms to the subcellular unit of life. Some zoologists are interested in the biology of particular group of animals. Others are concerned with the structure and function of animal bodies. Still others study how new animals are formed and how their characteristics are passed on from one generation to another generation. Zoologists study the interaction of animals with one another and their environments, as well as the significance of the behaviour of animals.

Zoology is both descriptive and analytical. It can be approached either as a basic science or as an applied science.

Historically, the study of zoology can be viewed as a series of efforts to analyse and classify animals. The ancient Greek Philosopher Aristotle is credited with devising the system of classifying animals that recognized similarities among diverse organisms in arranged group of animals according to mode of reproduction and habitat.