

Practical Manual
Zoo201 (Animal Diversity: Invertebrates)
Virtual University of Pakistan

Zoo201 Practical Manuals

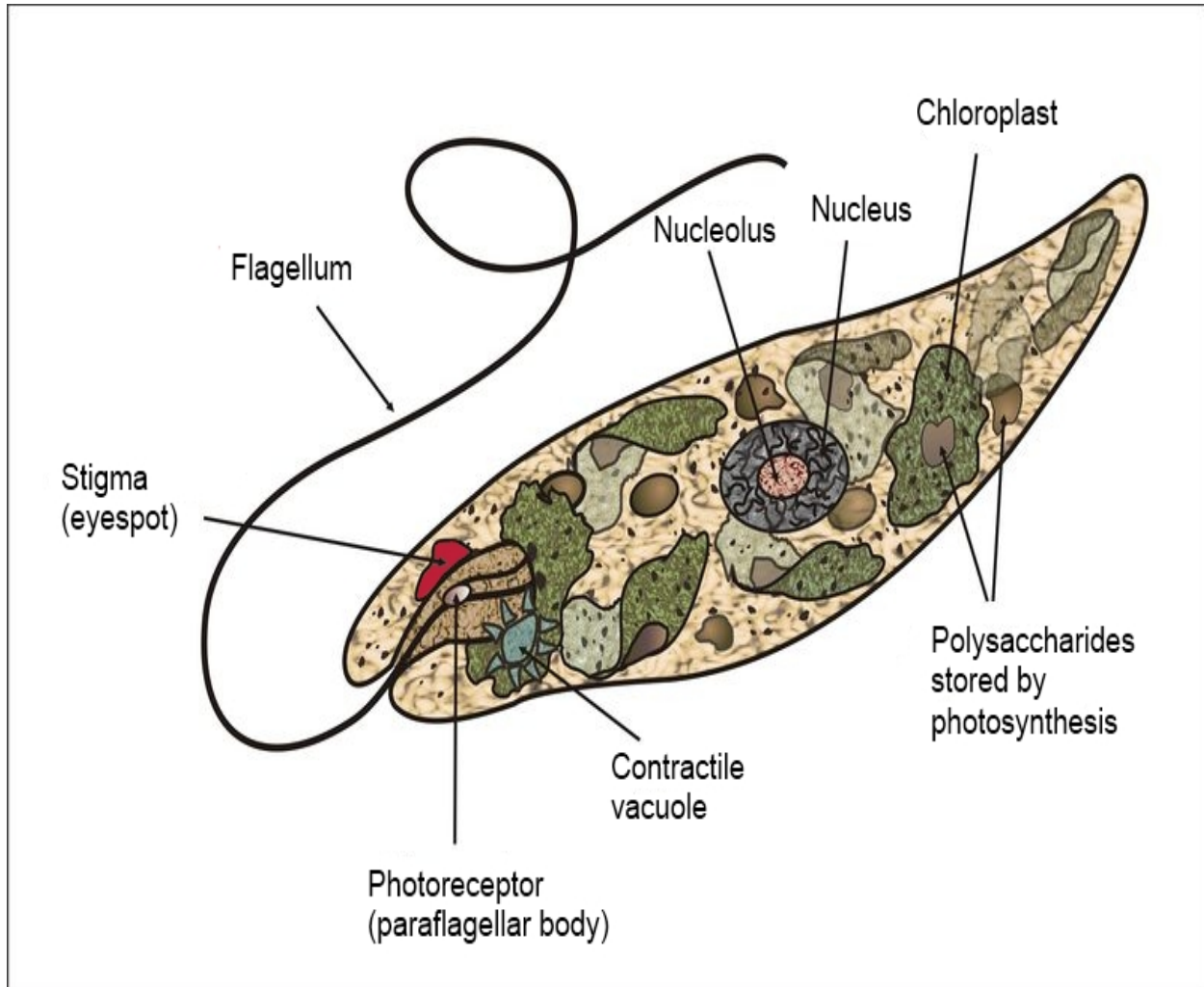
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Practical 01: Study of Euglena.

Euglena is single celled organisms that belong to the protist. As such, they are not plants, animal or fungi. In particular, they share some characteristics of both plants and animals. While they can manufacture their own food, a characteristic seen in plants, they are also capable of movement and also consume food, which are characteristics of animals.



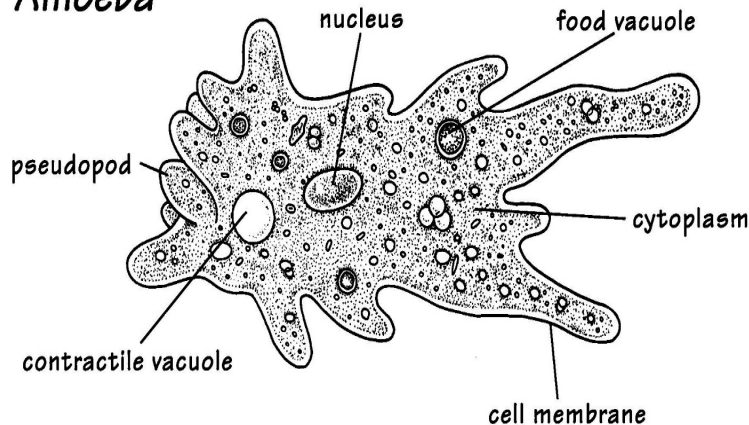
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Practical 02: Study of Amoeba.

Amoeba (plural amoebas/amoebae) is a genus that belongs to Kingdom protozoa. Generally, the term is used to describe single celled organisms that move in a primitive crawling manner (by using temporary "false feet" known as pseudopods).

- ☀ Single celled organism
- ☀ Move by false feet called pseudopodia
- ☀ Can change shape
- ☀ Structure of amoeba primarily encompasses 3 parts – the cytoplasm, plasma membrane and the nucleus.
- ☀ The cytoplasm can be differentiated into 2 layers – the outer ectoplasm and the inner endoplasm
- ☀ The plasma membrane is a very thin, double-layered membrane composed of protein and lipid molecules.
- ☀ Amoeba also contains other cellular organelles such as a contractile vacuole, mitochondria, Golgi apparatus and fat globules.
- ☀ Amoeba consumes food either through the process of [phagocytosis](#) or pinocytosis.
- ☀ The process of reproduction is through asexual means, such as binary fission.

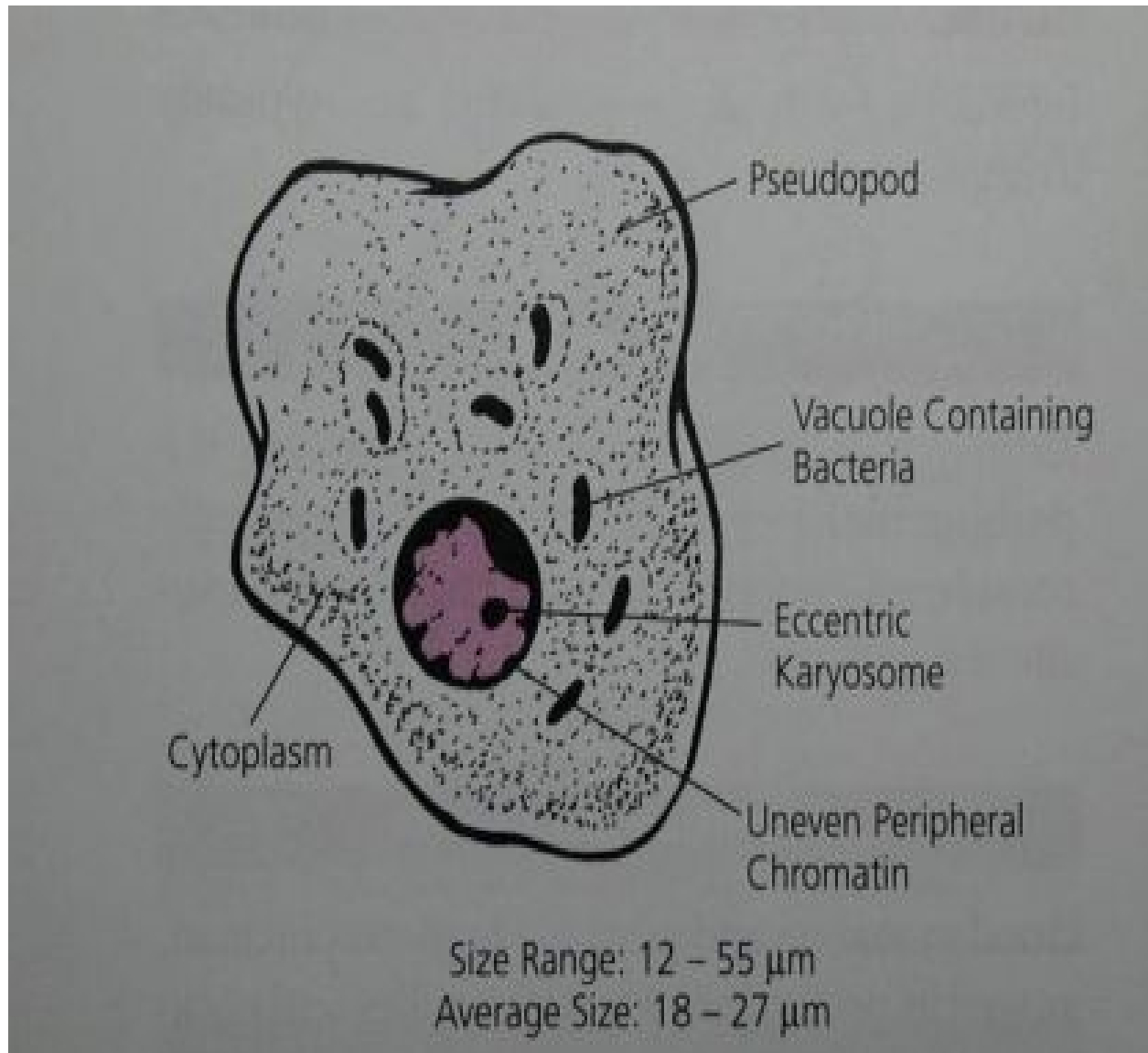
Amoeba



Practical 03: **Study of Entamoeba**

Entamoeba cells are small, with a single nucleus and typically a single lobose pseudopod taking the form of a clear anterior bulge. They have a simple life cycle. The trophozoite (feeding-dividing form) is approximately 10-20µm in diameter and feeds primarily on bacteria.

- ☀ It is the growing and feeding stage of parasite
- ☀ **Sape;** not fixed because of constantly changing position
- ☀ **Size:** ranging from 18-40 µm; average being 20-30 µm
- ☀ **Cytoplasm:** cytoplasm is divided into two portion; a clear transparent ectoplasm and a granular endoplasm. Ingested RBCs, tissue granules and food materials are also found in endoplasm
- ☀ **Nucleus:** It is single, spherical shape and size ranging from 4-6µ Nucleus contains central karyosome and fine peripheral chromatin.
- ☀ Trophozoites are actively motile with the help of pseudopodia.
- ☀ Trophozoites are anaerobic parasite,
- ☀ (present in large intestine)



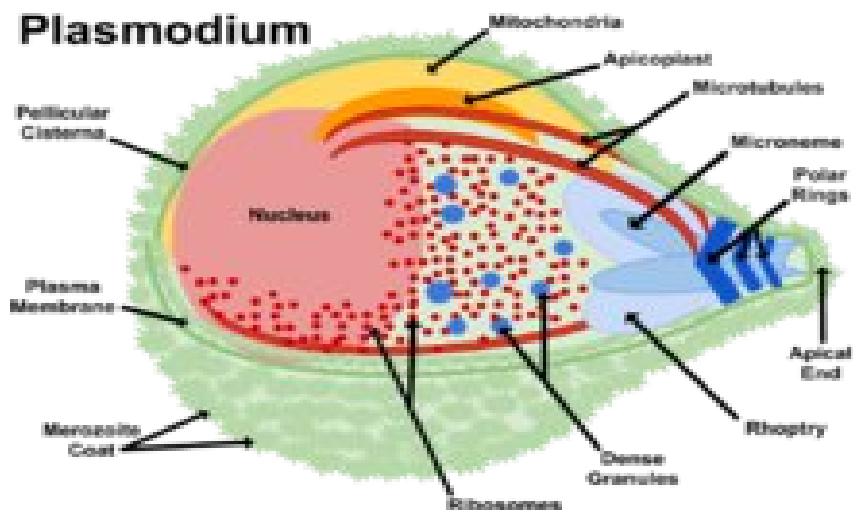
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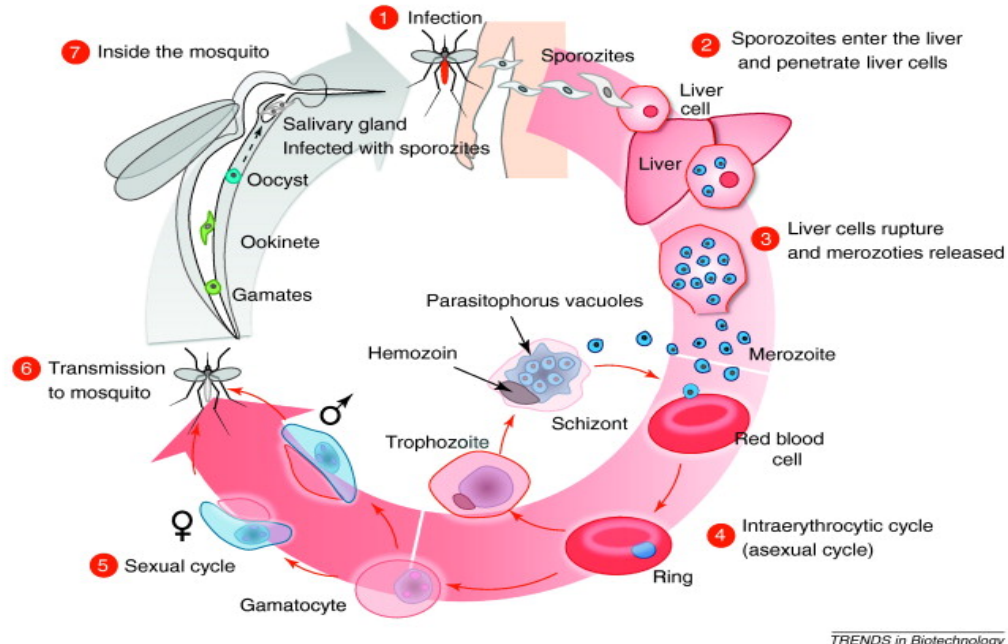
Practical 04: Study of Plasmodium

The genus of the class of Sporozoa that includes the parasite that causes malaria. Plasmodium is a type of protozoa, a single-celled organism that is able to divide only within a host cell. The morphological characteristics (size, shape and appearance) of the blood stages are characteristic for each Plasmodium spp. Microgametocytes have a larger more diffuse nucleus (ready for gamete production) while macrogametocytes have darker-staining cytoplasm (plentiful ribosomes for protein synthesis).

- ☀ Plasmodium, commonly known as malaria parasites, may be described as a genus of intracellular parasitic protozoa.
- ☀ They are obligate parasites of insects (such as mosquitoes) and vertebrates and thus referred to as digenetic parasites.

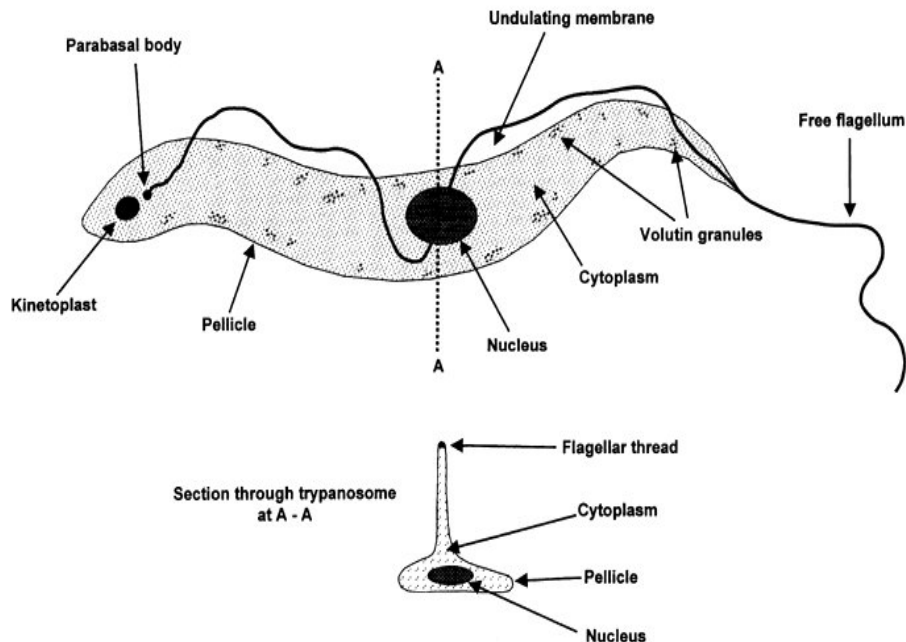
They require two different hosts in order to complete their life cycle. In vertebrates, they multiply within liver cells and red cells where they not only obtain nourishment, but also damage the cells (thus causing diseases).





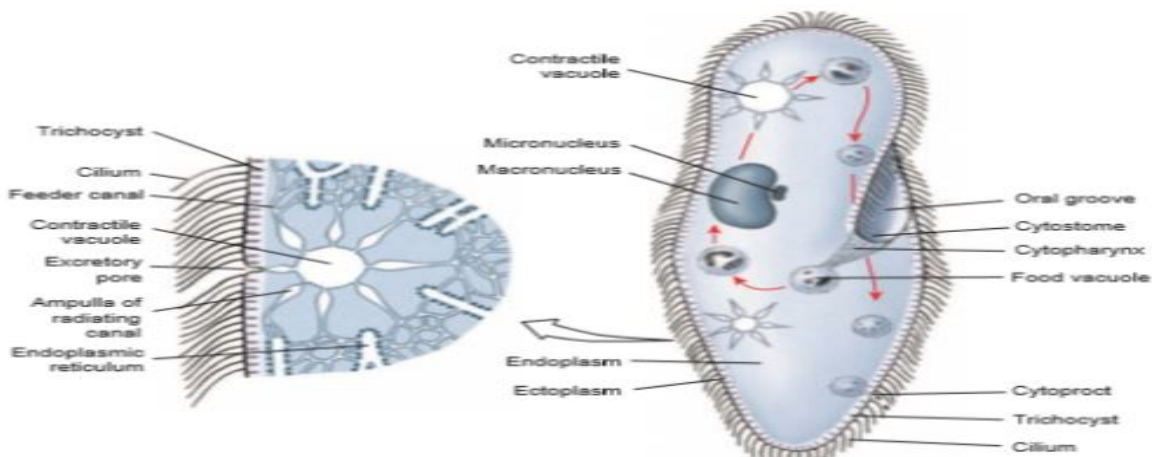
Practical 05: Study of *Trypanosoma*

Trypanosome cells are small and heterotrophic; they share common characteristics with other members of the phylum Euglenozoa, particularly the stiffening paraxial rod in the flagellum, and characteristics common to the order Kinetoplastida, specifically a large clump of DNA located at one end.



Practical 06: Study of *Paramecium Caudatum*.

Paramecia are often described as slipper shaped. *Paramecium caudatum* is 150 to 300 μm in length and is blunt anteriorly and somewhat pointed posteriorly. The organism has an asymmetrical appearance because of the oral groove, a depression that runs obliquely backward on the ventral side. The pellicle is a clear, elastic membrane that may be ornamented by ridges or papilla-like projections, and its entire surface is covered with cilia arranged in lengthwise rows. Just below the pellicle is the thin clear ectoplasm that surrounds the larger mass of granular endoplasm. Embedded in ectoplasm just below the surface are spindle-shaped trichocytes, which alternate with the bases of cilia. The infraciliature can be seen only with special fixing and staining methods. A cytostome at the end of the oral groove leads into a tubular cytopharynx, or gullet. Along the gullet an undulating membrane of modified cilia keeps food moving. Fecal material is discharged through a cytoproct posterior to the oral groove. Within the endoplasm are food vacuoles containing food in various stages of digestion. There are two contractile vacuoles, each consisting of a central space surrounded by several radiating canals that collect fluid and empty it into the central vacuole. We describe excretion and osmoregulation on. *Paramecium caudatum* has two nuclei: a large kidney-shaped macronucleus and a smaller micronucleus fitted into the depression of the former. These can usually be seen only in stained specimens. The number of micronuclei varies in different species; for example, *P. multimicronucleatum* may have as many as seven. Paramecia are holozoic, living on bacteria, algae, and other small organisms. Cilia in the oral groove sweep food particles in the water into the cytostome, from which they are carried into the cytopharynx by the undulating membrane.

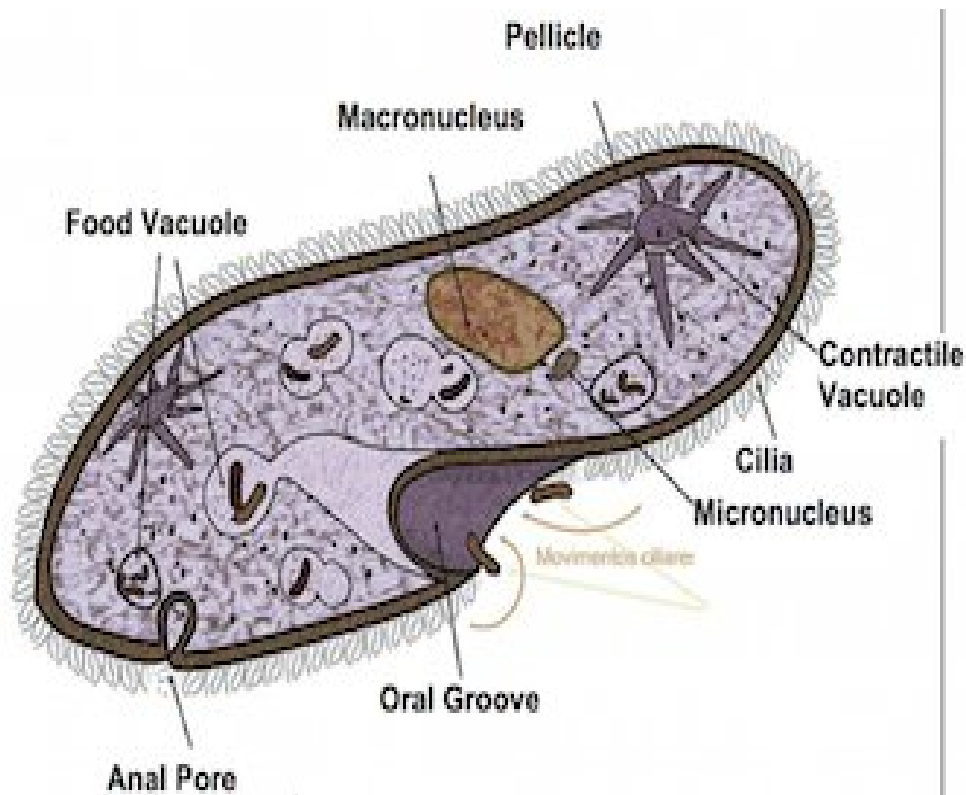


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Practical 07:

Study of Paramecium as Representative of Animal like Protists.

Paramecium is a unicellular organism with a shape resembling the sole of a shoe. It ranges from 50 to 300µm in size which varies from species to species. It is mostly found in a freshwater environment. It is a single-celled eukaryote belonging to kingdom Protista and is a well-known genus of ciliate protozoa. As well, it belongs to the phylum Ciliophora. Its whole body is covered with small hair-like filaments called the cilia which help in locomotion. There is also a deep oral groove containing not so clear oral cilia. The main function of these cilia is to help both in locomotion as well as dragging the food to its oral cavity.



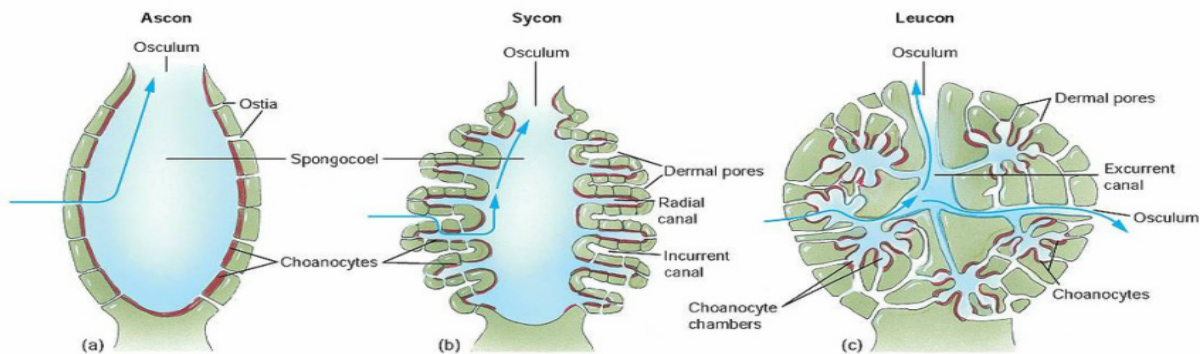
Practical 08:

Study of Sponges and Their Various Body Forms.

Sponges

- Phylum Porifera
- Aquatic, mostly marine
- Vary in size, shape, color
- Multicellular but lack organized tissues
- Have cellular level of organization
- Outer layer of cells made of flattened epidermal cells (contractile fibers)
- Middle layer of cells is semifluid matrix (ameboid cells)
- Inner layer has flagellated cells called collar cells
- The flagella on collar cells produce water currents that flow through pores into central cavity out the osculum
- Sessile filter feeders (digest food within cells)
- Pores in the walls and microvilli making up part of the collar cells strain food from water
- Food passes from collar cells to food vacuoles to ameboid cells pppppppto all cells
- Reproduce asexually by any of these methods fragmentation, regeneration, gemmule formation, or budding
- Body types: Sponges have three body types: asconoid, syconoid, and leuconoid.

Asconoid sponges are tubular with a central shaft called the spongocoel. The beating of choanocyte flagella forces water into the spongocoel through pores in the body wall.



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Practical 09:

Study of Principal Representative Classes of Phylum Cnidaria.

- Phylum Cnidaria
- Multicellular, tubular, or bell-shaped animals found in shallow coastal waters
- Radially symmetrical
- Have tissue level of organization
- Cnidocytes are specialized stinging cells
- Nematocysts threadlike fibers found in cnidocytes that are used to capture or sting prey
- Examples sea anemone, jellyfish, Hydra, corals
- Two basic body forms Polyp sessile stage and Medusa sexual, motile stage has a lot of mesoglea (jellylike material) produces sperm egg
- Alternates between poly medusa stage throughout life cycle
- Zygote develops into ciliated larva capable of dispersal

	<p>Phylum: Cnidaria <i>Aurelia</i> (Moon Jellyfish)</p>	
Sea anemone	Jelly fish	Hydra

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Practical 10:

Study of Principal Representative Classes of Phylum Platyhelminthes.

- Phylum Platyhelminthes
- Have three germ layers (endoderm, mesoderm, ectoderm)
- Acoelomate no coelom (body cavity)
- Have muscles and excretory, reproductive and digestive systems
- Lack respiratory and circulatory systems
- Body is flat and thin
- Diffusion is used to pass oxygen and other substances cell to cell
- Mostly freshwater found in lakes, ponds, streams, and springs
- Feed on small living or dead organisms (worms)
- Excretory system consisting network of interconnecting canals
- Flame cells have cilia that beat to keep water moving to excretory pores



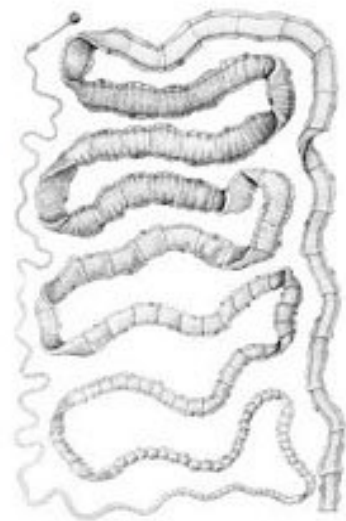
Planaria

Class - Turbellaria



Fasciola

Class - Trematoda



Taenia

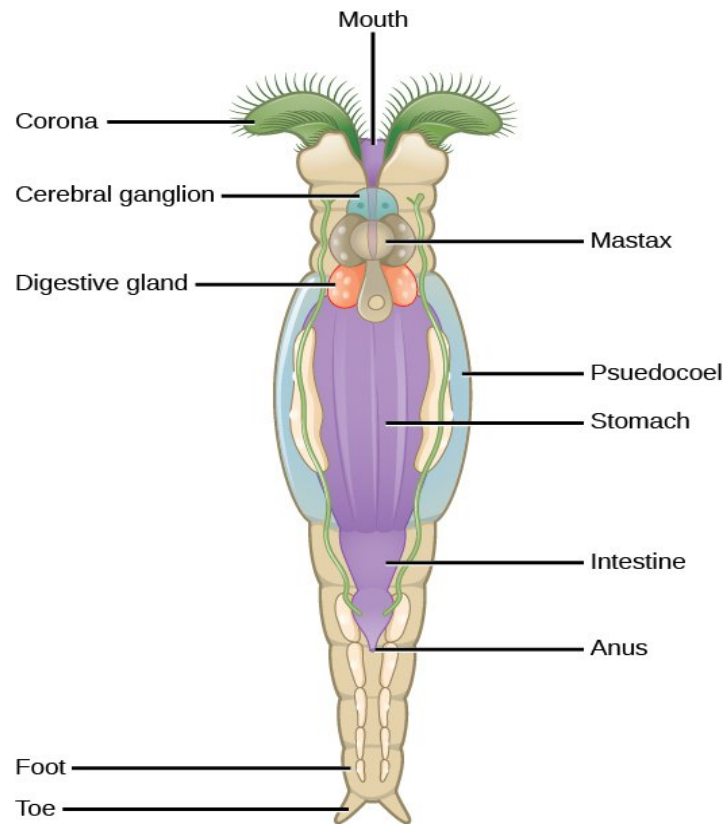
Class - Cestoda

Practical 11:

Study of Representative of Phylum Rotifera.

- ☹ The rotifers (from Latin rota “wheel” and -fer “bearing”), commonly called wheel animals or wheel animalcules, make up a phylum (Rotifera) of microscopic and near-microscopic pseudocoelomate animals
- ☹ The body form of rotifers consists of a head (which contains the corona), a trunk (which contains the organs), and the foot
- ☹ Rotifers are typically free-swimming and truly planktonic organisms, but the toes or extensions of the foot can secrete a sticky material forming a holdfast to help them adhere to surfaces
- ☹ The head contains sensory organs in the form of a bi-lobed brain and small eyespots near the corona.
- ☹ The rotifers are filter feeders that will eat dead material, algae, and other microscopic living organisms, and are therefore very important components of aquatic food webs
- ☹ Rotifers obtain food that is directed toward the mouth by the current created from the movement of the corona
- ☹ The food particles enter the mouth and travel to the mastax (pharynx with jaw-like structures). Food then passes by digestive and salivary glands, and into the stomach, then onto the intestines
- ☹ Digestive and excretory wastes are collected in a cloacal bladder before being released out the anus
- ☹ Reproduce sexually or partheongenetically

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This illustration shows the anatomy of a bdelloid rotifer.

Practical 12: Study of Representative of Phylum Nematoda.

- Phylum Nematoda
- Have tube-within-a-tube body plan (have mouth anus)
- Have a fluid-filled body cavity called pseudocoelom
- Provides space for the development of organs
- Substitutes for circulatory system
- Provides type of skeleton called a hydrostatic skeleton
- Hydrostatic skeleton fluid-filled interior that supports muscle contraction
- Bilaterally symmetrical
- Colorless, non-segmented
- Live in freshwater, marine, soil habitats
- Can be free-living or parasitic

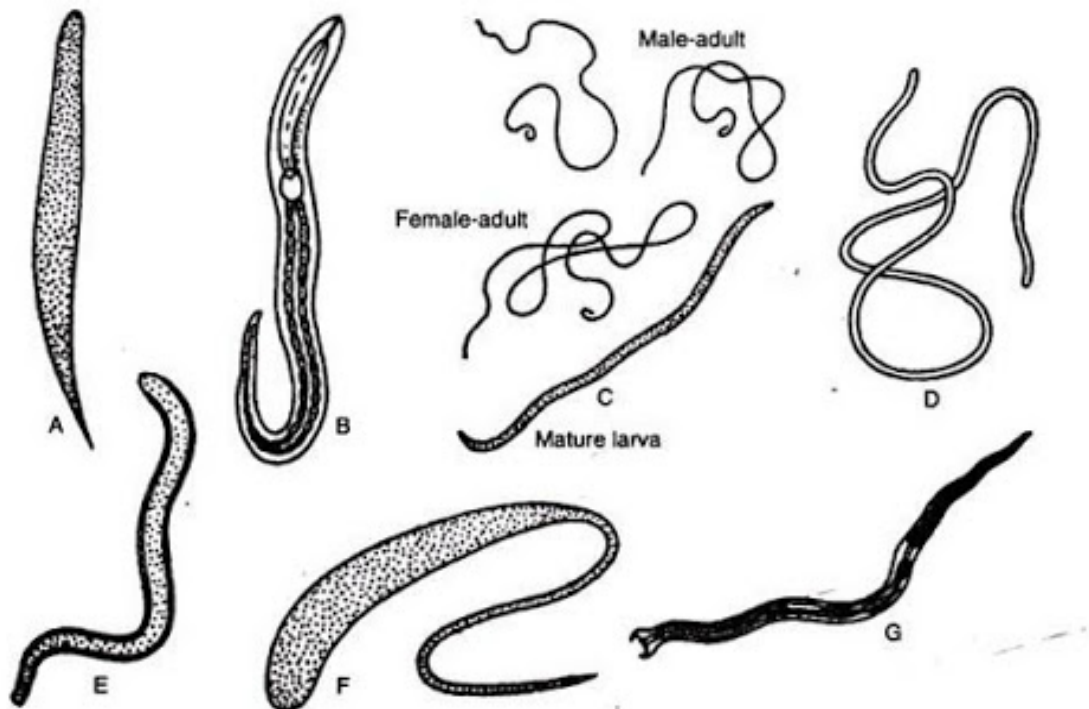


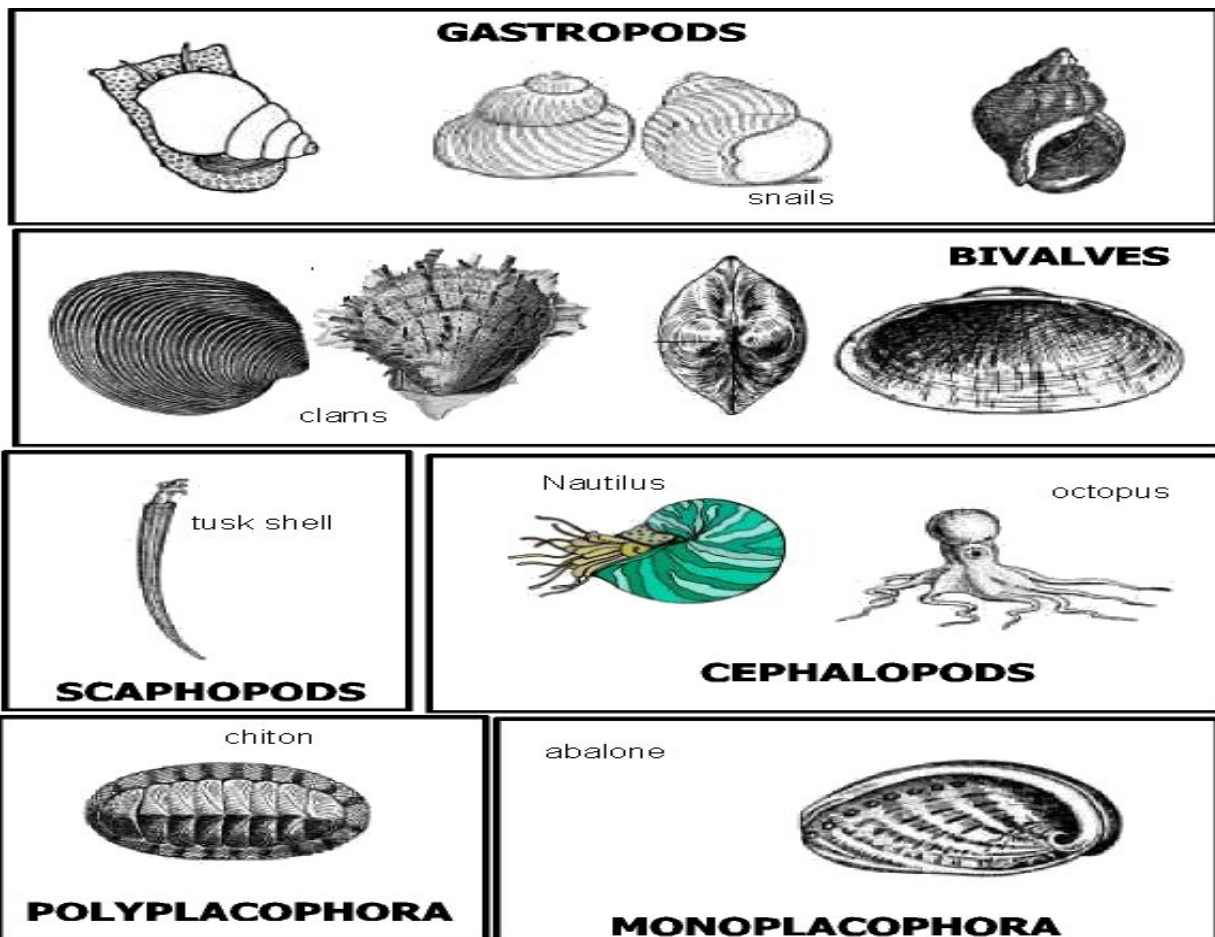
Fig. 15.15: A few examples of the Phylum Nematoda (not drawn up to scale). A. *Enterobius* (pin-worm). B. *Ancylostoma* (Hook-worm). C. *Wuchereria* (filaria-worm). D. *Loa* (eye-worm). E. *Dracunculus* (Guinea-worm). F. *Trichuris* (whip-worm). G. *Trichinella* male (Trichina-worm).

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Practical 13:

Study of Principal Representative Classes of Phylum Mollusca.

- Phylum Mollusca (make up second largest phylum)
- Bilateral symmetry, three germ layers, organ level of organization
- Tube-within-a-tube body plan
- Three distinct parts all molluscs have
- Visceral mass soft-bodied part that contains internal organs (digestive tract, paired kidneys, reproductive parts)
- Foot strong muscular portion used for locomotion
- Mantle membranous or muscular covering the envelops the visceral mass may secrete a shell (exoskeleton)
- Often have a rasping, tongue-like radula which has teeth and is used to obtain food



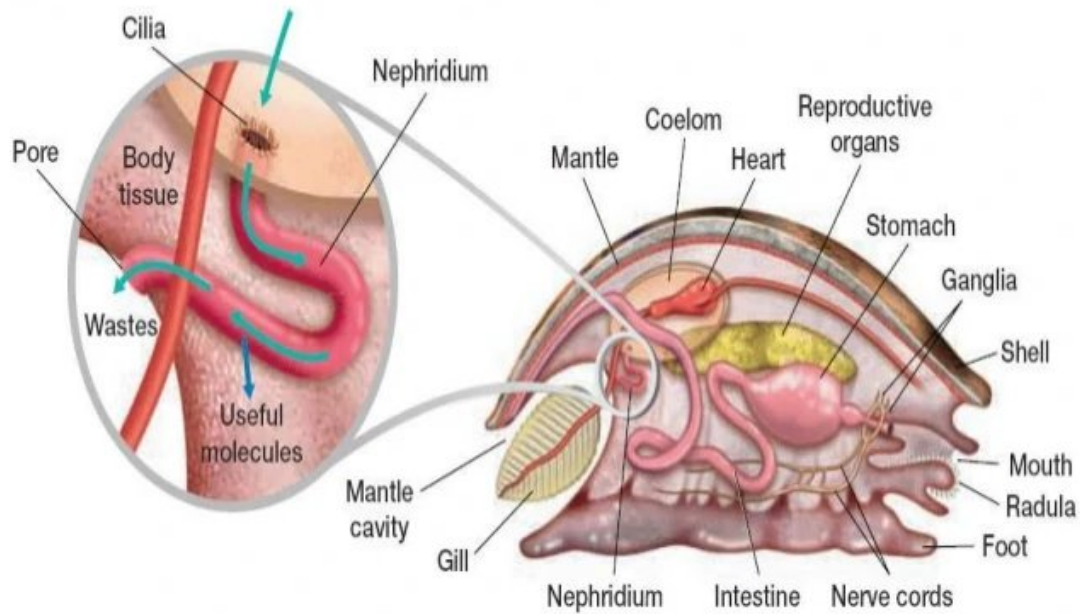


Figure: Structure of Bivalve

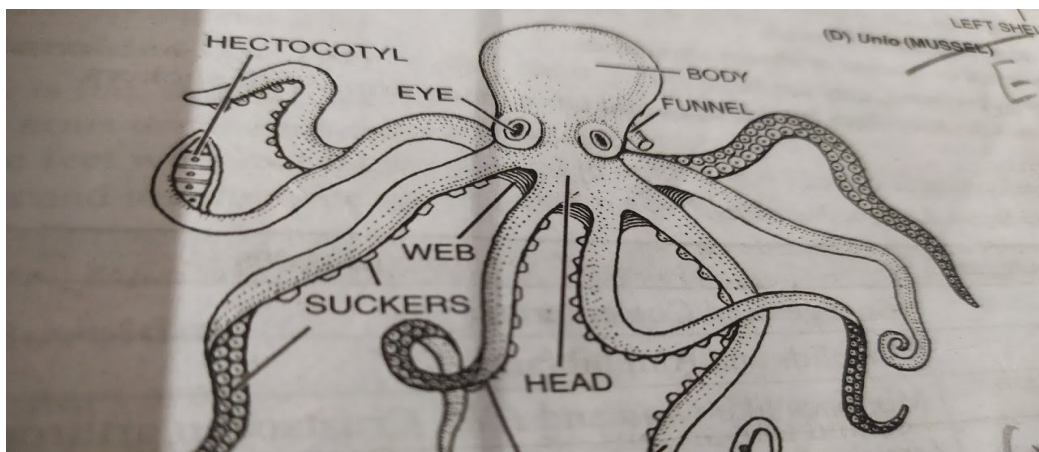


Figure: structure of octopus

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Practical 14:

Study of Principal Representative Classes of Phylum Annelida.

- Phylum Annelida that includes marine worms, leeches, earthworms
- Most are marine
- Segments are divided by septa
- Well-developed coelom that is fluid-filled and acts as a hydrostatic skeleton
- Permits each body segment to move independently
- Locomotion involves contraction expansion of each segment
- Tube-within-a-tube body plan with specialized digestive tract
- Includes a pharynx, esophagus, crop, gizzard, intestine, accessory glands

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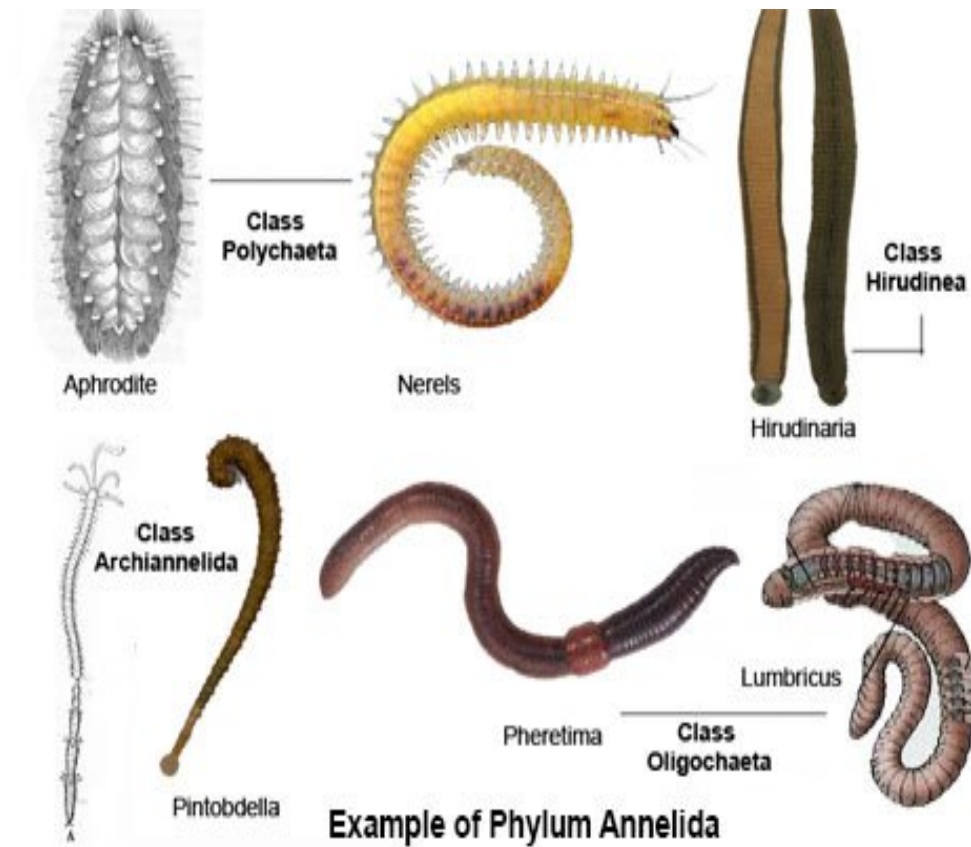
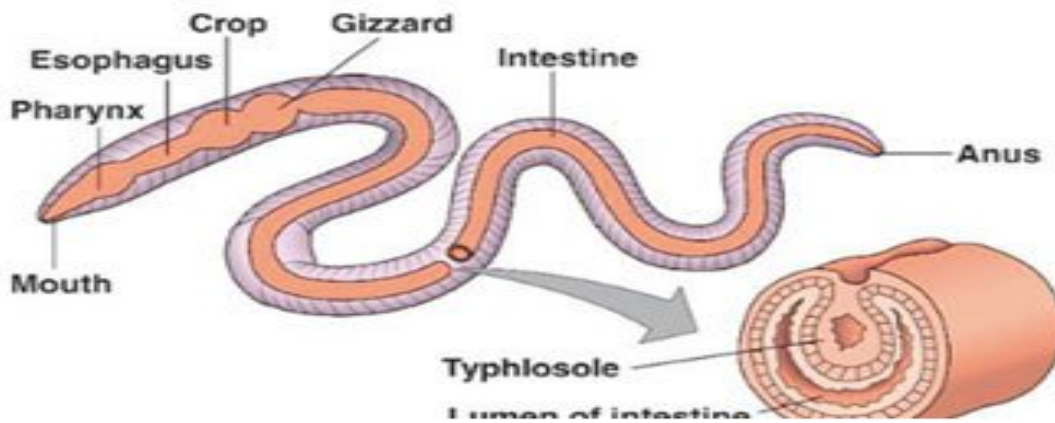
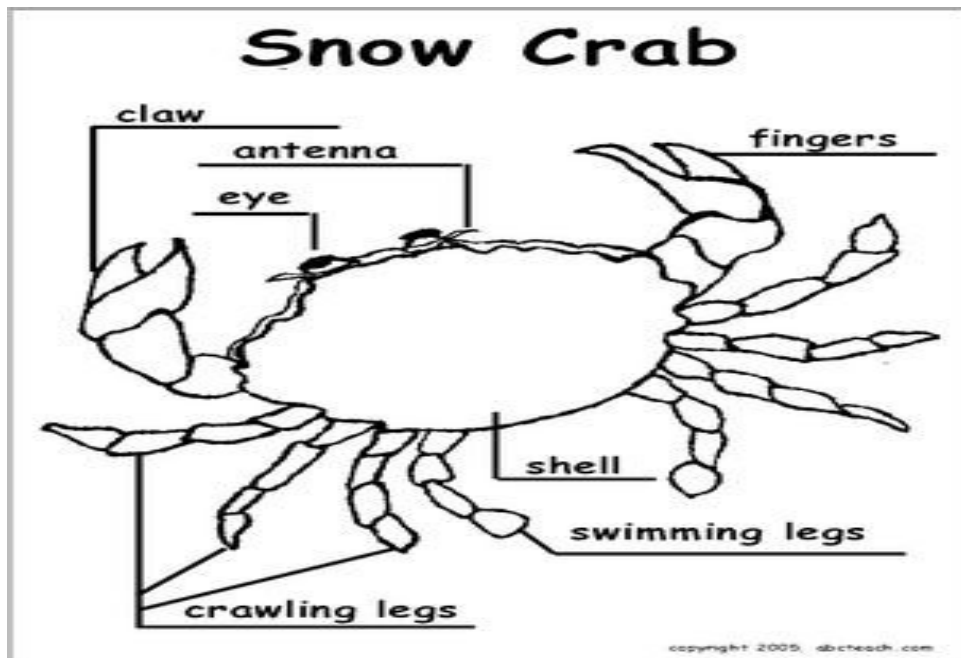


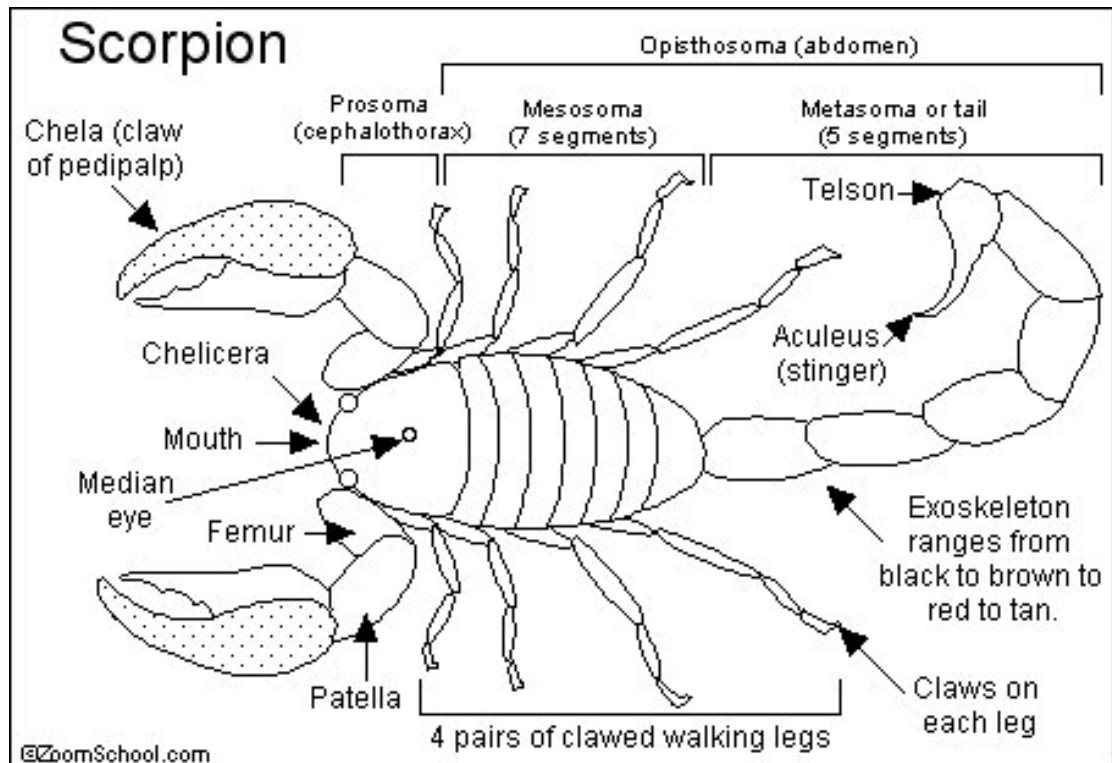
Figure: structure of earthworm

Practical 15:

Study of Principal Representative Classes of Groups of Phylum Arthropoda.

- Phylum Arthropoda that is divided into 3 subphyla
- Subphylum Crustacea barnacles, shrimps, lobsters, crabs (mostly marine)
- Subphylum Uniramia insects like bees, ants, termites
- Subphylum Chelicerata arachnids such as terrestrial scorpions, spiders, ticks, mites
- Have a jointed exoskeleton made of chitin
- Provides protection
- Attachment for muscles, Locomotion, Prevents drying out
- Must molt or shed exoskeleton as they grow larger
- Secretes new exoskeleton before molting
- Segmented body often fused into head, thorax, and abdomen
- Have specialized appendages for walking, swimming, reproducing, eating, sensory perception
- Well-developed nervous system with a brain solid nerve cord
- Head bear antennae two types of eyes (compound simple)
- Compound eye composed of many complete visual units that each operate independently





Practical 16:

Study of the representatives of the phylum Echinodermata

- ☞ These are exclusively marine animals.
- ☞ The larval forms show bilateral symmetry and adult forms show radial [symmetry](#).
- ☞ They are triploblastic.
- ☞ It exhibits organ system grade of [organisation](#).
- ☞ They have a true coelom.
- ☞ The body is uniquely shaped. It can star like, elongated or spherical.
- ☞ The body is unsegmented without a head.
- ☞ The body surface is covered with calcareous spicules.
- ☞ Body cavity has the distinguishing water vascular system.
- ☞ Tube feet help in locomotion.
- ☞ The brain is absent but a nervous system is present with a nerve ring and radial nerve cords.
- ☞ Respiration occurs through tube feet and gills.
- ☞ Sense organs are poorly developed and include tactile organs, chemoreceptors, terminal tentacles etc.
- ☞ Sexes are separate.
- ☞ Fertilization is external.
- ☞ Lost parts can be regenerated.

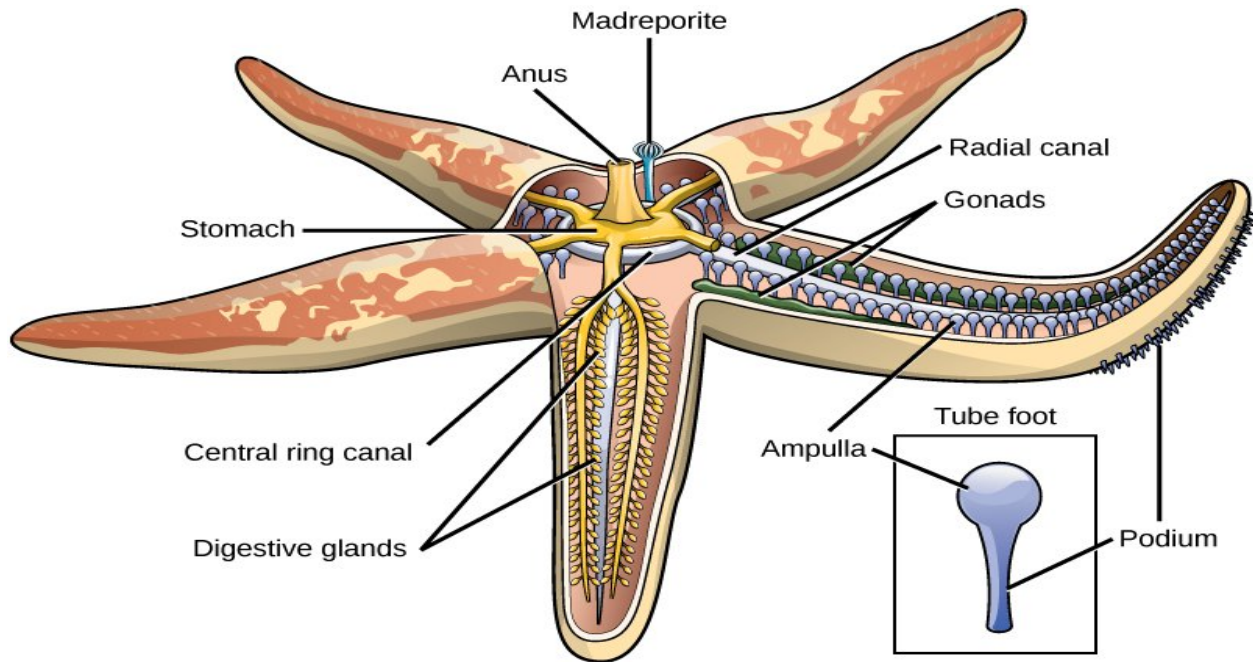


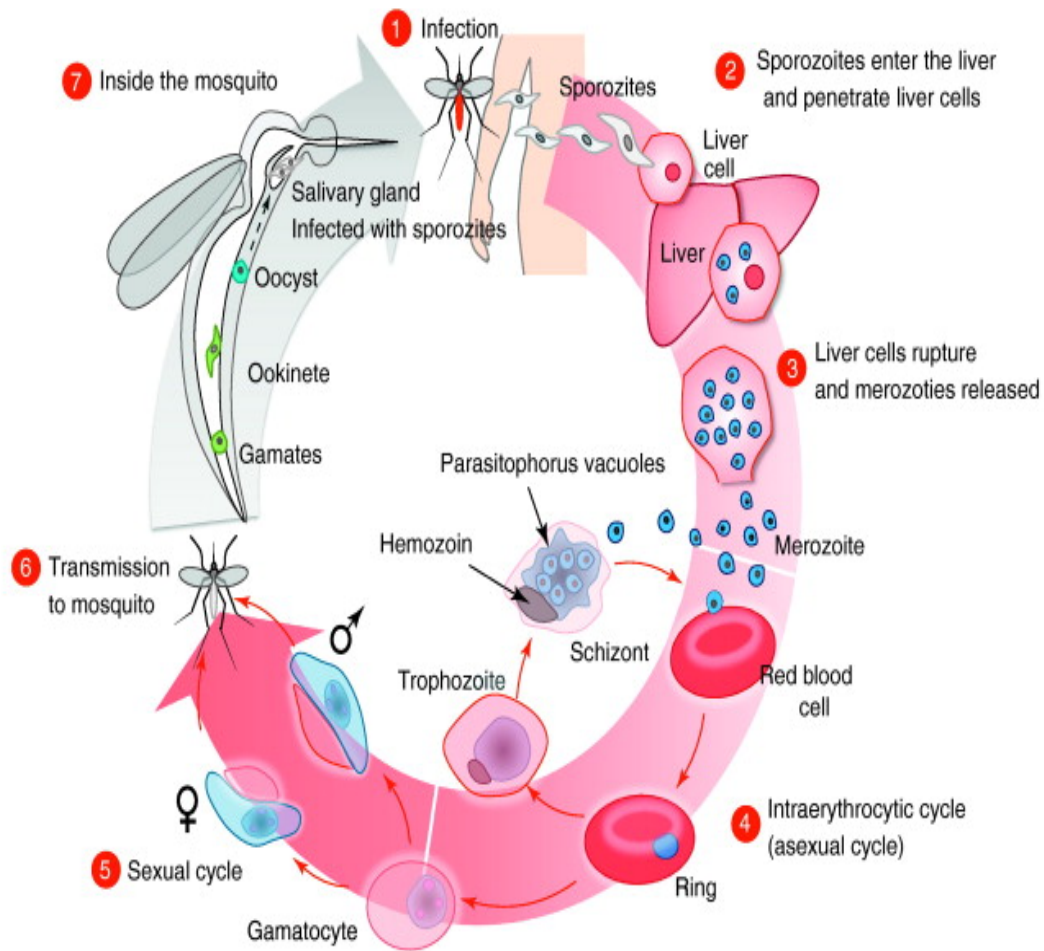
Figure: Structure of star fish

Practical 17

Brief Notes on Medical Importance of The Following.

i- Plasmodium

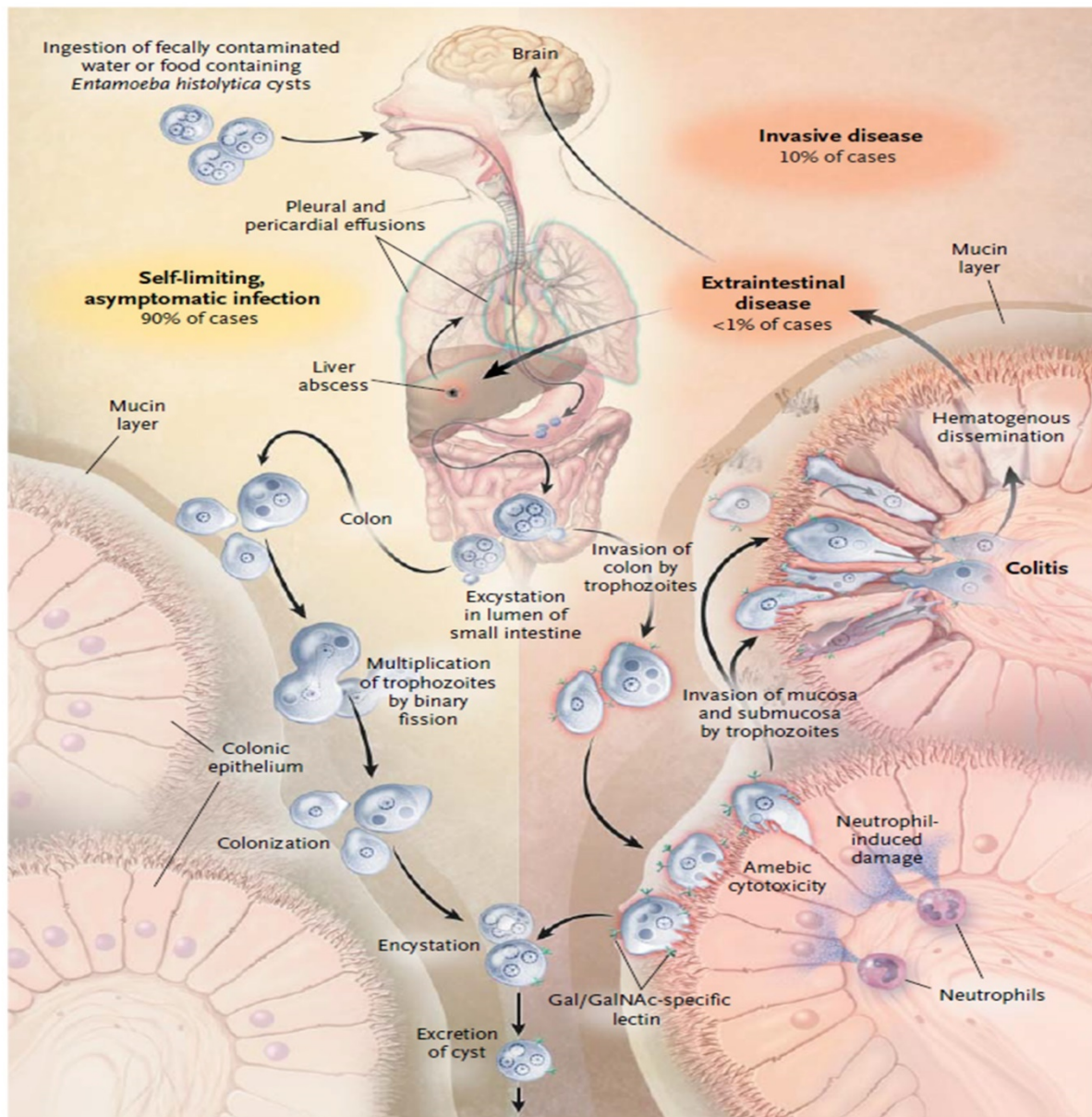
Plasmodium falciparum malaria parasite is the most life threatening, and accounting for the majority of malaria deaths in the developing world (WHO, 2005). One of the most important aspects of malaria is its negative economic importance on households.



TRENDS in Biotechnology

ii- Entamoeba Histolitica

Entamoeba histolytica is an invasive, pathogenic protozoan, causing amoebiasis, and an important cause of diarrhea in developing countries.



iii- Leishmania

Visceral leishmaniasis (VL) is a severe form of the leishmaniasis-disease complex. Its importance to public health relies on its high fatality rate in non-treated cases, the socio-economic impact related to its morbidity, and its endemicity on different continents.