

Jawale Chetan Suresh, Supriya Singh Gupta:

PRACTICAL HANDBOOK OF ZOOLOGY

F.Y.B.Sc. Zoology (ZO 123) According to S. P. P. University, Pune,

CBCS Syllabus w. e. f. 2019-20

Param Publication, India. 2016

EBook, ISBN: 9789384766078

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Practical No. 1:

MUSEUM STUDY OF PHYLUM PROTOZOA: EUGLENA, PARAMOECIUM, AURELIA, PLASMODIUM SP.

Phylum protozoa(Greek. Protos-First; zoan-animals)

Characteristic features:

1. **Habit and habitat:** Phylum protozoa include all small, acellular cellular or unicellular, microscopic organisms. They are *cosmopolitan* in nature. These are either free living fresh water forms or parasitic organism.
2. **Organization:** Protozoans exhibits **protoplasmic grade** of organization.
3. **Shape and size:** Protozoans are minute, small microscopic organisms showing variable shape and size.
4. **Body covering:** Body of some protozoans is covered by thin plasma membrane. In some protozoan plasma membrane is modified into thick flexible pellicle which is protective in nature.
5. **Cytoplasm:** Body protoplasm is differentiated into outer, thin, clear and dense ectoplasm and inner, thick, fluid like, semitransparent endoplasm.
6. **Nuclei:** Number of nuclei varies in phylum protozoa. Some are uninucleated e.g *Amoeba*; some are binucleated e.g *Paramecium* and some are multinucleated e.g *Opalina*.
7. **Digestions:** Digestion is intracellular as the process of digestion takes place within the cell in food vacuoles.
8. **Nutrition:** Protozoans feeds by various following means
Holozoic, Holophytic, Saprozoic, Saprophytic or Mixotrophic.
9. **Respiration and excretion:** both systems are wanting so it is done through general body surface by simple diffusion.
10. **Circulatory System:** Cytoplasm helps in circulations of different substances within organism as they are unicellular in nature.
11. **Nervous system:** Nervous system is totally absent.

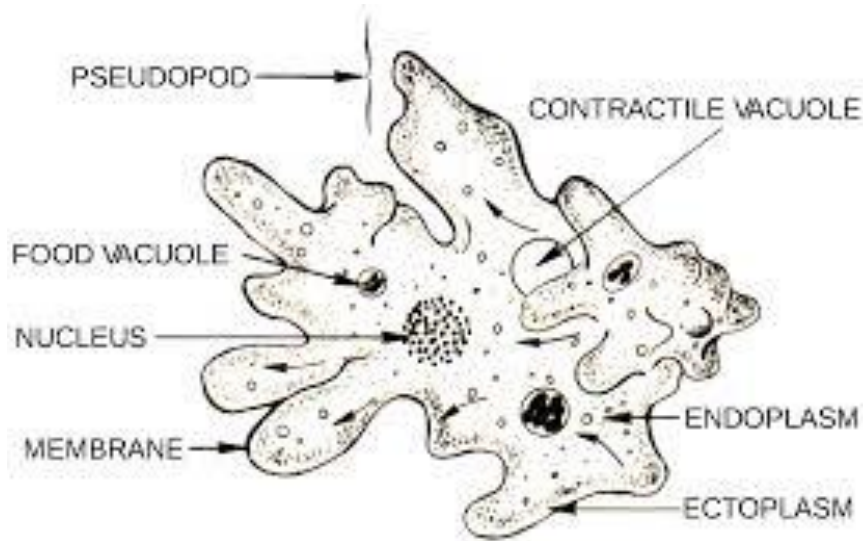
Reproduction: Protozoans reproduces both by asexual (Plasmotomy/ Fragmentation / Budding/ Binary fission/Multiple fission) as well as sexual (syngamy or conjugation or autogamy) method.

12. **Locomotion:** Different specialized organelles like flagella, cilia, pseudopodia are present for locomotion.
13. **Encystment:** It is an advanced character to overcome unfavorable climatic condition where organism forms a protective covering called cyst wall around the body.
14. **Osmoregulation:** Fresh water protozoans have a pair of contractile vacuole which helps in maintenance of water balance in cell body

Amoeba

Systemic Position

Kingdom	Protista	Unicellular Eukaryotes
Phylum	Protozoa	Unicellular, Primitive animals.
Sub Phylum	Sarco-mastigophora	Locomotion either by flagella or Pseudopodia
Class	Sarcodina	Creeping amoeboid forms with lobopodia as locomotory organ
Genus	<i>Amoeba</i>	



Comments:

1. Freshwater Protozoan.
2. It is colorless translucent and irregular in shape.
3. Locomotion is by formation of temporary finger like projections called- **pseudopodia**.
4. Nutrition is Holozoic.
5. Single nucleus and contractile vacuole are present.
6. Reproduction is by asexual method (Binary fission and multiple fission)

Euglena

Systemic Position

Kingdom	Protista	Unicellular Eukaryotes
Phylum	Protozoa	Unicellular, Primitive animals.
Sub Phylum	Sarco-mastigophora	Locomotion either by flagella or Pseudopodia
Class	Mastigophora	Plant like flagellates, food is

reserved as starch.

Genus

Euglena

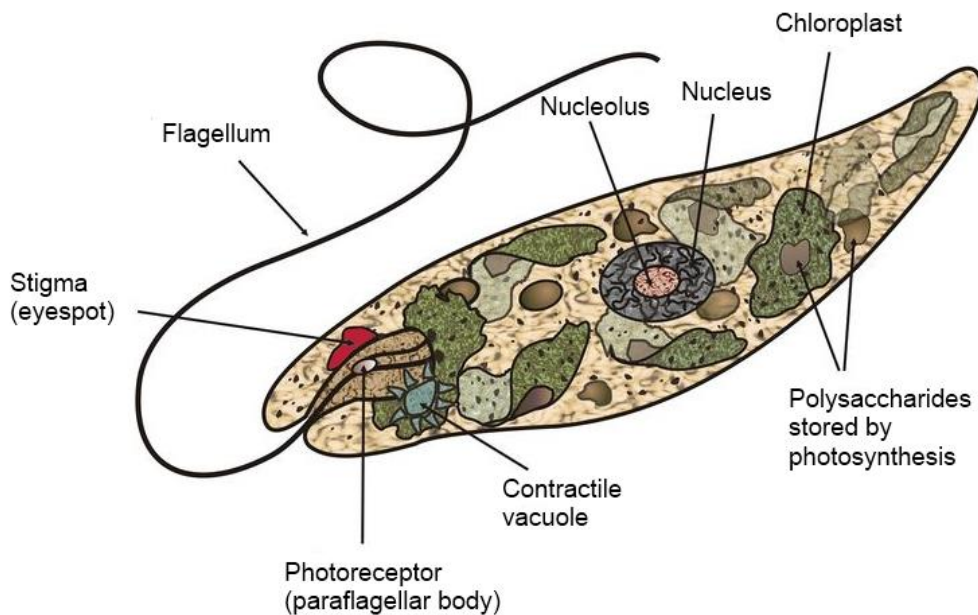


Fig: A diagram of *Euglena*

Comments:

1. Freshwater green flagellate.
2. Body is elongated spindle shaped with whip like single long flagella.
3. It measures 50 -100 micron in length.
4. Flexible and firm shape is attributed to pellicle.
5. It is a chloroplast bearing protozoan.
6. Nutrition is holophytic with starch as a food reservoir.
7. Reproduction is only by longitudinal binary fission.

Paramoecium

Systemic Position

Kingdom	Protista	Unicellular Eukaryotes
Phylum	Protozoa	Unicellular, Primitive animals.
Class	Ciliata	Cilia present over body as locomotory
Genus	<i>Paramoecium</i>	
Species	<i>caudatum</i>	

Comments:

1. It is commonly called as slipper animalcule.
2. Body shape is similar to the sole of a slipper with tapering posterior end and rounded anterior end.
3. Body is entirely covered with cilia and has elongated ciliary tuft at the caudal end.
4. Ventral side has an oral groove.
5. Cytoplasm is divided into ectoplasm and endoplasm.
6. Ectoplasm contains infra ciliary system, basal bodies and trichocyst.
7. Endoplasm contains two nuclei (macro and micro), two contractile vacuoles, food vacuoles and other eukaryotic organelles.
8. Locomotion is done by cilia.
9. Reproduction is either asexual (transverse binary fission) or sexual (conjugation/autogamy).

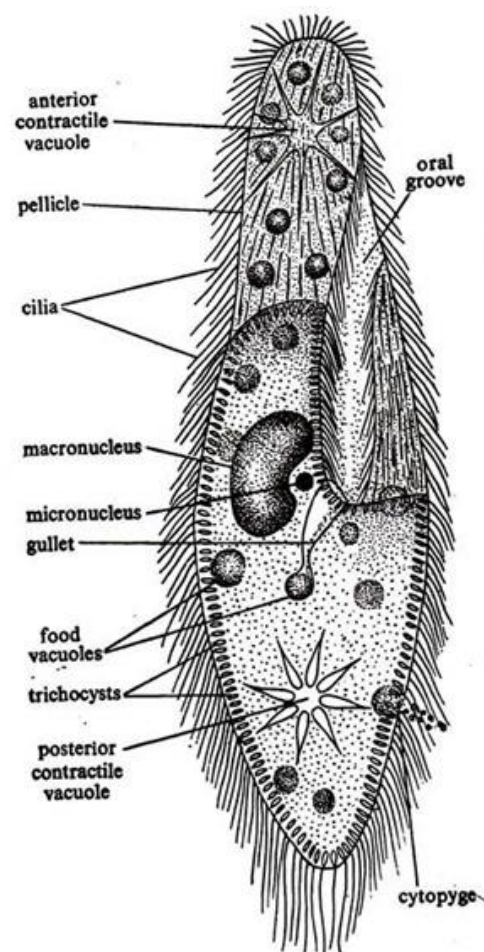


Fig. *Paramoeciumcaudatum*, showing internal organization

Plasmodium

Systemic Position

Kingdom	Protista	Unicellular Eukaryotes
Phylum	Protozoa	Unicellular, Primitive animals.
Class	Sporozoa	parasitic form, locomotory organelles absent, spores simple
Genus	<i>Plasmodium</i>	

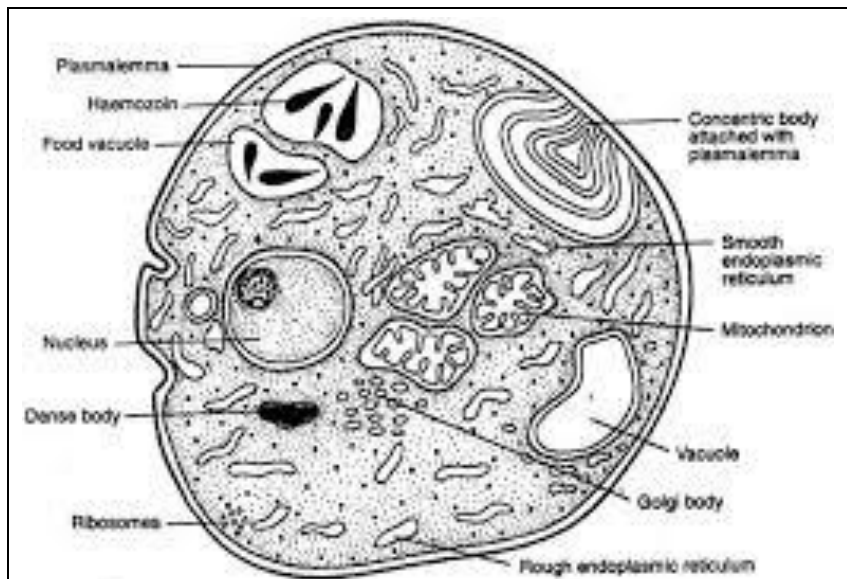


Fig: EM of Trophozoids of Plasmodium in RBC

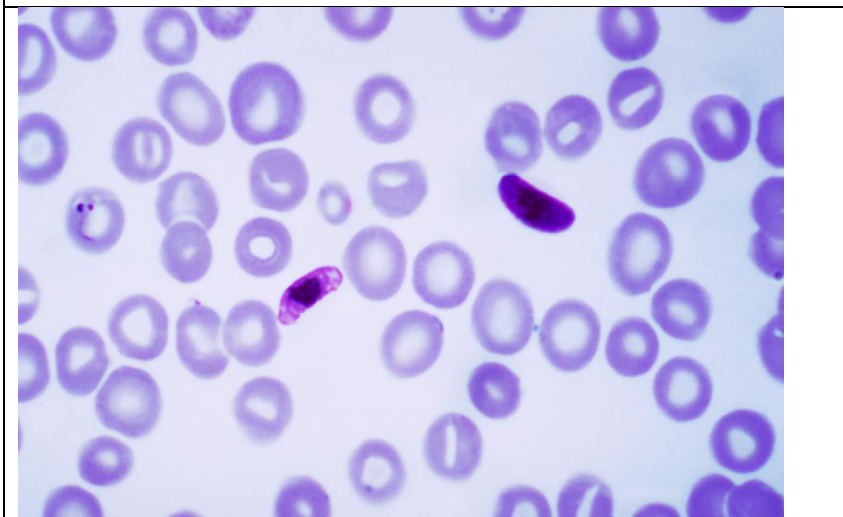


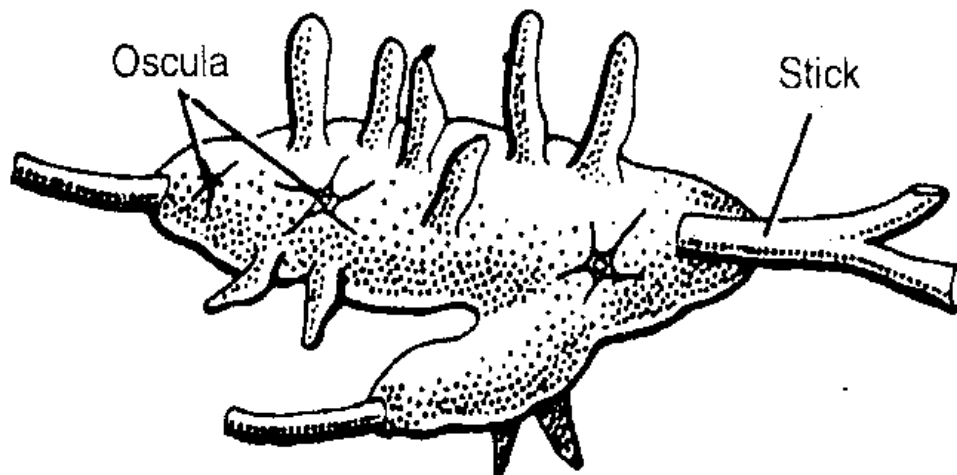
Fig: *Plasmodium falciparum* in Human blood smear.

Comments:

1. Plasmodium is commonly called as malarial parasite.
2. It needs two hosts to complete its life cycle i.e. man and female Anopheles mosquito.
3. Its infective stage to man is named Sporozoite.
4. Cryptozoites are formed in liver, out of which some enters into R.B.Cs to undergo multiple fission to form merozoites. These merozoites transform into male and female gametocytes. From blood they are sucked by female anopheles. Gametocytes in mosquito fuse to form a zygote, which forms sporozoites.

Spongilla

Phylum	Porifera	Pore bearing, cellular grade of organization
Class	Demospongia	Skeleton consist of sponging fibers or siliceous spicules or both.
Genus	<i>Spongilla</i>	



Comment:

1. It is a fresh water sponge found in lakes, ponds, streams etc.
2. It is green in colour due to the presence of a symbiont *Zoochlorellae* (green algae).
3. Body surface has numerous ostia and several osculate.
4. Endoskeleton is made up of siliceous spicules and spongin fiber.
5. Canal system is rhagon type.
6. Reproduction is by both sexual (gametes) as well as asexual (gemmules) mode.

Practical No. 2:

MUSEUM STUDY OF PHYLUM PORIFERA: SYCON, EUPLECTELLA, CHALINA, SPONGILLA.

Phylum Porifera (Greek :Poris-pores; fera- to bear, phylum of Sponges.)

1. **Habit and habitat:** Poriferans are aquatic animals present in both fresh and marine water bodies.
2. **Shape and Size:** Body form is either vase- like, cylindrical, cup shaped, globular or irregular.
3. **Symmetry:** Most of the poriferans are **asymmetrical** in nature while few which are cylindrical or vase-like show radial symmetry.
4. **Colour:** Body colour varies greatly from grey, brown, yellow, green, red, pink or black.
5. **Organization:** Sponges are primitive multicellular organism showing **cellular grade of organization**. Body of poriferans is made up of loose aggregation of cells without tissue formation.
6. **Body Covering:** Body of poriferans is made up of two layers ectoderm (pinacoderm) is made up of cells called Pinacocytes, endoderm (choanoderm) is made up of cells called Choanocytes and in between two is a noncellular layer called mesoglea.
7. **Coelom:** Coelom is absent and hence animals are commonly called Acoelomata. These organisms possess internal body cavity called spongocoel.
8. **Pores/Body opening:** Outer layer of the poriferans shows many small, minute opening called **ostia** through which water enters into the body continuously. Few large pores called **osculum** are also present through which water exit the body of organism.
9. **Skeleton:** Sponges show presence of internal organic skeleton in the mesoglea. It is seen as fine flexible fibers called **Spongin fibers** while in others it is in the form of thin needles called **spicules**. Spicules are made up of calcium carbonate or silica. Depending on the chemical nature they are called calcareous or silicious spicules. Spongin fiber is made up of protein-spongin.
10. **Canal System:** It is the space or canal through which water flows within sponge body. This helps in exchange of material between sponge and

outer environment. Water enters the sponges through ostia and through canal reaches Spongocoel. It moves out of body through anterior large opening called osculum

11. **Digestion:** Mouth and Digestive cavity are absent. Poriferans feed on the small micro-organisms which enter their body by diffusion. Digestion is intracellular.
12. **Respiration:** Respiration is done by simple diffusion of gases (oxygen and carbon dioxide) between cells and water.
13. **Excretion:** Excretory product is Ammonia which is released out by simple diffusion in water, which is taken out of the body through osculum.
14. **Circulatory system:** True Circulatory system is absent.
15. **Nervous system:** Nervous system is absent.
16. **Reproduction:** reproduction is by either Asexual mode (Fragmentation/Budding/ gemmules) or Sexual mode. Poriferans are either unisexual/dioecious or Monoecious/ hermaphrodite in nature. Archeocytes in favourable conditions give rise to sex cells (either sperm or ovum).
17. **Fertilization:** Fertilization is internal and is always cross fertilization. Cleavage is holoblastic.
18. **Development:** Development is indirect i.e they show presence of free swimming larval stage (amphiblastula or Parenchymula) in their life cycle.
19. **Regeneration:** Regeneration is phenomenon of replacement of lost body parts by animals. It is very well developed in Poriferans.

Sycon

Phylum	Porifera	Pore bearing, cellular grade of organization
Class	Calcarea	endoskeleton of calcareous spicules
Genus	Sycon	

1. It is a Marine sponge.
2. Body is slender vase shaped measuring around 2-3 cms.
3. Body surface is perforated by numerous ostia and a large osculum at the free end.
4. Canal system is syconoid.
5. Reproduction is by asexual and sexual methods.

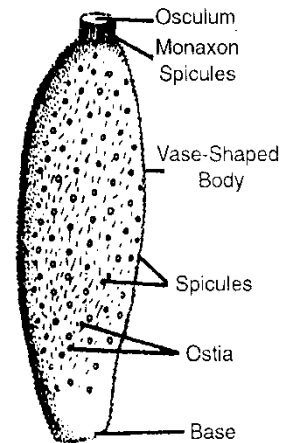


Figure :Sycon

Euplectella

Phylum	Porifera	Pore bearing, cellular grade of organization
Class	Hexactinellida	Skeleton consist of siliceous spicules
Genus	<i>Euplectella</i>	

Comment:

1. *Euplectella* is commonly called as venus flower basket
2. Numerous ostia are present on the long, curved, cylindrical body.
3. It is attached to the surface of mud and measures 15-30 cm in length.
4. A beautiful 3D interlaced network of 6 rayed spicules is present.
5. Osculum is closed with a sieve plate.
6. It displays an interesting commensal relation with shrimps. The young shrimp enters in the sponge to feed. It grows their and then trapped as the increased size of shrimp now doesn't allow it leave the spongocoel of *Euplectella*. This lifelong bonding has made it a popular wedding gift in Japan.

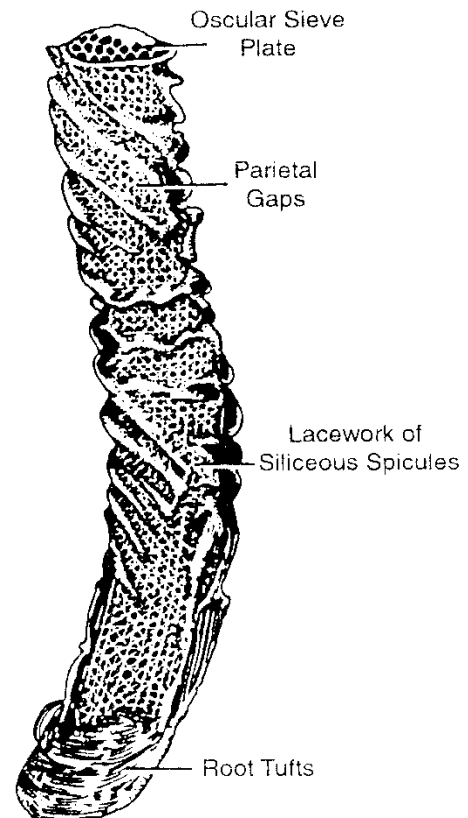


Fig. Euplectella

Chalina

Phylum	Porifera	Pore bearing, cellular grade of organization
Class	Demospongia	Skeleton consist of sponging fibers or siliceous spicules or both.
Genus	<i>Chalina</i>	

Comment:

1. It is commonly called as dead man's finger/mermaid's gloves.
2. It is yellow to red in colour.
3. Body surface is flat with finger like branches protruding.
4. Body surface has numerous ostia and several oscula.
5. Canal system is leucon type.
6. Reproduction is by both sexual (gametes) as well as asexual (budding /regeneration) mode.

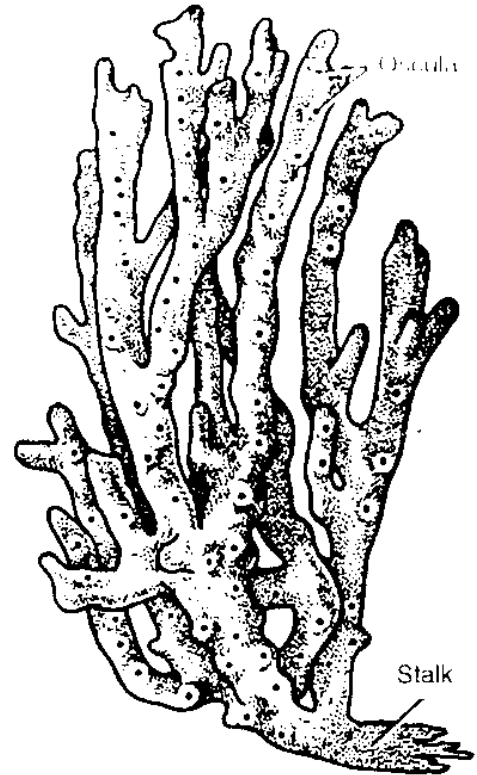


Fig: Chalina

Practical No. 3:

AIM: MUSEUM STUDY OF PHYLUM COLEENTERATA: HYDRA, PHYSALIA, AURELIA, METRIDIDIUM

Phylum: Colenterata/ Cnidaria (knide-nettle; aria - like)

1. It is also called *coelenterata* (Greek: coel – cavity; enteron - intestine)
2. Habit and habitat: These are aquatic organism, most of them belonging to marine water except some organisms of class ‘hydrozoa’. They are solitary/colonial and sedentary/free swimming organism.
3. Germ layer: These are diploblastic in nature showing presence of outer ectoderm and inner endoderm. In between these 2 layers a non-cellular jelly layer called *mesoglea* is present.
5. Body cavity: These organisms have ‘coelenteron’ or *Gastro Vascular Cavity* (GVC).
6. Body form: They exhibit various body forms i.e. filamentous, fan-like, vase-like, umbrella-like or plant-like cylindrical.
7. Body wall: It is diploblastic. Body wall is made up of 2 layers, Outer ectoderm consisting of stinging cells, Inner endoderm or *gastroderm* and an intermediate acellular layer called mesoglea.
8. Coelom: Coelom is absent. Cnidarian are *acoelomates*.
9. Cnidoblast/Nematocysts/Stinging cells: These are modified epithelial cells which are present in cnidarians and are useful in offence or defense. These are also useful in adhesion and food capture.
10. Polymorphism: Coelenterates or cnidarians have 2 different types of Individuals called ‘zooids’. They are either tube-like ‘polyps’ or saucer shaped ‘medusae’.
11. Organization: Cnidarians exhibit tissue level of organization.
12. Digestion: digestion is extra cellular in the gastro vascular cavity, as the inner wall secretes digestive enzymes into GVC.
13. Respiration: Respiration is by general body surface by simple diffusion which helps in exchange of gases.
14. Circulation: Circulatory system is absent.
15. Excretion: Cnidarians are ammoniotelic in nature and excretes ammonia by diffusion. General body surface helps in elimination of excretory waste.
16. Nervous system: Diffused or scattered primitive unpolarized nerve cells or ‘neuritis’ are present which brings about control and co-ordinations in organism.

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