

**Model Answer of Question Paper: AU-6892**

**LZC 101: Animal Diversity- I (Non Chordates)  
B. Sc. First Semester  
Department of Zoology,  
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**Section A: Multiple Choice Questions**

**(1X10=10)**

1. Binomial Nomenclature was given by **b) Carolus Linnaeus**
2. Anaima includes **c) Insects and Spiders**
3. External and internal Metamerism found in **b) Earthworm**
4. Psuedocoelomate animals belongs to phylum **a) Nematodes**
5. Primitive and simplest type canal system is **c) Ascon type**
6. Ascaris belong to class **d) Phasmida**
7. Egestion in paramecium takes place by **a) Cytopyge**
8. In arthropods respiration takes place by **d) All of the above**
9. During binary fission animal divide into **b) 2 daughter organisms**
10. Wiggler is the larval stage of **a) Mosquito**

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**Section B: Descriptive type questions**

**(4X5=20)**

**Question No 1: What is species? Define its character and types.**

**Answer:**

Species is a population of such organisms, which have gene pool, and have similar adaptations to the environment and possess the capacity to change into new species through organic evolution.

Mayer (1942) has defined species as a population of interbreeding individuals.

**Characters of species:**

- Each species possess a common gene pool with a free genetic flow
- Each species is in a process of continuous adjustment to its environment

- Each species occurs in an ecological niche
- Each species possess isolating mechanism that directly or indirectly prevent exchange of genes with related species.
- Each species has the capacity to give rise to new species.

### **Types of species:**

**Agamospecies:** Reproducing asexually

**Sympatric species:** Two or more species living in a common habitat.

**Allopatric species:** Two or more species living in a different habitat.

**Synchronic species:** Two or more species found in the same period.

**Allochronic species:** Two or more species found in different time period.

**Paleospecies or paleontological species:** Species are now available in the form of fossils; it is also called as fossil species.

**Neontological species:** Species are found living at present.

**Polytypic species:** Species which are found in more than one subspecies.

**Sibling species:** These are allopatric species which are morphologically similar but are found in different habitats.

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### **Question No 2: What is symmetry? Describe its types with suitable examples.**

#### **Answer:**

Symmetry means an arrangement of body parts into geometrical designs. It refers to the division of body into equal parts by lines or planes. An animal is called as symmetrical when a plane passing through its centre will divide it into similar halves. When an animal cannot be divided into like parts by a plane, it is called as asymmetrical. Examples of asymmetrical animals are most sponges, some protozoa (amoeba) and few others. Certain terms are related to symmetry such as;

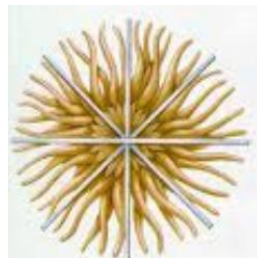
**Axis:** an axis is an imaginary line passing through the centre of the body, such as longitudinal axis and oral-aboral axis.

**Pole:** Either end of the axis is called as pole.

**Plane:** Straight line that divides organisms into corresponding halves.

#### **Types of symmetry:**

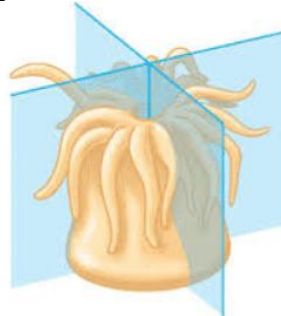
1. **Spherical symmetry:** It is found in the animals whose body has the shape of a sphere. All planes that pass through the centre will cut it into similar halves. Some protozoans (e.g. Volvox, Heliozoa, Radiolaria) have spherical symmetry, and it is adapted for free-floating or rolling movements.



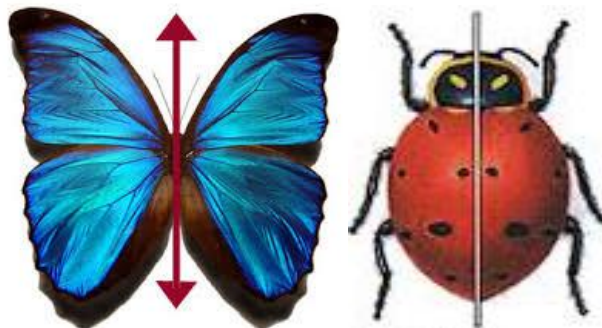
2. **Radial symmetry:** The body is in the form of a flat or tall cylinder. Many similar body parts, called antimers, are arranged around one main central or longitudinal axis in a circular or radiating manner like the spokes of a wheel. All the lines passing through this longitudinal axis, in any plane will divide the body into equal halves or antimers. The surface having mouth is called as oral surface and the opposite surface is the aboral surface. Examples are echinoderms and coelenterates (e.g. Hydra).



3. **Biradial symmetry:** It is a variant form of radial symmetry found in ctenophora and most anthozoa (e.g. anemones), and is best fitted for a floating life. Such symmetry has only two pairs of symmetrical sides. There are only two planes of symmetry, one through the longitudinal and sagittal axis and other through the longitudinal and transverse axis, which will divide the animal into two equal halves.



4. **Bilateral symmetry:** In higher animals, the longitudinal axis of body runs from the anterior end (head) to the posterior end (tail). There is a single plane, the median longitudinal or sagittal plane, through which the body can be divided into two similar right and left halves. This is called as bilateral symmetry. Bilateral symmetry is characteristic of the most successful and higher animals. e.g. Platyhelminthes.



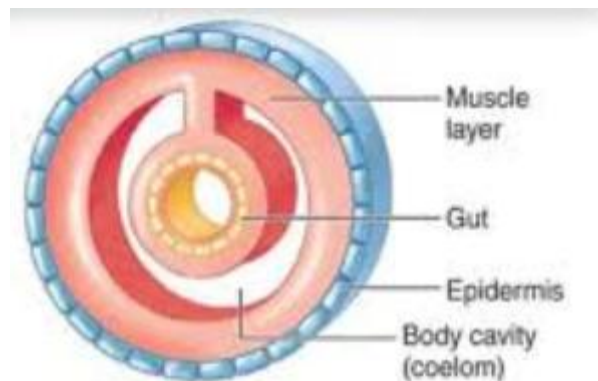
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**Question No 3: Briefly describe any two:**

**Answer:**

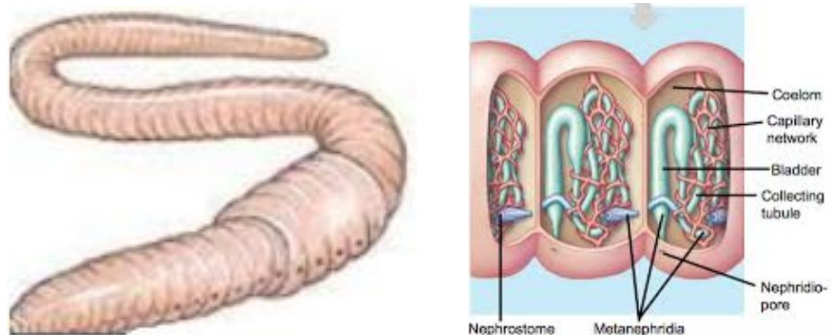
**a. Secondary coelom**

The **Coelom** refers to the main body cavity in most multicellular animals and is positioned inside the body to surround and contain the digestive tract and other organs. In more highly developed bilateria, the blastocoel is gradually obliterated by the archenteron. Secondly a new cavity or true coelom develops within the embryonic mesoderm and is lined outside by somatic mesoderm and on inner side by splenchnic mesoderm (Peritonium).



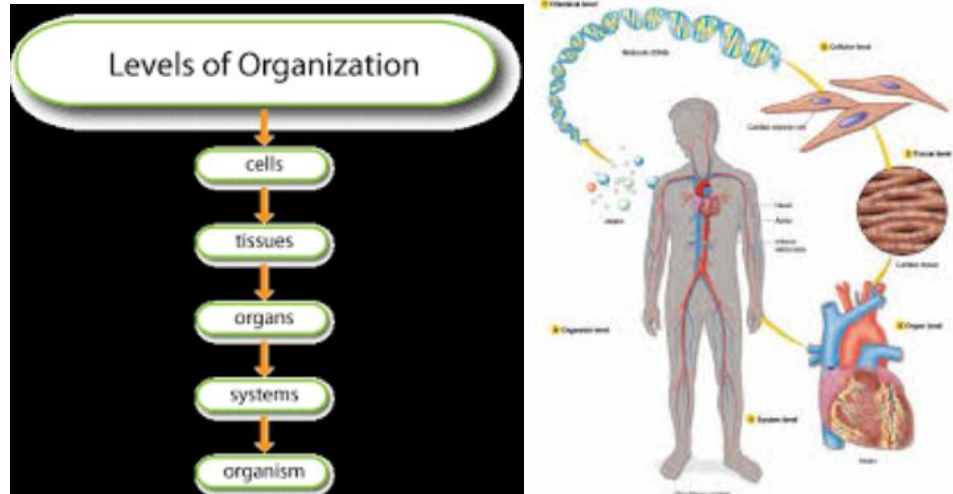
**b. Complete metamerism**

In complete metamerism, the segmentation of the body is based on the segmentation of mesoderm. New segments are formed at the posterior end (in front of the anal segment). Hence the youngest segments occur at the anterior end. The segments work in co-operation with all other segments. Complete Metamerism is found in Annelids, Arthropods & Chordates.



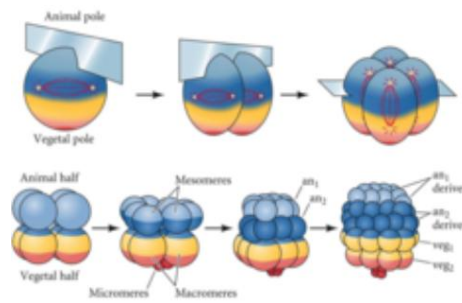
**c. Tissue organ level organization**

Here the organisms are made up of cells that are similar in structure and function and which work together to perform a specific activity. Examples - blood, nervous, bone etc.



**d. Radial cleavage**

Radial cleavage is characteristic of the deuterostomes, which include some vertebrates and echinoderms, in which the spindle axes are parallel or at right angles to the polar axis of the oocyte. It is characterized by arrangement of the blastomeres of each upper tier directly over those of the next lower tier resulting in radial symmetry around the pole to pole axis of the embryo.



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**Question No 4: Give an account on Polymorphism.**

**Answer:**

**POLYMORPHISM**

Occurrence in the same species of more than one type of individuals, which differ in form and function, is known as polymorphism. This ensures an efficient division of labour between the several individuals.

There are two basic forms of polymorphism:

1. Polyps- A polyp has a tubular body with a mouth surrounded by tentacles at one end. There end is blind and usually attached by a pedal disc to the substratum.
2. Medusa- A medusae has a bowl or umbrella-shaped body with marginal tentacles and mouth centrally located on a projection of the lower concave surface.

Importance of polymorphism:

- Polymorphism is essentially a phenomenon of division of labour.
- Different functions are assigned to different individuals, rather than to parts or organs of one individual.
- Polyps are concerned with feeding, protection and asexual reproduction while medusa are concerned with sexual reproduction.

Patterns of polymorphism:

1. Dimorphic- Simplest and commonest pattern of polymorphism. They have only two types of zooids (individuals)
  - Gastrozooids or hydranths are concerned with feeding.
  - Gonozooids or blastostyles with asexual budding forming sexual medusa or gonophores.

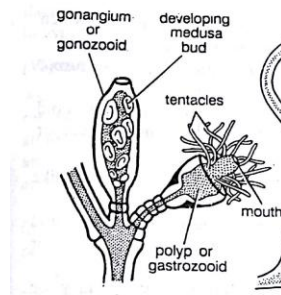
Such colonies bearing two types of individuals are called dimorphic and the phenomenon is termed dimorphism. Example- Obelia, Tubularia etc.

2. Trimorphic- They have three types of zooids
  - Gastrozooids
  - Gonozooids
  - Dactylozooids which are functionally non-feeding and defensive polyps bearing batteries of nematocysts.Example- Plumularia

3. Polymorphic- Coelenterates having more than three types of individuals are called polymorphic. Example- Hydractinia with five types of polyps each performing a specialized function. These are
  - Gastrozooids for feeding
  - Dactylozooids for protection
  - Tentaculozooids with sensory cells
  - Skeletozooids as spiny projections of chitin
  - Gonozooids or reproductive individuals, bearing male or female gonophores.

**Polymorphism** in biology occurs when two or more clearly different phenotypes exist in the same population of a species—in other words, the occurrence of more than one *form* or *morph*. In order to be classified as such, morphs must occupy the same habitat at the same time and belong to a panmictic population (one with random mating). Polymorphism as described here involves morphs of the phenotype. Polymorphism is common in nature; it is related to biodiversity, genetic variation and adaptation; it usually functions to retain variety of form in a population living in a varied environment. For example, in *Obelia* there are feeding individuals,

the **gastrozooids**; the individuals capable of asexual reproduction only, the **gonozooids**, **blastostyles** and free-living or sexually reproducing individuals, the medusae.



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**Question No 5: Give the general characters of phylum annelida and classify with suitable example.**

**Answer:**

#### **GENERAL CHARACTERS OF ANNELIDA**

1. Mostly aquatic, some terrestrial. Burrowing or tubicolous. Some commensal and parasitic.
2. Body is elongated, cylindrical, bilaterally symmetrical and triploblasti.
3. Animal possess true coelom means body cavity is lined by mesoderm.
4. Coelom divided into compartments by transverse septa. Coelomic fluid with cells or corpuscles.
5. Whole body divided into several equal parts or metamers that is termed as metamericly segmented.
6. Epidermis is single layer and made up of columnar epithelial cells. Epidermis or outer layer is externally covered by a thin cuticle.
7. Body wall dermo-muscular. Outer muscle fibres circular, inner longitudinal.
8. Locomotory organs are segmentally repeated chitinous bristles, called setae or chaetae, embedded in skin. May be borne by lateral fleshy appendages or parapodia.
9. Digestive system straight and complete. Digestion entirely extracellular. In earthworm undigested food and soil eliminated through anus to outside in the form of worm castings.
10. Blood vascular system closed. Respiratory pigments either haemoglobin or erythrocrurin dissolved in blood plasma.
11. Respiration by moist skin or gills.
12. Excretory system consisting of metamericly disposed coiled tubes, called nephridia.
13. Nervous system with a pair of cerebral ganglia (brain) and a double ventral nerve cord bearing ganglia and lateral nerves in each segment.
14. Sensory organs include tactile organs, taste buds, statocysts, photoreceptor cells and sometimes eyes with lenses in some.
15. Hermaphroditic or sexes separate. In earthworm 2 pair testes and one pair ovaries are present.
16. Cleavage spiral and determinate. Larva, when present, is a trochophore.
17. Regeneration common.

## PHYLUM ANNELIDA

Class Polychaeta	Class Oligochaeta	Class Hirudinea	Class Archiannelida
<p>Chiefly marine, some in fresh water.</p> <p>Segmentation internal and external.</p> <p>Head distinct with eyes, palps and tentacles.</p> <p>Setae numerous, on lateral parapodia.</p> <p>Clitellum absent.</p> <p>Sexes separate. Gonads temporary and in many segments. Trochophore larva present.</p> <p>Example-Arenicola, Amphitrite.</p>	<p>Mostly terrestrial, some in fresh water.</p> <p>Segmentation external and internal.</p> <p>Head indistinct, without sensory organs.</p> <p>Setae few, embedded in skin. Parapodia absent.</p> <p>Glandular clitellum present for cocoon formation.</p> <p>Hermaphroditic. Testes anterior to ovaries. Fertilization external (in cocoon). Development direct, no larval stages.</p> <p>Example-Pheretima, Tubifex.</p>	<p>Freshwater, marine or terrestrial. Generally ectoparasitic, blood-sucking or carnivorous.</p> <p>Body with fixed number of segments (33). Each segment subdivided externally into annuli.</p> <p>Segmentation external without internal septa. Parapodia and setae absent. Both anterior and posterior ends of body with suckers.</p> <p>Hermaphroditic with one male and female gonophores. Fertilization internal. Development in cocoons, direct without larval stages.</p> <p>Example- Hirudinaria.</p>	<p>About one dozen genera of small, marine worms of unknown affinities.</p> <p>Segmentation chiefly internal. No parapodia and satae.</p> <p>Sexes usually separate. Usually trochophore larva.</p> <p>Example- Polygordius.</p>

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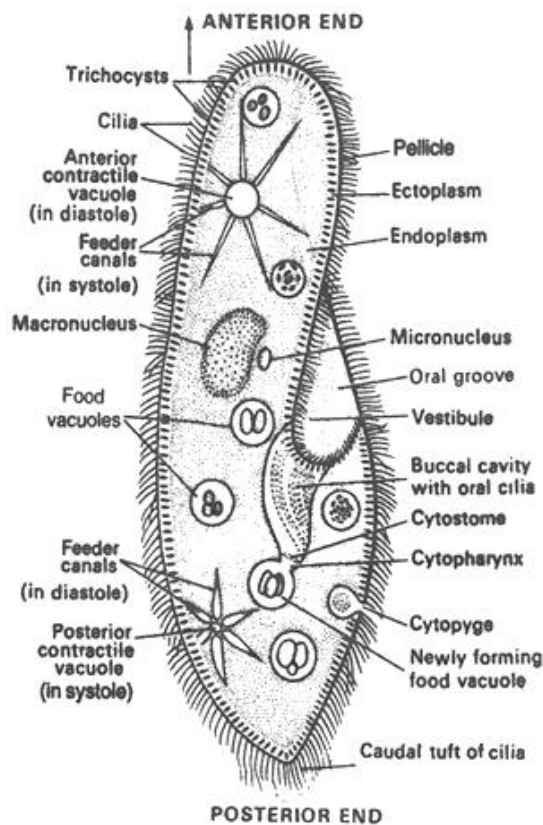
**Question No 6:** Give an account on intracellular pattern of digestion in *Paramecium*.

**Answer:**

*Paramecia* feed on microorganisms like bacteria, algae, and yeasts. To gather food, the *Paramecium* uses its cilia to sweep prey organisms, along with some water, through the oral groove, and into the mouth opening. The food passes through the cell mouth into the gullet.

**Feeding Apparatus:** It consists of a shallow and wide peristome (= oral groove), a funnel-like vestibule, somewhat S-shaped buccal cavity which opens through a cytostome (= cell mouth), into a short cytopharynx. The latter ends in the endoplasm. A temporary opening is called cytopyge (= cytoproct or cell anus), is present a little behind the cytostome. Undigested food is passed through cytopyge.

When enough food has accumulated at the gullet base, it forms a vacuole in the cytoplasm, which then begins circulating through the cell, starting at the back end. As it moves along, enzymes from the cytoplasm enter the vacuole to digest the contents; digested nutrients then pass into the cytoplasm, and the vacuole shrinks. When the vacuole, with its fully digested contents, reaches the anal pore, it ruptures, expelling its waste contents to the environment.



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**Question No 7: Write short note on any two of the following:**

**Answer:**

### Locomotion in Hydra

*Hydra* are generally sedentary or sessile, but do occasionally move quite readily, especially when hunting. They do this by bending over and attaching themselves to the substrate with the mouth and tentacles and then release the foot, which provides the usual attachment, this process is called looping. The body then bends over and makes a new place of attachment with the foot. By this process of "looping" or "somersaulting", a *Hydra* can move several inches in a day. *Hydra* may also move by amoeboid motion of their bases or by simply detaching from the substrate and floating away in the current. Gliding – By pseudopodia, snail like. Floating – By air bubbles, slowest locomotion. Swimming – With the help of tentacles. Walking – It walks on substratum with the help of tentacles. cuttle fish movement. Climbing – On aquatic plants with the help of tentacles. Dragging – On base by contraction of tentacles. Looping – In this process 180° angle is formed. Also known as caterpillar movement or leech movement. Most common type of known locomotion. Somersaulting – In this angle is of 360°. Fastest locomotion.

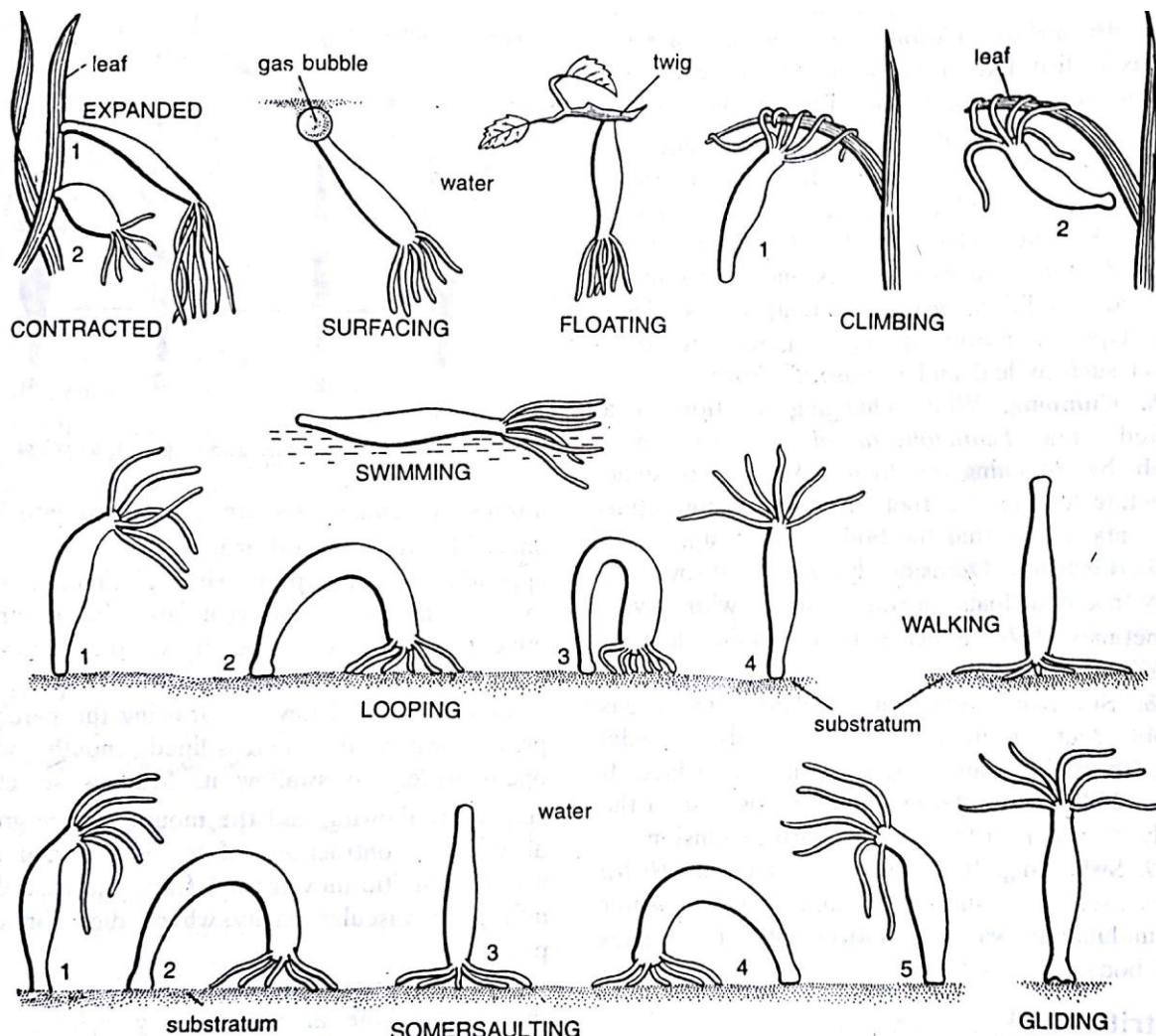
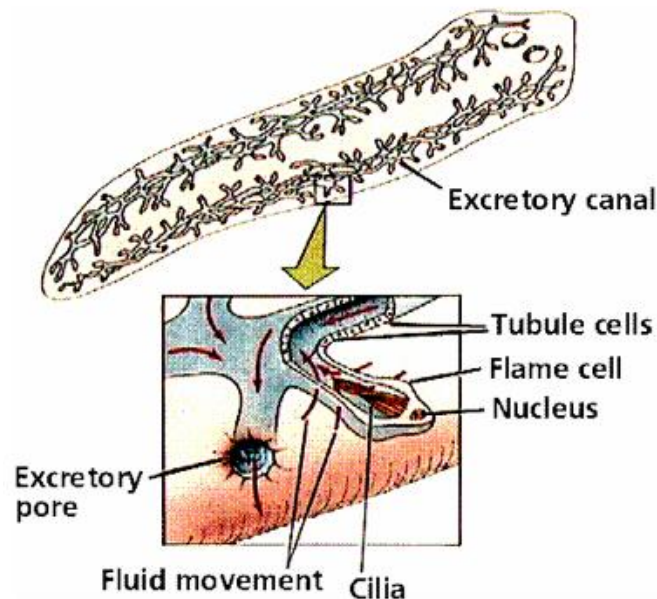


Fig. 14. Types of locomotion in *Hydra*.

## Protonephridia

A **protonephridium** (*proto* = "first") is a network of dead-end tubules lacking internal openings found in the phyla Platyhelminthes, Nemertea and Rotifera. The ends are called *flame cells* (if ciliated) or *solenocytes* (if flagellated); they function in osmoregulation and ionoregulation, respectively. The terminal cells are located at the blind end of the protonephridium. Each cell has one or more cilia and their beating inside the protonephridial tube creates an outward going current and hence a partial pressurization in the blind of the tube. Because of this, pressurization drives waste fluids from the inside of the animal, and they are pulled through small perforations in the terminal cells and into the protonephridium. The perforations in the terminal cell are large enough for small molecules to pass, but larger proteins are retained within the animal. From the bottom of the protonephridium the solutes are led through the tube, formed by the canal cells, and exits the animal from a small opening formed by the nephridiopore. Selective reabsorption of useful molecules by the canal cells occurs as the solutes pass down the tubule. Protonephridia are generally found in basal organisms such as flatworms. Protonephridia likely first arose as a way to cope with a hypotonic environment by removing excess water from the organism. Their use as excretory and ionoregulatory structures likely arose secondarily. These are excretory systems in phyla Platyhelminthes and are also called blind tubules. These tubules bear a tuft of cilia or flagellum. An organ of excretion in flatworms: a hollow cup-shaped cell containing a bunch of cilia or flagellum, whose movement draws in waste products and wafts them to the outside through a connecting tubule.



## Regeneration

Regeneration is the process of renewal, restoration, and growth that makes genomes, cells, organisms, and ecosystems resilient to natural fluctuations or events that cause disturbance or damage. Every species is capable of regeneration, from bacteria to humans. Regeneration can either be complete where the new tissue is the same as the lost tissue, or incomplete where after the necrotic tissue comes fibrosis. At its most elementary level, regeneration is mediated by the molecular processes of gene regulation. Regeneration in biology, however, mainly refers to the morphogenic processes that characterize the phenotypic plasticity of traits allowing multi-cellular organisms to repair and maintain the integrity of their physiological and morphological states. Above the genetic level, regeneration is fundamentally regulated by asexual cellular processes. Regeneration is different from reproduction. The hydra and the planarian flatworm have long served as model organisms for their highly adaptive regenerative capabilities. Once wounded, their cells become activated and start to remodel tissues and organs back to the pre-existing state.

