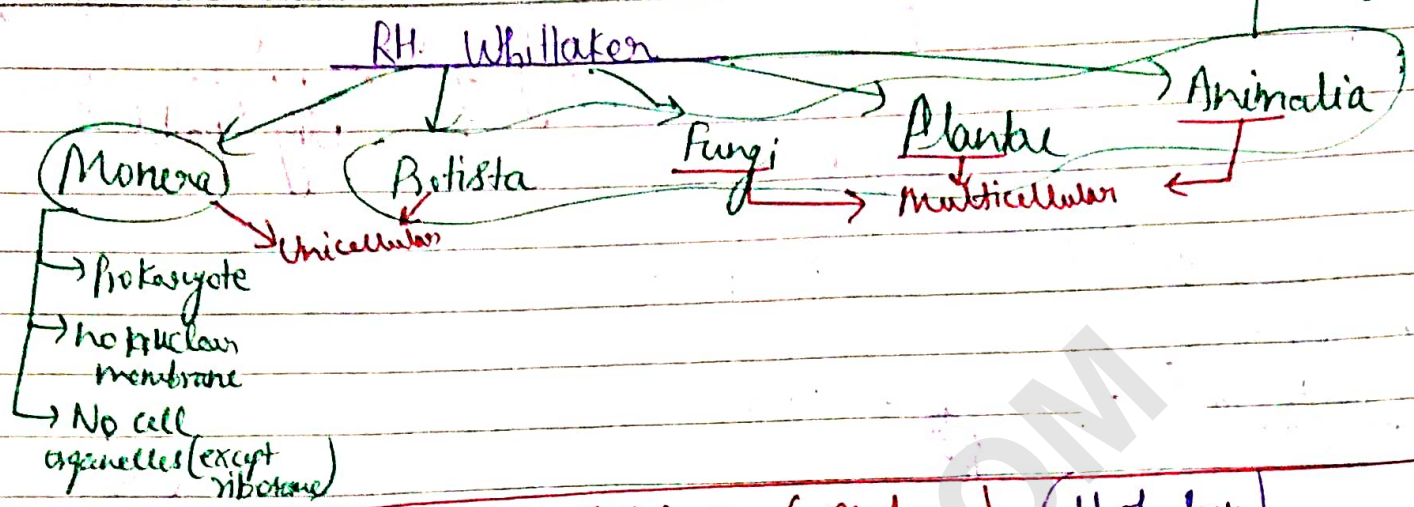
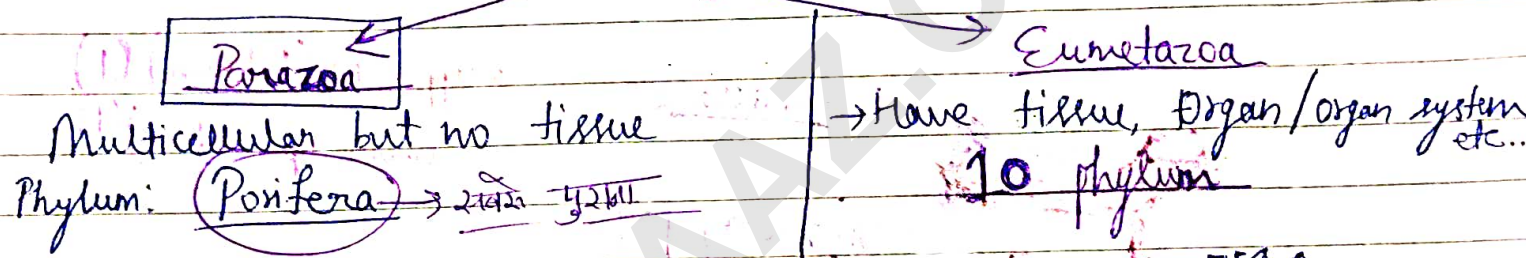


# Chapter-4 Animal Kingdom (Metazoa)

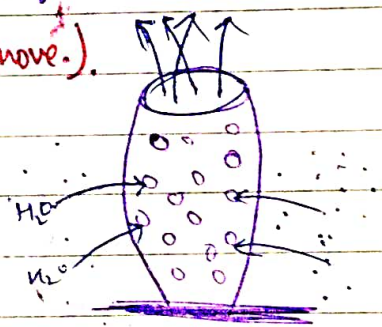
→ Have nuclear membrane  
→ Have cell organelles  
↳ membrane bound.  
Eukaryotes



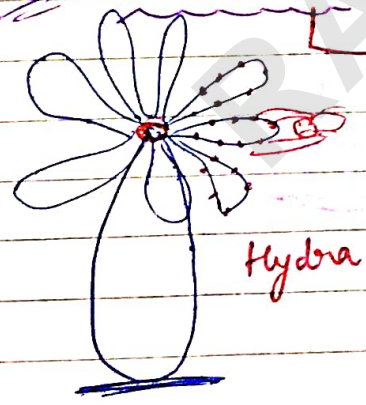
## Animal Kingdom (Metazoa) (11 phylum)



1. Porifera → i) Aquatic ~~(A)~~ ii) Sessile (no move).  
Common name: Sponges.  
(Have Pores)



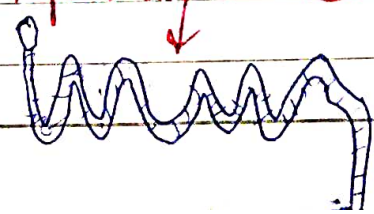
2. Cnidaria → i) Aquatic ii) Some move  
↳ Cnidoblast cells (in tentacles).  
Cnocytes



3. # Ctenophora → → Bioluminescences.  
→ Aquatic. (Marine)

# 4 Platyhelminthes → Flat worms.  
→ Some aquatic, mostly endoparasites  
↳ dorsoventrally flattened body

eg. ① Tape worm → ② Liver fluke



4. Aschelminthes  $\Rightarrow$  Round worms  $\rightarrow$  parasitic  
 eg  $\rightarrow$  Ascaris (block small intestine, only in humans)



5. Annelida  $\Rightarrow$  Annule  $\rightarrow$  little ring 

6. Arthropoda  $\Rightarrow$  (Insects)  $\rightarrow$  Largest phylum.

7. Mollusca  $\Rightarrow$  Soft bodied eg., Octopus.



8. Echinodermata  $\rightarrow$  Aquatic



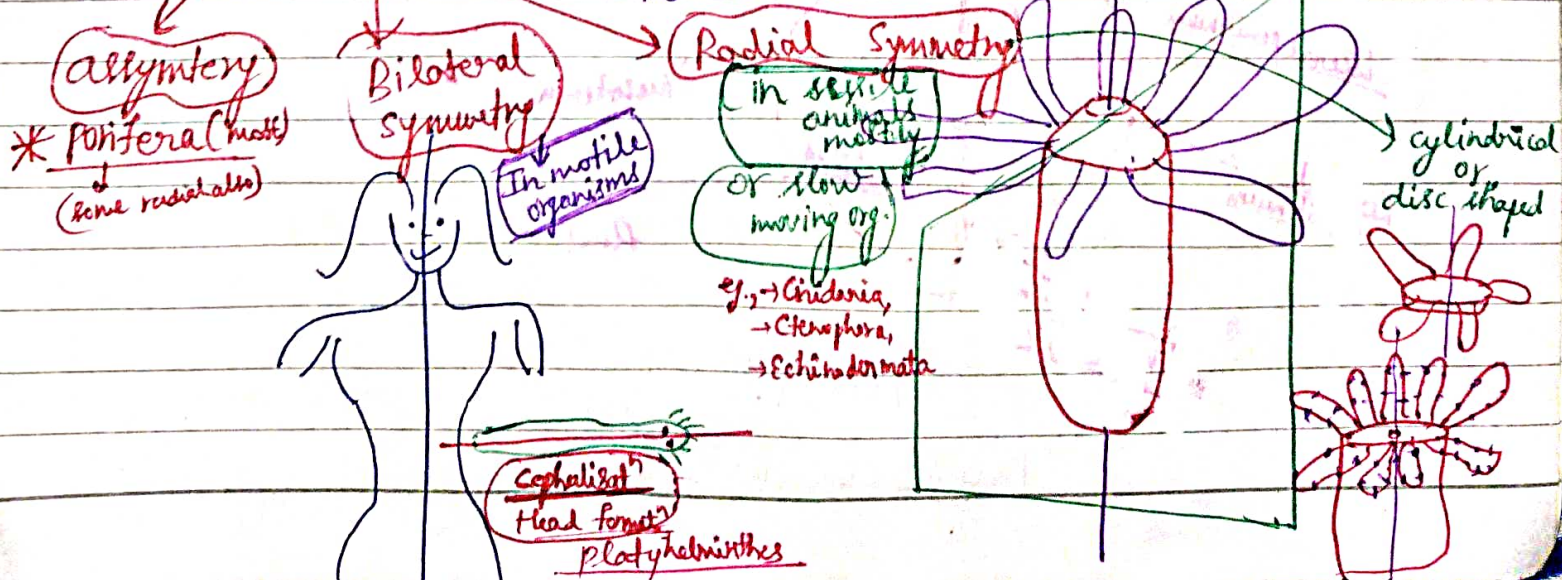
9. Hemichordata  $\rightarrow$  All aquatic eg., Balanoglossus

10. Chordata  $\rightarrow$

## \* 10 Basics of Animal Kingdom

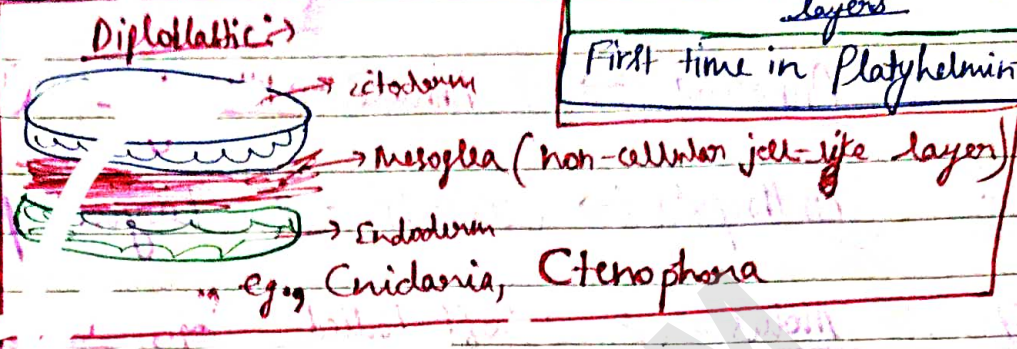
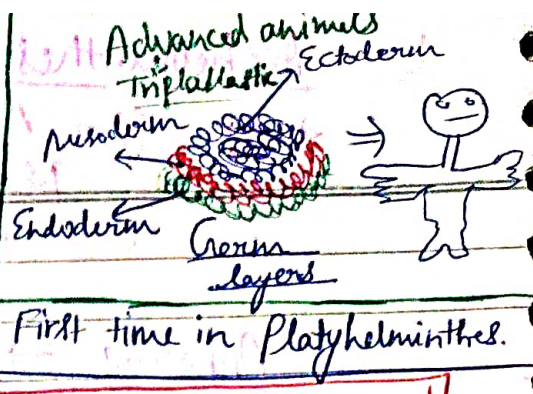
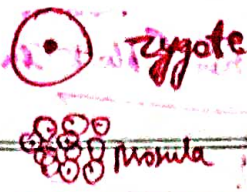
### # Basics of Classification $\Rightarrow$

① Symmetry  $\Rightarrow$  Geometrical arrangement of body parts of an animal.

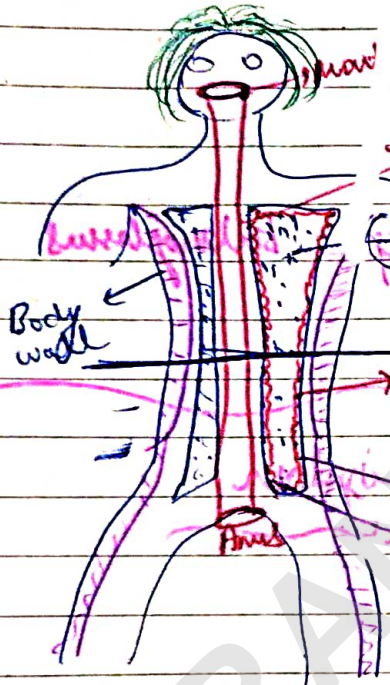


② Germ layers :-

\* No germ layers of Porifera

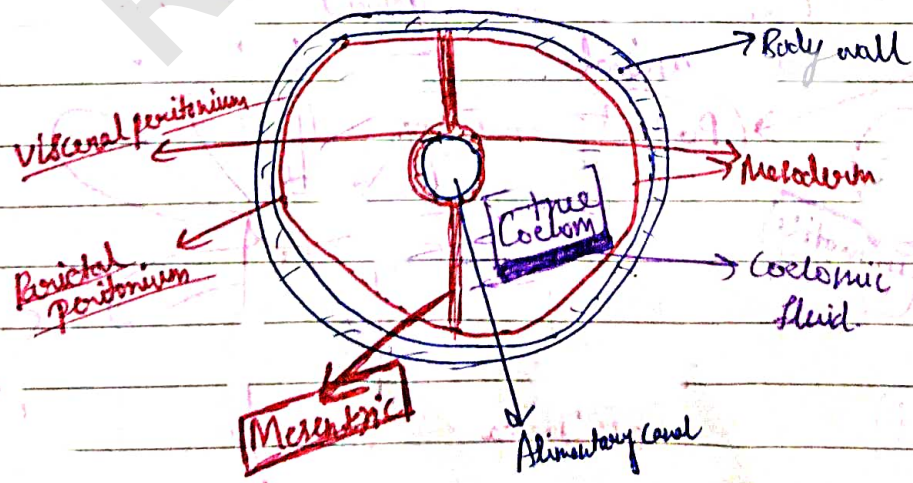


③ Coelom :- Space b/w body wall & alimentary canal filled with fluid (Coelomic)

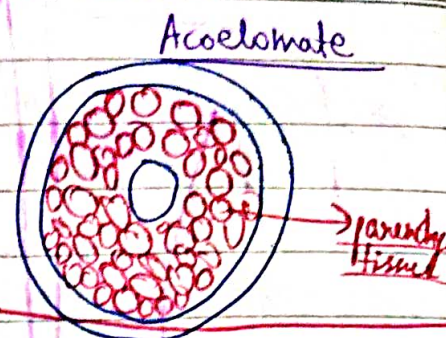
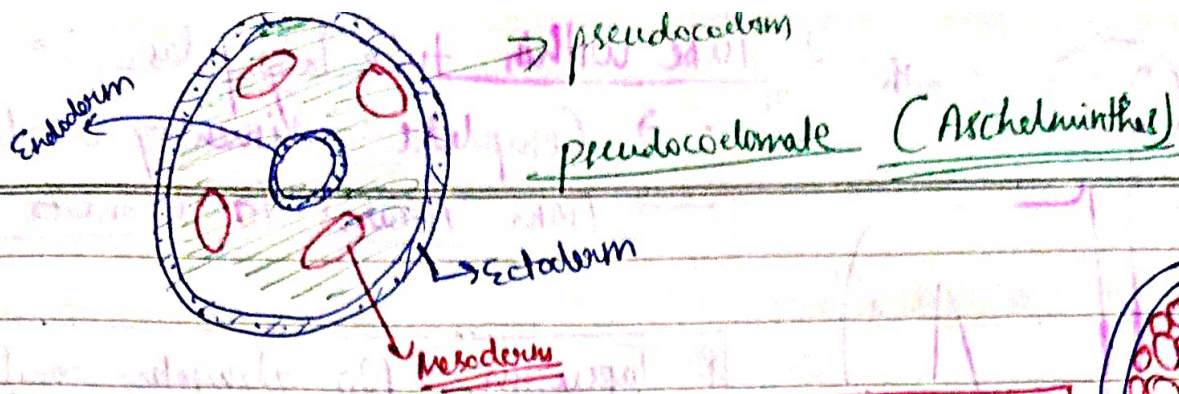


Coelom	
<p><u>Acoelomate</u> No cavity b/w gut &amp; body wall → Porifera → Platyhelminthes</p>	<p><u>Pseudocoelomate</u> Cavity Not lined by mesoderm → Aschelminthes</p>
<p><u>True coelom</u> Cavity lined by mesoderm on both sides eg. Annelida -&gt; upwards Chordata -&gt; downwards</p>	

Peritonium → Lining of mesoderm

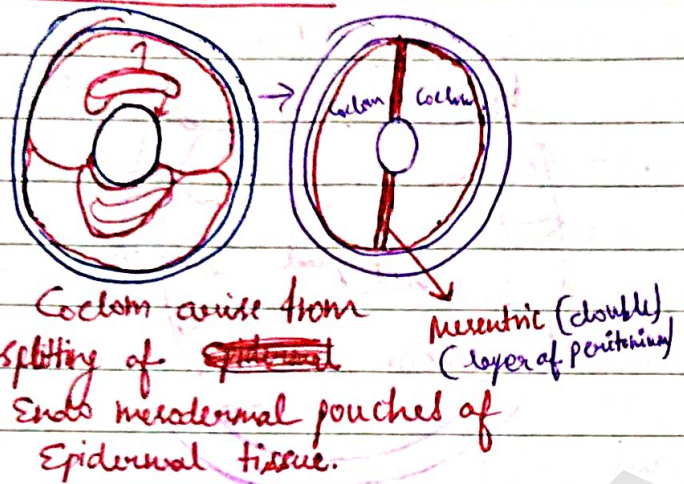


True Coelomate



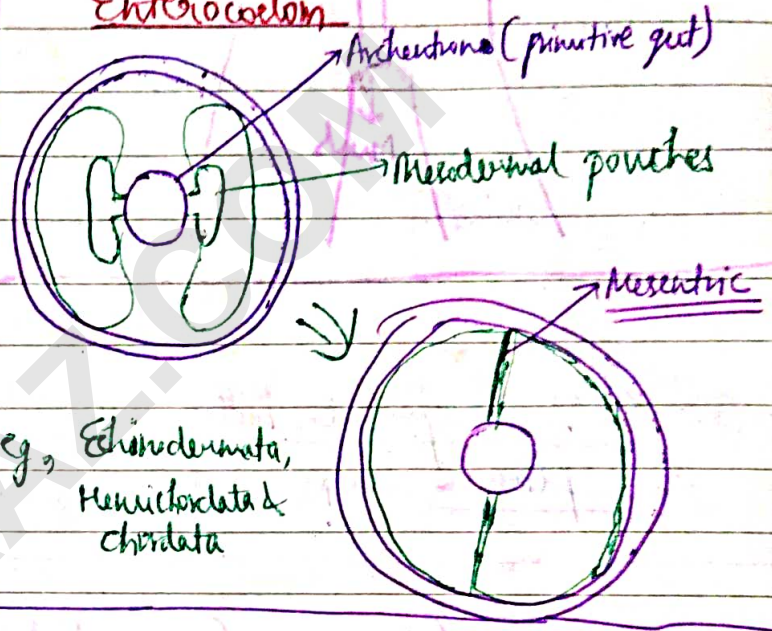
Eucoelom

Schizocoelom

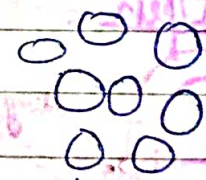


Ex: Annelida, Arthropoda, mollusca

Enterocoelom

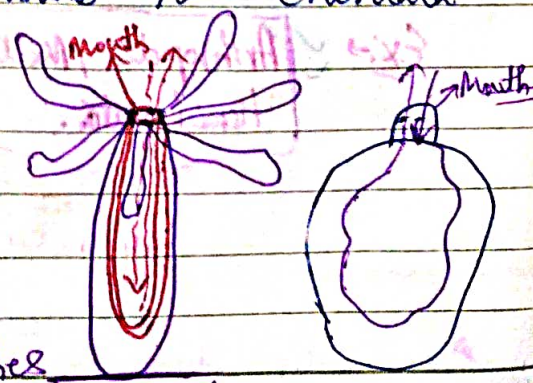


4 # Level of organisat<sup>n</sup> (L.O.O.)

1. Cellular L.O.O.  $\rightarrow$  Porifera. 
2. Tissue L.O.O.  $\rightarrow$  Cnidaria, Ctenophora.
3. Organ L.O.O.  $\rightarrow$  Organ Platyhelminthes.
4. Organ System L.O.O.  $\rightarrow$  Aschelminthes to Chordata.

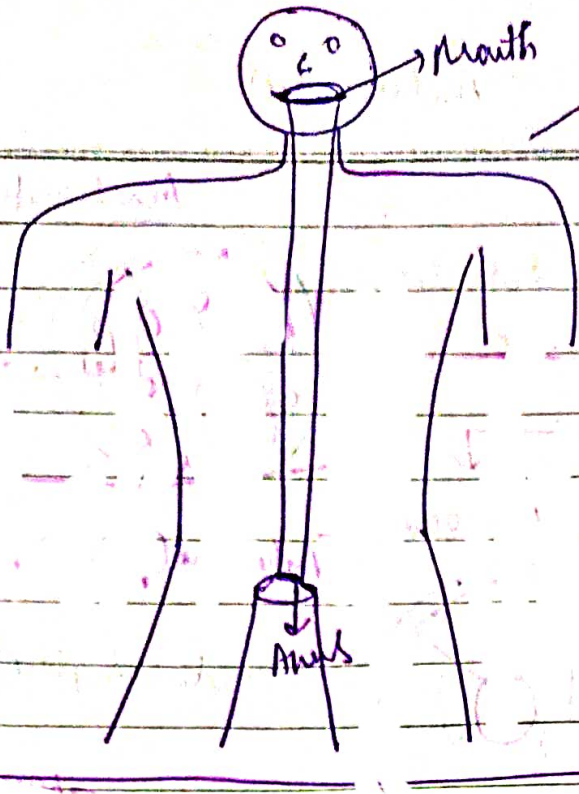
5 # Body Plan

1. Blind sac body plan  
eg, Cnidaria, Ctenophora, Platyhelminthes  
Incomplete ~~digest~~ digestory canal.



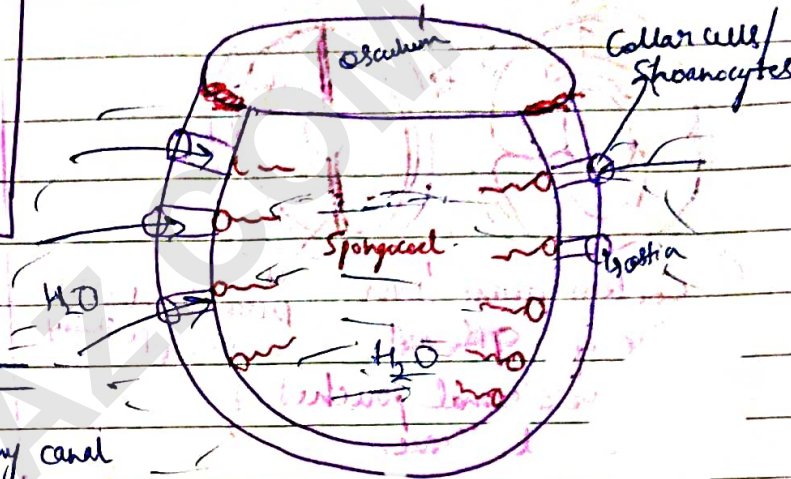
2. Tube within tube body plan →

→ Complete alimentary canal  
→ From Ascaris to Chordata.



\* Tapeworm → No alimentary canal.

# Porifera → No digestive canal.  
→ Intracellular digestion

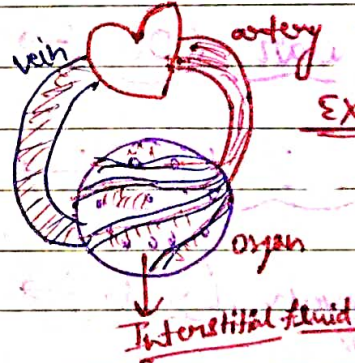
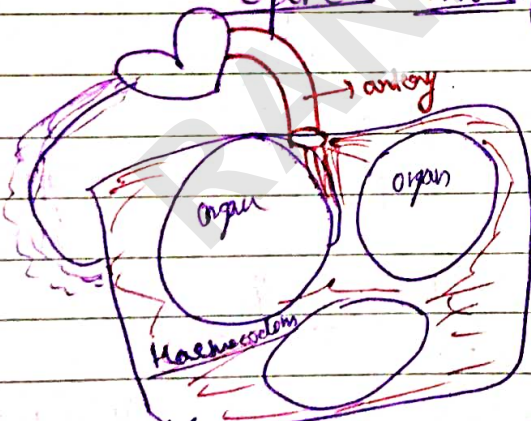


3. Cell aggregate body plan → No coelom, alimentary canal

6. Circulatory System

Open → No capillaries

closed (blood never comes out of tube)



EX: ✓ Annelida & ✓ Chordates.  
Cephalopoda (Mollusca)

Ex: → ✓ Arthropoda, Mollusca, Schizodermata, Hemichordata.

# Segmentation : → Some animal's body divided into segments externally & internally with repetition of at least some organs.

eg, Earthworm → Metamerism.

# Notochord : → Mesodermally derived rod like str. on dorsal side

# Animals with Notochord → Chordates

\* // without // → Non-chordates eg, porifera to echinoderms

## # ← Phylum & Characteristic →

1. Porifera (Pore bearing) : → (c/a sponges).



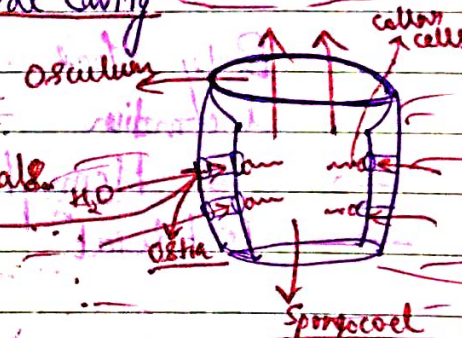
→ Mostly marine → Asymmetric mostly

→ Have a Water transport / Canal system.

→ H<sub>2</sub>O enters through pores (ostia) into central cavity [spongocoel] & gets out through osculum.

→ This helps to gather food, respirat<sup>n</sup>, excret<sup>n</sup>

# Choanocytes / collar cells → line Spongocoel & canals.



→ Intracellular digest<sup>n</sup>.

→ Exoskeleton of spicules / spongin fibres.

→ Sexes not separate [Hermaphrodite].

→ Asexual repro. by → Fragmentat<sup>n</sup> Sexual → by gamete format<sup>n</sup>.

→ Fertilisat<sup>n</sup> internal & indirect develop. (larval stages tnt)

eg, Sycon (scypha), Euspongia (both sponge), Spongilla (fresh water)

2. Cnidaria : → (Cnidocytes / cnidoblast cells) →

→ Radial symmetry

→ Have cnidocytes (containing stinging capsules / nematocytes) on tentacles → Used for defense, anchorage, prey capturing.

→ Diploblastic, T-LOD, → Have central gastro-vascular cavity with mouth on Hypostome.

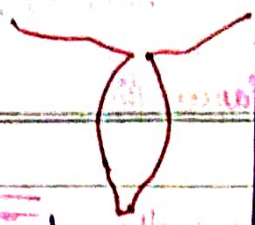


→ Extra & Intra cellular digestion.

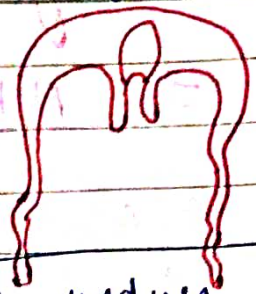
→ Corals have skeleton of CaCO<sub>3</sub>.

→ Have two basic body forms →

Polyp  
 → Sessile, cylindrical  
 → Asexual repro.  
 eg., Hydra, Adamsia etc.



Medusa  
 → Motile / free swimming  
 → Umbrella shaped  
 eg., Aurelia etc.



Shown by cnidarians having both body forms

# Metagenesis → Polyp reproduce medusa asexually & medusa form polyp sexually. eg., Obelia  
 eg., Physalia (Portulaca man of war), Adamsia (Sea anemone), Pennatula, Gorgonia, Meandrina.

3. Ctenophora (Bioluminescence). (class sea walnuts / comb jellies)

- Exclusively marine, Diplo., T.L.O.O., Radial sym.
- Body has 8 external rows of ciliated comb plates for locomotion → Extra & Intra cellular digest.
- Hermaphrodite → Repro. by only sexual means.
- Fertilizat<sup>n</sup> external, indirect develop.

4. Platyhelminthes → (flat worms)

- Flat body → Mostly endoparasites. - Bilateral sym. → Triplo. → 3 germ layers
- Hooks & suckers that in parasites. & some absorb nutrient directly from body surface ≠ Protonephridia / Flame cells → for osmoregulation & excretion.
- Hermaphrodite (internal fertilizat<sup>n</sup>) → indirect develop.
- Planaria (high regenerat<sup>n</sup> capacity). - eg., Taenia (Tapeworm), Fasciola (liver fluke).  
 1. host: sheep → 2. snail → 1. man → 2. pig  
 → causes cirrhosis

5. Aschelminthes → (Roundworm)

→ Aquatic, terrestrial, parasitic in plants & animals.

- O.S. L.O.O. → Triplo. → Bil. sym. → Muscular pharynx.
- Complete alimentary canal
- Excretory tube removes waste through excretory pore.
- Dioecius (longer females). → Internal fertilizat<sup>n</sup>
- Direct/Indirect development.
- eg., Ascaris, Wucheria (Filarial worm), Anchylostoma (Hookworm).  
Pinworm.

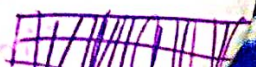
## # 6. Annelida → Annulus (ring)



- Aq. (marine, fresh H<sub>2</sub>O), terrestrial, parasitic.
- Triplo, O.S. L.O.O., Coelomate. Bil. sym. → Metamerically segmented & coelomate animals. → (Longitudinal & circular muscles for locomotion → Aquatic annelids eg., Nereis → parapodia. For swimming. → Closed circulatory system.)
- Nephridia → for osmoregulation & excretion.
- Paired ganglia connected by lateral nerves to a double ventral nerve cord.
- eg., Nereis (dioecious), earthworm & leeches (monoecial).  
→ Sexual reprod., Hirudinaria (Blood sucking leech).

## # 7. Arthropoda → (Joint appendages).

- Largest phylum → Over  $(\frac{2}{3})^{\text{rd}}$  of all named species on earth.
- O.S. L.O.O., Bil. sym, Triploblastic, segmented, coelomate animals.
- Have Chitinous exoskeleton → Head
- Body has divided into → Thorax
- Respiratory organs → Gills, Book gills, book lungs / tracheal system.
- Circul. syst. → open → Sense organs → Antennae, eye (compound)
- Statocyst / balance organs. int.
- Excretion through Malpighian tubules.
- Mostly Dioecious → Internal fertilizat<sup>n</sup> usually → Oviparous  
mostly → Direct/Indirect develop.



eg, Economically Imp → Apis, Bombyx (Silkworm), Lacifer (Lac insect)  
 Vectors → Anopheles, Culex, Aedes.  
 Gregarious pest → Locusta (Locust)  
 Living fossil → Limulus (King crab).

8 Mollusca → 2<sup>nd</sup> largest phylum.  
 → terrestrial / aquatic → OSLOO, triplo., coelomate.  
 → Body covered by calcareous shell  
 → Unsegmented body with distinct: Head, Muscular foot & visceral hump.  
 → Mantle (of soft, spongy skin) over visceral hump.  
 → Mantle cavity → space b/w hump & mantle  
 → Has gills (feather like) → Has respiratory & excretory function.  
 → Anterior head → has sensory tentacles.  
 → Mouth → rasping organ, radula.  
 → Diocious & biparous, Indirect develop.  
 → gastropods  
 ex: → Pila, Pinctada, Sepia; Loligo, Octopus, Aplysia,  
Dentalium, Chaetopleura.  
 → devil fish

# 9 Echinodermata → (spiny skin). → Adult → Radial symm.  
 → Endoskeleton of calcareous ossicles → Exclusively marine  
 → Complete diges. syst. Mouth → ventral, anus → dorsal.  
 → Have Water Vascular system → Locomot<sup>n</sup>, respirat<sup>n</sup>, capture of food.  
 → Excretory sys. → Absent  
 → Diocious, external fertilisat<sup>n</sup>, Indirect develop. (free worm larvae)  
 eg, Asterias, Echinus, Antedon, Cucumeria, Ophiura

# 10 Hemichordata →  
 → small gp. of worm-like marine animals.  
 → Cylindrical body with i) anterior proboscis ii) Collar iii) long trunk system  
 → Circulatory tract → open type # Respirat<sup>n</sup> → by gills  
 → Excret<sup>n</sup> → proboscis gland → Sexes → separate.  
 → Diocious, external fertilisat<sup>n</sup>, Indirect develop.  
 eg, Balanoglossus, Saccoglossus.

## Chordates

1. Notochord prt
2. Central nervous system is dorsal & hollow & single
3. Pharynx perforated by gill slits
4. Heart ventral
5. Post-anal tail prt

## Non-chordates

2. Notochord absent
2. CNS → ventral, solid & double  
↳ nerve cord
3. Gill slits absent.
4. Heart dorsal
5. Post anal tail absent

## Chordata (subphylum)

### 1. Orochordata/Tunicata

→ Notochord prt only in basal tail.  
eg, Ascidia, Salpa, Doliolum (Dorsal)

### 2. Cephalochordata

→ Notochord persistent throughout life & extend from head to tail  
eg, Branchiostoma (Amphioxus) lancelet

### 3. Vertebrata

→ Notochord in embryonic stage replaced by bony / cartilaginous vertebral column.  
in adult.  
→ Muscular hoist  
→ Kidney → paired appendages (fins, limbs)

## Vertebrata

### Division

### Agnatha (jawless)

Class. Cyclostomata

### Gnathostomata (have jaws)

#### Super class

#### Pisces (fins)

- Class
1. Chondrichthyes
  2. Osteichthyes

#### (limb) Tetrapoda

- Class
1. Amphibia
  2. Reptiles
  3. Aves
  4. Mammals.

## Class

1. Cyclostomata → ectoparasite on some fish.  
→ elongated body with 6-15 pairs of gill slits for respiration.  
→ Sucking & circular mouth.  
→ No scales and paired fins. → Cranium & vertebral column is cartilagenous. → Circulat<sup>n</sup> closed type.  
→ Marine but migrate to fresh water for spawning & after spaw. they die. → larvae return after metamorphosis.  
eg., Petromyzon & Myxine (Hagfish). <sup>EST fish</sup>

2. Chondrichthyes → Marine, cartilage. endoskeleton.  
→ Streamlined body.  
→ Ventral mouth with jaws → No notochord → persistent throughout life.  
→ Gill slits separate & without operculum.  
→ tough skin with placoid scales. Teeth → modified placoid scales.  
→ Predaceous animals. → No air bladder (swim continuously).  
→ Heart → 2 chamber. Torpedo → electric organs.  
Trygon → Poison sting. → Poikilothermous.  
→ Dioecious → Males: pelvic fins have claspers.  
→ Internal fertilizat<sup>n</sup>, viviparous.  
eg., Scoliodon (dog fish), Pristis, Trygon, Torpedo, Charcharodon (great white shark) <sup>sting ray</sup>

3. Osteichthyes → Marine + fresh water → Bony endoskeleton.  
→ Streamlined body + paired fins.  
→ terminal mouth. → 4 pairs of gill + operculum covering.  
→ skin with cycloid / ctenoid scale.  
→ Air bladder that → for buoyancy.  
→ Heart → 2 cham. → Poikilothermous → Dioecious  
→ external fertilizat<sup>n</sup>, oviparous, direct develop.

ex: Marine → Exocoetus (flying fish), Hippocampus (Sea horse).  
Fresh water → Labeo (Rohu), Catla (Katla), Clavial (Magur)  
Aquarium → Betta (fighting fish), Pterophyllum (Angel fish)

#### 4 Amphibia (Gr: Amphi → dual | bios: life)

- In aq. as well as terrestrial habitats → 2 pair limbs.
- Body → Head → Tail in some.
- Skin moist (must poison glands). (No scales)
- eyes → eyelids that → 1 Tympanum → ear.
- # Alimentary, reproductive & urinary tract open into common chamber called cloaca
- # Respirat<sup>n</sup> → by gills, lungs & through skin
- \* Heart → 3 Cham. → Poikilothermous (indirect / direct develop)
- Dioecious, external fertilizat<sup>n</sup>, oviparous, / direct develop

eg., Bufo (Toad), Hyla (tree frog), Rana (Frog), Salamandra,  
Ichthyophis (limbless amphibia).

#### 5 → Reptilia

- terrestrial. → body has dry cornified skin,  
epidermal scales & or scutes.
- No external ear openings. Tympanum → ear
- 2 Paired limbs. → 3 chamber heart (except<sup>n</sup> crocodile-4)
- Poikilothermous → Snakes & lizard → shed their scales as skin cast.
- Dioecious → Internal fertilizat<sup>n</sup> → oviparous  
 → direct develop.

eg., Chelone (turtle), Crocodilus, Hemidactylus (wall lizard),  
Alligator, Chameleon, Grotel (garden lizard)

Snakes: Naja, Bangarus, Vipera.

## 6 ⇒ Aves ⇒

- thrice of feathers → most fly (except flightless birds eg. Ostrich)
- Have beak → Forelimbs ⇒ wings modify
- Hind limb ⇒ beak scales ⇒ modified for clasping, swimming
- Skin → dry without glands except oil glands at tail base
- Endoskeleton → ossified (long) fully long bones → pneumatic (with air cavities).
- Digestive system → Has crop & gizzard.
- Heart 4 chamber. → Homiothermous.
- Lungs → respirat<sup>n</sup> Air sacs → supplement respir<sup>n</sup>.
- Dioecious → Internal fertilizat<sup>n</sup> → viviparous & direct develop.  
eg, Cornus, Columba, Psittacula (Parrot)  
Struthio (Ostrich), Pavo (peacock), Aptenodytes (Penguin).  
Neophron (Vulture).

## 7 ⇒ Mammalia ⇒

- mammary gland → 2 pair of limbs.
- skin unique in possesing hair. → External ears/pinnae are int. → Thecodont (diff. types of teeth).
- Heart - 4 chamber. → Homiothermous. → Respirat<sup>n</sup> by lungs.
- Dioecious, internal ferti, direct develop.  
viviparous (except duckbilled platypus).
- eg, Ornithorhynchus (Platypus), Macropus (Kangaroo), Pteropus (Flying Bat).  
Camelus, Macaca (monkey), Rattus (rat), Canis (dog),  
Felis (cat), Equus (Horse), Delphinus, Balaenopterus (Blue whale)