BASIS OF CLASSIFICATION

Level of organisation

Protoplasm
Protozoa

Cell → Porifera
Tissue → Coelenterata
Ctenophora
Organ → Platyhelminthes
Organ system → Aschelminthes

Symmetry

→ Asymmetry
Protoza
Porifera
→ Radical
Coelenterata
Ctenophora
→ Bilateral
Platyhelminthes
to
Chordata

Germ Layer

Diploblastic
Porifera
Coelenterata
Ctenophora

Triploblastic
Platyhelminthes
to
Chordata

Coelom (Body cavity)

Acoelomate
Platyhelminthes

Pesudocoelomate
Aschelminthes

Coelomate
1) Schizocoelomate
A, A, M
2) Enterocoelomate
E, H, C

Body Plan

Cell aggregate
Porifera

Blind sac
Coelenterata
Ctenophora
Platyhel

Tube within tube
Aschelm to Chordata

Segmentation

Pesudometameric
tapeworm

Metameric
Annelida
(Int. + Ext.)

Arthropoda
(External)

Chodata
(External)

Circulatory System

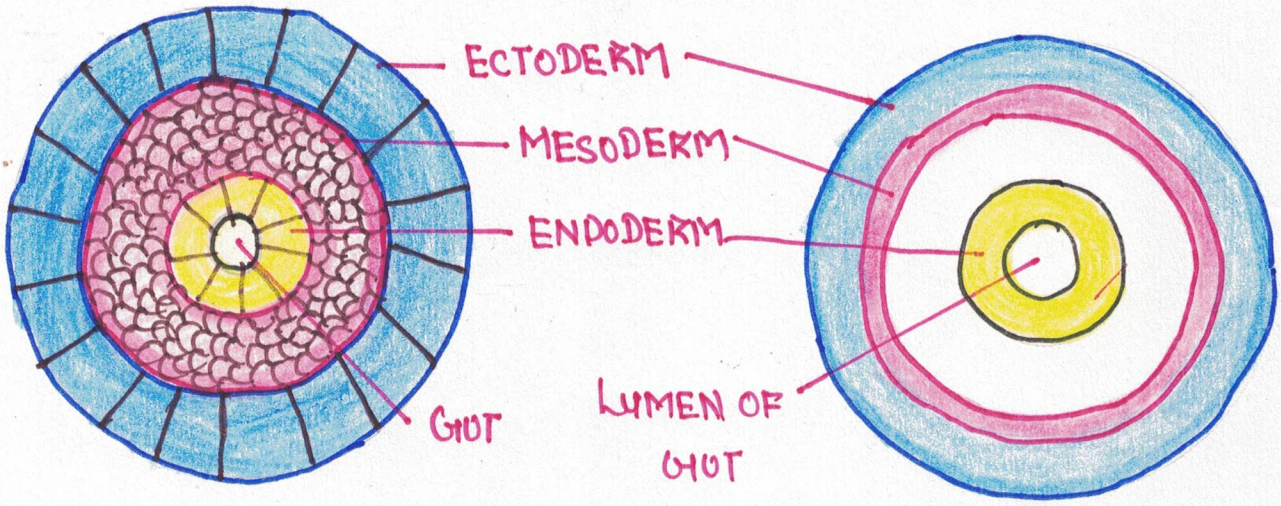
open
Arth., Mollusca
Hemich
(Lower Invertebrates)

Close
↓
Vertebrates
Molluscs
(Cephalopoda)

Embryo development

Protostom
Platyhelmin
to
Mollusca

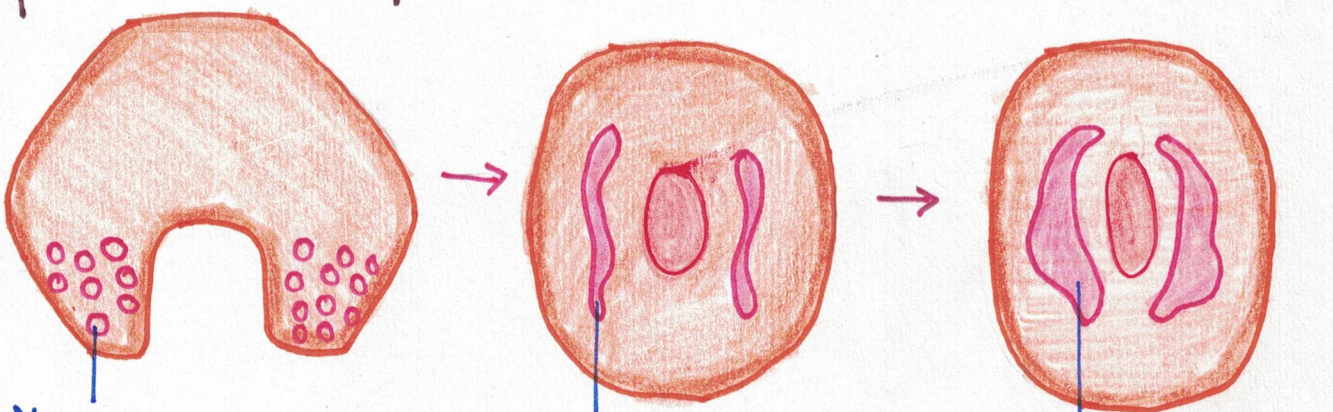
Deutro
E H C



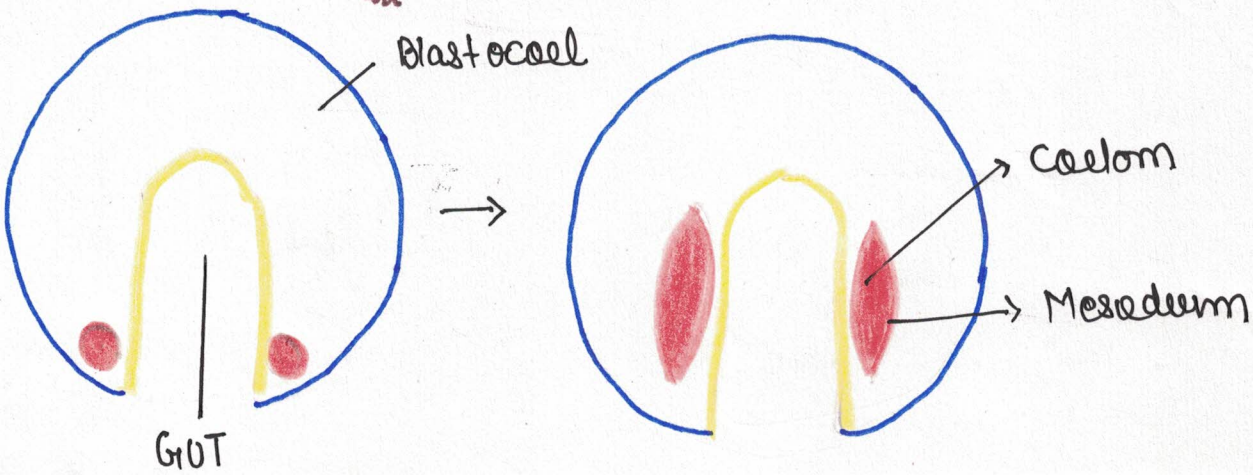
ACOELOMATE (NO COELOM)

PSEUDOCOEL

Schizocel



Enterocel



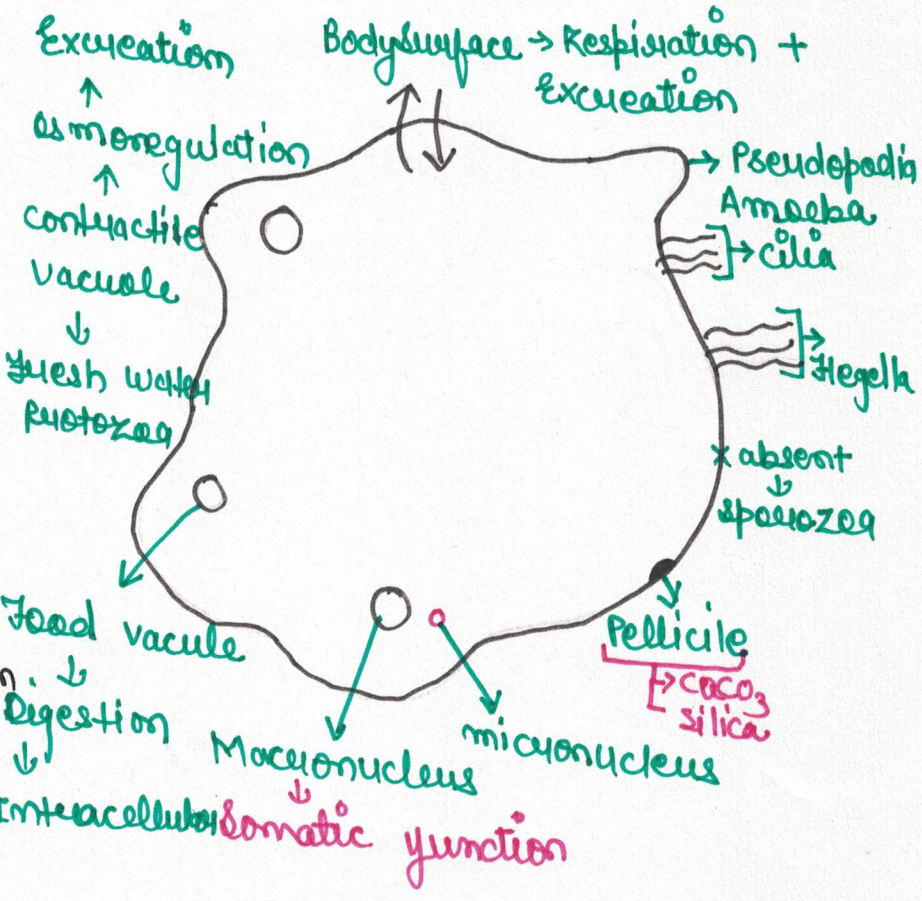
PROTOZOA

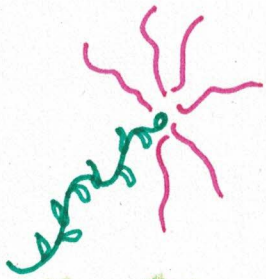
3rd Largest Phyllum

REPRODUCTION

- ASEXUAL
  - Binary fission
    - Simple → Amoeba
    - Multiple fission → Plasmodium
    - Transverse → Paramaecium
    - Longitudinal → Trypanosoma
  - Budding → Ephelata
- SEXUAL
  - Conjugation → Paramacium
  - Syngamy → Plasmodium

- → Protoplasmic
- → Acellular
- → Parasitic
  - → Marine
  - → Freshwater
- → Pathogenic
- → Solitary / Colonial
- → Nutrition
  - Holozoic → Amoeba
  - Parasitic → Plasmodium
- → Immortal





	Mastigophora or Flagellata	Sarcodina or Rhizopoda	Ciliata	Sporozoa
Free living	Free living	Free living	Free living	X
Parasitic	Parasitic	Parasitic	Parasitic	Parasitic
Locomotory organ	Flagella	Pseudopodia	Cilia	X
Body covering	Pellicle	naked/shell	Pellicle	Pellicle
Asexual Reproduction	Binary fission	Binary fission	Binary fission	Multiple fission
Sexual Reproduction	X	X	conjugation	Syngamy

SPOROZOA

1) Plasmodium

Causes :- Malaria

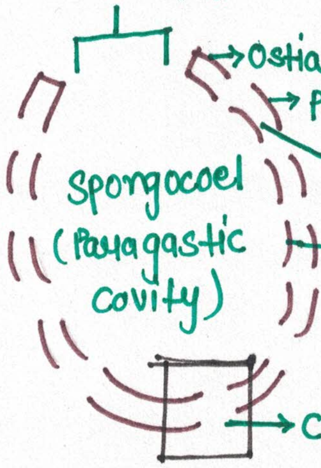
2) Babesia

Causes :- Takes cattle for "Tick fever"

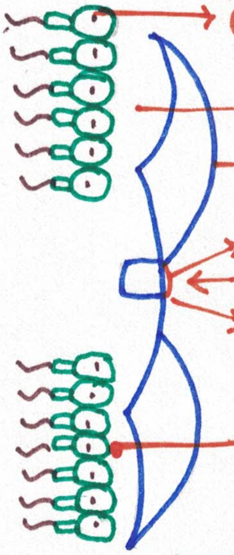
PONIFERA

Pore Bearing

- Study - ParaZoology
- cellular
- Diploblastic
- Solitary / colonical
- Sessile
- Freshwater / sea water



Canal system → Nutrition → Holozoic; Respiration; Excuration → Ammonia



Amoebocyte →
- Spongoblast → Spongin fibre
- Scleroblast → Spicules → Calcareous / Siliceas
- Arachaeocyte (totipotent) ⇒ forms game

Arachaeocyte → Reproduction →
- Sexual (favourable condition)
- Asexual (Unfavourable condition)
  - Germination

Fertilization:-
- Internal
- Cross
- Protogynous condition

CTENOPHORA

- Tissue level
- Diploblastic
- Radical symmetry
- sea walnut
- sea gooseberries
- comb jellies

CTENOPHORA

Cnidaria

8 Ciliary comb plates for locomotion

Bioluminescence

Lasso cells on tentacles

Hermaphrodite

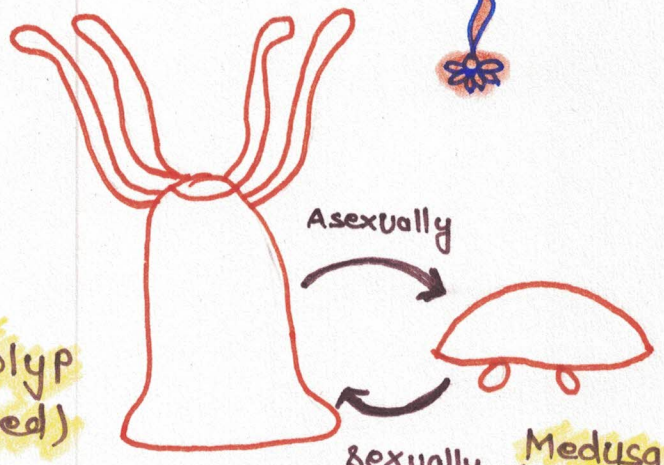
Cydippid larva

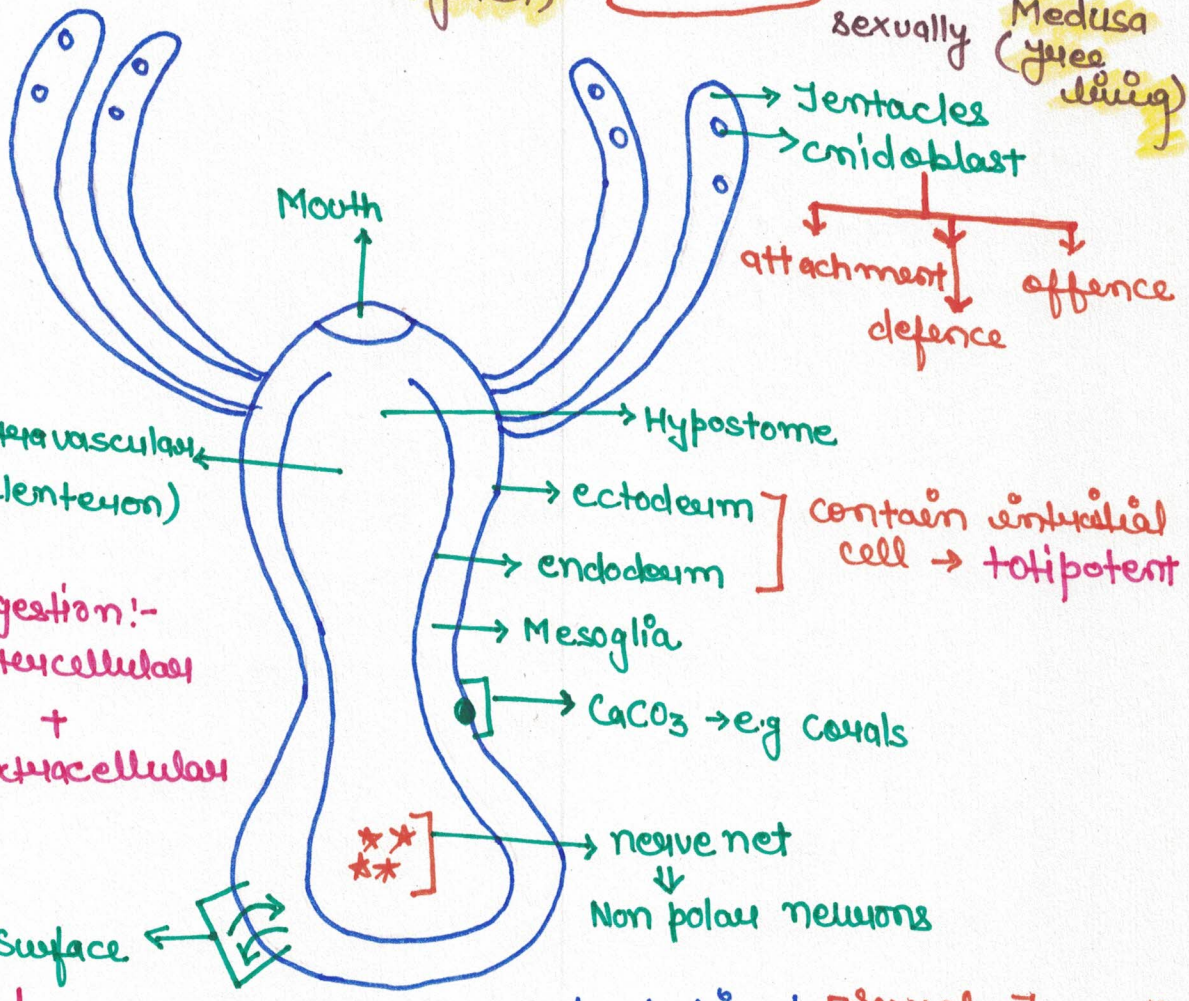
Only sexual Reproduction

Fertilisation external

CNIDRIA [COELENTRATA]

- contain cnidoblast cell.
- Diploblastic
- Blind sac
- Radical symmetry





Digestion :-
intercellular
+
Extracellular

Reproduction :- [Sexual / Asexual] Budding

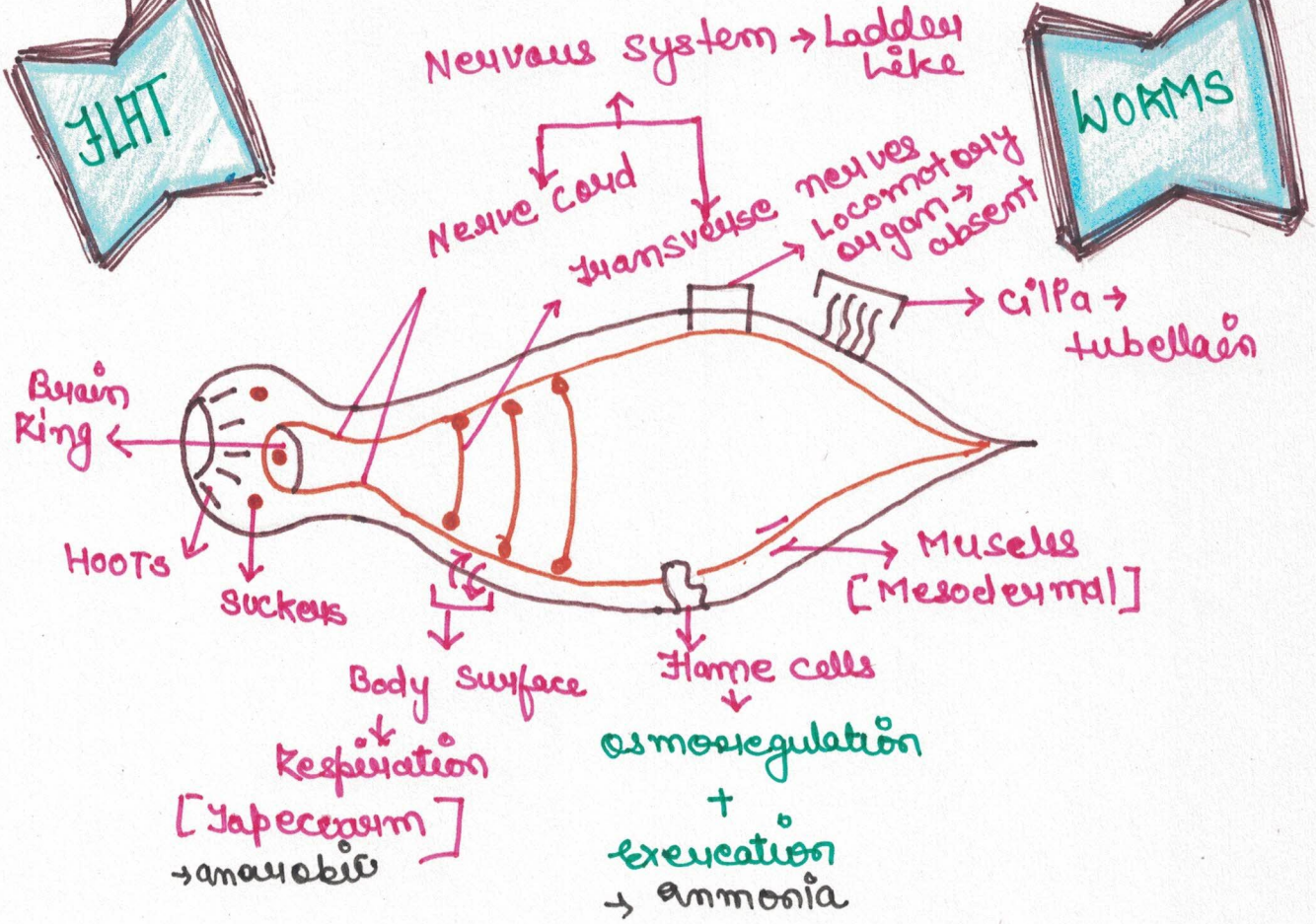
Development :- indirect

Planula → (obelia)
Ephyra → (Aurelia)

PLATYHELMINTHES

FLAT

WORMS



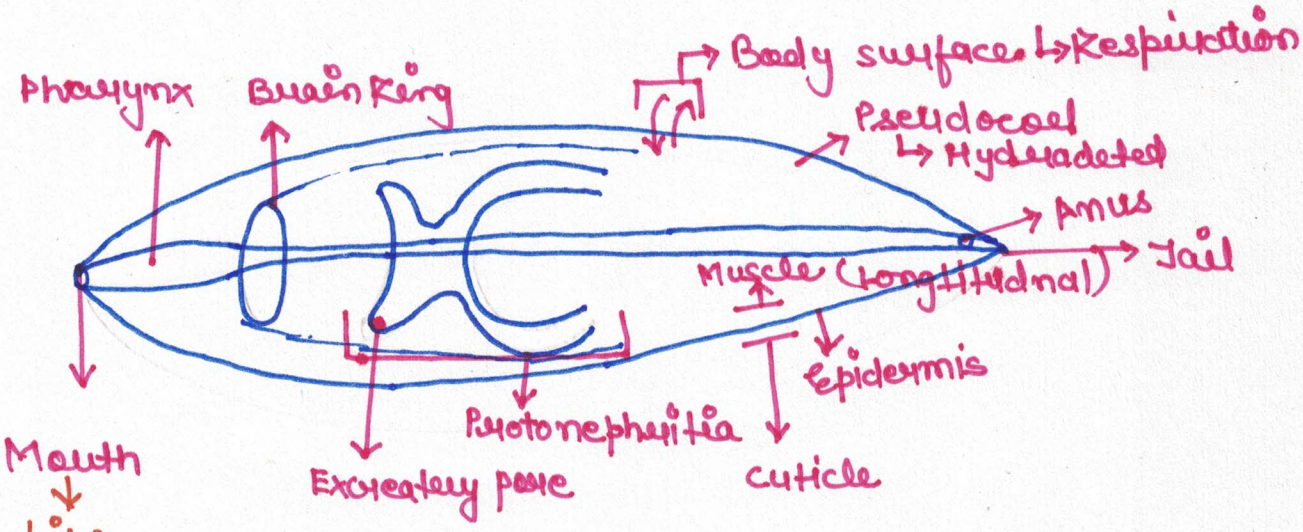
- organ / organ system Schistosoma
- triploblastic
- Blind sac
- Bilateral symmetery
- Tapeworm → • absorbs nutrition trough • body surface
- Digestive system → Absent

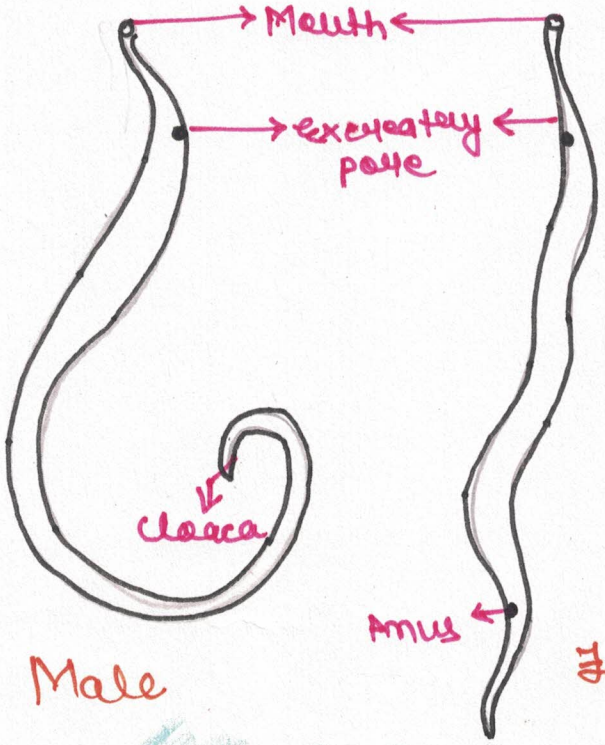
Fasciola hepatica

1° host → sheep + goat

2° host → (Garden snail)

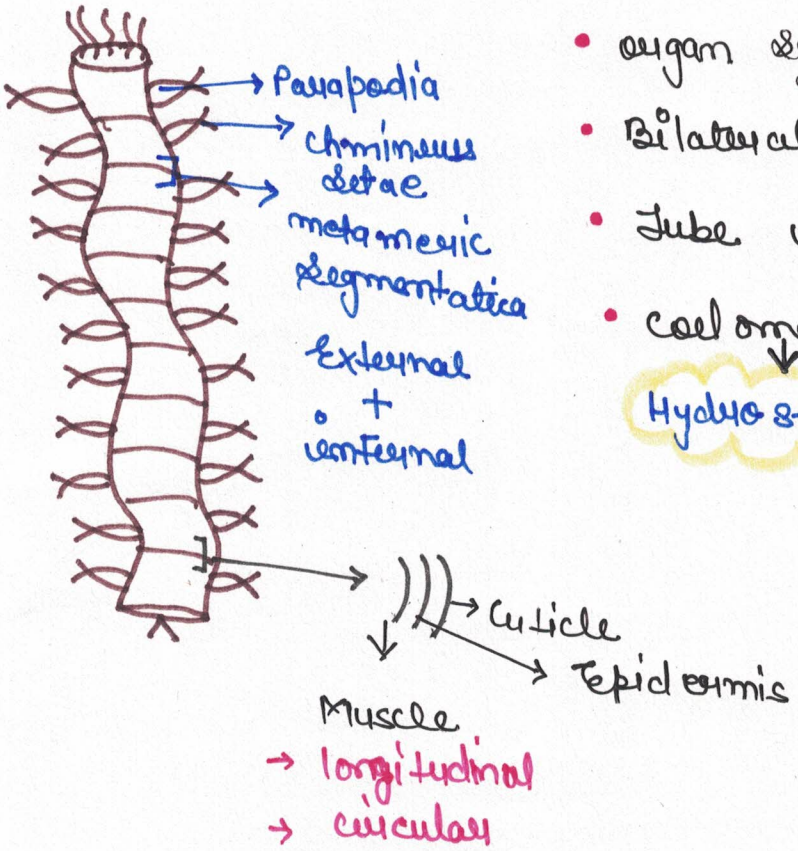
ASCHELMINTHES





ASCARIS

ANNELIDA



- organ system
- Bilateral symmetry
- Tube within tube
- coelomate
  ↓
  Hydrostatic skeleton

- Digestive system
  ↓
  gastric gland present complete
- Respiration
  ↓
  Cutaneous
  → gills
- Circulatory system
  ↓
  Closed
  → Pulsatile heart
  → Haemoglobin
- Excretion
  ↓
  Nephridia
  → Excretory matter
  → Ammonia (Aquatic form)
  → urea (land form)
- Nervous system
  → Brain ring (cerebral ganglia)
  → Nerve cord (double, solid, ventral)

	Polychaeta	Oligochaeta	Hirudinea
Ceptalisation	✓	×	×
Locomotory organs	Parapodia ✓ Setae ✓	Parapodia × Setae ✓	Parapodia × Setae ×
Sexual dimorphism	✓	× (Hermaphroditic)	× (Hermaphrodite)
Development	Indirect trochophore larva	direct	direct

ARTHROPODA

arthrakada

Joined — appendeges

- Chitinious exoskelaton
- Digestive System → complete
- Respiration → Gills Prawn
  → Book Gills King crab
  → Book lungs scorpion
  → tracheal system Insects
- Excreation → Antenary or green glands prawn
  → Coxal glands scorpion
  → Malphighian tubule Insects
  → Excreatory matter
- Circulatory system → open, Haemacoel, Haemolymph
  Haemacyanin (Prawn)
- Nervous System → Brain Ring, Nerve cord, ventral, & Solid, double
- Sensory organs → Antennae, eyes, Statocyst, Anal

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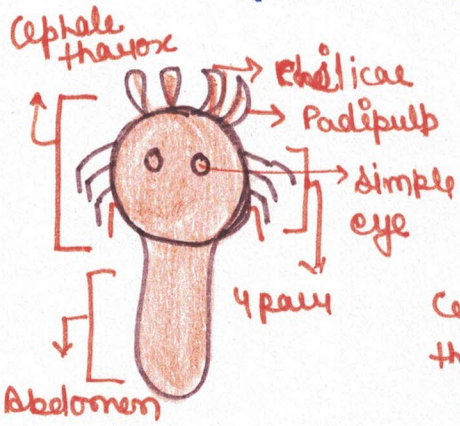
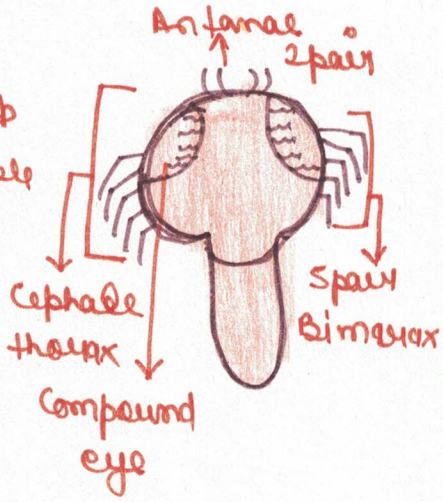
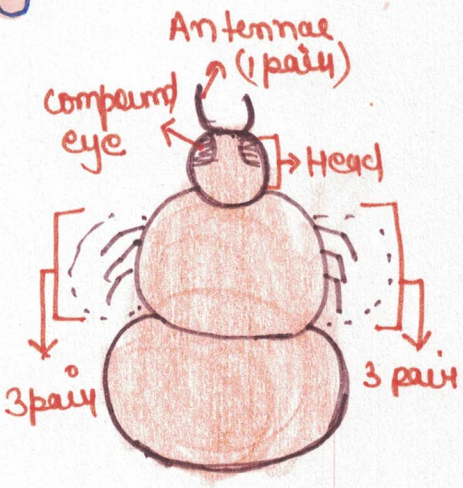
organ system
Bilateral
triploblastic
Coelomate
Metamerism → External
Dorsal Heart

Arachnida







Respiratory organ	Book lungs tracheal	Gills, body surface	tracheal system
Excretory organ	Coxal gland Malphighean Tubule	Green glands	Malphighean tubule
Development	Direct	Indirect	Indirect / Direct

M → Limulus
Kong crab

A C

D → Julus
Malphigean tubule

C → Scolopendra
Malphigean tubule

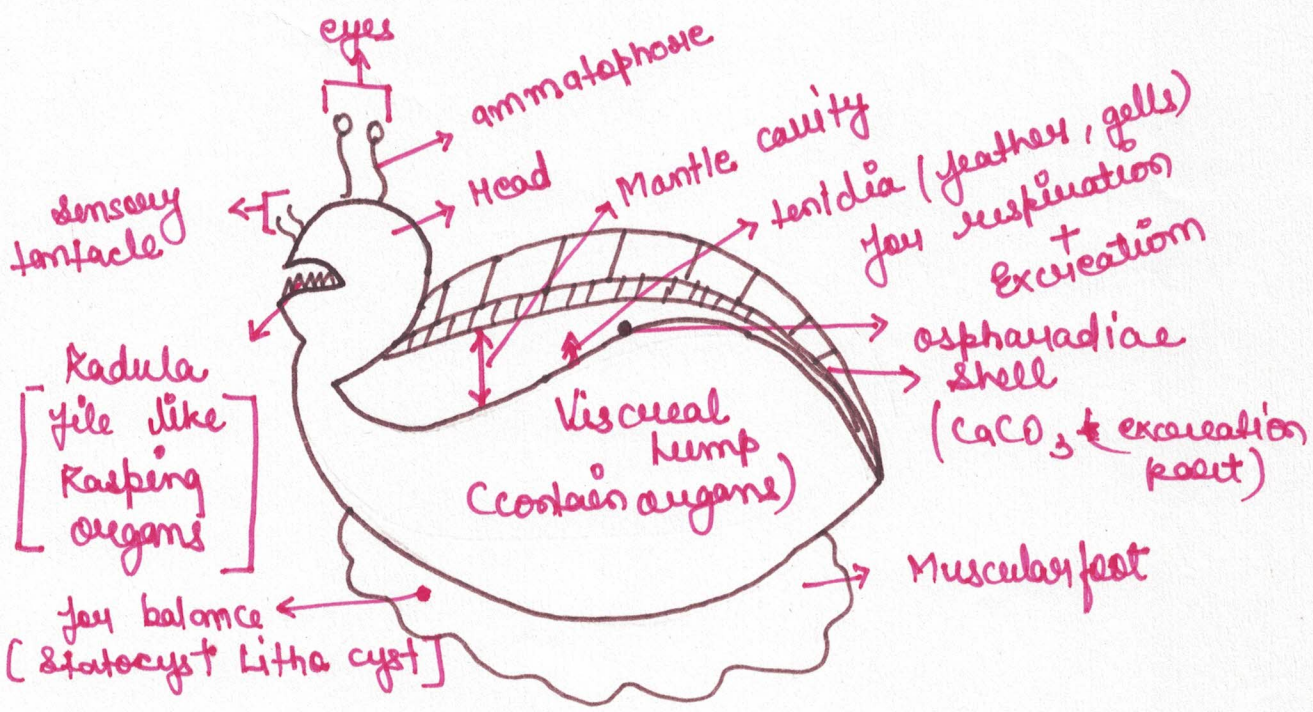
I → Apterygota

O → Apterygota
Pauropus (Nephrids.

MOLLUSCA

mollusca

- Organ system
- Triploblast
- Bilateral symmetery → Gastropoda asymmetrical
- Coelomate
- Dioecious
- oviparous
- Development indirect
- circulatory system
- open, Haemocoel, Haemocyanin, Dorsal Heart
- (Cephalopoda → closed)
- Excreation → Keber's organ or organ of Bajanus
- Nervous system → 4 paired Ganglia
- Excreatory matter → ammonia
- Resp → Pulmonary sac → Land
- gills → water

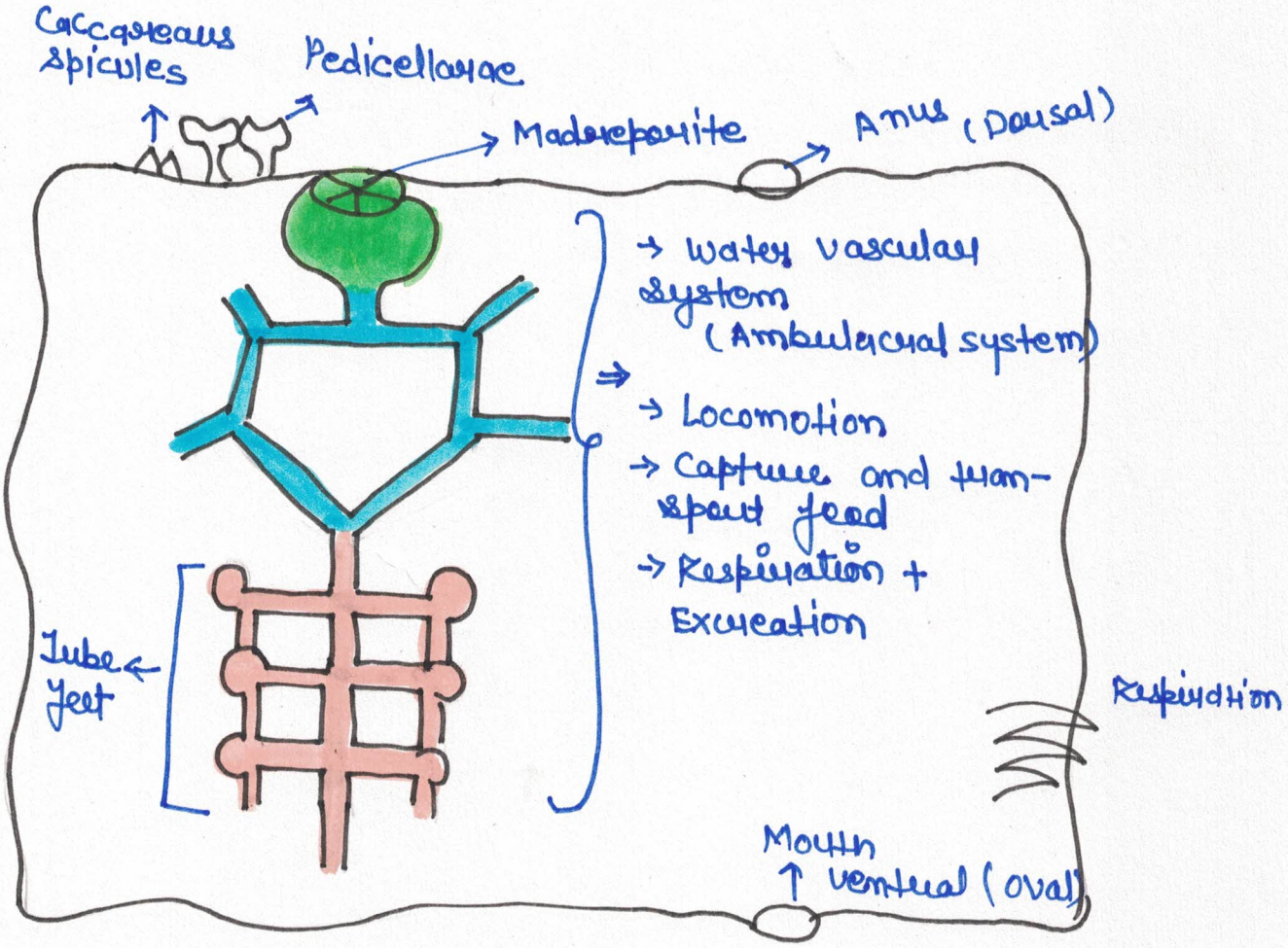


ECHINODERMATA

spiny body

echinoderm

- Organ system
- Symmetry → Larva - Bilateral
- Adult → Radical
- Enterocoel
- Deuterostomiate
- Mesodermal skeleton
- Head absent, brain absent
- Nerve ring present,
- Radical nerves.
- Circulatory system → open
- Heart absent
- Perihaemal system
- All are marine
- Dioecious



Hemichordata

marine

Connecting link b/w Non-Chordata and chordatas.

- Notochord absent
- Buccal diverticulum or stomochord present.
- Respiration → gills
- tornaria larva
- Digestion → ciliary feeder (filter feeder)
- circulatory system → open → Vanak present few
- Dioicious
  Fertilisation → external
  Development → Indirect

Chordata

Thick String + to have

- organ system
- Bilateral
- Triploblastic
- Enterocoel
- circulatory system – closed

- Notochord (mesodermal)
- Nerve cord (ectodermal)
  - → Dorsal
  - → Hollow (tubular)
  - → single
- Pharyngeal gill slits
- Heart (ventral)
- Post anal Tail

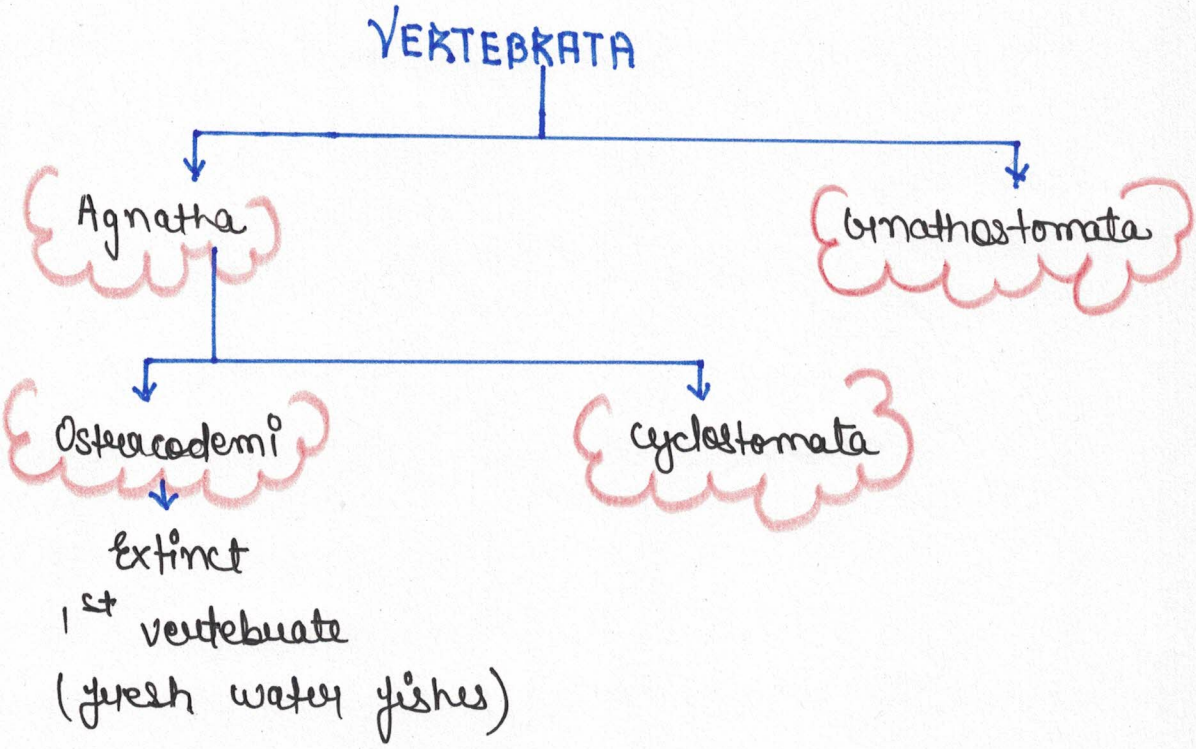
Chordates
- Acraniata (Protochordata)
  - Urochordata
  - Cephalochordata
- Craniata (Euchordata)
  - Agnatha (jawless)
    - Ostracodermi
    - cyclostomata
  - Gnatho Stomata (jaw present)
    - Pisces
      - chondrichthyes
      - Placodermi
      - Osteichthyes
    - Tetrapoda
      - Aves
      - Reptiles
      - Amphibia

Acraniata

	Urochordate / tunicate	Cephalochordate
Ex → Salpa 2) Ascidia 3) Doliolum 4) Herdmania Pyrosoma	Larva tail / Adult (x)	Larva (✓), Adult (✓)
3) Circulatory system	Larva (all), Adult → Pharyngeal open	Larva Gill, Adult all closed
4) Excretion	Supra neural gland / pytonic gland, nephrocytes	Flame cell (Hatschek)
5) Feeding	ciliary	ciliary
6) Habit	External	Larva (free), Adult External
7) Fertilisation	x (Hermaphrodite	✓
8) Sexual Dimorphism	Endostyle	
9) other features		

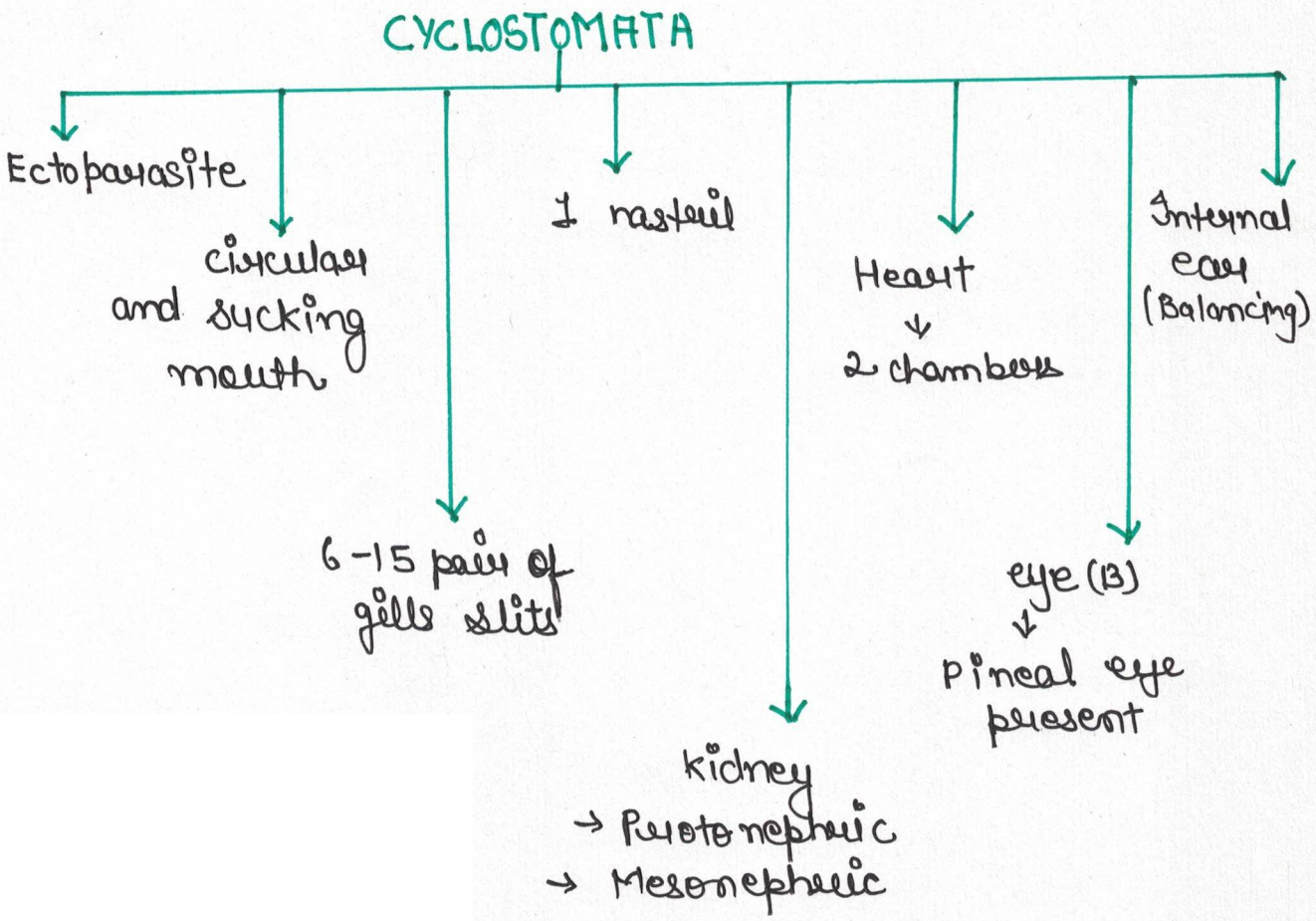
Vertebrata

- All vertebrates are chordates but all chordates are not vertebrates.
- notochord → Embryonic stage
- Adult → Vertebral column → cartilegenous
  → bony
- Heart (ventral, muscular) → 2, 3, 4 chamber
- Kidney → osmoregulation + Excreation
- Paired appendages → fins
  → Limbs

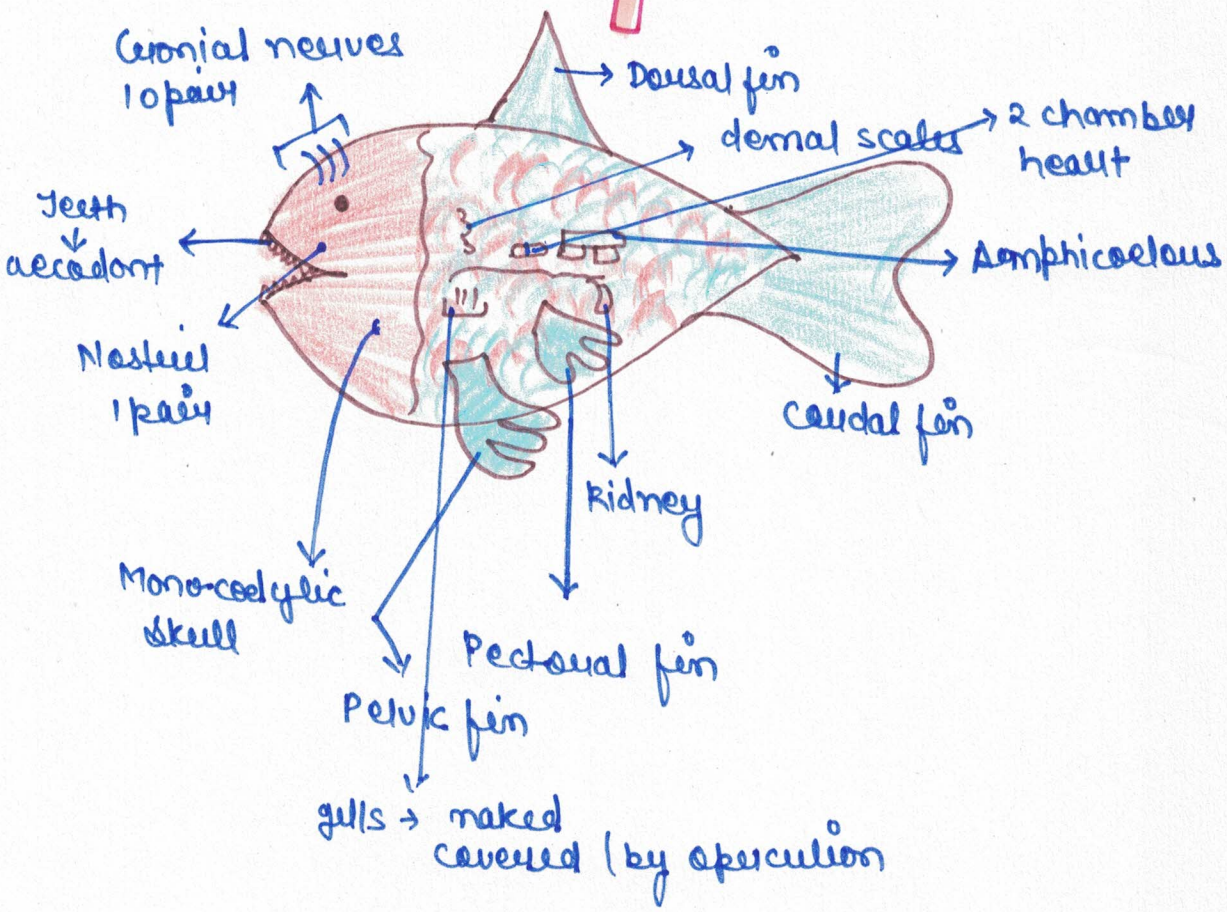


Cyclostomata

Example:→ Petromyzon (Ammocoete larva) → Sanguivorous
→ Myicine (fish)



Pisces

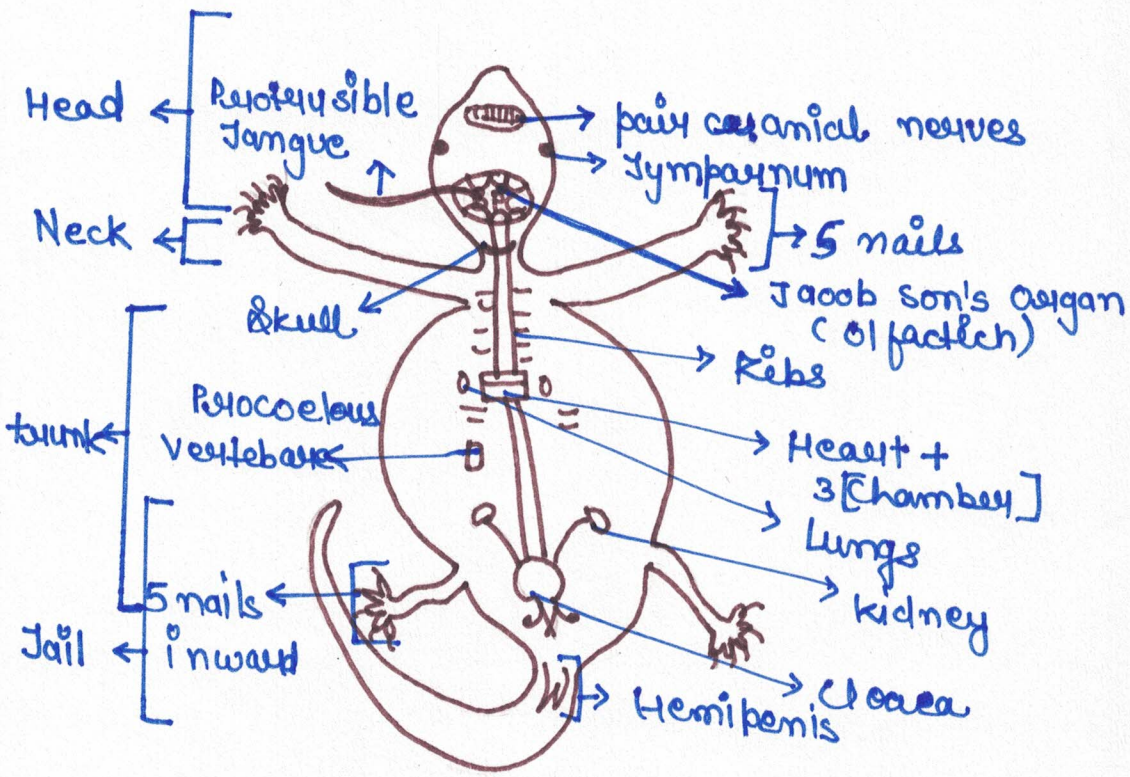


- cold blooded
- RBC → nucleated
- sinus venosus present
- Hepatic portal system
  ↓
  Present
- Renal portal system
  ↓
  Present
- Development direct
- Unisexual
- Fertilization internal or external

	Chondrichthyes (cartilagenous) (Elasmobranchi)	Osteichthyes (bony) (Telostomi)
Scales	Placoid	cycloid, ctenoid ganoid
Gills	5-7 pairs	4-pairs
Mouth	Ventral	terminal
Air bladder	X (constantly	✓
Sex	Separate	Separate
Ampulla of Lorenzini	✓ Placodermi → extinct → 1st freshwater true fish	X
Scroll valve	✓ → Armoured fish	X
Cloaca	✓ lung fish → Bony freshwater	X
Operculum	X 3 chambered heart	✓
Claspers (on pelvic fin)	✓ air bladder → for respiration on land	X
Fertilisation	internal	External
Liver	bilobed	trilobed
Other features	notochord persist, vertebral column also present, heterocercus, Jaw strong, teeth modified placoid scales mostly viviparous	Mostly oviparous nerve cord ↓ Vertebral column

Reptilia (To Creep or crawl)

- Cold blooded
- Parental care
- egg covered by $CaCO_3$
- leathery eggs
- Cleidoic eggs



Classification on the basis of temporal fossa.

Reptilia

Anapsida

Carapace → Dorsal

Plaston → Ventral

Cloacal respiration

e.g → Testudo

chetone

Diapsida

Rhynchocephalia

Pineal eye (third eye present)

Acrodont teeth

eg. Sphenodon punctatum (tuatara)

Living fossil

In New Zealand

Squamata

(Pleurodont + teeth)

	Lizard	Snake
eyelids	movable	immovable
limb/girdles	✓	×
Nictating membrane	✓	×
tympanum	✓	×
Urinary bladder	✓	×

Crocodilia

4 chambered Heart

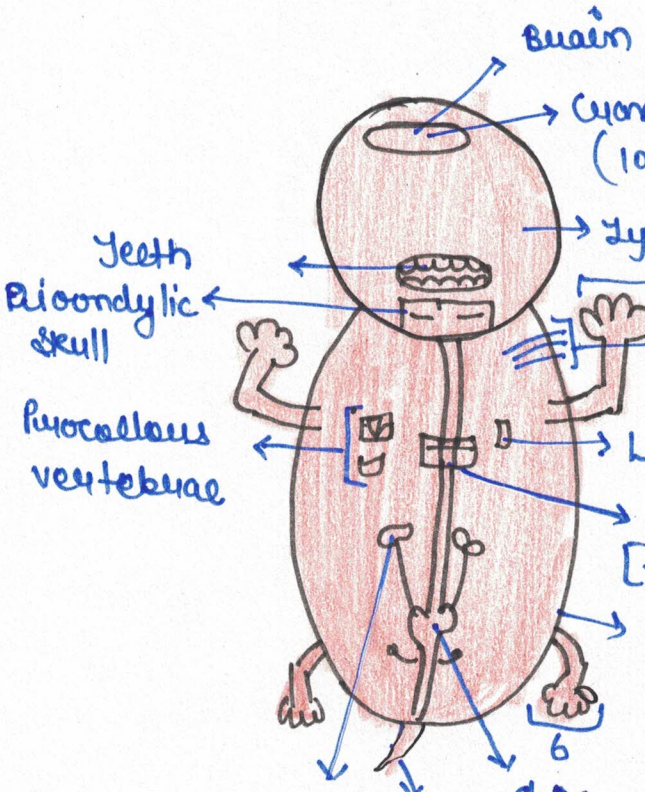
Thecodont teeth

Diaphragm present

Urinary bladder absent

eg:- Crocodile, Alligator

Amphibia



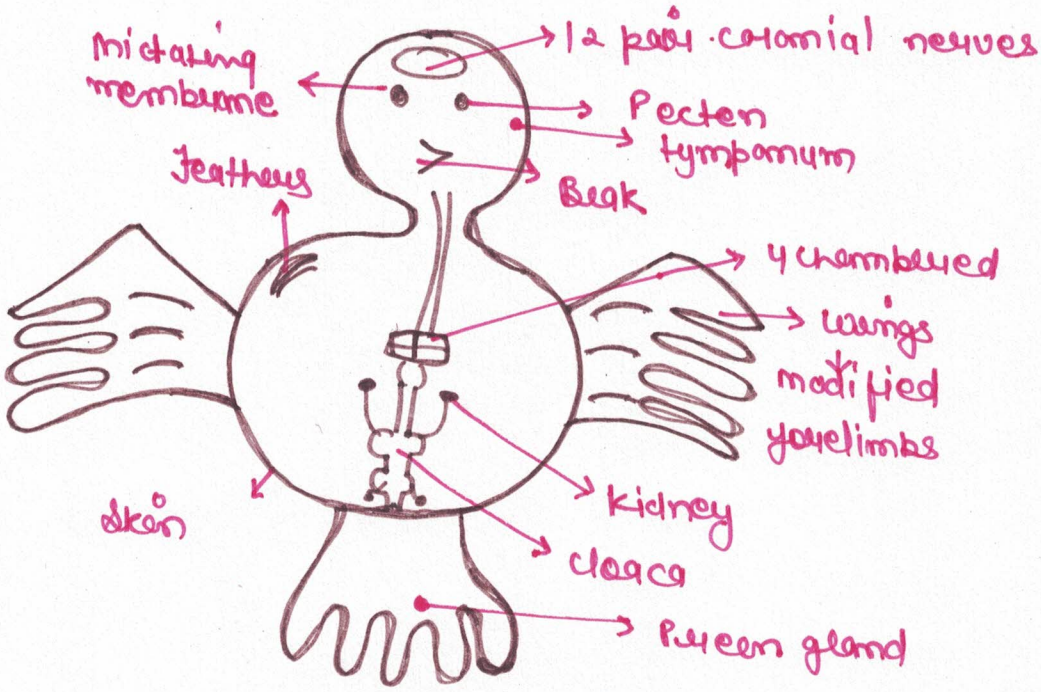
ORDER

Gymnophiona
Primitive limbless amphibia
eg. Ichthyophis

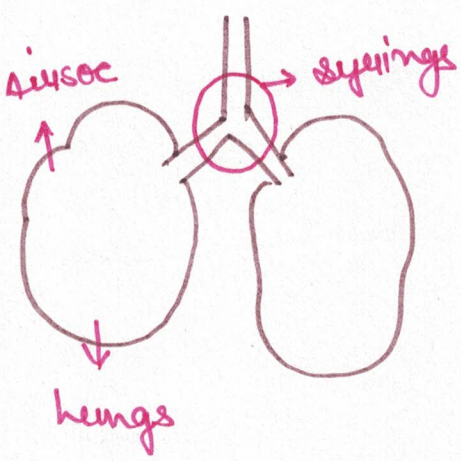
Caudata
Tailed amphibia
Adult have gills
Show neoteny
eg. Necturus
Ambystoma.

Anura
Tailless
Tadpole

Aves



- Warm Blooded
- Parental care
- monodelphic condition
- Pigeon Milk
  ↓
  Crop Product



AVES

Archaeornithes

→ extinct
→ toothed birds
→ connecting link between Reptilia and Aves
e.g → Archaeopteryx

Neornithes

Impennae

→ Aquatic or marine birds
eg → Penguine

Paleognathae

→ massive, flightless
→ wings ill developed
→ Urinary bladder, copulatory organ.

Neognathae

→ small, flight bird
→ wings well developed
→ syrinx, Pygostyle keel, preen glands.

Mammals

- Warm blooded
- Hair on skin
- Mammary glands
- 4 chambered Heart
- Diaphragm (without any exception)
- Pentadactyl
- External ear pinna
- teeth
  - → thecodont
  - → Heterodont
  - → diphyodont
- kidney
  - → Metanephric
  - → urea
- 7 cervical vertebrae
  - → Acoelous
  - → amphiplatyan
- lungs
- 12 pair cranial nerves
  - → dicondylic skull
  - → corpus callosum present.

Prototherian

- → egg laying
- → mammary gland (without nipples)
- → corpus Callosum absent
- → cloaca

eg. ornithorynchus

Metatherian

- → Marsupium present
- → Placenta- false
- → mammary gland present
- → corpus callosum absent
- → Uterus vagina clitoris, penis } 2 pair

eg. Macropus

Eutherian

- → Marsupium absent
- → Placenta - true
- → mammary gland present
- → corpus callosum present.
- → Uterus, vagina clitoris, penis

1 pair