

Animal Kingdom

Animal:- multicellular, eukaryotic
heterotrophic, cell wall $\ominus$ nt,
chloroplast $\ominus$ nt

Kingdom	Phylum	→ Phylum
protista	Porifera	chordata
phylum	invertebra	vertebra
prototzoa	complexity	

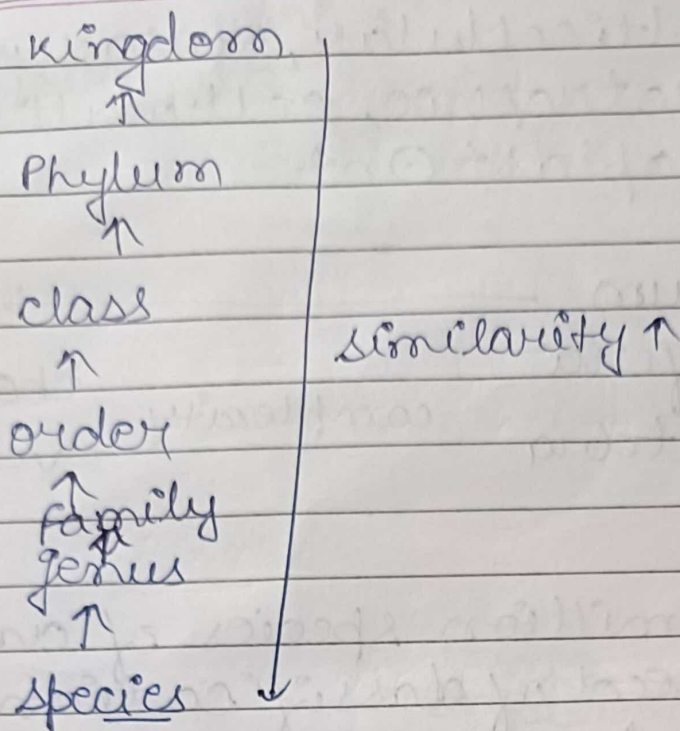
→ more than 1 million species of animals exist. so need of classification is important

- classification helps in assigning a position to newly described species.
- Although of differences in forms there is still similarities in s. system, R sys., E. sys., coelom, symmetry.

5 Kingdom classification

↳ R.H. Whittaker (1969)

- Kingdom monera
- " Protista
- " Fungi
- " Plantae
- " Animalia



Phylums of Kingdom

porifera → eg:- sponges → sycon

coelenterata (cnidaria) → eg:- Hydra

ctenophora → eg:- Pleurobranchia

platyhelminthes → eg:- Tapeworm

Aschelminthes → eg:- Ascaris

Annelida → eg:- Earthworm

Arthropoda → eg:- cockroach

mollusca → eg:- Octopus, Pila (snail)

echinodermata → eg:- starfish

chordata (vernichordata) → eg:- ^{balanoglossus} ~~saccoglossus~~

chordata → eg:- dog, cat, monkey, monkey, lion, birds, human

* Basis of classification

- ① Level of organisation
- ② Body plan
- ③ circulatory system.
- ④ Symmetry
- ⑤ germinal layer
- ⑥ coelom (body cavity)
- ⑦ segmentation/metamerism
- ⑧ notochord
- ⑨ embryonic development
- ⑩ sexual stages.

① Level of organisation:-

→ (a) Protoplasmic level:-

Body is composed of single cell

e.g. → Amoeba

Rest & Repro.
Ecc. ←

* Cellular level:-

Body is composed of loose cell aggregate with some division of labour.

e.g.:- Porifera / sponges

→ (c) Tissue level:-

cell → group → Tissue
(similar) Func. ↓

e.g.:- coelenterata, ctenophora

→ (d) organ cell

→ Tissue $\rightarrow$ group $\rightarrow$ organ (func.)

e.g.:- platyhelminthes + higher phylum.

→ (e) organ system level:-

organ $\rightarrow$ group $\rightarrow$ system (func.)

e.g.:- Aschelminthes $\rightarrow$ chordata

② body plan!

(a) cell aggregate plan:- $C_1 \rightarrow C_2 \rightarrow C_3 \rightarrow C_4$

(v) Blind sac plan:- digestive sys. in complete single opening $\swarrow$ mouth

acton, Arus

e.g.:- coelenterata, ctenophora, platyhelmin-
-thes.

Hydra = hyposome

Phenylacetylene: Everted phenylac.

(c) Tube within tube body plan:-

- ↳ complete digestive system.

- ↳ separate opening & closing

e.g. :- Aschelminthes ~~to~~ chordata.

③ circulatory system

open bus.

pumping org. $\rightarrow$ heart

capillary network ent-

- organs are bathed in blood.

e.g. :- Anthranta

mollusca (except

cephalopod e.g. cuttlefish, squid, nautilus

close cū. syst.

Heart

4

17) Defining blood volume in pairs of function and

Auxiliary Vessels

echinodermata, hemichordata, lower chordates (Tunicates) solistum pascidici, salpa	e.g. - Annelida (first phylum to have c.c. system) • cephalopod mollusca • higher chordates.
---	--

④ Symmetry (includes morphology)

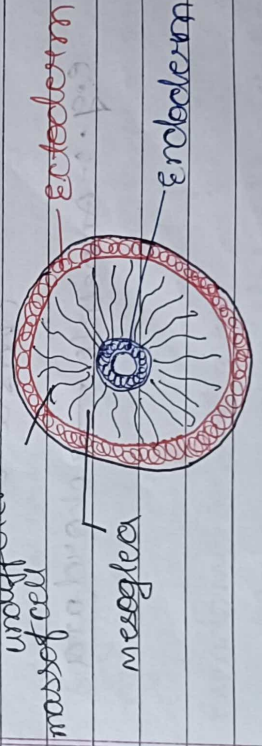
(a) asymmetry:- body cannot be divided into two equal halves through any plane.
e.g.:- most of sponges (except Sycon, Leucosolenia)

(b) radial symmetry:- body divided into 2 halves through any plane passing through center.
e.g.:- coelenterata, ctenophora, echinoderms (adult)

(c) bilateral symmetry:- body is divided into right and left halves through a single plane.
e.g.:- Platyhelminthes → chordata.
+ echinodermata (larva)

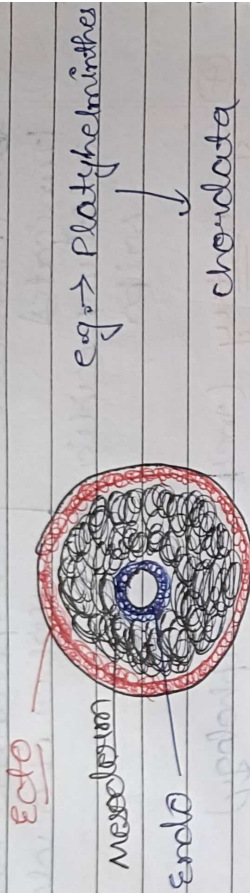
⑤ germinal layers

(a) diploblastic:- ectoderm
undifferentiated endoderm



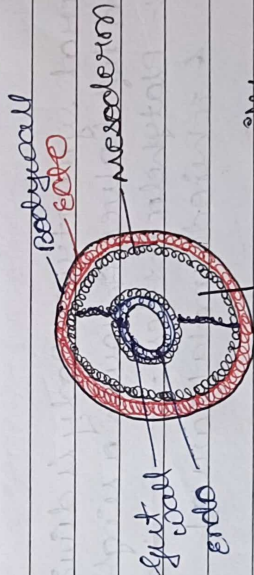
e.g.:- coelenterata, ctenophora

(B) Diploblastic :- $\left\{ \begin{array}{l} \text{ectoderm} \\ \text{mesoderm} \\ \text{endoderm} \end{array} \right.$



(6) Coelom (Body cavity)

(a) Coelomate (Body cavity)
Coelom :- space b/w body wall & gut (extra space)
Coelom is lined by mesoderm on either (both side)



Coelomic cavity
[filled with coelomic fluid]
- alkaline
(has coelomate)

eg. :- Annelide $\rightarrow$ chordata

(6) Pseudocoelomate:-

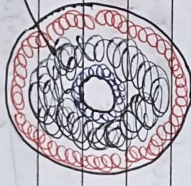
e.g.:- Aschelminths



mesoderm is scattered
in form of pouches

(7) Acoelomate:-

mesoderm/merogel



e.g.:- coelenterata, ctenophora,
platyhelminthes

(8) Metamerism:-

(a) True metamerism:-

body is divided $\leftarrow$ externally or internally

in segments with serial repetition of at least some organ.

segments = metamers

e.g.:- Annelida, arthropoda, chordata.

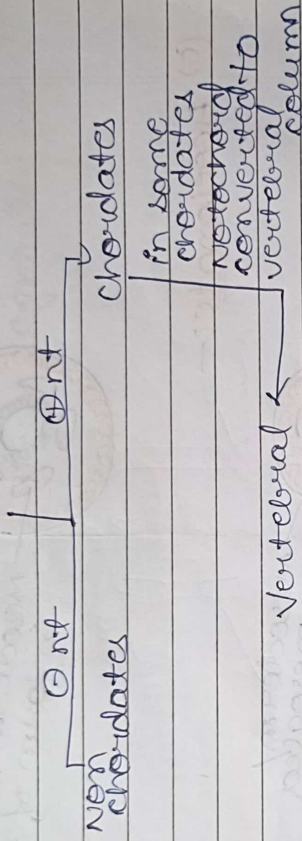
(b) Pseudo metamerism:-

{ } = Tapeworm (platyhelminthes)

(viii)

Notochord:-

- ↳ solid, rod like str.
- ↳ mesodermally derived
- ↳ $\oplus$ at dorsal end



(ix)

Embryonic development:-

- ↳ on the fate of blastopore (opening of gastrula)

(a) Protostomates:-

- blastopore $\rightarrow$ 1st $\rightarrow$ convert $\rightarrow$ mouth
- e.g.:- Platyhelminthes $\rightarrow$ mollusca (blind sac) (Tube within Tube)

(b)

Deuterostomates:-

- blastopore $\rightarrow$ 1st $\rightarrow$ convert $\rightarrow$ anus
- e.g.:- Echinodermata $\rightarrow$ chordata

(x)

Larval stage:-

- Larval stage:- stage which is morphologically different from adult.
- Larval $\oplus$:- indirect dev.
- Larval $\ominus$:- direct dev.

* Porifera

Pori = Pore

fera = to have / to bear

- commonly sponge
- 1st multicellular animal
- most primitive animal

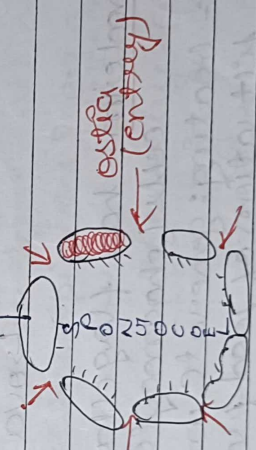
Habitat/Habitat:-

- Aquatic → mostly marine (salty water)
(spongiellus)

sessile:- (attach to substratum, bottom dwellers, non motile).

- solitany (rare), colonial (= Leucosolenia)

- They have numerous mouthlets called ostia (entry of water) & a single large opening osculum (exit of water)
(many entry, single exit)
→ osculum (exit)

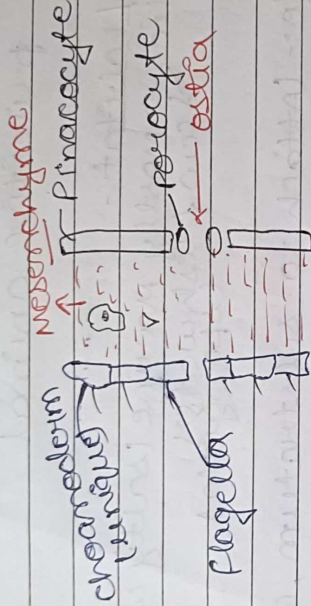


- cellular level of body organisation.
- cell aggregate body plan.
- mostly asymmetrical.

→ Acoelomate

Body wall:

Outer :- Pinacoderm
Middle :- Mesenchyme
Inner :- Choanoderm



Mesenchyme :- soft gelatinous material, contains amoebocytes cells
(distribution of food to other cells)
→ differentiate into

- Trophocytes - storage of food
- Scleroblasts - skeleton
- Archeocytes - (Totipotent cells)
↳ ova → sponges

Choanoderm :- has flagellated collar cells (choanocytes)

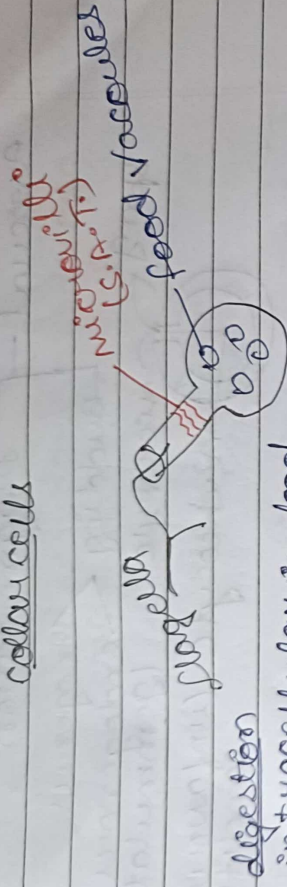
func. :- beating: generate water current; filtration of food from water

Body cavity :-

Spongocoel / paragastric cavity

↳ lined by choanoderm
↳ has collar cells

collar cells



water transport system / water canal system / canal system

(characteristic features)

• water → entry → ostia → spongocoel
exit ← osculum ← circulate

Advantages:- → gathering of food.

→ respiration

→ excretion (NH₄)

→ diffusion

→ Reproduction

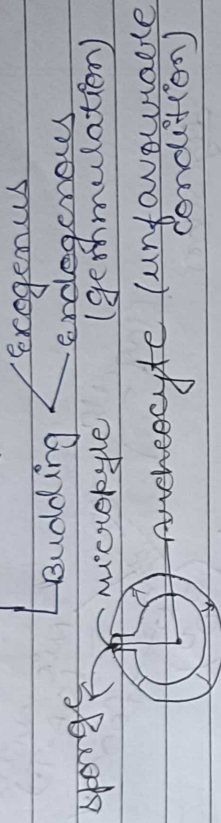
Skeleton: (Internal) →

↳ calcareous spicules } by sclerocytes
↳ siliceous ,

↳ soft spongin fibres → by spongiocytes
eg:- Euspongia

* Reproduction → asexual
sexual

Asexual — Fragmentation



sexual reproduction :- members :- bisexual hermaphrodite / monoecious

- ♂ and ♀ gamete in single individual
- internal and cross fertilization
- Protogyny condition (female gamete mature early)

• Sperm + ovum = zygote → larva

• ~~Indirect dev.~~ **Indirect dev.** — metamorphosis

• Amphiblastula : sycon

• Parvencymula : Leucopora - **Adult**
- secunda

examples :-

* Sycon = scypha

* Spongilla = freshwater sponge

* Euspongia = bath sponge

Cliona = boring sponge

Euplectella = Venus flower basket
(budding gift in Japan)

Leucosolenia = smallest sponge

Phylum Coelenterata

↳ Also called = cnidarians = due to special cells = cnidoblast

↳ Aquatic $\swarrow$ mostly marine
↳ fresh water
e.g. (Hydra)

↳ sessile / free swimming / carnivore

• Tissue level organization

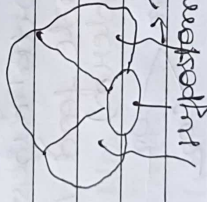
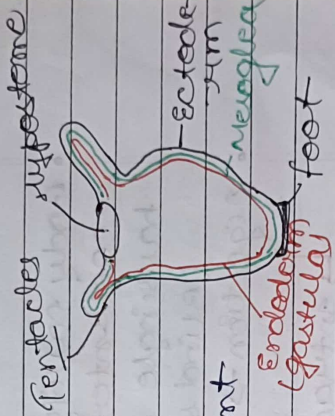
• Blind sac plan

• Radial symmetry

• Diploblast $\begin{cases} \text{ectoderm} \\ \text{mesogel} \\ \text{endoderm} \end{cases}$

• Acoelomate

• Intestinal cells = Totipotent



Atyelia (Jelly fish)

• 2 forms (dimorphic)

Polyp

→ sessile

→ Asexual reproduction

→ cylindrical

→ mouth / tentacles upward

→ may be solitary or colonial

e.g. - Hydra / Anemone

Medusa

→ Free swimming

→ Sexual reproduction

→ Umbrella shape

→ Jovianoid

→ always solitary

e.g. - Aurelia

(Jelly fish)

- Alternation of generation

Metagenesis

Poly $\xrightarrow{\text{asexual}}$ medusae $\xleftarrow{\text{sexual}}$

eg:- Physalia physalis

(note:- Hydra, Adamsia and Aurelia do not show ~~the~~ alternation of gens.)

- Body cavity

= coelenteron / gastrovascular cavity

has single opening, mouth called hypostome
(blind sac)

- Digestion $\rightarrow$ extracellular in gastrovascular

cavity (partial digestion)

↳ Intracellular inside food vacuole (gastroderm)

- respiration $\rightarrow$ ley diffusion $\leftarrow$ or

- excretion - by diffusion (NH_3)

- nervous system :- diffused and in form net
nerve net (flat earth)

1133/1134

neurons:- Apolar / non polar
(no axon and no dendrite)

- stinging cells $\rightarrow$ cnidoblasts

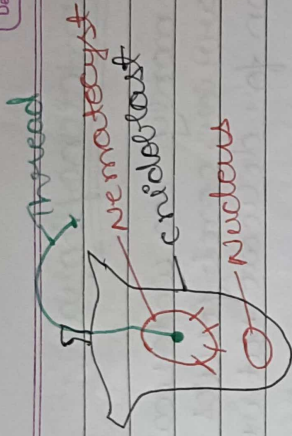
~~Neurotoxicity has~~

function (stinging capsule) (ont on body & tentacles)
Anchorage (attachment)

Archeage (attachment)

reference

offence (to capture prey)



- Some members have skeleton made of calcium carbonate.

e.g. Nematocyst = Brain coral

* Reproduction

Asexual :- Budding

Sexual :- Gamete formation

- Indirect development
- Larva stage

Examples

* Physalia : Portuguese man of war

Obelia : sea fan

* Nematocyst : Brain coral

* Adambia : sea anemone

Aurelia : Jelly fish

* Ephyra : sea fan

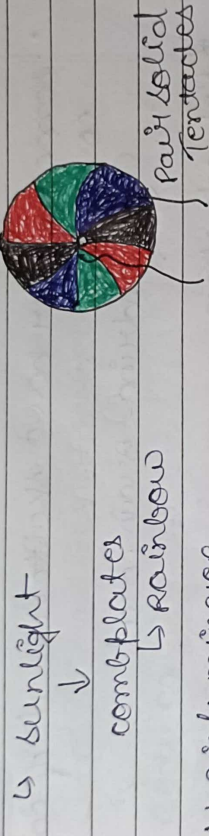
* Pennatulid : sea pen

Hydra :

Physics objective शुद्ध में Adam aur George
अ pen होले फाँट

* Phylum Ctenophora

↳ commonly - sea water inhabit, sea goose
butterfly, comb-jellies
↳ known for delicate nature and beauty



↳ bioluminescence
↳ property well known
↳ body jelly-like, transport, spherical, cylindrical, pear shape
• Habitat → exclusively marine
• free swimming → (pelagic)
• carnivore
• 8 ciliary comb plates helps in locomotion

• Tissue level of body plan
• Blind sac body plan
• Radial symmetry
• Diploblastic
↳ ecto
↳ mesoglea
↳ endo

• Acoelomate
• Digestive syst → extracellular
↳ intracellular

• Respiration → by diffusion
• Skeleton → Ont
• excretion → by diffusion (nvg)

→ In place of ciliated cells they have

lasso cells/ collablast

on their Tentacles

↳ for capturing of prey

• Acantharians

• Reproduction:-

↳ only sexual

↳ Hermaphrodite/ bisexual

↳ fert = external

↳ indirect development

↳ Larva: ciliated (free swimming)

eg:- Pleurobrachia

ctenophora

comb

PCB

* Phylum Platyhelminthes

↳ flat worms

Helminthology

↳ study of worms and their infestation

• dorsoventrally flattened body.

• mostly parasite

(depend on host body)

↳ endoparasite

(mostly animals
humans (intestine))

• free living:- planaria
(high regeneration cavity)

• organ level

• blood sac

• Bilateral symmetry.

• Triploblastic → ectoderm
solid mesoderm [parenchyma, mesenchyme]
enteron

- Acoelomate
- Locomotory str. Org. in place they have hooks and suckers.
 - ⊕ suckers (absorption)
 - ⊕  hooks (attachment/adhesion)
 - ⊕

• Parasite adaptation

(Hooks, suckers, cuticle (thick) (tegument)
body wall

cuticle (tegument) secrete
epidermis (some time ciliated)
circular muscles
longitudinal muscle → oblique muscle

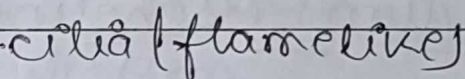
- cuticle:- Protect worm from digestive enzyme of host.

digestion (digestive system):- blind body sac plan
↳ in complete

- food is either ingested through mouth
- some member do not have digestive system
organ - mouth Org. → eq (taenia)
anus Org. → eq (taenia)

↳ They absorb nutrition by attaching themselves to the host surface with the help of hooks and suckers. (as ectotrophy)
eg:- (Taenia)

- ↳ (salt and water balance)



- longitudinal nerve chord.

- cross
(probandy)

↳ many

cause:- Tacriasis / cyclic causes.

spread by eating uncooked meat of pig.
 • Pseudometamerism.

(iii) Planaria (regeneration)

↳ high regeneration power

(iii) Fasciola: (Liver fluke)

↳ cause liver rot

disease in cattle.

(Teen of planning & fail)

* Phylum: Aschelminthes

↳ Nematohelminthes / Nematode

↳ cross section :- circular

↳ caudal end / posterior end (Tapering)

↳ Round worm / Threadworms

Habitat: Free living, Aquatic, Terrestrial, Parasite

↳ Plants

↳ Animals

• organ system level of body

• Tube within tube

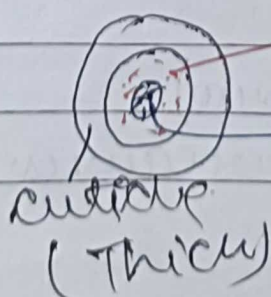
• Bilateral symmetry

• Triploblastic

↳ Ectoderm
 ↳ Mesoderm
 ↳ Endoderm

• pseudocoelomate: Mesoderm is not in form of pouches.

• Body wall:



(syncytium)
 epidermis
 (multinucleated)

longitudinal muscle

• Digestive system.

→ (complete)

→ Mouth → muscular pharynx → nonmuscular intestine
↓
Anus.

• Respiration

↳ Body surface (diffusion)

• circulation:- Ont

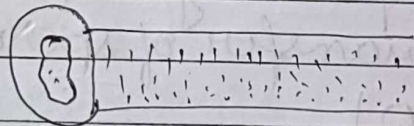
• Skeletal system:-

↳ pseudocoelomic fluid acts as hydrostatic skeleton

• Excretory system:- Protonephridia help in osmoregulation

↳ product (NH_3)

• Nervous system:- longitudinal nerve chord. nerve ring (acts as brain)



(ladder like)

Receptors → Touch
↳ chemicals.

• Cephalization is Ont

• Reproductive system

↳ members unisexual / mostly dioecious.

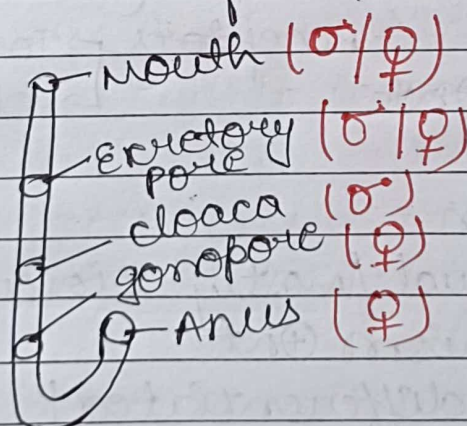
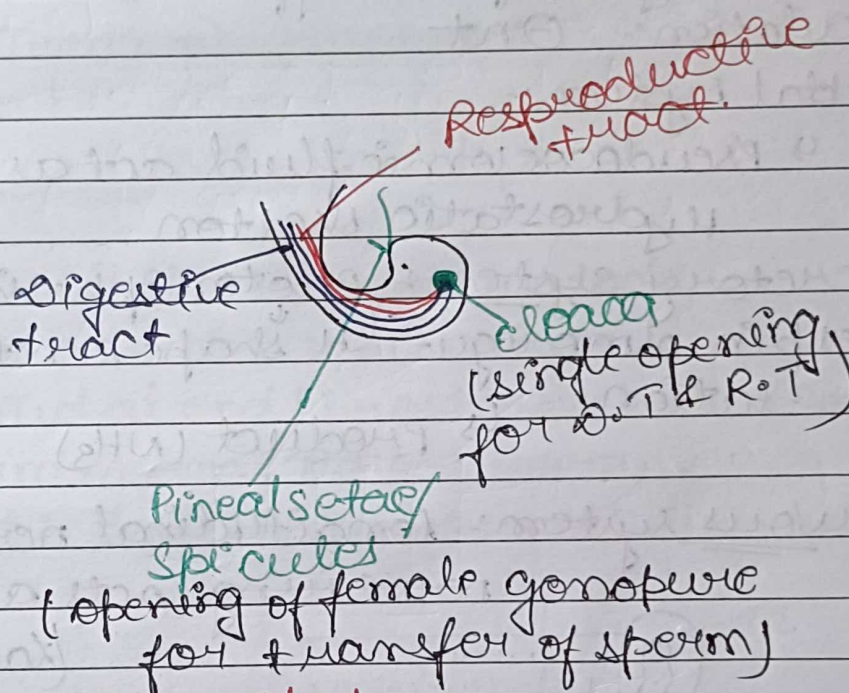
↳ sexual dimorphism Ont

(sexes can be differentiated)

fertⁿ → internal

cross dev.
 direct (no larva)
 indirect (larva)

male Ascaris	female Ascaris
• short	• long
• caudal end lateral curved	• straight
• Pinal setae/ Spicules Θ nt	• Θ nt
• cloaca Θ nt	• cloaca Θ nt



Examples

- ① Ascaris:- (endoparasite of S.I.)
disease:- Ascariasis

(ii) Ancylostoma: (hook worm)

↳ S.I. Endoparasite

(iii) Wuchereria (filarial worm)

↳ Endoparasite of lymph vessels / system

↳ cause: - elephantiasis

↳ vector: culex mosquito (♀)

(iv) Trichenella: - viviparous

↓
(birth to young ones)

(v) Enterobius (Pin worm).

Trick → (AAW)

* Phylum: - Annelida

↳ Annulus = Ring like segments (metamerically segmented).

Habitat: -

• Marine: - Nereis

• Freshwater: - Hirudeneria

• Terrestrial: - Earthworm

• Parasitic: - Leech (blood sucking leech)

locomotory ←

(sanguivorous)

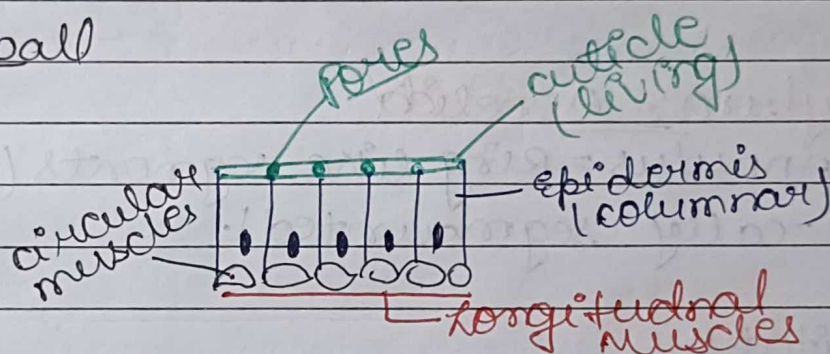
str. Orgt
suckers @ ant.

→ soft, cylindrical and elongated with ring like Annulus (Metamer)



- organ system level
- Tube within Tube ← mouth
← Anus
- Bilateral symmetry
- closed circulatory system
- Triploblastic
- eucoelomatic (True)
- metamERICALLY segmented
 - ↳ external segment with serial repetition
 - ↳ and internal segment of atleast some organs

• Body wall



- longitudinal muscles and circular muscles
 - ↳ Help in locomotion.

• Locomotory str.:-

- (i) chitinous setae / chetae:-
 - ↳ earthworm (walking)
- (ii) Parapodia: (lateral appendages)
 - e.g. Nereis (swimming)

- Digestive system
 - complete

Mouth $\rightarrow$ Pharynx $\rightarrow$ Oesophagus $\rightarrow$ Crop (store)

Anus $\leftarrow$ Intestine $\leftarrow$ Gizzard (crush)

$\rightarrow$ Digestive glands appear, 1st.

• Respiratory system.

$\rightarrow$ Through skin (cutaneous Respⁿ)

$\rightarrow$ Cuticular pores $\rightarrow$ Mucous pores out $\rightarrow$ Trap O_2 & CO_2

Exception: Terubella

(gills) $\rightarrow$ branchial respⁿ...

Exchange of gases

• Excretory system:

$\hookrightarrow$ Nephridia (coiled tubules)

$\downarrow$ Help
Excretion
osmoregulation

$\downarrow$ opening (nephridiopores)

waste — Aquatic = NH_3

Terrestrial = uric acid

• Circulatory system

$\rightarrow$ 1st time closed circulatory system.

• Some large blood vessels modified for pumping hearts.

• Blood = Red

• Haemoglobin $\oplus$ nt (Hb)

• Haemoglobin dissolve in plasma (erythrocyte)

• RBC $\oplus$ nt

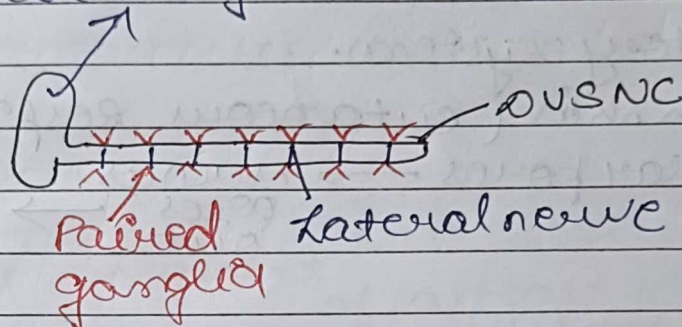
• Nervous System:

↳ 1st time

↳ Double Ventral solid nerve chord (DVSNC)

↳ Bear paired ganglia joined by lateral nerve.

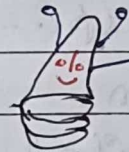
↳ Nerve Ring → acts as brain



• Cephalization is not in some member.

(Head)

e.g. → Neries, bear sense organs



cephalization

• Reproductive System

members: some → dioecious

(unisexual)

e.g. Neries

some:- monoecious

(earthworm, Hirudinaria)

fertⁿ → internal
external

dev:- → direct (earthworm, Hirudinaria)
indirect (Neries)

• Examples:

- (i) Hirudinaria -
↳ Blood sucking leech
- (ii) Pheretima postuma (earthworm)
↳ Farmer's friend
- (iii) Nereis: (sand worm / ragworm)
↳ cephalization & nt.
- (iv) sea mouse (Aphrodite)

Hey Prabhu Nahin Satoo

1st time in Annelida:-

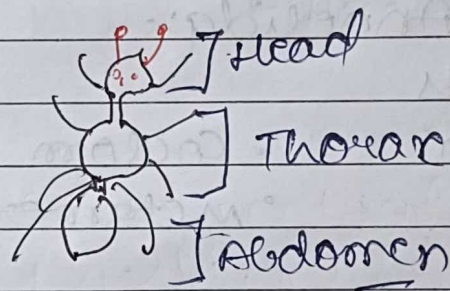
- digestive glands
- c. circ. system
- Heart
- Haemoglobin
- DUSNC
- Coelom
- Metamerism

* Phylum Arthropoda

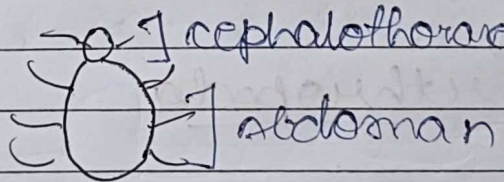
- Largest phylum of A. Kingdom
↳ class Insecta
↳ Largest class
- every 2/3 species named are arthropoda.
- cosmopolitan:
 - ↳ Terrestrial
 - ↳ Aquatic $\leftarrow$ F.W. marine
 - ↳ Solitary
 - ↳ colonial
 - ↳ parasite
- ↓
gregarious
(polyphagous)

- organ system
- Tube within Tube
- open cir. system
- Bilateral
- Triploblast
- coelomate
- metamerically segmented

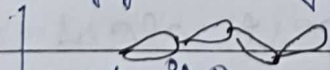
• Body part
 ↗ Head
 ↘ Thorax
 Abdomen



• In some head & Thorax fused = cephalo-
 thorax
 + abdomen



* unique features:- Jointed lateral appendages [Arthro = Jointed & Poda = legs]



↳ chitinous exoskeleton (Brown colour)

• space around viscera (soft organ) in coelom is filled.

So, blood-filled coelom called (hemocoel) with blood.

• Digestive system: complete.
↳ omnivores

• Respiratory system (various organ)

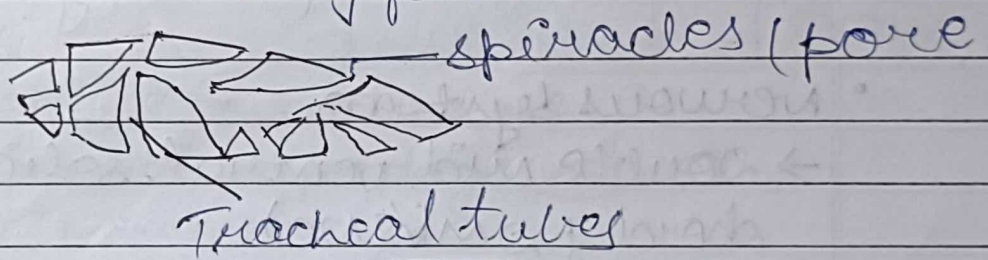
(i) gills → prawns

(ii) book lungs → spiders, scorpions
↳ last segment (Telson)

(iii) Tracheal tubes → insects (cockroach) ↳ sting

(iv) book gills → Limulus

(king crab / house shoe crab)
↳ living fossils.



• Excretory system: (various organs)

(i) malpighian tubule → insects (class)
e.g. cockroach

(ii) coxal gland → spiders, scorpions
class: (Arachnida)

(iii) Anterior gland
or green gland → class crustaceans
(prawns, lobster)

→ High degree of cephalization is not

• bear sensory organs

Antennae, eyes → simple compound

↳ unit = ommatidia
(mosaic vision)

Statocyst = Balancing organ
(like inner ear)

And cerei < sound
vibration

• Circulatory system:

→ open circulatory system

→ Blood is colourless

↳ Haemolymph

→ in some mem. of crustaceans like
Prawn → copper containing respi.
pigment

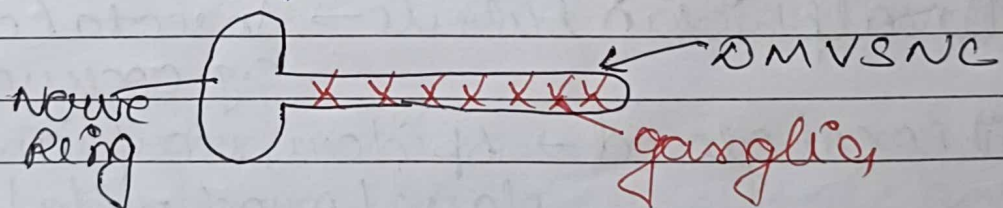
↳ (Haemocyanin)

• Nervous system

→ double mid ventral, solid nerve
chord (DMVSN)

→ Bear ganglia

→ nerve ring → acts as brain



• Reproductive system:

→ member mostly dioecious (unisexual)

→ sexual dimorphism may be ♂ & ♀

→ fertilization
 Internal
external (water)

→ mainly oviparous (some viviparous)
eg. scorpion

→ direct & indirect

	class Insecta	class Arachnida	crustaceans
<u>Legs</u>	6	8	10
<u>Body Division</u>	H+T+A	CT+A	CT+A
<u>Respⁿ</u>	Tracheal Tubes	Book lungs	gills
<u>Excretⁿ</u>	Malpighian Tubules	coxal gland	green gland
<u>Ex. prod.</u>	uric acid	guanine	NH ₃
<u>Antennae</u>	1 pair	no	2 pair
<u>eye</u>	compound	simple	compound
<u>e.g.</u>	cockroach, Ant, Housefly etc.	spiders, scorpions	prawns, crabs, lobsters, crayfish

- * successful land invaders why?
- jointed lateral appendages (xx)
 - chitinous exoskeleton
 - wings.

* Example

- ✓ lolita: locusta (H. Pest)
- ✓ ↓ limulus
- ✓ Bombay: Bomby x mori (silkworm)
↓ Economic imp.
- ✓ aakar: apis (Honey bee)
 - 1st product = wax
 - 2nd " = Honey
- ✓ store: scorpion
- ✓ se: spiders
- ✓ Butter: Butterfly
- ✓ Pehle: Palcomon (prawns)
- ✓ mat: mosquito - vectors
 - culer = Elephantiasis
 - Anopheles = malaria
 - Aedes = dengue, chikungunya
- ✓ lena: lacifer lacca (lac insect) → E. imp.

* Larva :-

- caterpillar $\leftarrow$ silkworm
- butterfly
- grub - honeybee
- maggot - housefly
- wiggler - mosquito

Peripatus - centipede $\leftarrow$ annulida
(PAA) $\leftarrow$ Arthropoda

* Phylum mollusca

$\rightarrow$ 2nd largest Phylum

$\rightarrow$ Study: Malacology

$\rightarrow$ Body is covered by shell

calcareous - CaCO_3

$\rightarrow$ Study = (chondroitin) chitin
+ chondroitin protein

members $\leftarrow$ soft bodied animal

$\leftarrow$ Terrestrial, Aquatic $\leftarrow$ F. water
M. water

$\rightarrow$ Organ system level

$\rightarrow$ Tube within tube

$\rightarrow$ open c. system

$\rightarrow$ Bilateral symmetry

$\rightarrow$ Triploblastic

$\rightarrow$ Eucoelomate

$\rightarrow$ Metamerism Int

$\rightarrow$ exception (Neopilina)

(Living fossil)

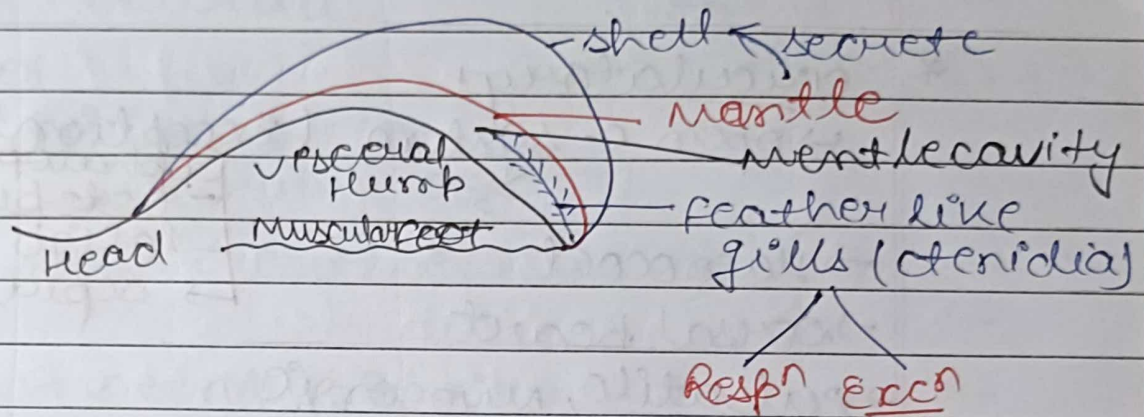
c. link

$\leftarrow$ annulida

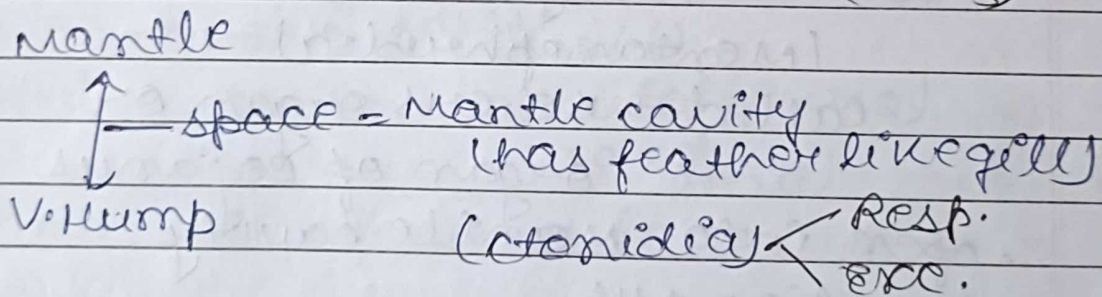
$\leftarrow$ mollusca

* Body division:

- ↳ Head — eyes — tentacles
- ↳ visceral hump —→ visceral organs.
- ↳ ventral muscular foot —→ locomotion



- A soft, spongy layer of skin that covers the visceral hump called mantle or palium. It secretes shell (CaCO₃)



* Digestive system.

- complete
- mouth contains file like (2d part)
- Rasping organ —→ Radula
- bear —→ Transverse rows of teeth
- Anus opens into mantle cavity.

* Respiratory:

By ctenidia (gills)

e.g. - pila $\left\{ \begin{array}{l} \text{land} = \text{pulmonary sac} \\ \text{water} = \text{gills} \end{array} \right.$

* Circulatory:

→ open c. system (exception)

→ haemocoel

→ dorsal heart

→ pulsatile, myogenic

→ cu. as a Respiratory pigment (haemocyanin)

Cephalopods
 - Octopus
 - Loligo
 - Sepia

* Excretory:

1 to 2 kidney like str.

(Metanephridia)

called → Keber's organ or organ of Bojanus

• open into mantle cavity

• Aquatic = NH_3

Terrestrial = uric acid

* Nervous system:

• 3 pair ganglia

• eyes:

• ophthalmia

↳ (chemical & physical nature of water)

statocyst

↳ balance

fourth $\rightarrow$ internal
external

father = Kōichi
Mikoto

✓ lo- loligo (squid) (c)

~~X~~ Phylum Echinodermata

Echino → spiny
dermata → skin } animal

- Exclusively marine
- Body forms
 - star shape = starfish
 - cylinder or melon = sea cucumber
 - flower / flower = sea lily

→ spiny skin, bottom dweller slow moving

(Benthos)

→ Pedicellary (फुटल शीट) str. for cleaning of body.

→ Endoskeleton—made up of calcareous ossicles

dermal ossicles

→ organ system level

→ Tube within tube

→ open c. system — Adult: Radial

→ symmetry — Larva: Bilateral

→ Triploblastic

→ Eucoelomate

→ Metamerically segmented

→ Deuterostomates.

• Water Vascular System

→ it is a unique feature

→ other name Ambulacral Syst. helps in

- locomotion by tube feet.
- capturing of food.
- Transportation of food
- Respiration
- Excretion

• Digestive system

- ↳ complete — ventral
- ↳ mouth
- ↳ Anus — dorsal

• Respiratory system

↳ Body surface

↳ gills $\oplus$ $\rightarrow$ dorsal branchiae or papulae
e.g. starfish

• Circulatory system

↳ open circ. system

↳ Heart $\oplus$

↳ Blood colourless

↳ Haemocoel

• Excretory system

$\rightarrow \oplus$

$\rightarrow$ Diffusion by body surface

$\rightarrow$ Product $\rightarrow \text{NH}_3$

• Nervous system

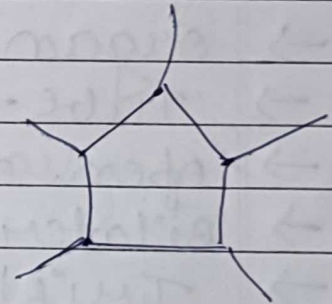
• Primitive

• Pentamerous nerve ring

• Radial nerves

• Brain $\oplus$, Eyes $\oplus$

• Power of regeneration in some.



• Reproductive system

• Mem = unisexual

• Fern = External

• dev = Indirect

larva = free swimming larva

• Examples

office : ophiura (brittle star)

Aunty : asterias (starfish) $\rightarrow$ power of regeneration (Autotomy)

asked : antedon (sea lily)

eh : echinus (sea urchin)

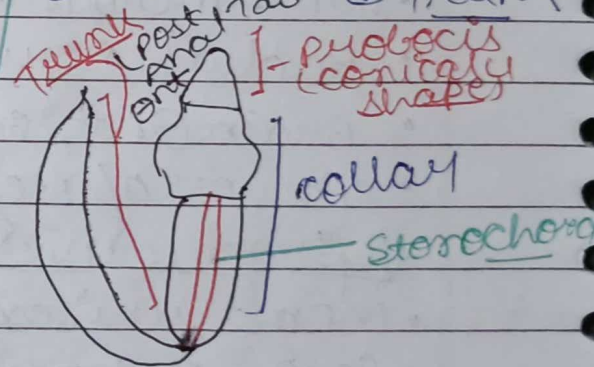
cucumber : cucumera (sea cucumber)

* Phylum Hemichordata

- Earlier they were placed as sub Phylum under phylum chordata.
- Later on moved to separate phylum under Non chordates.
- It was thought to have notochord which was mistaken for stomochord (buccal diverticulum) - outgrowth of gut wall.
- Stomochords
 - ↳ rudimentary (dorsal)
- Soft bodied worm like animals.
- marine, fossorial (Burrow - ~~for~~)
- connecting link b/w chordates & nonchord.
- organ sys. level
- Tube-within tube
- open. circulatory sys.
- Bilateral symmetry.
- Triploblastic
- coelomate
- cephalization Ont
- Deuterostomates

Body division

- ① Anterior proboscis
- ② collar
- ③ Trunk



• Digestive system

- complete
- ciliary feeders.

• Respiratory system

- Paired Pharyngeal gill slits
(Typical chordata character)

• Circulatory system

- open c. system
- Haemocoel.
- some times Vanadium as Resp. pigment
- sinuses filled with blood (empty space)

• Excretory sys.

- single glomerulus called Proboscis gland in Proboscis Region.

• waste = NH_3

• Nervous syst

- Nerve Ring
- Ventral nerve chord.

• Reproductive syst

- Members:- separate
- fertⁿ = External, dev:- Indirect

• Example

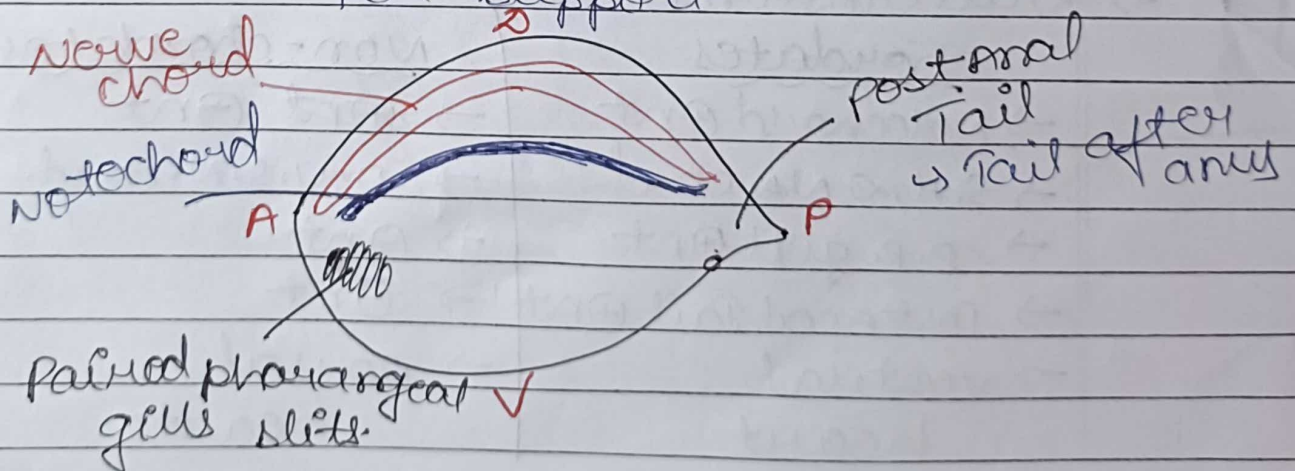
Balanoglossus

Saccoglossus

* Phylum chordata:

chord = Thick string ata:- to have

- Notochord:
- solid, Rod like str.
 - dorsal, mesodermal
 - for support



- (i) Notochord :-
- Below Nerve chord
 - Above alimentary canal
 - Solid rod like str.
 - mesodermal
 - for support.

→ Anterior to posterior

(ii) Nerve chord → Above Notochord

→ Below skin

→ single, hollow, dorsal

→ ectodermal

→ Anterior to posterior

(iii) Paired pharyngeal gills slits:-

→ Paired for respiration

→ in Aquatic - They persist throughout life

→ in Terrestrial - converted to lungs.

→ organ system level

→ Tube within Tube

→ close c. system

→ Bilateral sym.

→ Triploblastic

→ Eucoelomate

→ Metamerism

→ Deuterostomates

Chordates

→ Notochord

→ S.H.O.N.A. cord

→ P.P. gill

→ Post Anal Tail

→ ventral heart

Non-chordates

→ ~~Ant~~ Ont

→ D.V.S.N. cord.

→ Ont

→ Ont

→ dorsal heart

Phylum chordates

groups

cranium Ont
BRAIN Bore Ont
BRAIN Ont

Acraniata / protochordates

→ urochordata (Tunicata)

sub phylum → cephalochordata

Tunicata Agnatha

classes
→ Osteocodermi (Cincti)
→ cyclostomata (false fishes)

craniata

sub phylum → vertebrata (vertebral column Ont)

gnathostomata (Jaw Ont)

superclass

Tetrapoda

→ Amphibia
→ Reptilia
→ Aves
→ mammalia

class → placodermi (Cincti)

(cartilaginous) → chondrichthyes

(bony fishes) → osteichthyes

Note

All vertebrates are chordates, but all chordates are not vertebrates.

* Acuariata / protochordates

- They are exclusively marine
- notochord is $\oplus$ nt either in larval stage or persist throughout life.
- P.P. gills slits $\oplus$ nt
- cranium $\oplus$ nt
- Invertebrates

sub phylum

(i) urochordata : (Tunicata).

- notochord is $\oplus$ nt in Tail of larva $\oplus$ nt in adult.
- larva : free swimming
- adult : sessile
- Retrogressive metamorphosis (Advance to weaker)

eg. $\Rightarrow$ Doliolum, Asidia, salpa

(ii) cephalochordata:

- Notochord extend from head $\rightarrow$ Body
 - Larva = free swimming
 - Adult = " "
 - 1st typical chordates
- eg. $\Rightarrow$ Branchiostoma (Amphioxus or lancelet)

* Craniata

sub phylum

$\Rightarrow$ Vertebrata

- Notochord convert $\rightarrow$ vertebral column

$\nearrow$ cartilaginous

$\searrow$ bony

• Ventral heart → 2 chamber

→ 3 chamber

4 chamber

• closed c. system

• kidney

↳ Excretion

↳ osmoregulation

• Paired appendages
(Pectoral, Pelvic)

super class

Agnatha

• Jaws are 0nt

• Mouth is not covered
by Jaw.

• Notochord + V. column

cartilaginous

• Paired appendages 0nt

gnathostomata

• Jaws are 0nt

• covered by Jaw

• N.C. covered by V. column

Bony cartilage

• Paired appendages

0nt.

* class cyclostomata: of agnatha:

↳ False fish.

↳ Ectoparasite on larger fishes

↳ sanguivorous

↳ scavengers

↳ Body: elongated body, without scales,

paired fins 0nt, unpaired 0nt

↳ mouth circular

suctorial

without Jaws.

• Respiration:- 6-15 pair gills slits.

• Circulation:- closed
↳ 2 chambered heart ← Atricle
Ventricle

↳ single circulation

↳ RBC nucleated.

• Excretion:-

↳ one pair pronephric kidney.

• Mono Rhynous 'condition'
Prostomium

→ 3 eyes ← 2 lateral

1 pineal eye

• Nervous

↳ cranial nerves
(10 pair)

→ Notochord persist over which coelom regresses
ventral column Dnt.

• Repⁿ

→ sexes = separate

↳ fert'n = external

↳ dev. = direct

excretion: ammocete larva
of petromyzon
↓
larva after metamorphosis
↓
Adult die

→ seasonal migration

Anadromous migration
sequence

Marine water → move → freshwater → for spawning
(Adult)
(egg laying)

• Example:

① Petromyzon (lamprey)

↳ anticoagulant → Zampudin

② Myxine → hagfish
(direct)

BMW
Bird / warm
blooded
mammals

Gnathostomata

on the basis of locomotory str., blood circulation and heart str.

Super class Pisces

↳ study = Ichthyology

↳ Poikilothermal (cold blooded)

↳ const. Temp. (cannot maintain)

↳ streamlined body, scales, gills, slime gland, etc.

↳ body division → head

Trunk

Tail

↳ (neck, gill)

ventral fin

→ lateral line system



↳ Devonian period - golden age of fishes

→ Respiration

- ↳ 4 to 7 pair gill slits
↳ with 0 without operculum/gill cover

→ Circulation

- 2 chambered heart (S shape)
- 1 auricle / ventricle (mixing of blood)
- single circulation
- RBE = nucleated

→ Excitation:

- 1 pair mesonephric kidney
- urinary bladder Ent
- waste

→ waste

- NH₄ → freshwater bony fishes (Teleost)
- urea → marine water cartilaginous fishes.
- TMAO → marine water bony fishes.
 - ↳ The methyl am.

→ swollen system

- Notochord $\rightarrow$ V.C $\leftarrow$ cartilaginous
[Endoskeleton]

- scales → Ekoskeleton
- monocondylic (one occipital condyles)

→ Nervous system

- Nervous system
- ↳ 10 pair cranial nerves. (neurotransmitter)
 - ↳ lateral line system (mechanoreceptor)
 - ↳ vibration & electric detector.

- ↳ Anterior car: - Balancing.
- ↳ Nostril (l)

→ Reproductive system

sexes = separate

penis — internal

external

development = direct

youngones — fry

hatching

→ Migration

① Andromous : marine → stream

eg. mulla, salmon

Indian carp.

② Catadromous : Freshwater → marine

eg. → Anguilla (eel)

Characteristics	Chondrichthyes : cartilaginous (elasmobranchs)	osteichthyes : bony (teleostome)
Habitat	marine	Freshwater
Endoskeleton	cartilage	bony
scales	Placoid scales	cycloid/scleroid scales
Mouth	ventral: both are placoid scales	terminal
gills	5-7 pairs	4 pairs
operculum	⊖ nt	⊕ nt
Air bladder	⊖ nt = no buoyancy to swim continuously towards sinking ↓	⊕ nt
clacra	⊕ nt / urea	⊖ nt / NH_4^+ TMAO
notochord	v.c ⊕ nt, both notochord is cartilaginous	N.C → v.c (bony)
claspers	⊕ nt	⊖ nt
penis	internal	external
Tail	Heterocercal 	Homocercal 

claspers: copulatory organ
↳ Antanal fin

Ampulla of Lorenzini:

↳ Receptor

Ant:- cartilaginous

Ant:- Bony

small valve, Gill like

Ant:- cartilaginous

Ant:- Bony

development

viviparous:- cartilaginous

oviparous:- bony fishes

Examples

① cartilaginous fishes

• Carcharodon → Great white shark.

↳ Man eating shark.

• Scoliodon → dog fish

↳ shark

(Smell power ↑)

• Pristis → saw fish

• Tygion → sting ray

• Torpedo → Electric ray

↳ produce voltage.
(110V - 220V) ↓

• Chimera → King of herrings

↳ C.H. - osteichthyes

↳ conodonts

(ii) Boney fishes

↳ Marine water

(a) Hippocampus :- sea horse

↳ vertical swim

♂ = Pregnant male

↳ Brood Pouch

↳ store eggs.

2nd = viviparous

(b) Exocoetetus :- Flying fish

↳ glide

↳ freshwater

(c) Clarias :- mugil (cat fish)

↳ scale less

(d) Labo Rohita :- Rohu

(e) Catla catla :- Katla

↳ Aquarium fish

(f) Pterophyllum :- Angel fish

(g) Betta :- Fighting fish.

* Tetra*

↳ Gambusia :- Larvivorous

↳ Cat mosquito larva

Xotemerya :- O.L. < fishes

Amphibian

* Super class

Tetrapoda

├ Amphibia

├ Reptilia

├ Aves

├ Mammalia

* class: Amphibia

Amphi:- Dual

Bia:- life

• Terrestrial

[Aquatic (Exclusively freshwater)]

↳ They are first chordates to come out of water but can't live on land permanently as their eggs are non shelled

↳ (Non cleoidic)

↳ so prevent them from desiccation (evaporation)

↳ Body: Head → Trunk

neck → Ant, Tail → Ant

• But exception: - Tad pole larva tail → Ant

& balancer. non-movable
↳ tail → Ant

↳ mouth → Ant, eyes (eyelids) → upper eyelid, middle eyelid, lower eyelid
irritating mem. (translucent) → movable

↳ Oily rhynous (2 nostrils)

↳ ear → external: Tympanum (eardrum)
middle ear: - stapes (otomelia ovus)
inner ear: - balancing.

↳ limbs: forelimbs (4 digits) hindlimbs (5 digits)
↳ webbed.

- ↳ claws and nails Ont.
- cloaca (3 chambered) $\leftarrow$ $\begin{matrix} \text{S.T.} \\ \text{R.T.} \\ \text{I.T.} \end{matrix}$
- skins = numerous gland (mucous gland)
 - ↳ In some poisonous gland (Bufo = Toad)
 - ↳ skin: rough/warty.
- Metachrosis: camouflage (color change)
 - ↳ protective
- ↳ Digestive
 - ↳ complete alimentary canal
 - ↳ mouth = Teeth
 - ↳ Pseudodont :- fang (Acrodont)
 - ↳ Homodont
 - ↳ Polyphyodont
- mouth $\rightarrow$ Buccal cavity $\rightarrow$ Pharynx $\rightarrow$ Oesophagus
 - cloaca $\leftarrow$ $\begin{matrix} \text{Aperture} \\ \text{Intestine} \end{matrix}$ $\leftarrow$ stomach
- Salivary gland Ont.
- Tongue: - Protrusible
 - ↳ sticky.
- ↳ Respiratory system.
 - Lungs :- 56%
 - SKIN :- 35% } on land
 - Buccopharyngeal cavity :- 9%
 - in water
 - ↳ skin
- In hibernation: winter sleep
- In aestivation: summer sleep
 - ↳ skin

• most common used organ of Respn is skin.

• Tadpole larva: gills (branchial).

↳ Circulatory system

- ↳ 3 chambered heart
- ↳ 2 auricle, 1 ventricle
- ↳ mixing blood
- ↳ incomplete double
- ↳ RBC: oval, biconvex, nucleated.

↳ Excretory system:

- 1 pair Mesonephric kidney.
- Urotelic :- urea
- Salamendra: NH₃

Tadpole: - NH₃

↳ Skeletal system:

- 21 condylic skull
- (2 occipital condyles)
- ribs - 0 or 1

↳ Nervous system

- 10 pair cranial nerves
- Tadpole: lateral line system

↳ Reproductive system

- sexes = separate
- ♂ has vocal sacs in breeding season
- ↳ (Q, A)

• breaking sound (mating call)

• fertn: external

• development :- Indirect.

Tadpole larva $\leftarrow$ Frog
Bufo / Toad.

Axoblast larva: - Salamander larva

$\hookrightarrow$ Neoteny: - Persistence of larval character in adult (gills).

$\hookrightarrow$ Parthenogenesis: -

Reproductive organs mature early without reproduction.

* Examples:

① Rana tigrina: Indian bull frog.

② Bufo: Toad

③ Hyla: Tree frog.

④ Salamander: - Salamander.

⑤ Ichthyophis: limbless amphibian

$\hookrightarrow$ scales absent

cover $\leftarrow$ eye $\leftarrow$ ear
so deaf & blind.

* class Reptilia
(Reptum)

$\hookrightarrow$ To crawl & creep locomotion.

$\hookrightarrow$ 1st successful choroides to invade terrestrial ecosystem.

$\hookrightarrow$ Poikilothermal (cold blooded)

$\hookrightarrow$ ectothermal

$\hookrightarrow$ Habitat $\leftarrow$ Terrestrial

Aquatic

$\hookrightarrow$ crocodile

$\hookrightarrow$ monitor

$\hookrightarrow$ gharials

• Body $\leftarrow$ Head
Neck
Trunk
Tail

↳ Body: exoskeleton ^{skin dry, rough, without glands.}

↳ by epidermal scales (chond)

↳ bony scutes

↳ cornified/hornified epidermal

↳ snakes and lizard cast ^{shed scales.} their skin as skin cast (moulting).

↳ mouth $\oplus$ ant, nostrils (2), eyes $\oplus$ ant

↳ ear $\leftarrow$ External ear: ~~typ~~ tympanum

middle ear: stapes (columella auris)

↳ inner ear = balance

↳ limbs $\leftarrow$ forelimbs (5 digit)

hind limbs (5 digit)

(nails and claws in curved).

• mesozoic era

↳ digestive system

complete alimentary canal

mouth

$\rightarrow$ pleurodont

teeth $\leftarrow$ Polyphyodont

$\rightarrow$ Homodont

Except $\leftarrow$ crocodile = Thecodont

snake = Acrodont

W.T

Claspa (3 chambers) $\leftarrow$ R.T.

E.T.

↳ Respiration

↳ Lungs :- Throughout life

↳ Circulation

- 3 chambered heart

- 2 Atricle + 1 ventricle

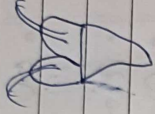
- Mixing of blood

- Incomplete double circulation

- LSA (Left systemic arch)

- RSA (Right " ") (Ant)

- RBC = nucleated



- Exception :- Crocodilia (4 chamber heart)

↳ Skeleton

- ↳ Ancestral skull

(one occipital condyle)

- Ribs Ant

↳ excretion

- One pair metanephric kidney.

- Waste = uric acid (as water conservation)

↳ Nervous

- 10 pair cranial nerves.

- Roof of buccal cavity has

• Vomeronasal organ (olfactory organ)

called - Jacobson organ

- Tongue - Protrusible (Bifid)

↳ Reproductive

- Sexes : Separate
- Fert : Internal
- dev. :- direct
- Oviparous (clecloid) leathery
↳ Shelled
- Parental care
- Amniota (Amnion as a protective covering)

examples

Turtle

- Testudo (Tortoise)
↳ teeth Ont, Beak horny, cloacal Respⁿ.

Lizard

- Chelone (Turtle) → Marine
- Calotes (Garden lizard)
- Chameleon (Tree lizard)
↳ hood Ont, club shape tongue
Prehensile tail, Metachrosis

- Hemidactylus (wall lizard)
↳ Autotomy

Crocodile

- Crocodilus (crocodile) → India
- Alligator (Alligator) → Mexico
- Gharialis :- (Gharial) → Snout

Poisonous snakes

- Naja Naja (cobra)
↳ neurotoxic
↳ Poisonous gland = Parotid gland (modification)

↳ Fangs :- Maxillary Teeth

- Vipera: viper (Haemotoxic)
- Bungarus: krait (Neurotoxic)

Non-poisonous snake:

- Python :- Aggar
- Eupre :- dumahi
- Pylis :- Rat snake

* class AVES

↳ Study: ornithology

↳ Dr. Salim Ali (Bird man of India)

↳ glorified Reptiles

↳ feathered Biped

↳ Flight Bird

↳ Non-flight Bird: (ostrich, kiwi, penguin, Emu) national bird of New Zealand

↳ Homeothermal

↳ streamlined Body

↳ Body $\leftarrow$ Head
Neck $\leftarrow$ long & flexible
Tail Trunk

↳ Skin $\leftarrow$ Dry
Rough
non glandular

except:- oil gland / preen gland / uropygial gland - secrete oily sec

↳ preening

↳ Exoskeleton:-

• whole body is covered by feather except hindlimbs (Talon)

↳ epidermal scales.

• feather: modified epidermal scales

clapping ————— peeching
walking swimming

- spongy lungs (vascular)
 - ↳ exchange of gases
- Additional air sacs connected to lungs
 - ↳ non vascular
 - (no exchange of gases) → help in respiration
- At furc. of trachea & bronchi
 - ⊕ Ant Syrinx (voice box)

↳ Circulatory system.

- 4 chambered heart
- $2A + 2V$
- no mixing of blood.
- double circulation
- RSA (Right Systemic Arch Ant)
- RBC = Nucleated
- Hepatic Portal System Ant

↳ Excretory system

- 1 Pair metanephric kidney
- uricotelic: semisolid waste
 - ↳ uric acid
- urinary bladder Ant (Aerial mode)
- uroter open in cloaca

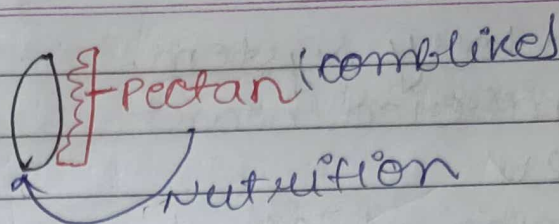
↳ Marine water birds: Guano

(phosphate rich)
↳ use as fertilizer.

↳ Nervous system:

- 12 pairs cranial nerves
- Brain ← Round
well developed.
- cerebellum = well developed (Aerial mode)
- olfactory lobes less developed.
- Ear ←
 - external ear = ear canal, Tympanum
 - middle ear = stapes (columella)
 - inner ear = cochlea
 - (uncoiled)
 - ↳ hearing.

Lens



• Telescopic vision in flight birds.

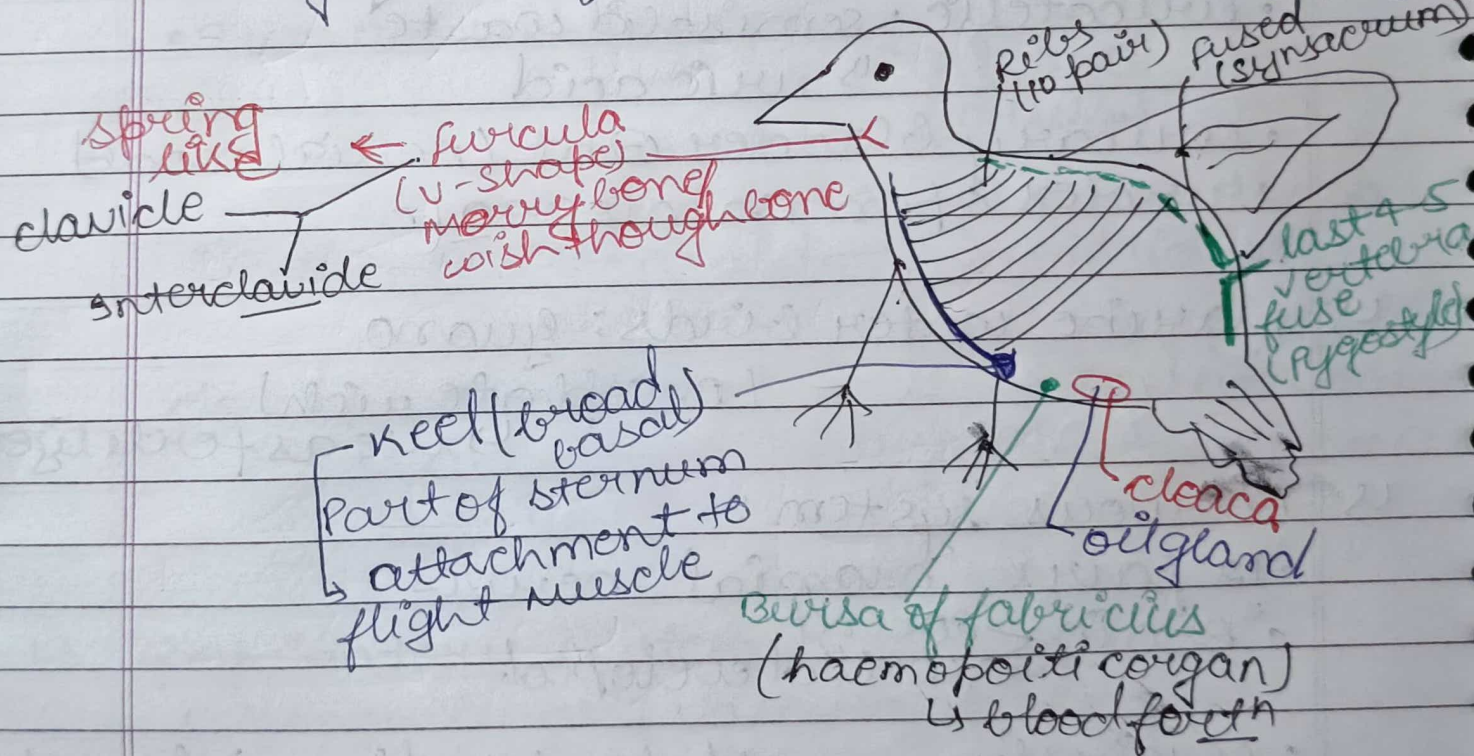
Kidney - pecten $\ominus$ nt

vision:- monocular vision (diff. image in diff. eye).

↳ Endoskeleton

• Fully ossified.

• long bones of birds are hollow (Pneumatic bones).



↳ Reproductive system

members: sexes separate

sexual dimorphism well marked.

fertn = internal

dev = direct

oviparous

- egg = cleidic egg - CaCO_3 shell
- Amniota (Amnion $\oplus$ nt)
- Extra embryonic $\leftarrow$ mem.
- Parental care $\oplus$ nt
- monodelphus (only one ovary func)
- megalecithal egg (yolk $\uparrow$)
- centrolecithal egg

$\hookrightarrow$ Examples

Sita : Psittacula = Parrot

And : Aptenodytes = Penguin

Shreel : Struthio = ostrich

NE : Neophron = Vulture

Corca : Corvus = crow

Cola : Columba = Pigeon

Piya : Pavo : Peacock (national bird of India)

hummingbird

cuckoo

$\hookrightarrow$ can fly $\left\{ \begin{array}{l} \text{forward} \\ \text{backward} \end{array} \right.$

$\hookrightarrow$ helicopter bird.

$\star$ class Mammalia Mammalia

$\hookrightarrow$ Study $\rightarrow$ mammology.

- Cenozoic era

$\hookrightarrow$ age of mammals.

- $\oplus$ nce of mammary gland.

$\hookrightarrow$ modified sweat gland.

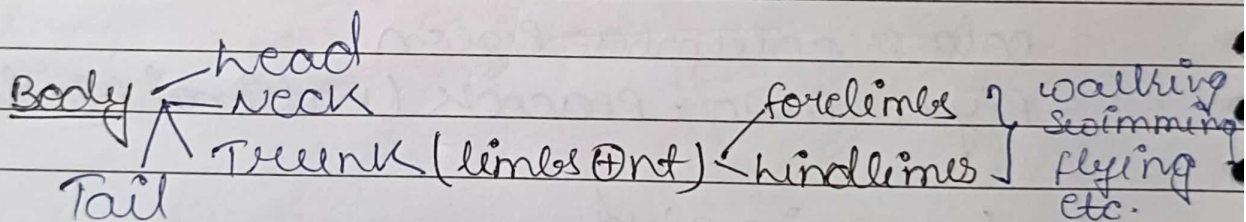
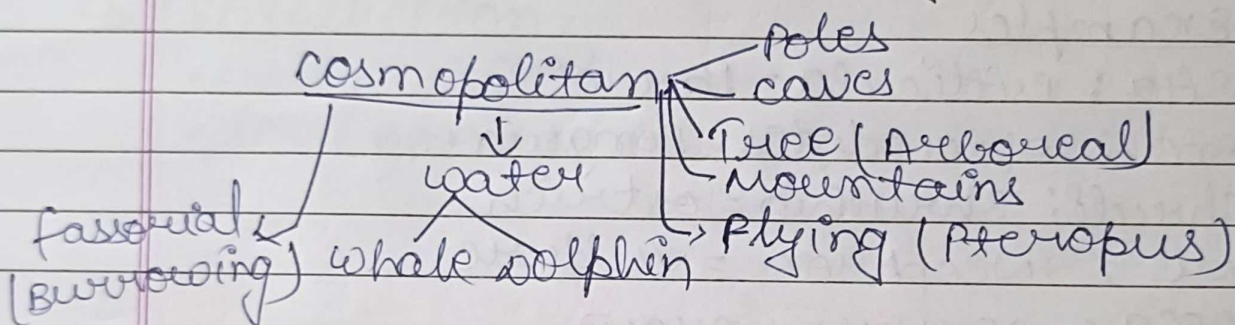
prototherians: egg laying
 metatherians / marsupials: Broad Pouch
 eutherians: placental mammals.

• $\sigma \rightarrow$ = vestigial.

• Thin Horizontal muscular sheath

↳ Diaphragm. helps separate
 Thoracic cavity
 Abdominal cavity.

- Respiration
- Micturition (urine voiding)
- Defecation
- Parturition (baby birth)



Exoskeleton: - skin
 horns, hoofs, nails,
 claws (keratin)
 ↳ Protection

Thick
 hairy
 water proof
 glandular

↳ Digestion

- complete alimentary canal.
- separate opening for urogenital tract as well as for Anus.
- cloaca ant
- Teeth
 ↳ Thecodont
 ↳ Heterodont
 ↳ Polyodont

↳ Respiratory system:

- 1 pair lungs covered by Pleural Mem.
- Located in Thoracic cavity.
- Larynx is $\oplus$ nt as voice box.

↳ Circulatory system

- 4 chambered heart
- 2 Atricle + 2 ventricle
- Complete double circⁿ.
- No mixing of blood
- RBC:- small, circular, Biconcave, Enucleated (Entnuc.)

family

Canilidae - camel and llama.

RBC: oval and nucleated.

↳ Excretory system

- 1 pair metanephric kidney in Abdominal cavity.
- uricotelic - urica Remove

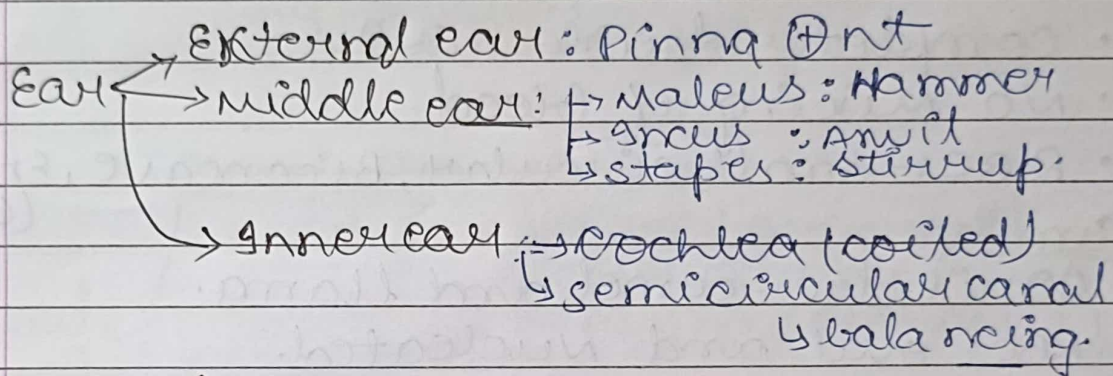
↳ Skeleton system

- Sicomorphic skull
- 7. cervical vertebrae
- Ribs are Bicephalic (dorsal end have two attachment site)

↳ Nervous System

- 12 pair cranial nerves.
- Homeothermal/warm blooded. Endothermal.
- Brain $\leftarrow$ ^{large} well developed convoluted
- cerebrum is well developed.

- 2 cerebral hemisphere joined by tract of nerve fibres called corpus callosum. (Eutherians)
- 4 optic lobes
(Corpora quadrigemina)
→ related to vision.



→ Reproductive system

- sexes separate / ~~sexual dimorphism~~
- fertn: internal
- development: direct
- viviparous
- ♂ = Testes (extraabdominal)
- ♀ = ovaries (abdominal)
- ovum = egg (lecithal)

- placenta ⊕ nt / connection b/w mother and embryo
 - Respⁿ
 - excretion
 - nutrition

- Amniota (Amnion ⊕ nt)
- parental care ⊕ nt)

Examples

- Ornithorhynchus (Suckbill Platypus)
 - Prototherian
 - Oviparous
 - ♂/♀ both have func. mammary gland.
- macropus: kangaroo
- camelus: camel
- Pteropus: Flying fox
- macaca mulatta: monkey
- macaca prisbistis: langur
- Rodus: Rat
- felis: cat
- canis: dog
- elephas: elephant
- equus: Horse
- Balenoptera: Blue whale (largest mammal)
- delphinus: dolphin
 - (Indian National Aquatic Animal)
- Panthera Tigris: Tiger
- Panthera Leo: Lion