Animal Kingdom

Basis of Classification

① Habit and Habitat
- Solitary
- Colonial
- Terrestrial
- Aquatic
  - freshwater
  - Marine water

② Level of Organisation
Cellular → Tissue → organ → organ system
- Cellular: minimum division of labour
- Tissue: Porifera, Cnidaria, Ctenophora
- organ: Platyhelminthes
- organ system: Aschelminthes till chordates — Max. division of labour

③ Symmetry
- Asymmetrical — Eg: Sponges — Never get into two equal halves
- Radial — Eg: Cnidaria, Ctenophora, Adult Echinoderms — when any plane passing through central axis divides into two equal halves
- Bilateral — only one plane passing through central axis divides body into 2 equal halves. — Eg: Platyhelminthes till chordates, Larval Echinoderms

④ Body plan & Germ layers
- Blind sac — Eg: Cnidaria, Ctenophora, Platyhelminthes
- Tube within Tube (mouth, anus) — Eg: Aschelmithes till chordates
- Diploblastic: outer → ecto, middle → mesoglea, inner → endo — Eg: Cnidaria & Ctenophora
- Triploblastic: outer → ecto, middle → meso, inner → endo — Eg: Platyhelminthes till chordates

⑤ Coelom
- Acoelomate (Absent) — without coleom, dorsoventrally flattened — Eg: Platyhelminthes
- Pseudocoelomate (False) — ecto, pouches of mesoderm, endoderm — Eg: Aschelminthes
- True Eucoelomate
  - Schizocoelomates — Splitting of mesoderm — Eg: Annelida, Arthropoda, Mollusca
  - Enterocoelomates — gut, pouches — Eg: Echinoderms, Hemichordata, Chordata

⑥ Segmentation
⇒ external demarcation should correspond to internal demarcation, Repetition of atleast some organ
Eg: Annelida, Arthropoda, Chordata ★ Earthworm → metamerism
Pseudosegmentation → Taenia solium

Digestive system
Digestion
- complete — Aschelminthes till chordates
- incomplete — Cnidarians, Ctenophora, Platyhelminthes
  - Extracellular — Eg: Cnidarians till chordates
  - Intracellular — Eg: Porifera, Cnidaria, Ctenophora

Circulatory system
- Open — Eg: All arthropods, Leeches, Mollusca, Hemichordata, Urochordata
- Closed — Eg: Cephalopods, Chordates, Annelida

Notochord → mesodermal
Nerve cord → Ectodermal

PORIFERA
Eg: Sycon (Scypha), Spongilla (Freshwater sponge), Euspongia (Bathsponge)
- commonly known as Sponges
- marine, mostly asymmetrical
- cellular level of organisation
- water canal system
  - ostia (water in) → Spongeocoel → osculum (water out)
  - useful in food gathering, respiratory exchange and removal of waste
  - lining of spongeocoel and the canals ⇒ choanocytes
  - Skeleton made up of spicules or spongin fibres
- Hermaphrodite
- Asexually → fragmentation
- Sexually → formation of gametes
- development is indirect → larval stage

COELENTERATA
also called Cnidaria — derived from cnidoblasts/cnidocytes
- aquatic mostly marine
- sessile or free swimming,
- radially symmetrical
- used for anchorage, defense and for the capture of prey
- diploblastic
- tissue level of organisation
- Digestion — extracellular & intracellular
- corals → skeleton ⇒ $CaCO_3$ — Eg: Hydra, Adamsia
- Cnidarians have two basic body forms:
  - polyp; sessile & cylindrical
  - medusa: umbrella shaped & free swimming — Eg: Aurelia or jelly fish
- shows Alternation of generation (metagenesis) ⇒ polyp produce medulla asexually & medusae produce polyp sexually — Eg: obelia ★
- Eg: physalia (Portugue-se man of war), Adamsia (sea anemone), pennatula (sea-pen), Gorgonia (sea fan), Meandrina (Brain coral)

CTENOPHORA
Comb jellies or sea walnuts
- commonly known as sea walnuts
- exclusively marine
- radially symmetrical
- diploblastic
- Tissue level of organisation
- Body bears 8 external rows of ciliated comb plates ⇒ locomotion
- show Bioluminescence
- Bisexual - sexual Reproduction
- Indirect development

Eg: pleurobrachia & ctenoplana



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PLATYHELMINTHES

- commonly called flatworms
- mostly endoparasites
- Bilaterally symmetrical
- triploblastic • Acoelomate
- organ level of organisation
- Hooks and suckers → present in Parasitic forms
- Flame cells → osmoregulation & excretion
- Bisexual

Eg: Taenia (Tapeworm)
Fasciola (Liver Fluke)

ASCHELMINTHES

- Body → circular hence the name round worms.
- Free-living, aquatic, terrestrial or parasitic
- organ-system level of organisation
- Bilaterally symmetrical
- triploblastic • pseudocoelomate
- unisexual [dioecious]

Eg: Ascaris - Round worm
Wuchereria - filarial worm
Ancylostoma - HOOKworm
Loa loa - eye worm
Enterobius - pinworm

ANNELIDA

- aquatic (marine and freshwater) or terrestr...
- free-living, parasitic
- organ-system level of organisation
- Bilateral symmetrical • Triploblastic
- coelomate animals
- longitudinal & circular muscles → locomotion
- Aquatic annelids - Nereis - parapodia
- closed circulatory system - Nephridia → help in osmoregulation & excretion
- Nereis - dioecious
- earthworm & leeches - monoecious
- Sexual Reprodn Eg: Nereis, Pheretima (earthworm) and Hirudinaria (Blood sucking leech)

ARTHROPODA

- largest phylum • Triploblastic
- organ-system level of organisation
- Bilaterally symmetrical
- chitinous exoskeleton
- jointed appendages
- Respiratory organs → Living fossil
  gills, Book gills - Limulus
  Book lungs - scorpions, tracheal system - insects. • open type CVS
- Excretion - malpighian tubules
- dioecious • oviparous
- indirect / direct development

Eg: Apis (Honeybee), Bombyx (Silk worm)
Laccifer (Lac insect)
vectors - Anopheles, Culex, Aedes
Locust - Gregarious pest

MOLLUSCA

- second largest phylum
- terrestrial or aquatic • organ-system level of organisation
- Bilaterally symmetrical
- Triploblastic • coelomate • calcareous shell
- space blw hump and the mantle - mantle cavity
- feather like gills - ctenidium • dioecious
- radula - file-like rasping organ for feeding
- oviparous • indirect development.

Eg: Pila (Apple snail), Pinctada (pearl oyster), Sepia (cuttle fish), Loligo (squid), Octopus (Devilfish) Aplysia (Sea-hare), Dentalium (Tusk-shell) Chaetopleura (chiton)

ECHINODERMATA

- endoskeleton - calcareous hence name ← ossicles
  Echinodermata → spiny body
- organ-system level of organisation
- Adult echinoderms - radially symmetrical
- larvae - Bilaterally
- Triploblastic • coelomate
- water vascular system - locomotion, capture, transport of food and respiration
- Excretory system is absent
- unisexual • sexual Reprodn
- indirect development - free swimming larvae

Eg: Asterias (star fish), Echinus (sea urchin), Antedon (sea lily), Cucumaria (sea cucumber) Ophiura (Brittle star)

HEMICHORDATA

- Bilateral • Triploblastic • coleomate
- Have rudimentary structure in collar region called stomochord
- worm-like marine animals
- organ-system level of organisation
- open type circulatory system • unisexual



Eg: Balanoglossus and saccoglossus

CHORDATA

- closed circulatory system
- presence of notochord
- pharyngeal gill slits → paired
- Triploblastic
- organ-system

↓ (continuata)
Urochordata — notochord present only in larval tail
Eg: Ascidia, Salpa, Doliolum

Cephalochordata → head to tail region
Eg: Branchiostoma (Amphioxus or lancelet)

Vertebrata

- **Agnatha** (lack jaws) → class Cyclostomata
- **Gnathostomata** (bears jaws) → Superclass
  - **Pisces** (bear fins) → class Chondrichthes, Osteichthyes
  - **Tetrapoda** (bear limbs) → class Amphibia, Aves, Reptilia, Mammals

CYCLOSTOMATA

- ectoparasites
- 6-15 pairs of gill slits for respiration
- sucking and circular mouth without jaws
- devoid of scales and paired fins
- circulatory system - closed type
- marine but migrate for spawning into fresh water → After they die
- larvae after metamorphosis, return to ocean

Eg: Petromyzon (lamprey) & Myxine (Hag fish)

CHONDRICHTHYES

- cartilagenous
- marine • gill slits without operculum
- absence of air bladder • unisexual
- Electric organs
- poison sting - Trygon (sting ray)
- poikilothermous
- males - pelvic fins - claspers
- 2 chambered heart
- Viviparous (oviparous)

Eg: Torpedo, Scoliodon

OSTEICHTHYES → Bony fishes

- Both marine and aquatic
- 4 pairs of gills - operculum
- Air bladder - present
- 2 chambered heart
- cold-blooded
- unisexual
- flying fish
  marine - Exocoetus
  Freshwater - Clarias (magur)

AMPHIBIA

- aquatic & terrestrial
- 2 pairs of limbs
- tympanum - external ear
- 3-chambered heart • unisexual
- cold-blooded

Eg: Rana (Frog)
Ichthyophis (Limbless Amphibia)

REPTILIA

- creeping or crawling locomotion
- mostly terrestrial
- poikilothermous • unisexual • 3-4 chambered heart
- 4-chambered heart in crocodile

Eg: Chelone (Turtle), crocodile, snakes (naja)

AVES

- feathers
- forelimbs → wings
  Hind limbs → walking, swimming etc.
- 4-chambered heart
- Homoiothermous animals
- unisexual

Egs: Crow, parrot etc.

MAMMALIA

- found in variety of habitats
- mammary gland - milk
- limbs - 2 pairs - adapted for walking, climbing
- hair, ears, teeth are seen
- 4-chambered heart
- Homoiothermus

Eg: Ornithorhynchus, Pteropus, Camel