**Kingdom Animalia**

Animals are **mobile, multicellular, eukaryotes, heterotrophic**, don’t have a cell wall or chlorophyll in their cells. Kingdom Animalia has been classified into different phyla based on their **habitat, levels of organisation, nature of coelom** (*coelomate, pseudocoelomate or acoelomate*), **patterns of circulatory system** (closed or open), **digestive system** (*incomplete or complete*) **&** **reproductive system, germ layer organisation** (*diploblastic or triploblastic*), **presence of notochord, metameric segmentation,** etc

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| **Phyla; *few members*** | **Features** |
| **Porifera/Sponges**  (animals with holes)  *Euplectela, Spongilla, Sycon,* | **Marine**, **Non-motile, multicellular organisms, cellular level of organisation** (don’t have well-developed organ or organ system), **hermaphrodite** (*male and female organs present on the same body*), Reproduce asexually by internal fragmentation or from gemmules and sexually by gametes and indirect development if observed  Have **porous asymmetrical body** with the hard skeletons made up of **spicules/ sponging fibres**.  Pores (**ostia**) on the bodies lead to **water canal system (Ostia 🡪 Choanocytes/collar cells lined Spongocoel 🡪 Osculum**) which circulate water throughout the body to **bring in food and oxygen**. Intracellular digestion |
| **Coelenterata** (Cnidaria) *(Term Coelenterata is derived from the Greek word “kilos” meaning hollow bellied)*  *Hydra, Physalia, Sea anemone, Sea pen, Sea fan, Brain coral, Obelia* | **Marine**, either **sessile** (fixed) or **free swimming**, **radially symmetrical, diploblastic,** have **cnidoblasts/cnidocytes** (*stinging capsule on tentacles*) for defence, anchorage and to capture the prey  **Tissue level of organisation** i.e. cells performing the same function are arranged into tissues (show coordination among the cells)  Body is made of two layers of cells: inner lining (**gastrodermis**) and outer lining (**epidermis**).  Have a hollow body cavity (**gastrovascular cavity**).  Mouth on hypostome, Digestion is extracellular and intracellular  Live as **solitary** (*Sea anemone, jellyfish*) or in **colonies** (corals -*have skeleton made of calcium carbonate*)  Show alternation of generation (**metagenesis**) where polyp forms medusa asexually and medusa forms polyp sexually. **Polyp** is sessile cylindrical; hydra) and **Medusa** is umbrella shaped free living. |
| **Ctenophora**  *Pleurobrachia, ctenoplana, sea walnuts or comb jellies* | **Marine**, body bears **eight rows of ciliated comb plates** for locomotion,  **Diploblastic, radially symmetrical** body with **tissue level of organization**  Intra and extra cellular digestion  Exhibit **bioluminescence** (light produced by a chemical reaction within the living organism).  Sexes are not separate (**monoecious**), reproduce sexually, fertilization is external and indirect development |
| **Platyhelminthes**  *(flat worms)*  *Usually called flatworms as their body is flattened dorsiventrally*  *Liver flukes, Tapeworm,*  *Planaria,* | **Dorso-ventrally flattened** body with **bilaterally symmetrical** (i.e. left and the right halves of the body have the same design).  organ or organ system level of organisation, triploblastic (i.e. three layers of germ cells are present from which differentiated tissues form inner and outer linings of body and organs.  **Hooks and suckers** are present, **acoelomate** i.e. there is no coelom (internal body cavity) for accommodating well developed organs, **monoecious,** either **free living** (*for example planaria*) or **parasitic** (*like liver flukes*), **flame cells** for excretions, Fertilization is internal and development is through many larval stages  Have high regeneration capacity |
| **Nematoda/Aschelminthes** *(nematodes or roundworms)*  *Ascaris, Wuchereria (filarial worm), Ancylostoma(hookworm)* | **Free living, aquatic, terrestrial parasitic, triploblastic** with **cylindrical body** showing **bilaterally symmetry**, **Organ system level**, **pseudocoelom** (*a false body cavity*), **dioecious, have complete digestive system, Fertilization is internal and development is direct.**  Parasitic filarial worms or Wuchereria cause elephantiasis and ascaris cause ascariasis. |
| **Annelida**  *Pheretima (earthworm), Hirunidaria (Blood sucking leech), Nereis,* | **Aquatic or terrestrial**, **triploblastic, cylindrical, bilaterally symmetrical body** exhibit **metamerism** i.e body is segmented, have **organ system level of organisation**, **Coelomate** i.e. Mesodermal body cavity between the body wall and the gut wall is present.  The body is differentiated into head and tail. **Nephridia** help in osmoregulation and excretion, Neural system consists of paired **ganglia**, Dioecious (Nereis) or monocious (earthworm, leech), Nereis possesses lateral appendages **parapodia** for swimming. |
| **Arthropoda** *(Arthropod means jointed legs)*  *Honey bees (Apis), silkworm worm (Bombyx), vectors (like Mosquito, Housefly), Marine (crab, prawn, lobster), Spiders, butterflies, centipede, cockroach,* | Largest phylum (2/3 are insects of animalia), **coelomate, chitinous exoskeleton, segmented,** and **Bilaterally symmetrical body with organ system level of body organisation**, **have head, thorax and abdomen**,  **gills/book gills/Book lungs/ tracheal system** for respiration, have **open circulatory system**, sense organs are **antennae, eye, statocysts** (balance organs), excretion by **malpighian tubules,** sexes are separate (**Dioecious**), members are **oviparous,** fertilization is **internal**, development may be **direct/ indirect**  **Economically important**, have an **open circulatory system i**.e. blood don’t flow in well differentiated blood vessels. |
| **Mollusca** *(consists of a large group of animals)*  *Snails, octopus, oyster, snail, squid,* | **Terrestrial or aquatic, second largest phylum, Dioecious, oviparous, Coelomate, Triploblastic, Bilaterally symmetrical body** with **organ system level of body organization**, Have **open circulatory system** and **kidney like organs** for excretion,  Body show segmentation into head (*with sensory tentacles*), muscular foot and visceral hump, **Calcareous shell** (*Calcium carbonate coating*) surrounds **Mantle** (Soft spongy layer of skin) which protect the visceral hump. Gills for respiration and excretion, Mouth has file like rasping organ (radula) for feeding, Limbs are present for locomotion, Show indirect development |
| **Echinodermata** (*spiny skinned animals*; *Greek words, echinos meaning hedgehog and derma meaning skin)*  *Sea urchins, starfish, Sea lily, Sea cucumber, etc* | Free-living **marine animals, Coelomate, Triploblastic, Bilaterally symmetrical body** with **organ system level of organization**, have a peculiar water-driven tube system (**water canal/vascular system**) for locomotion, respiration, and nutrition (procuring food), Spiny **skin with calcium carbonate exoskeleton** covering, Mouth is on the lower side and anus on the upper side, Excretory system is absent, **Dioecious and fertilization is external, development is indirect** with free swimming larva |
| **Hemichordata**  *Balanoglossus, Saccoglossus* | **Worm like marine animals, Coelomate, Triploblastic, Bilaterally symmetrical body** with **organ system level of organization**, Body has **anterior proboscis, a collar** (*with rudimentary* ***stomochord***) and a **long trunk**,  Have **open type circulatory system**, Present **gills** for respiration, Excretory organ is **proboscis gland,** Sexes are separate (**Dioecious**), Fertilization is external, development is indirect |
| **Chordata** | **Generally, notochord, single dorsal hollow nerve cord, paired pharyngeal gill slits, post anal tail, and closed circulatory system are present, Coelomate, Triploblastic, Bilaterally symmetrical body** with **organ system level of organization**,  **Divided into three subphyla:**   1. **Urochordata (Tunicata),** 2. **Cephalochordata and** 3. **Vertebrata**   **Urochordata** like ascidia, salpa, Doliolum are marine, Notochord is present only in larval tail  **Cephalochordata** like branchiostoma (amphioxus or lancelet) are marine, Notochord extends from head to tail, notochord is persistent throughout their life |

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| **Sub-phylum Vertebrata** | Members of **Vertebrata** possess **ventral muscular heart** (*with* ***2, 3 or 4 chambers***), kidneys for excretion and osmoregulation, have **paired lateral appendages** which may be **fins or limbs.**  Their **embryonic notochord** is replaced by a **cartilaginous or bony vertebral column in the adult.** |
| **Class Cyclostomata is** classified under super class Agnatha (*jaw less*) are ectoparasites on some fishes. Examples: Petromyzon (Lamprey) and Myxine (Hagfish). They are **marine but migrate for spawning** (*laying mass of eggs*) to fresh water and die within a few days, **larvae return to the ocean** after metamorphosis,  Have **elongated eel like body** bearing **6-15 pairs of gill slits** for respiration, **sucking and circular mouth** **without jaws**, **slimy skin**, devoid of scales (**scaleless**) and **paired fins, cartilaginous cranium and vertebral column, closed circulatory system,** |
| **Super class Gnathostomata (with jaw)** has six classes: **Chondrichthyes, Osteichthyes (bony fish), Amphibia, Reptilia, Aves, Mammalia.** |
| **Class Chondrichthyes (***Cartilaginous fishes***)**  *Scoliodon, Pristis* | **Marine, streamlined body** with **cartilaginous endoskeleton, Notochord** is persistent throughout life, Gill slits are separate and without **operculum** (gill cover).  **Tough skin** covered by minute **placoid scales,** mouth is ventral,Teeth are modified placoid scales which are backwardly directed, have very **powerful jaws, predaceous (***living by preying on other animals***), Swim constantly** to avoid sinking (as **air bladder is absent)**. |
| **Class Osteichthyes (bony fish)**  *Angel fish, Clown fish, Rohu, Katla, Tilapia, Hippocampus,* | **Poikilotherms** (*cold blooded*), **Bony endoskeleton** body covered by **cycloid scales** (*smooth edged scales*), **four pairs of gill slits** with operculum, mouth is terminal, air bladder helps in buoyancy, **two chambered heart** (1 auricle and 1 ventricle) is present, Sexes are separate, fertilization is external and oviparous |
| **Class Amphibia (dual life)**  *Toad, Frog* | **Oviparous** (*egg laying*), **Terrestrial** and move to **water for breeding**, Body has **head and trunk**, Tail is in larval stage, **two pairs of limbs,** digits without claws, **poikilotherms**, eyes are with nictitating membranes, Sexes are separate, Fertilization is external and development is indirect with tadpole larva, Smooth and moist skin with mucous glands, **tympanum** is ear drum, **three chambered heart** (*2 auricles and 1 ventricle*s), respiration by gills in larva and by lungs and skin in adults, Urinary tract and reproductive tract open in to **cloacal chambers** (*common chamber into which digestive, urinary, and reproductive tracts discharge their content*). **cloacal chambers** open into cloacal aperture. |
| **Class Reptilia**  *Snake, Tortoise, Turtle, Viper, Lizard* | horny **epidermal scales (scutes) on dry skin without glands**, small tympanum without external opening, **12 pairs of cranial nerves,** Trunk bears **two pairs of pentadactyl** (*five fingered*) limbs with claws, three and half chambered heart (two auricle, one which is incompletely partitioned ventricle) except Crocodile with four chambered hearts, lungs for respiration, Oviparous, fertilization is internal and egg is covered by hard calcareous shells (*made up of calcium carbonate*) |
| **Class Aves**  *Pigeon, Crow, Sparrow, Ostrich* | **Streamlined body** covered **with feathers**, jaws are modified in to various shapes and sizes of **beaks,** digestive system has **crop and gizzard** (*grinding the food*), forelimbs are modified into wings, Hind limbs for perching, swimming, running, etc., **syrinx** (*Voice box*) is present, respiration is by lungs.  Dry kin with oil glands at the base of tail, **pneumatic bones** (*air cavities*) help to make the body light, Air sacs help in respiration and buoyancy, **Homeiothermous** (*maintains their constant body temperature without getting much affected by the external environmental temperature*), **4 chambered heart, oviparous** (*egg laying*), eggs are covered with calcareous shells, Fertilization is internal |
| **Class Mammalia**  *Oviparous Ornithorhynchus (Platypus), Viviparous Macropus (Kangaroo), Pteropus (Flying fox), Camelus (Camel), Macaca (Monkey), Rattus (Rat), Canis (Dog), Felis (Cat),* | **Aquatic/aerial/terrestrial**, body has **head, neck, trunk and tail**, have **mammary glands in females** external ear (**pinna**) is present, Skin has sweat glands and sebaceous glands, **4 chambered heart**, respiration is by **lungs**, body has hair, excretion is by kidneys (**ureotelic** -*Urea excreting animals*), Sexes are separate (***Dioecious***), Majority of the mammals are **Viviparous** (give birth young ones) like *Elephas (Elephant), Equus (Horse), Delphinus (Common dolphin), Balaenoptera (Blue whale), Panthera tigris (Tiger), Panthera leo (Lion)*, few are **oviparous** (*like Platypus*), few are marsupials i.e. pouched mammals with brood pouches (Kangaroo) |