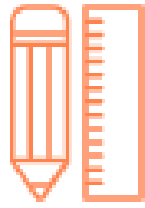


# KINGDOM ANIMALIA

Comprehensive Comparison Notes



**Ali Azlan**


# KINGDOM ANIMALIA

## COMPREHENSIVE COMPARISON NOTES

By ALI AZLAN

	Porifera	Coelenterata	Platyhelminthes	Aschelminthes	Annelida	Arthropoda	Mollusca	Echinodermata	Hemichordata	Chordata
<b>Common Name</b>	5000 species, <u>Sponges</u> , Pore-bearing animals	<u>Cnidaria</u> -Presence of Cnidocytes (Give rise to <u>Nematocysts</u> -stinging cells)	<u>Flatworms</u>	<u>Nematoda</u> -Pointed Ends(Round Worms)	<u>Annelids</u> -From Latin word for "Little Ring" (Segmented Worm)	<u>Arthropods</u> (arthron=joint + pods=feet)(Animals with Jointed Legs)	Over 50,000 living species-2nd largest phylum of invertebrates	Over 5000 species, Spiny Skinned Animals	Pre-chordates, <u>Combination of both invertebrate (Echinoderm) and chordate characteristics</u>	Derive its name from Notochord
<b>Habitat</b>	All are <u>Aquatic</u> . 150= <u>Fresh Water</u> , Other= <u>Marine</u>	<u>Aquatic (Freshwater+Marine)</u>	<u>Parasites</u> (more common in tropics.) mostly <u>Endoparasites</u> , e.g. <i>Taenia solium</i> (tapeworm), <i>Fasciola hepatica</i> (liver luke), <i>Schistosoma</i> (blood luke). Some cause Diseases in humans. <u>Free living</u> and found in <u>freshwater</u> , e.g. <i>Dugesia</i> (planaria)		<u>Marine (Nereis)</u> , <u>Freshwater (stylaria)</u> <u>Damp soil, Land</u> (earthworms). <u>Parasites</u> --> <u>Hirudo</u> - (leech)	Every type of habitat <u>on land and in water</u> . <u>Aquatic</u> species include both <u>freshwater and marine</u> . Visit air periodically (can fly)	<u>Exclusively aquatic groups</u> (cephalopoda), <u>freshwater or marine</u> . <u>Terrestrial animals</u> (land snail) living mostly in <u>moist places</u> .	<u>Exclusively marine</u> (found at the bottom along shorelines in shallow seas).		
<b>Symmetry</b>	<u>Lack Symmetry</u>	<u>Radial</u> , Arranged related to <u>centralized axis</u>	<u>Bilateral</u>	<u>Bilateral</u>	<u>Bilateral</u> <u>Protostomes</u>	<u>Bilateral</u> <u>Protostomes</u>	<u>Bilateral</u> <u>Protostomes</u>	<u>Bilateral (Larva)</u> <u>Radial (Adult)</u> <u>Deuterostomes</u>	<u>Bilateral</u> <u>Deuterostomes</u>	<u>Bilateral</u> <u>Deuterostomes</u>

<p><b>Body Structure</b></p>	<p>Pores in the body wall. The pores through which <b>water enters the body</b> are called <u>Ostia</u>, and pore by which the <b>water leaves the body</b> is known as <u>Osculum</u> (main opening)</p>	<p>Found in <b>two BASIC FORMS. Polyps</b> (cylindrical animals, Nutritive in function, <u>gastrozooids</u>). <u>Medusae</u> (umbrella like, Free swimming. Involved in <b>sexual reproduction</b>-have gonads), <u>MOUTH</u> is surrounded by <u>Tentacles</u>. These bear stinging cells or <u>Nematocysts</u> (organs of defense and offense)</p>	<p><b>Soft and Dorsoventrally Compressed Body</b></p>	<p>One end of the body = <b>anterior</b>, <b>Head is not clearly marked</b> and there are <b>no special sense organs</b> at this end. A <b>fluid filled space</b> is present <b>b/w the body wall and alimentary canal</b>. It provides <b>“tube within tube”</b> type structure</p>	<p>Body becomes divided <b>transversely</b> into similar parts or segments. Subdivisions may be indicated <b>externally</b> by <b>constrictions of the body surface</b>. <b>Internally</b>, the segments are separated from each other by <b>septa</b>. Various <b>systems of body</b> (gut, blood vessels, and nerve cord) are <b>continuous throughout the length</b> penetrating segment.</p>	<p>They possess <b>jointed appendages</b> (modified for specialized functions). <b>Variable structurally</b> (<b>worm-like centipedes</b> while the others are <b>flying insects</b> with the body divided into distinct regions, <b>the head, thorax and abdomen</b>. The body is covered with <b>waterproof chitinous cuticle</b> (secreted by the epidermis).</p>	<p>Body covered by a glandular epithelial envelope called <u>Mantle</u> which secretes <u>Calcereous Shell</u>(Protective, handicap to locomotion, More active molluscs show <b>reduction of shell</b>. The body can be divided into <b>head, a ventral muscular foot</b> and a <b>dorsal visceral mass</b> (containing internal organs). Over the visceral mass, mantle is present. The space between the shell and mantle cavity contains <b>gills</b> in some animals. In the <b>mouth cavity</b>, there is a <b>rasping tongue-like radula</b> provided with many horny teeth.</p>	<p>The body may be <b>flattened like biscuit</b> (cake urchin), <b>star-shaped with short arms</b> (starfish) <b>globular</b> (sea urchin), <b>star-shaped with long arms</b> (brittle star) or <b>elongated</b> (sea-cucumber), <b>Central Disc</b> from which arms radiate</p>	<p><b>Soft bodied worm-like</b> animal. Body is divided into an <b>anterior proboscis, collar and trunk</b>. <b>Body wall</b> is made of <b>unicellular epidermis with mucus-secreting cells</b></p>	<p><b>Notochord (rod-like semi rigid body of vacuolated cells, filled with proteinaceous material which extends the length of the body between enteric canal and the dorsal hollow CNS)</b>. Primary purpose is to <b>support and to stiffen the body</b> that is to act as <b>skeletal axis</b>.</p>
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<b>Body Layers</b>	<p><b>Outer layer Pinacoderm</b> (made of <b>pinacocytes</b>), <b>inner layer Choanoderm</b> (made of <b>flagellated collar cells-choanocytes</b>). Between these two layers is present <b>gelatinous Mesenchyme</b> (may contain <b>amoeboid cells and spicules or sponging fibres</b>)</p>	<p>During development, two germinal layers, <b>Outer Ectoderm</b> (forms <b>outer covering</b> and some cells of this give rise to <b>nematocysts</b>) and <b>Inner Endoderm</b> (specialized for <b>digestion of food</b>). Between the two layers is a <b>jelly-like Mesoglea</b></p>	<p><u>Triploblastic</u> Ectoderm, Mesoderm, Endoderm</p>	<p><u>Triploblastic</u></p>	<p><u>Triploblastic</u></p>	<p><b>Common origin with annelids</b> (segmented body, appendages and cuticle)</p>	<p><u>Triploblastic</u></p>	<p><u>Triploblastic</u>. The body is covered by <b>delicate epidermis</b>.</p>		
<b>Body Organization</b>	<p>Composed of many cells however there is <b>no tissue organization</b> and have <b>no organ</b></p>	<p><b>Tissue grade organization</b> and have <b>organs</b></p>	<p><u>Unsegmented</u> </p>	<p><u>Unsegmented</u></p>	<p><u>Metamerically Segmented, Organ System</u> Developed</p>	<p><u>Segmented</u>. Each segment is attached to its neighbour by means of <b>cuticle</b> (thin and flexible).</p>	<p><u>Unsegmented</u>, Soft, Highly Organized body with <b>Organ Systems</b></p>	<p><b>Low Degree of organization</b></p>		
<b>Size</b>	<p>From <b>few mm wide to more than 1m tall</b>. <b>Macroscopic. Scolymastra joubini</b> - a barrel like glass sponge of Antarctica is more than 1m tall.</p>	<p>From <b>microscopic Hydra</b> to <b>macroscopic, Branchioceranthus</b> (a hydrozoan polyp that 2m in length)</p>	<p>From <b>few mm (10 mm-Planaria)</b> to several meters (tapeworm)</p>	<p>From <b>small microscopic forms</b>, to a length of upto 1m</p>			<p><b>Giant Squid = Largest Invertebrate</b></p>			

<p><b>Coelom</b></p>			<p><u>Acoelomates</u></p>	<p><u>Pseudocoelomates</u> s-Derived from <b>Blastocoel</b> (hollow space situated in the blastula), <b>Blatula</b> (an early stage in embryological development), and <b>not from the mesoderm</b>. Consists of <u>vacuolated cells</u> (filled with a <b>protein-rich fluid</b>) which develops <b>high hydrostatic pressure</b></p>	<p><u>Coelomates</u> <b>Coelom</b> (the space between the two layers of mesoderm) <b>Mesoderm</b> splits into <b>Parietal layer</b> (lines the body wall), <b>Visceral layer</b> (Covers the alimentary canal). Coelom is filled in by <u>coelomic fluid</u>, which serves- as <b>hydrostatic skeleton</b></p>	<p><b>Haemocoel</b> The coelom is <b>not present as the main body cavity</b>. Instead a <u>haemocoel</u> (<b>Reduced coelom</b> and communicates with <b>blood vascular system</b>)</p>	<p><u>Coelomates</u>, The coelom is divided into <u>sinuses</u> (blood spaces). <b>Heart</b> pumps the blood into the sinuses.</p>	<p><u>Coelomates</u>, <u>water vascular system</u> in coelom. <b>Complex system of tubes and spaces surrounding the mouth</b> and <u>passing into the arms and tube feet</u>. water circulates through channels. <u>Water enters canals through a sieve-like plate called Madreporite</u> on aboral (Upper) body surface</p>	<p><u>Coelomates</u> Coelome in each of the <b>three body regions</b> i.e. that of <b>proboscis, collar and trunk coelomic pouches</b></p>	
<p><b>Nervous System</b></p>	<p>No definite nervous system <b>neurosensory and neuron cells</b> present which seem to coordinate the low of water</p>	<p>Network of <b>neuron cells forming an irregular net</b> or plexus in the body wall. <b>No CNS</b></p>	<p>Well developed nervous system. Either a simple <b>network of nerves</b> or ganglia. <u>Sense organs</u> are at the <b>anterior end</b></p>	<p>A nerve ring around the <b>pharynx</b>, which give rise to <b>dorsal, ventral and lateral nerve cords</b> running throughout length. <u>Sense organs</u> are in the form of <b>sensory papillae</b> present on the lips at the <b>anterior end</b></p>	<p>Well developed CNS. Comprises of a <b>simple brain</b> and a solid <b>double, longitudinal, ventral nerve cord</b>. Nerves arise in <b>each segment</b> from the nerve cord</p>	<p>Highly developed. Consists of <b>paired ganglia (simple brain)</b> connected to a <b>ventral double nerve cord</b>. A <b>ganglion</b> is present in each segment. Nerves arise from these ganglia. The <u>sensory organs</u> are usually a <b>pair of compound eyes and antennae</b></p>	<p>Consists of three pairs of <b>interconnected ganglia</b> present in <b>the head, foot and body region</b></p>	<p>Poorly developed. <b>No brain</b>, a nerve ring is present around the <b>pharyngeal region</b></p>	<p><b>Sub-epidermal plexus of cells and fibres</b></p>	<p><b>Dorsal &amp; hollow CNS</b></p>

Respiratory System	<b>Absent</b>		<b>Absent</b>	<b>Absent.</b> Gaseous Exchange through <b>General Body Surface</b>	<b>Absent.</b> Exchange of gases= <b>diffusion</b> through the skin in to blood capillaries. <b>Skin</b> is kept <b>moist</b> by ,mucus, and coelomic fluid	<b>Extensive tracheal system</b> formed of air tubes called <b>tracheae</b> . Main tubes open to the exterior through <b>paired spiracles</b> . <b>Aquatic</b> arthropods respire through <b>gills</b> and <b>book lungs</b>	By <b>gills</b> mostly. In <b>snail</b> , the <b>mantle cavity</b> is converted into a <b>lung</b>	<b>No specialized Organ</b>	Gill-slits forming a dorsal row behind collar	<b>Paired gill openings</b> in embryonic stage. In some <b>non-functional</b> , in others <b>functional for some period(Frog)</b> . In still other <b>functional throughout life</b> (amphioxus, and ishes)
Nutrition	Sessile, therefore depend upon the <b>food</b> along with <b>water currents</b> brought about by <b>movement of flagella of choanocytes</b> . This includes small <b>animals (zooplankton)</b> and <b>plants, (phytoplankton)</b> which constitute about <b>20%</b> of their food. <b>80%</b> of their food consists of <b>detrital organic particles</b>	<b>Carnivores</b> (feed upon small organisms). Organisms are immobilized by <b>Nematocysts</b> and taken into the <b>digestive cavity</b> where it is <b>digested</b> and then distributed by <b>diffusion</b>	<b>Parasitic species</b> (nutrients from the hosts). <b>Free-living species (Planaria)</b> (small animals and bodies of dead and decaying animals)				The food comprises of <b>small plants and animals</b> .			

<b>Digestive System</b>	Food enters the spongocoel cavity through <u>Ostia</u> . The food is <b>ingested by the flagellated cells, the choanocytes</b>	<b>Sac-Like</b> , Only <b>one cavity- digestive</b> as well as <b>body cavity- Gastrovascular cavity or Enteron</b> and opens to the outside by <b>mouth</b>	<b>Branching sac type</b> digestive system. <b>Poorly developed</b> (some species) or <b>absent</b> (tape-worms)	<b>Alimentary Canal with 2 openings</b> . The opening at the <b>anterior end=Mouth</b> and at the <b>posterior end=Anus</b> . In <b>parasitic nematodes</b> , the digestive system is <b>simple</b>	<b>Alimentary Canal with 2 openings, Mouth (anterior end, Overhung by a lobed structure, Prostomium) &amp; Anus (posterior end)</b> . In <b>parasitic species</b> , the digestive system is <b>poorly developed</b>	<b>Alimentary canal with 2 openings (the mouth and anus)</b>	<b>Gut with 2 openings (mouth + anus)</b>	<b>Mouth=lower surface (oral), Anus=upper surface (aboral)</b>	<b>Straight</b> and may show variations	
<b>Excretory System</b>	Waste products either <b>diffuse</b> out of the sponge <b>directly through the body wall</b> or <b>flow out through osculum</b>		Consists of <b>branching tubes ending in bulb-like cells, Flame cells</b>	<b>2 longitudinally running excretory canals</b> which unite at the <b>anterior end to form a single canal</b> that opens to the exterior through an <b>excretory pore</b> on the <b>ventral surface</b>	Takes place by <b>Nephridia</b> . (Ciliated organs present in each segment in the body cavity)	<b>Malpighian tubules</b> Nitrogenous wastes excretion = solid uric acid	<b>Paired Nephridia</b>	<b>No specialized Organ</b>	<b>Single glomerulus</b> connected to blood vessels	
<b>Circulatory System</b>	<b>Absent</b>		<b>Absent</b>	<b>Absent</b>	1st group of invertebrates have <b>Closed Circulatory system</b> ( Blood flows in a network of <b>blood vessels</b> ). <b>Transports gases and nutrients</b>	<b>Open Circulatory system. Blood</b> flows in the body cavity (Hemocoel) bathing the tissues of the body. <b>Colourless= without haemoglobin. Primitive heart and a main blood vessel</b> situated dorsally.	<b>Open Circulatory System</b> (EXCEPT Cephalopoda). Heart pumps the blood into the <b>sinuses</b> . <b>Respiratory pigment of blue</b> in color, called <b>haemocyanin</b> is present	<b>Poorly Developed</b>	Consists of a <b>median dorsal</b> and a <b>median ventral vessel</b>	

<b>Locomotion</b>	<p>Adult sponges = <b>stationary, attached to the rocks</b> at the bottom or other <b>solid objects</b>.  <b>Larvae = move (swim)</b></p>	<p><b>Sessile</b> (<i>Hydra</i>, <i>Obelia</i>, sea-anemone and corals), <b>Free living and Motile</b> (Jelly fishes), <b>Solitary individuals</b> (<i>Hryda</i>, jelly fishes and sea anemones), <b>Colonial</b> (<i>Physalia</i>, <i>vellela</i>)</p>	<p>The <b>free-living forms are motile</b>. They move by cilia present on their undersides (<i>Planaria</i>). In <b>parasitic forms the movement is restricted</b></p>	<p>By <b>undulating waves of contraction and relaxation of muscles</b>. Muscles arranged in <b>4 bands, 2 dorso-lateral and 2 ventro-lateral</b>. <b>Circular muscles = absent (bending is dorso-ventral only)</b></p>	<p>Muscles which help in locomotion. <b>2 types, Circular Muscles</b> (Circumference of the body) <b>Longitudinal Muscles</b> (Length of the body), <b>Locomotion by the interaction of muscles and hydrostatic skeleton</b>.  <b>Contraction of circular muscle --</b>        &gt; pressure in the coelomic fluid --&gt; <b>body elongate</b>.  <b>Contraction of longitudinal muscles --</b>        &gt;pressure in the coelomic fluid --&gt; <b>body widen</b>.  <b>Organs of locomotion</b> in annelids are <b>chitinous chaetae or setae</b> embedded in <b>sacs (earthworm)</b> or on <b>Parapodia</b> present in the body wall ( <i>Nereis</i> ). <b>Chaetae</b> are <b>absent in leech</b></p>	<p><b>Active and swift movements</b>. They <b>swim, crawl or fly</b>. <b>Organs = paired appendages, paired wings</b></p>	<p><b>Organ = muscular foot, Slow movement</b>. The others are <b>sessile</b> i.e. unable to move.</p>	<p>Most species are <b>freely moving</b>, some are <b>attached to the substratum</b>. <b>Motile species</b> move with <b>tube feet</b>. (soft sac-like structure present along the edges of grooves present in the arms)</p>		
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<p><b>Skeleton</b></p>	<p>Various shaped <b>needle-like structures, spicules</b> (calcareous or siliceous). <b>Bath sponge</b> has a skeleton of <b>spongin fibres</b>. Skeleton present among <b>pinacocytes</b> and provides <b>support</b>. Spicules also present around <b>osculum and ostia</b></p>	<p><b>Hard exoskeleton formed of CaCO<sub>3</sub></b>. Secreted by <b>epidermal cells</b> that take lime from sea water. Responsible for formation of <b>small coral islands or large coral reefs</b></p>				<p><b>Exoskeleton</b>, In form of Outer covering--&gt;<b>light weight and chitinous cuticle</b>. Provides surface for the <b>attachment of muscles</b></p>		<p>Mesodermal cells -&gt;<b>calcareous exoskeleton</b> bear <b>spines</b> and because of its <b>origin, from mesoderm</b> it is called <b>endoskeleton</b></p>	<p><b>Endoskeleton</b>(chief basic factor in the development and specialization of higher animals)</p>
<p><b>Reproduction</b></p>	<p><b>Asexual Reproduction</b> is by <b>budding</b>. Buds may be <b>external or internal</b>, The <b>internal buds</b> are called <b>gemmules</b>. Both buds develop into <b>new sponges</b>. <b>Sexual Reproduction</b> <b>Hermaphrodite</b>, mostly <b>protandrous</b> (male sex cells develop first). <b>Separate Sexes, Sperms</b></p>	<p><b>Asexual &amp; Sexual Reproduction</b>, <b>Hydra</b> reproduces <b>asexually</b> by the <b>formation of buds</b>. Bud separate &amp; develops into a new individual. In <b>Obelia</b>, has zooid = <b>blastostyle</b> which gives rise to individual zooids called <b>medusae</b> (<b>Asexual method</b>). <b>Medusae</b> when released in water develop</p>	<p><b>Asexual reproduction</b> is by <b>Fission</b>(the animal constricts in the middle into <b>two pieces</b>, each of which <b>regenerates the missing part</b>). In <b>Sexual Reproduction</b>, species are <b>hermaphrodite</b>. <b>Larval form</b> is sometimes present</p>	<p><b>Sexual Reproduction</b> <b>Separate Sexes</b>. <b>Ovaries(Female Gonads, produce Eggs)</b>. <b>Testes (Male Gonads, produce Sperms)</b>. <b>Larval stage</b> is present in the life cycle</p>	<p><b>Sexual Reproduction</b> <b>n</b> (Common Mode) Most annelids (Earthworm, leech) are <b>Hermaphrodite</b>. Some annelids (Nereis) <b>Separate Sexes, External fertilization</b> and a <b>free swimming Trochophore larva</b> is produced during the life cycle.</p>	<p><b>Sexual Reproduction</b> <b>n Separate Sexes</b>. <b>Ovaries(Female Gonads, produce Eggs)</b>. <b>Testes (Male Gonads, produce Sperms)</b>.</p>	<p><b>Sexual Reproduction</b> <b>n Separate Sexes</b>. <b>Trochophore larva</b> development</p>	<p><b>Sexual Reproduction</b> <b>Separate Sexes, External fertilization</b>. Larvae such as <b>bipinnaria and brachiolaria</b> (complex, bilateral symmetry, resemble those of chordates)</p>	

	<p>released in water are carried to the <u>eggs</u> by <u>amoeboid cells</u>. <u>Fertilization</u> occurs in <u>mesenchyme</u> and zygote is formed. <u>Embryo development</u> includes <u>blastula</u> and <u>larval stage</u></p>	<p><u>reproductive organs</u> --&gt; gametes --&gt; zygote --&gt; Obelia colony (<u>Sexual Method</u>)</p>							
<p><b>Distinguishing Characters</b></p>	<p>Single cavity inside the body <b>Spongocoel</b> may be divided into <b>flagellated chambers or canals</b>, lined by <b>flagellated choanocytes</b></p>	<p><b>Alternation of Generation</b> e.g. <u>Obelia</u> (Asexual gen. and sexual gen. alternates <u>with each other</u>), <b>Asexual Generation</b> (2n, Attached, Polyp). <b>Sexual Generation</b> (2n, Free living, Medusae), <b>Ploymorphism</b> (The occurrence of <u>structurally and functionally more than two different types of individuals</u> (zooids) within</p>	<p><b>Adaptations for Parasitic Mode of Life:</b>  (1) Epidermis is absent  (2) Formation of resistant cuticle (protection)  (3) Developed Adhesive organs, (suckers and hooks), for attachment to the host.  (4) Degenerated Muscular system and Nervous system  (5) Simplified digestive system due to increased dependence on host</p>	<p><b>Burrowing activity of earthworms:</b>  Permits greater penetration of air into the soil, Improves drainage capacity of the soil. Enables roots to grow downwards through the soil. <u>Mixing and churning of the soil</u> is brought about when earth <u>which contains inorganic particles</u> is brought up to the surface from lower regions. Earthworm most</p>	<p><b>Metamorphosis:</b> (meta = change + morphe = form). An abrupt change of form or structure during the life cycle. <b>3 distinct stages</b> [Egg--&gt;Larva--&gt;Motionless Pupa--&gt;Adult] In primitive insects, metamorphosis is <b>incomplete</b>. The <b>larva resembling adult (nymph or instar)</b> lives in the same habitat as adult.</p>	<p><b>Regeneration</b> (the ability to reform lost <u>organs</u>) Starfish, Sea Cucumber, Sea Lily, Brittle Star and Sea-Urchin exhibit. <b>Resemblance between echinoderms &amp; chordates</b>  (1) Radial cleavage during the development of embryos  (2) Blastopore formation from Anus (3) Common biochemical peculiarities e.g. phosphocreatin</p>	<p><b>Resemblance between echinoderm &amp; hemichordates:</b>  (1) Formation of coelom  (2) Retention of blastopore (site for future anus). In invertebrates the blastopore develops into mouth  (3) Mesoderm is derived from cells close to the blastopore.  (4) Possess mesodermal</p>		

		(zooids) within the same organism) In <b>Obelia</b> Gastrozooids (Feeding Individual), Gonozooid (Asexual Reproduction-Blastostyle), Medusae (Free living sexual reproduction)	(6) <b>Complicated Reproductive systems and ova in huge numbers for continuity of the species</b> (7) <b>Complexity of life cycle and Presence of more than one host during the life cycle</b>		active annelid in churning the soil, <b>Natural Plough</b>				endoskeleton, the exoskeleton is ectodermal in origin.	
<b>Examples</b>	<p><b>1. Spongilla</b> (Freshwater sponge) <b>Sycon</b> (Marine sponge)</p> <p><b>2. Leucosolenia</b> (Consist of group of erect tubes)</p> <p><b>3. Euplectella</b> (Beautiful and delicate sponge, glassy framework. <b>Venus flower basket</b>)</p>	<p><b>1. Hydra</b> [Freshwater coelenterate, Only in polyp form, No AoG]. <b>2. Actinia (sea anemone)</b> [Polyp only, Enteron is divided by large partitions (Mesenteries)].</p> <p><b>3. Obelia</b> [Marine colonial that exhibit AoG].</p> <p><b>4. Aurelia (jelly fish)</b> [Polyp reduced, medusa dominant]</p> <p><b>5. Madrepora (Corals)</b> [Hard calcareous exoskeleton formed of CaCO<sub>3</sub>].</p>	<p><b>1. Dugesia (Planaria)</b> : (Free-living flatworms with a ciliated outer surface),</p> <p><b>2. Fasciola (Liver fluke)</b> (Endoparasite in sheep and occasionally in human beings. Suckers used for attachment to host tissue. Life cycle in <b>2 hosts</b>, 1. Snail, 2. Sheep or man. <b>Location:</b> Bile duct of its hosts,</p> <p><b>3. Taenia (Tapeworm)</b> : Endoparasite of humans, cattle and pig. Life cycle in <b>2 hosts</b>, Intermediate</p>	<p><b>1. Ascaris lumbricoides</b> (intestinal parasite of man)</p> <p><b>2. Enterobius vermicularis</b> (Pinworms) Parasites in the human caecum, colon and appendix</p> <p><b>3. Ancylostoma duodenale</b> (hook worm). Parasite of human small intestine</p>	<p>(1) Class Polychaeta: <i>Nereis</i>, <i>Chaetopterus</i></p> <p>(2) Class Oligochaeta: <i>Lumbricus terrestris</i>, <i>Pheretima posthuma</i> and other earthworms</p> <p>(3) Class Hirudinea: <i>Hirudo medicinalis</i> (medicinal leech)</p>	<p>(1) Class Crustacea: Daphnia, Cyclops, Crabs, Lobsters, Prawn, Wood louse</p> <p>(2) Class Insecta: Ragonly mosquito, Butterflies, Moths, Wasps, and Beetles</p> <p>(3) Class Arachnida: Scorpions, Spiders, Mites and Ticks</p> <p>(4) Class Myriapoda: Centipedes and Millipedes.</p>	<p>(1) Class Gastropoda: <i>Helix aspersa</i> (garden snail), <i>Limax</i> (slug)</p> <p>(2) Class Bivalvia (Pelecypoda): <i>Mytilus</i> (marine mussel), <i>Anodonta</i> (freshwater mussel), <i>Ostrea</i> (oyster)</p> <p>(3) Class Cephalopoda: <i>Loligo</i> (squid), <i>Sepia</i> (cuttlefish), <i>Octopus</i></p>	<p>(1) Asterias (starfish), (2) Sea urchin, (3) Sea cucumber, (4) Cake urchin, (5) Brittle star</p>	<b>Balanoglossus and Saccoglossus</b>	<b>Man</b>

hosts: intermediate

**host = pig or cattle.**

body is **ribbon-like**  
and divided into  
segments

**(Proglottids)** which  
contain mainly **sex**  
**organs.** The

segments continue  
to break off and are

**passed out from**  
**the intestine** along  
with **faeces**



Ali Azlan

# CLASSES OF PHYLUM ANNELIDA

	Polychaeta	Oligochaeta	Hirudinea
<b>Habitat</b>	Aquatic (marine)	Terrestrial or Aquatic	Aquatic
<b>Segmentation</b>		Internal and External Segmentation	Fixed number of Segments. Each segment has additional circular rings or markings called <u>Annuli</u>
<b>Head</b>	Distinct head region with eyes and structure known as <u>palps</u> and <u>tentacles</u>	No distinct head	No distinct head is present but leeches have <b>chitinous jaws</b> for making a puncture in the skin
<b>Locomotion</b>	Organs=Parapodia	Organs=Setae	No organs (move due to the contraction of their body and with help of suckers)
<b>Sexes</b>	Separate Sexes	Hermaphrodite (bisexual)	Hermaphrodite
<b>Larva</b>	Trochophore Larva	No larva formed	Trochophore Larva
<b>Digestive System</b>			Anticoagulant secretion which is passed into the wound to allow smooth flow of blood into its digestive system where it can be stored for a long time
<b>Examples</b>	<i>Nereis</i> , <i>Chaetopterus</i>	<i>Lumbricus terrestris</i> , <i>Pheretima posthuma</i> and other earthworms.	<i>Hirudo medicinalis</i> (medicinal leech)

# Classes of Phylum Arthropoda

By Ali Azlan

	Crustacea	Insecta	Arachnida	Myriapoda
Habitat	<u>Aquatic</u>	<u>Largest group of Animalia &amp; Arthropoda, Everywhere</u> , show social behaviour		
Body	In <u>exoskeleton</u> , deposition of <u>salts &amp; chitin</u> (firm). The <u>appendages</u> are modified for capturing food, walking, swimming, respiration and reproduction.	<u>Brain</u> is formed of <u>fused ganglia</u> and <u>double nerve cord</u> is ventral	<u>Anterior segments</u> that are fused to form a <u>combined cephalothorax</u>	Divided into large number of <u>segments</u> each having <u>1 pair of legs</u>
Head	<u>2 pairs of antennal appendages</u> , <u>1 pair of mandibles (jaws)</u> & <u>2 pairs of maxillae</u>	Vertical to the body and <u>jaws</u> are ventrally placed, <u>1 pair of antennae</u> & <u>compound eyes</u>	No <u>antennae</u> & No true <u>jaws</u>	<u>1 pair of antennae</u> & <u>1 pair of eyes</u>
Thorax		Has <u>3 segments</u> in which are present <u>3 pairs of jointed legs</u> and <u>1 or 2 pairs of wings</u>	Has <u>1 pair of appendages (chelicerae)</u> with <u>claws</u> , <u>2 pairs as pedipalps</u> & <u>4 pairs of legs</u>	
Abdomen		Has <u>varying number of segments</u>	<u>Segmented/Unsegmented</u> with or without <u>appendages</u>	
Sexes	<u>Separate</u>	<u>Separate, Oviparous</u>	<u>Separate, Oviparous</u>	
Metamorphosis		Takes place during development	No True	
Respiration	<u>Gills</u>		<u>Gills/Book Lungs</u>	
Excretion			<u>Malpighian tubules</u>	
Examples	<u>Daphnia, Cyclops, Crabs, Lobsters, Prawn, Wood louse</u>	<u>Dragonfly mosquito, Butterflies, Moths, Wasps, Beetles</u>	<u>Scorpions, Spiders</u> (eight eyes-panoramic view of the predators and prey), <u>Mites, Ticks</u>	<u>Centipedes, Millipedes</u>

# Classes of Phylum Mollusca (6 Classes)

By Ali Azlan

	Gastropoda	Pelecypoda(Bivalvia)	Cephalopoda
<b>Symmetry</b>	<u>Asymmetrical</u>	<u>Bilateral</u>	<u>Bilateral</u>
<b>Body</b>	Covered with usually coiled <b>one piece shell</b> .	<b>Laterally compressed</b>	<b>Dorso-ventrally flattened body</b> , Highly developed and active
<b>Habitat</b>	<u>Aquatic and Terrestrial</u>	<u>Aquatic</u>	<u>Aquatic</u>
<b>Shell</b>	<b>1 Piece Shell</b> , The animal can <b>withdraw</b> itself into the shell	<b>2 pieces of shell (Bivalves)</b>	<b>Reduced &amp; Internal / Absent</b>
<b>Respiration</b>	<b>Aquatic species</b> have <u>gills</u> , In <b>land</b> forms the <u>mantle cavity is converted into lungs</u>	<u>Plate like Gills</u>	
<b>Examples</b>	<i>Helix aspersa</i> (Garden snail) <i>Limax</i> (Slug)	<i>Mytilus</i> (marine mussel), <i>Anodonta</i> (freshwater mussel), <i>Ostrea</i> (oyster)	<i>Loligo</i> (squid), <i>Sepia</i> (cuttlefish), <b>Octopus</b>

# Classes of Pisces (Fishes)

By Ali Azlan

	Cyclostomata	Chondrichthyes	Osteichthyes
<b>Common Names</b>	Jawless Fishes	Cartilaginous Fishes	Bony Fishes
<b>Body</b>	long eel-like, No paired appendages	Fusiform	Fins {median (single) or paired}, Fin rays of cartilage or bone
<b>Scales</b>	Absent	Placoid	Embedded Dermal scales (Ganoid, Cycloid or Ctenoid scales). No Placoid scales
<b>Skeleton</b>	Cartilaginous	Endoskeleton (Entirely Cartilaginous)	More or less bony skeleton, Notochord present
<b>Mouth</b>	Ventral Suctorial mouth	Ventral, Olfactory sacs not connected to mouth cavity	Terminal. Jaws (With or without teeth)
<b>Circulatory System</b>	Heart with 1 auricle	Many pairs of Aortic Arches	2 chambered heart (1 atrium and 1 ventricle). Blood (Nucleated red cells)
<b>Respiratory System</b>	6-14 pairs of gills	5-7 pairs of gills without the covering (Operculum)	Gills supported by bony gill arches with Operculum
<b>Sexes</b>	Separate (in lampreys), Hermaphrodite (Hag Fishes)	Separate	Separate, Gonads (paired)
<b>Swim Bladder</b>		No	Present with or without
<b>Stomach</b>	Lacks stomach	J-shaped stomach	
<b>Fertilization</b>	External, Long Larval period (in	Oviparous or viviparous	External
<b>Nervous System</b>			Brain with 10 pairs of cranial nerves





**Ali Azlan**