# Classification of Phylum Annelida

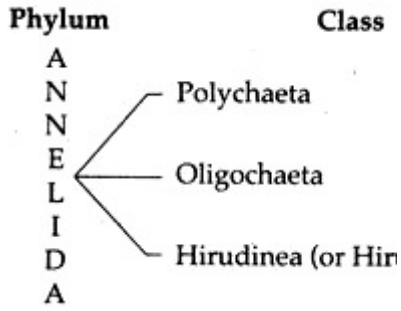
## Definition of Phylum Annelida

Annelids are Bilaterally symmetrical, elongated, metamerically segmented eucoelomates and soft bodies covered with thin cuticle containing segmental chitinous setae.

## Characteristic Features of Phylum Annelida

1) Triploblastic animals with bilateral symmetry.
2) Body soft, vermiform and more or less elongated.
3) Body metamerically segmented and covered by a thin cuticle.
4) Head comprised of prostomium and peristomium.
5) Prostomium contains head and sensory appendages.
6) Locomotory organs are epidermal chitinous setae or chaetae (lost in leeches and in a few groups of Polychaetes).
7) Body cavity is a true coelom which lies between the two layers of mesoderm.
8) Digestive tract straight, tubular running from the anterior mouth to the posterior anus.
9) Gas exchange performed either by general body surface or by gills in some tube- dwellers ( *Arenicola, Cirratulus*).
10) Closed blood vascular system with dorsal and ventral longitudinal vessels connected by smaller vessels.
11) The dorsal vessel acts as pumping vessel.
12) The closed, circulatory system is reduced or absent in leeches.
13) Respiratory pigments are red haemoglobins or green chlorocruorins. Both pigments are found in blood plasma. Haemerythrin is also present in some polychaetes.
14) Nervous system represented by cerebral ganglia (supra-pharyngeal ganglia) and double ventral nerve cord with segmentally arranged ganglia and lateral nerves.
15) Excretory system are nephridia (protonephridia) in some, and segmentally coiled tubes open at both ends, called metanephridia.
16) Animals often provided with coelomoducts which are channels for the outward passage of reproductive elements.
17) Sexes united or separate.
18) Cleavage spiral.
19) Development direct (e.g., Oligochaeta or Hirudinea) or indirect (e.g., Polychaeta, Archiannelida).
20) Larval stage when present is a trochophore.

**Scheme of classification:** The scheme of classification of Phylum Annelida, upto the classes, has been followed from the book “Invertebrate Zoology” written by Ruppert and Barnes (6 th Ed).




### Classification with Characters

**Class 1. Polychaeta (Gk. poly – many + chaeta = setae):**

1) Exclusively marine, and mostly carnivorous but some are herbivorous.
2) Body elongated, segmented with identical, cylindrical body segments.

3) Anterior end modified into a head which bears sensory appendages, such as eyes, antennae, cirri and palps.
4) Numerous setae on the trunk segments, hence called polychaeta.
5) Each body segment bears a pair of fleshy parapodia, bearing numerous long setae in setigerous sacs.
6) The parapodia act as locomotory and respiratory organs.
7) Clitellum absent.
8) Alimentary canal is provided with an eversible buccal region and protrusible pharynx.
9) Highly vascularised gills are present in most large-sized polychaetes used for gas exchange.
10) Protonephridia present in a number of families. Segmental metanephridial systems in most cases.
11) Sexes separate (gonochoristic) in most.
12) Epitoky, a reproductive phenomenon seen in some polychaetes (e.g., nereids, syllids and eunicids).
13) Fertilization external.
14) A trochophore larval stage in the life cycle.

***Examples*** :- *Nereis; Aphrodite; Chaetopterus; Sabella, Arenicola*

**Class 2. Oligochaeta (Gk. Oligos = few + L. chaetae = bristles):**

1) Most species are found in freshwater or terrestrial habitats, a few species are marine.
2) well-developed segmentation and a simple prostomium without sensory appendages, such as eyes, and tentacles.
3) Head indistinct.
4) Clitellum present.
5) Setae less distributed along the body.
6) Usually no respiratory organs except a few species (e.g., *Dero, Branchiura*, etc.) which possess true gills. Gas exchange takes place by diffusion through the moist body wall.
7) Excretory system metanephridial type.
8) Brain simple type with ventral nerve cords.
9) Hermaphrodites.
10) Fertilization (cross-fertilization) occurs externally.
11) Development direct and takes place within cocoon secreted by the clitellum.
12) Asexual reproduction usually common in freshwater species and involves by the transverse division of the adult body.
13) No larval stage in the life cycle.

***Examples*** :- *Pheretima; Lumbricus; Tubifex; Megascolex; Alluroides, Drawidia, Eudrilus, Aeolosoma*

**Class 3. Hirudinea (L Hirudo = a leech):**

1) Body consists of definite and limited number of segments.
2) Trunk consists of 21 segments with preclitellar region, clitellum and post clitellar region.
3) Clitellum includes 3 segments and never conspicuous except reproductive period.
4) Segments are marked externally by secondary rings or annuli.
5) Usually with a small suctorial anterior sucker and a large powerful posterior sucker.
6) Parapodia and head appendages absent.
7) Coelom generally reduced by the presence of connective tissue, called botryoidal tissue, and muscles.
8) Both sinuses and muscular blood vessels present.
9) Excretory organs include segmentally arranged 10 to 17 pairs of metanephria.
10) Asexual reproduction absent.
11) Hermaphrodite.
12) Gonads and gonoducts restricted to anterior few segments.
13) Fertilization internal.
14) Development direct and takes place within cocoons secreted by clitellum.

***Examples*** :- *Hirudinaria; Hirudo; Acanthobdella*; *Glossiphonia*

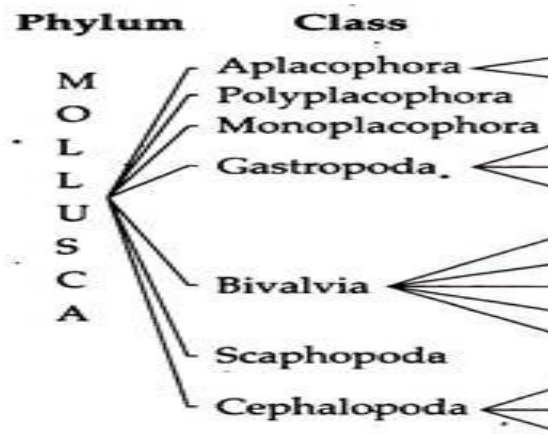
# Classification of Phylum Mollusca

Mollusca (Latin: molluscus, a soft nut or soft fungus) are soft bodied, unsegmented, bilaterally symmetrical, triploblastic, coelomate animals whose bodyis covered with mantle andhaving large ventral muscular foot with exter nal or internal shell.

**Diagnostic Features of Phylum Mollusca:**

1. Bilaterally symmetrical (some are asymmetrical due to torsion as in Gastropods).
2. Majority are aquatic animals with a few being terrestrial.
3. Body soft, unsegmented (except Monoplacophora), with an anterior head, foot, mantle and visceral mass.
4. Presence of a protective external dorsal shell. It may be internal and covered by tissue or secondarily reduced or lost.
6. The visceral mass remains enclosed by a thick muscular fold of the body wall called mantle.
7. A toothed, chitinous, tongue-like ribbon, the radula is present which assists in feeding.
8. The respiratory organs are in the form of one or more ctenidia gills housed in the mantle cavity and pulmonary sacs.
9. An open blood system with a heart enclosed by the pericardium is present.
10. Excretory organs include a pair of saclike 'kidneys'.
11. Nervous system comprises of a circumoesophageal ring and two pairs of ganglionated longitudinal cords with various modifications.
12. Sexes are usually separate, a few forms are hermaphrodite.
13. Typically with a single pair of gonads, discharging the gametes into the mantle cavity.
14. Cleavage is spiral.
15. Development indirect via trochophore and veliger larval stages or secondarily direct.

**Scheme of classification:** The scheme of classification of Phylum Mollusca, upto the classes, has been followed from the book "Invertebrate Zoology" written by Ruppert and Barnes (6 th Ed).




Systematic Resume of Phylum Mollusca:

**Class Aplacophora:**
1. Worm like mollusc, body covered by cuticle. Absence of shell.
2. Foot absent or reduced to a ventral ridge.
3. Mantle thick, with minute calcareous spicules.
4. Head poorly marked and without eyes or sensory tentacles.
5. There are no excretory organs.

Example: *Chaetoderma , Neomenia, Proneomenia.*

**Class Polyplacophora:**

1. Body oval to somewhat elongated and dorsoventrally flattened.
2. Dorsal surface covered by eight shell plates.
3. A broad muscular creeping foot is present on the ventral surface.
4. Between the foot and mantle cavity, in the pallial groove lies a number of gills.
5. Head is poorly developed. Eyes and tentacles are absent.
6. Radula is large and bears many teeth.

Example: *Chiton, Loricata, Lepidopleurus, Chaetopleura.*

**Class Monoplacophora:**
1. Body bilaterally symmetrical and covered by a shield-like shell.
2. On the ventral side, present circular foot surrounded laterally and posteriorly by mantle cavity.
3. On the sides of the foot are present five to six pairs of monopectinate ctenidia.
4. Head distinct but poorly developed and without sensory tentacles and eyes.
5. On the posterio-median end of the foot, anus is present.
6. Radula well developed;

Example: *Neopilina, Monoplacophorus, Vema.*

**Class Gastropoda:**
1. A muscular foot is present below the digestive system and visceral mass.
2. Visceral mass is twisted at 180° in an anticlockwise direction (torsion), relative to the head and foot.
3. Mantle cavity occupies a forwardly facing position.
4. Shell is in one piece and asymmetrically spiralled.
5. Head distinct with one or two pairs of tentacles and eyes.
6. A well-developed flat, crawling foot present.
7. The mantle cavity contains a single pair of bipectinate ctenidia.
8. A chemo-receptive sense organ in the mantle cavity called the osphradium is present.

Example: *Patella, Haliotis , Pila, Murex , Cypraea, Aplysia, Doris, Achatina*

**Class Bivalvia:**
1. Laterally compressed body enclosed within a pair of shell valves.
2. Relatively sedentary or even sessile.
3. Head indistinct and a *radula is absent*.
4. Foot blade-like in burrowing species and reduced in attached forms.
5. Mouth provided with two pairs of labial plaps.

Examples: *Anodonta, Trigonia, Mytilus, Elliptio, Pinctada, Lamellidens, Pandora, Poromya, Lyonsia.*

**Class Scaphopoda:**
1. Presence of a tubular, tusk-like shell, open at both ends.
2. The elongated body completely enclosed by the mantle.
3. From the large ventral opening of the shell projects the conical or cylindrical foot and buccal region.
4. Buccal mass possess a radula.
5. The small proboscis-like head lacks eyes and sensory tentacles.
6. Paired clusters of narrow, contractile filaments surrounding the mouth and are used in feeding.
7. Gills absent, instead a part of mantle serves for gaseous exchange.
8. Possess a single gonad that discharges via the right kidney.

Examples: *Dentalium , Cadulus*.

**Class Cephalopoda:**
1. Foot modified into a series of prehensile arms or tentacles and siphon.
2. Shell absent or reduced and covered by the mantle in most species.
3. This group has a well formed head bearing large eyes.
4. Mouth possesses radula and jaws.
5. Presence of a single gonad and development is direct.

Example: *Nautilus, Sepia , Loligo , Octopus , Argonauta*