# PHYLUM - ARTHROPODA
## GENERAL CHARACTERS

- The term Arthropoda was coined by - Voi **Siebold**
- The relationship between arthropods and annelid; was recognised by - **Cuvier and Lankestei**
- Arthropods are separated out as a distinct phylum by- **Leuckart**
- ' Arthropoda'means- **Jointed feet**
- Largest Phylum in the animal kingdom - **Arthropods**
- Distribution - **Cosmopolitan**
- Arthropoda accounts for 80% of animal species
- Symmetry in Arthropoda- **Bilateral**
- Arthropods are **- Triploblastic, heteronomous metamerically segmented animal: with chitinous exoskeleton and jointed appendages.**
- Arthopods are characterised by - **Tagmosis**
- The three tagmata are - Head, Thorax and Abdomen
- Muscles of Arthropods are striated
- Outer covering of the body or exoskeleton
- **Chitinous cuticle & Protein**
- Shedding of exoskeleton - **Moulting or Ecdysis** which facilitates **Growth**
- Segmentation - **Heteronomous metarmerism**
- In the evolution of Arthropods there is **Increasing cephalization with incorporation of more segments in the head and concentration of nervous control and sensory perception in the head region.**
- Haemocoel is not a true but a cavity derived from the embryonic - **Blastocoel**
- In arthropods true coelom in confined to spaces of-Gonads & saccate nephridia
- The body spaces through which the blood (Haemolymph) moves - **Haemocoel.**
- Alimentary canal is with three regions.
- Respiration in small crustaceans-gaseous exchange across the general body surface.
- Large aquatic arthropods respire through - gills and book gills.
- Terrestrial arthropods respire through - **tracheae and book lungs.**
- Circulatory system - **Open type, no blood vessels**
- Position of heart **- Dorsal**
- Respiratory pigment - **if present is mostly haemocyanin (few with haemoglobin)**
- Copper containing respiratory pigment is **Haemocyanin.**
- Nervous system in Arthropoda-**Nerve ring with Brian, anal cerci, Statocyst, Antenna, etc.**
- Receptors - **compound eyes, simple eyes, Bristles, anal cerci, Statocyst, Antenna etc.**
- Organs of excretion in aquatic arthropods - **Saccate nephridia (Green glands and Coxal gland)**
- In terrestrial arthropods- **Malphigian tubules**
- Sexuality - **Mostly Unisexual**
- Fertilization - **External or Internal in aquatic forms; only internal in terrestrial forms.**
- Development - Indirect or direct
- Clevage - **Meroblastic and superficial**
- Growth of the body from - **Teloblastic growth zone.**
- Eggs**: Centrolecithal**

## CLASSIFICATION OF ARTHROPODA

- Arthoropoda is divided into three sub-**phyla-Trilobita-Chelicerata-Mandibulata**

## SUB-PHYLUM-I : : TRILOBITA

- Fossil Arthropods abundant during the Paleozoic era and now extinct.
- Body is divided into a median and two lateral lobes by two prominent longitudianl axial furrows, hence the name - **Trilobita (Trilobitomorpha)**
- Division of body in Trilobita - **Head, Abdomen, and Pygidium**
- Head of Trilobites bears - **one pair of Antenna and compound eyes**
- In Trilobita appendages are - Biramous
- Appendages do not show any specialisation or structural differentiation into mouth parts **a Primitive features of trilobites.**

## SUB PHYLUM-II : : CHELICERATA

- In chelicerata, the anterior six segmented parts is-**Cephalothorax or Prosoma**
- In Chelicerata the posterior thirteen segmented abdomen is - **Opisthosoma**
- Abdomen is divided into - **Mesosoma and Metasoma**
- Antennae are - **Absent**
- The Anterior most appendages are modified as - Chelicerae

## CLASS-I XIPHOSURA

- No. of prosomal appendages - 6 pairs
- One pair of chelicerae; four pairs of **walking legs** and one pair of **pusher legs**.
- Eyes are - Median ocellus and A pair of flateral compound eyes
- First pair of **Mesosomal appendages** are fused to form **Genital operculum** and oher five pairs ar modified as - Book gills
- **Excretory organs** are **coxal glands**
- Development **- Indirect**
- The larva of Limulus **- Trilobite**
- **E.g: *Limulus***
- Limulus has remained unchanged structurally overs million of years so it is called - **Living Fossil**.

## CLASS-II : : ARACHNIDA

- Terrestrial chelicerates belong to-**Arachnida**
- Prosoma bear - A pair of preoral chelicerae and a pair of postoral pedipalps and four pairs of walking legs.
- In spiders each chelicera bears a fang into which a poison gland opens.
- Abdominal appendages are modified into **Book lungs, spinnerets in spinders and pectines in scorpion.**
- Respiratory organs in scorpions-**Book lungs**
- Respiratory organs in spinder - **Book lungs to tracheae or both.**
- Excretory organs are - **Coxal glands and Malpighian tubules**.
- Development is - **Direct**
- Scorpions are - **Viviparous**
- **Eg: Plamnaeus (Scorpion)**
- **Aranea (Spider)**
- **Sarcoptes (Mite)**

## SUB-PHYLUM-III : : MANDIBULATA

In this group the first pair of mouth parts are - **Mandibles**

The first pair of appendages are - Antennae

## CLASS-I : : CRUSTACEA

Crustaceans are - **mostly Aquatic marine arthropods.**

In most species head and thorax unite to form **- Cephalothorax**

Cephalic appendages are 5 pairs - **one pair of first antennae (antennules) one pair of second antennae, one pair of mandibles, one pair of first maxillae and a pair of second maxillae.**

The only arthropods with two pairs of antennae are - **Crustaceans**

In Crustaceae, thoracic and abdominal appendages are typically **- Biramous**

Respiratory structures in crustacea are **- Gills**

Excretory organs in crustacea are - **Green glands or Antennal glands**

Sense organs in clude - **statocysts, compound eyes and antennae**.

Gonopores are **paired**

Development is **Direct or Indirect**

Basic larva is **nauplius**

**Ex:** ***Palaemon*** (freshwater prawn)

***Balanus*** (rock barnacle)

***Sacculina*** (root headed barnacle)

***Astacus*** (cray fish)

***Cancer*** (crab)

***Daphnia*** (water flea)

## CLASS-II : : CHILOPODA or TRIGNATHA

This class includes the **Centipedes**

These are terrestrial and carnivorous

These are **trignathic** - with mandibles, first maxikkae and second maxillae

Body is divisible into **head** and **trunk**

Each segment of the trunk bears - **one pair of clawed legs**

First pair of trunk appendages bear - **poison claws**

Respiratory organs - **Tracheae**

Excretory organs - **Malpighian tubules**

The condition in which a single genital aperture occurs at the posterior end of the trunk is - **Opisthogoneate**

Development is **direct or indirect**

Eg : ***Scolopendra, Scutigera***

## CLASS-III : : DIPLOPODA or DIGNATHA

The common name of the animals belonging to this class are - **Millipedes (thousandlegged worms)**

Diplopods are - **Terrestrial and Detritivorous**

Diplopodans feed on - **Decaying plant material**

Body is divisible into - **Head, Thorax and Abdomen**

They are **Dignathic,** with **mandibles and gnathochilarium (formed by the fusion of second maxillae)**.

Trunk segments are - **diplosegments,** formed by the fusion of two segments during development.

Each diplosegment has - 2 pairs of legs, 2 pairs of spiracles

The masticatory structure formed eue to the fusion of 'maxilae' is - **Gnathochilarium.**

Respiration takes place by - **Tracheae**

Excretion takes place by - **Malphigian tubules**

The condition in which single genital aperture opens in the anterior part of the trunk is - **Progoneate**

Development is **indirect**

Eg : ***Spirobolus, Julus***

## CLASS-IV : : INSECTA or HEXAPODA

insects are absent in - **Marine environment**
Body is divided into - **Head, Thorad and Abdomen**
In Insecta head is made up of - **six segments**
Thorax bears three pairs of jointed legs, hence it is referred as - **Hexapoda**
Respiratory structure are - **Tracheae**
Excretory structures are - **Malphigian tubules**
The main nitrogenous exretory waste is - **Uric acid (Uricotelism)**
The least toxic nitrogenous waste and can be sent out of the body in a highly concentrated form with minimum water loss (water conservation adaption) - **Uric acid**
Development is - **Indirect**
Larval stages are - **Present**
Metamorphosis - **occurs**
Eg : - *Musca* - **Housefly**
*Lepisma* - **Silverfish**
*Pediculus* - **Headlouse**
*Periplanata* - **Cockroach**
*ADDITIONAL INFORMATION :*
Chilopoda and Diplopoda are included under - **Myriapoda**
Myriapoda and Hexapoda are grouped under the Infraphylum - **Tracheata**

- Phlyum Arlhropoda was established by **Von Sicbold.**
- Arlhropoda constitute about 80% of the known animal species.
- Insecta constitutes the **largest class** in the animal kingdom.
- They exhibit the greatest adaptive radiation.
- Athropods are the **most successful** of all the known animal groups. it is due to Presencnce of hard and rigid exoskeleton, which is in the form of chitinous cuticle.
- Presence of jointed legs/appendages which show rapid movement with the help of bundles of striated muscles. **Striated muscles** appeared for the first time in the arthropods among the invertebrates.
- Presence of extensive haemocoel which is a part of open type of blood vascular system.

**Evolutionary characters of Arthropods:**

- Arthropods arc believed to have evolved from worm like ancestors, hundreds of millions of years ago.
- Arhropods are characterised by true **metamerism,** a heteronomous type of segmentation.
- The segments of the body are differentiated into functional regions called **tagmata.**
- The body is divisible into 3 parts or tagmata - Head. Thorax and Abdomen.
- The body is externally covered by waxy **chitinous exoskeleton.**
- Main function of the cuticle or exoskeleton is to prevent the loss of water.
- In terrestrial organisms **tracheae** are the respiratory organs.