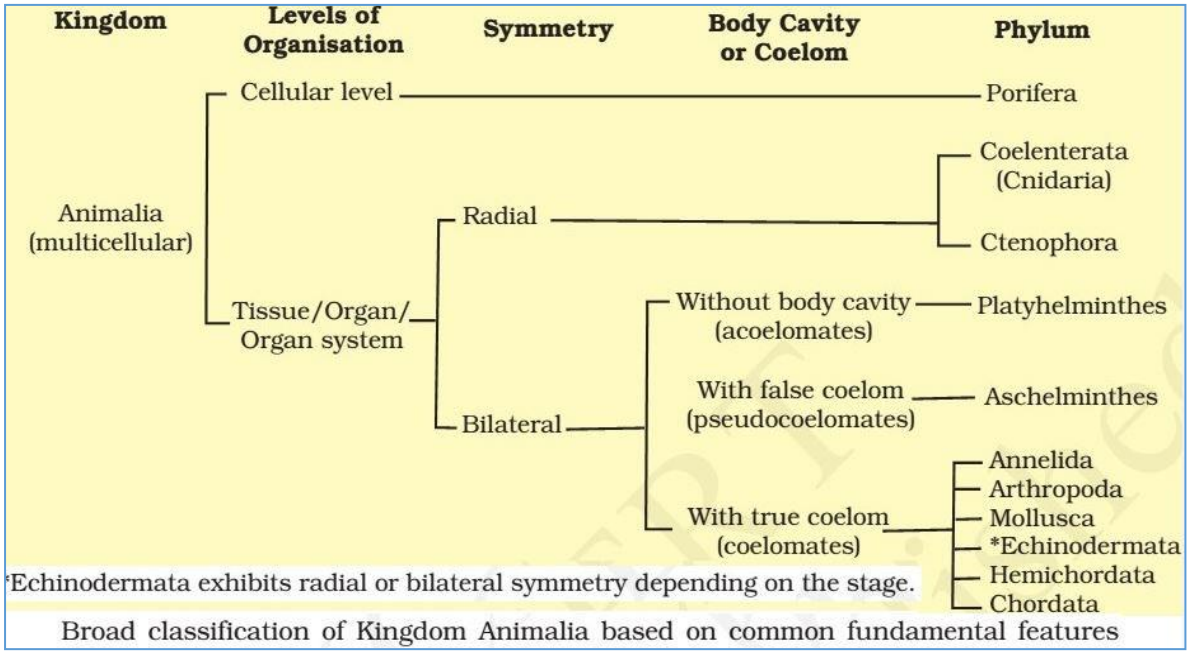
Classification of Animal Kingdom



Broad classification of Kingdom Animalia based on common fundamental features

- All members of Animalia are multicellular and do not exhibit the same pattern of organization of cells.

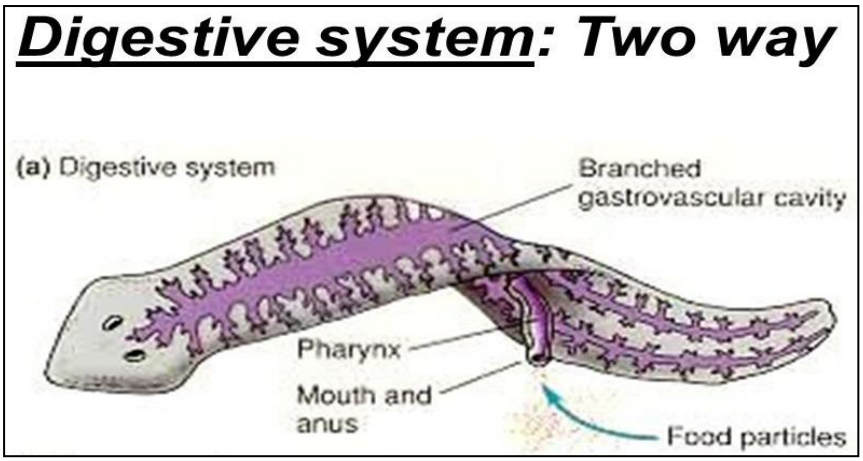
For example

- ☒ In sponges, the cells are arranged as loose cell aggregates, i.e., they exhibit **cellular level of organization**.
- ☒ In coelenterates, the arrangement of cells is more complex.
- ☒ **Organ level of organization** is exhibited by members of Platyhelminthes and other higher phyla where tissues are grouped together to form organs, each specialized for a particular function.
- ☒ In animals like Annelids, Arthropods, Molluscs, Echinoderms and Chordates, organs have associated to form functional systems, each system concerned with a specific physiological function. This pattern is called **organ system level of organization**.

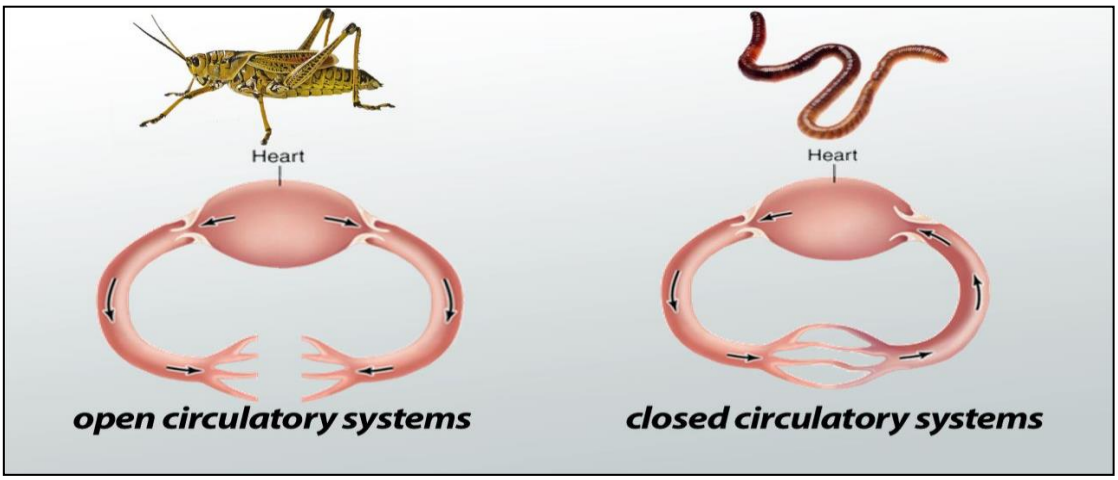
- Organ systems in different groups of animals exhibit various patterns of complexities.

For example:

☒ The digestive system in **Platyhelminthes (incomplete digestive system)** has only a single opening to the outside of the body that serves as both mouth and anus, and is hence called incomplete. A **complete digestive system** has two openings, mouth and anus.



☒ Similarly, the circulatory system may be of two types: **open type** in which the blood is pumped out of the heart and the cells and tissues are directly bathed in it and **closed type** in which the blood is circulated through a series of vessels of varying diameters (arteries, veins and capillaries).



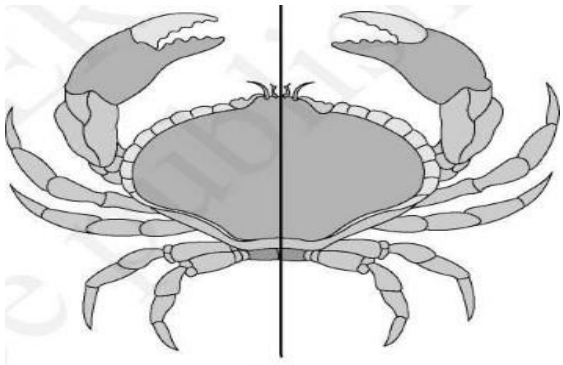
Therefore the basis for animal kingdom classification are:

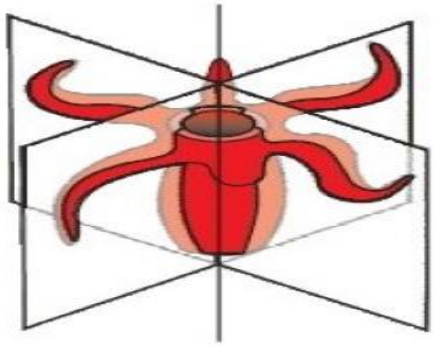
1. Levels of Organisation,
2. Symmetry,
3. Diploblastic and Triploblastic Organisation,
4. Coelom development,
5. Segmentation of the body and
6. Presense or absence of Notochord.

Symmetry

- Animals can be categorized on the basis of their symmetry.
- Sponges are mostly asymmetrical, i.e., any plane that passes through the centre does not divide them into equal halves.
- When any plane passing through the central axis of the body divides the organism into two identical halves, it is called **radial symmetry**. Coelenterates, Ctenophores and Echinoderms have this kind of body plan.
- Animals like Annelids, Arthropods, etc., where the body can be divided into identical left and right halves in only one plane, exhibit **bilateral symmetry**.

Bilateral Symmetry →





← **Radial Symmetry**

Diploblastic and Triploblastic Organization

- Animals in which the cells are arranged in two embryonic layers, an **external ectoderm** and an **internal endoderm**, are called **diploblastic animals**, e.g., Coelenterates. An undifferentiated layer, **mesoglea**, is present in between the ectoderm and the endoderm.
- Those animals in which the developing embryo has a third germinal layer, **mesoderm**, in between the ectoderm and endoderm, are called **triploblastic animals** (platyhelminthes to chordates).

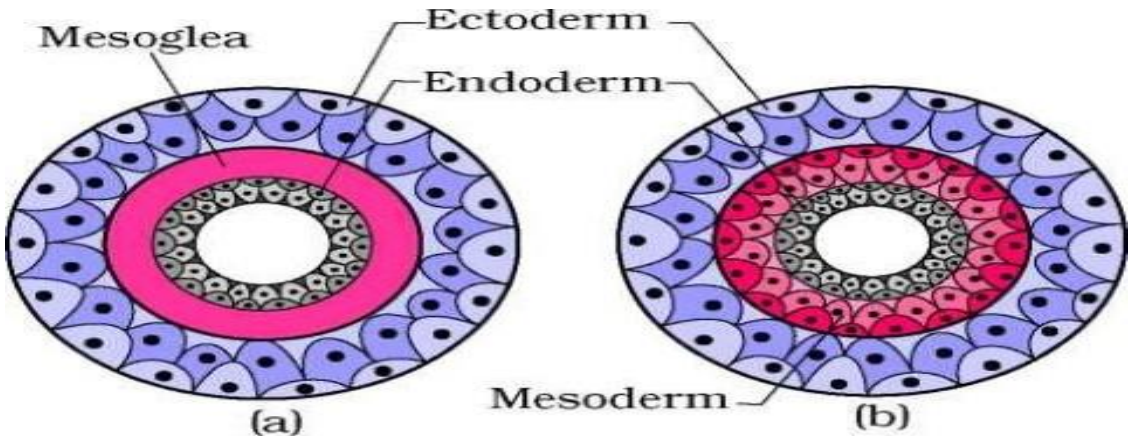


Figure: Showing germinal layers: (a) Diploblastic (b) Triploblastic

Coelom

- Presence or absence of a cavity between the body wall and the gut wall is very important in classification.
- The body cavity, which is lined by **mesoderm** is called **coelom**.
- Animals possessing coelom are called **coelomates**, e.g., Annelids, Molluscs, Arthropods, Echinoderms, Hemichordates & Chordates.
- In some animals, the body cavity is not lined by mesoderm, instead, the mesoderm is present as scattered pouches in between the ectoderm and endoderm. Such a body cavity is called

pseudocoelom and the animals possessing them are called pseudocoelomates, e.g., Aschelminthes.

- The animals in which the body cavity is absent are called **acoelomates**, e.g., Platyhelminthes.

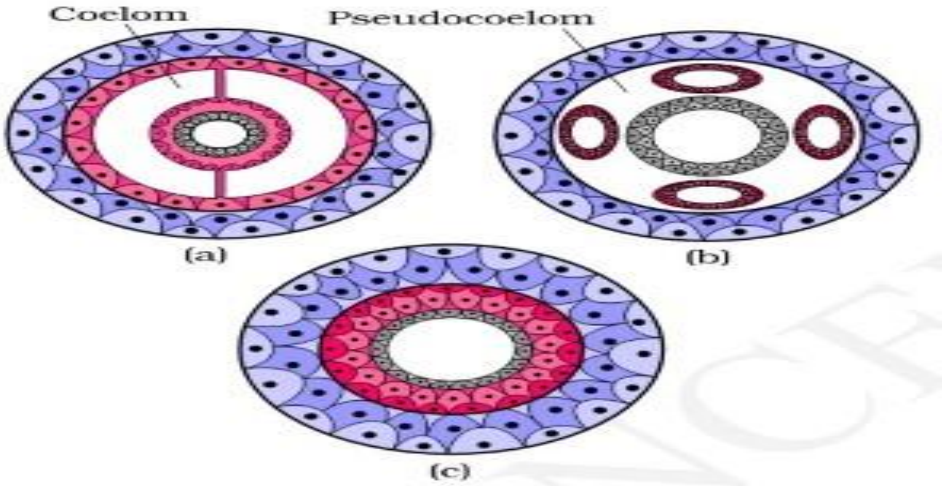
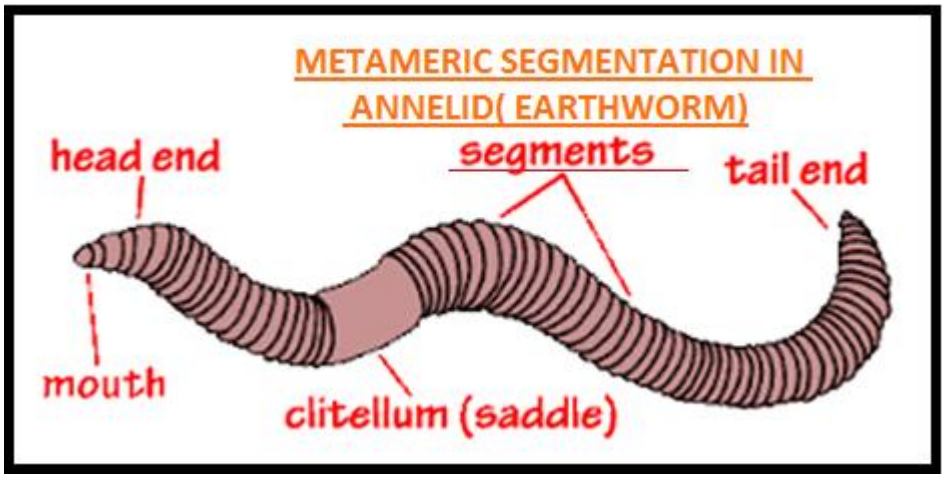


Figure 4.3 Diagrammatic sectional view of : (a) Coelomate (b) Pseudocoelomate (c) Acoelomate

Segmentation

- In some animals, the body is externally and internally divided into segments with a serial repetition of at least some organs.
- For example, in earthworm, the body shows this pattern called **metameric segmentation** and the phenomenon is known as **metamerism**.



Notochord

- Notochord is a mesodermally [the middle layer of cells or tissues of an embryo, or the parts derived from this (e.g. cartilage, muscles, and bone)] derived rod-like structure formed on the dorsal side [posterior] during embryonic development in some animals.
- Animals with notochord are called **chordates** and those animals which do not form this structure are called non-chordates, e.g., Porifera to Echinoderms.