# General Zoology (2)

## Part 1

Physics & Chemistry - Grade 2

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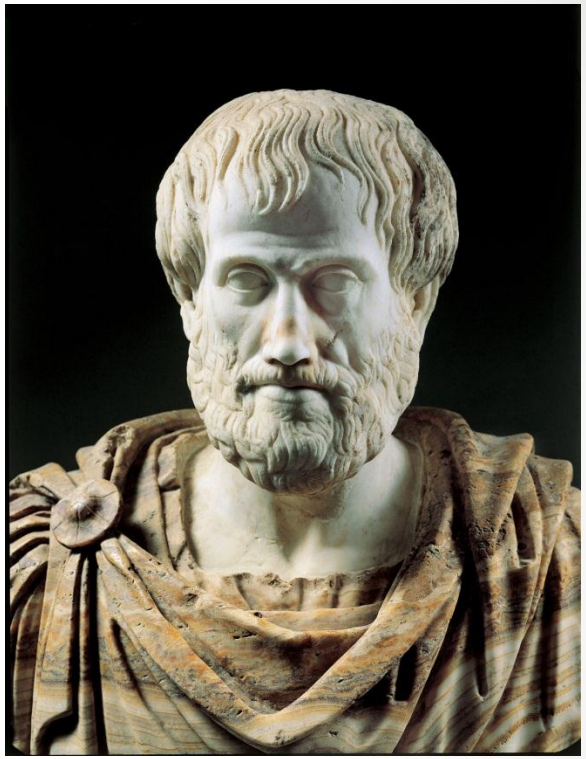
# Introduction

- Animal taxonomy is one of zoology branches that is concerned with identifying different types of animals, describing them, naming them and placing them in the appropriate classification position.
- More than million animal species are currently known to facilitate their study and to understand various relationships between their groups.

The Greek philosopher Aristotle (384-322 BC) was among the first scientists who were interested in classifying living organisms from animals and plants. He suggested that animals could be classified according to the presence or absence of red blood into two groups: Enaima and Anaima.



**Aristotle**

- Other attempts were performed to classify animals on other bases, such as:

✓ Environment: accordingly, animals have been classified into terrestrial, aquatic and aerial.

✓ Food type: consequently, animals were divided into two groups: carnivores and herbivores.

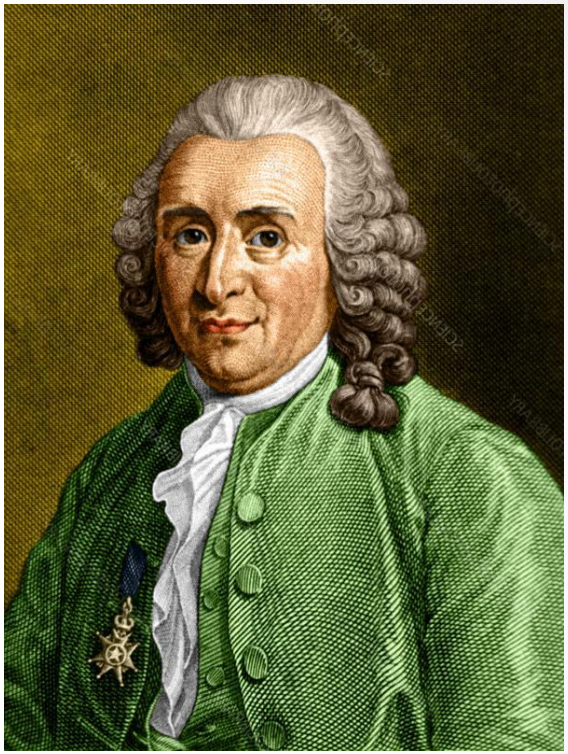
Gradually, however, emerged the idea of classifying animals according to the morphological similarities between them. This idea was formulated clearly by the English naturalist John Ray (1627-1705).

**John Ray**

- Ray's idea was taken up by the scientific community throughout the seventeenth century and considered the first attempt to classify animals on an accurate scientific basis.
- The scientist Ray was also the first to develop an accurate definition of species, which is the basic unit of classification for living organisms in general.

- The species was defined as: "A group of individuals with similar morphological characteristics, that can mate with each other, but do not mate with members of another species, and if this happens, sterile hybrids will result."

Later came the Swedish naturalist Linnaeus (1707-1778) who laid down the basis of the system of classification we use nowadays.

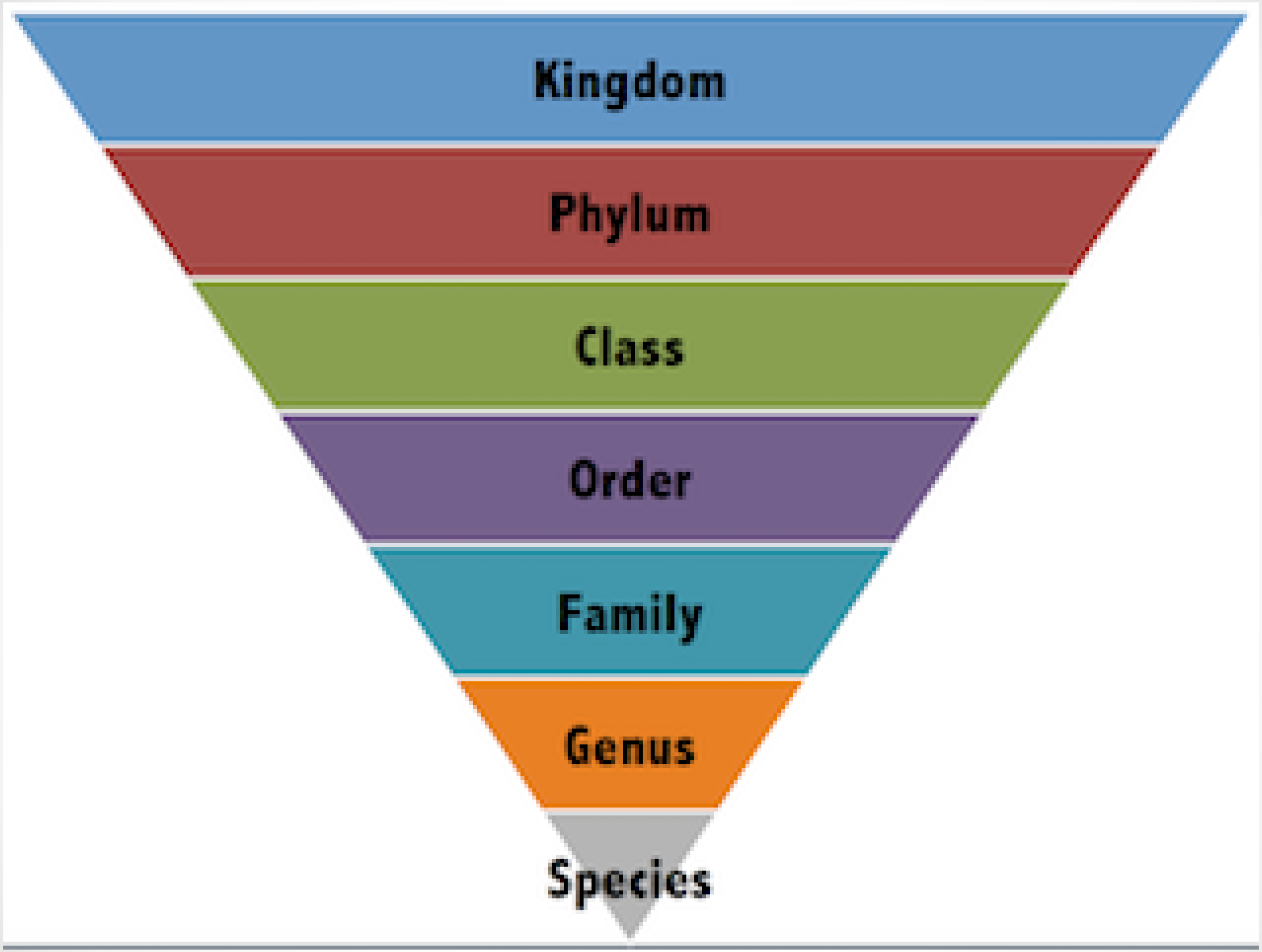


**Linnaeus**

- He classified living organisms according to the morphological and anatomical similarities between them.
- He also devised the system of “Binomial nomenclature” by which each type of organism is given a name composed of two words, the first is the name of the **genus**, and the second is the name of the **species**. Both are latin and are written underlined or typed in italics. The name of the genus starts with a capital letter and that of the species with a small letter.

- Nowadays, the classification of animals is not only based upon morphological and anatomical characteristics but also on biochemical, genetical, embryological and physiological features.

- Species having many features in common are placed in the same genus. Similarly, related genera are grouped in a family, and families with certain common characteristics constitute an order, and orders in turn are grouped into classes. From these classes, the higher taxonomic groupings known as phyla are formed.
- Although the relationships between the different phyla may not be obvious, it is always possible to arrange them according to the degree of complexity of structure and function into larger groups known as subkingdoms or branches.


Kingdom
Phylum
Class
Order
Family
Genus
Species

# Kingdom: Protozoa

# General Characteristics of Protozoa

- **Nucleus**: Eukaryotes, have true nuclei in animal cells.

  Eukaryote cells are more complex than the simpler prokaryote cells found in bacteria.

- **Cellular Structure:** They are unicellular and the animal is made up of only one cell.

- **Habitat:** They are aquatic microscopic organism in general.

- **Living:** They are either free-living (solitary but sometimes become colonial) or parasitic.

# General Characteristics of Protozoa

- **Body**: Microscopic. Protoplasm consists of two parts, outer ectoplasm and inner endoplasm.
- **Nutrition:** Heterotrophic, which means they can't produce their own food. Members of the Protozoa Kingdom must ingest, or eat other organisms.
- **Respiration:** Respiration may be aerobic or anaerobic.
- **Excretion:** Excretion takes place through body surface.
- **Reproduction:** Reproduction is mostly asexual.
- **Locomotion:** Locomotion takes place by pseudopodia or flagella.

# Examples of Protozoa

# Amoeba

Classification

Kingdom: Protozoa

Phylum : Amoebozoa

Class : Tubulinea

e.g. : *Amoeba* sp.

## Origin of name:

- The name is derived from a Greek word meaning “to change”.

## Shape and Size:

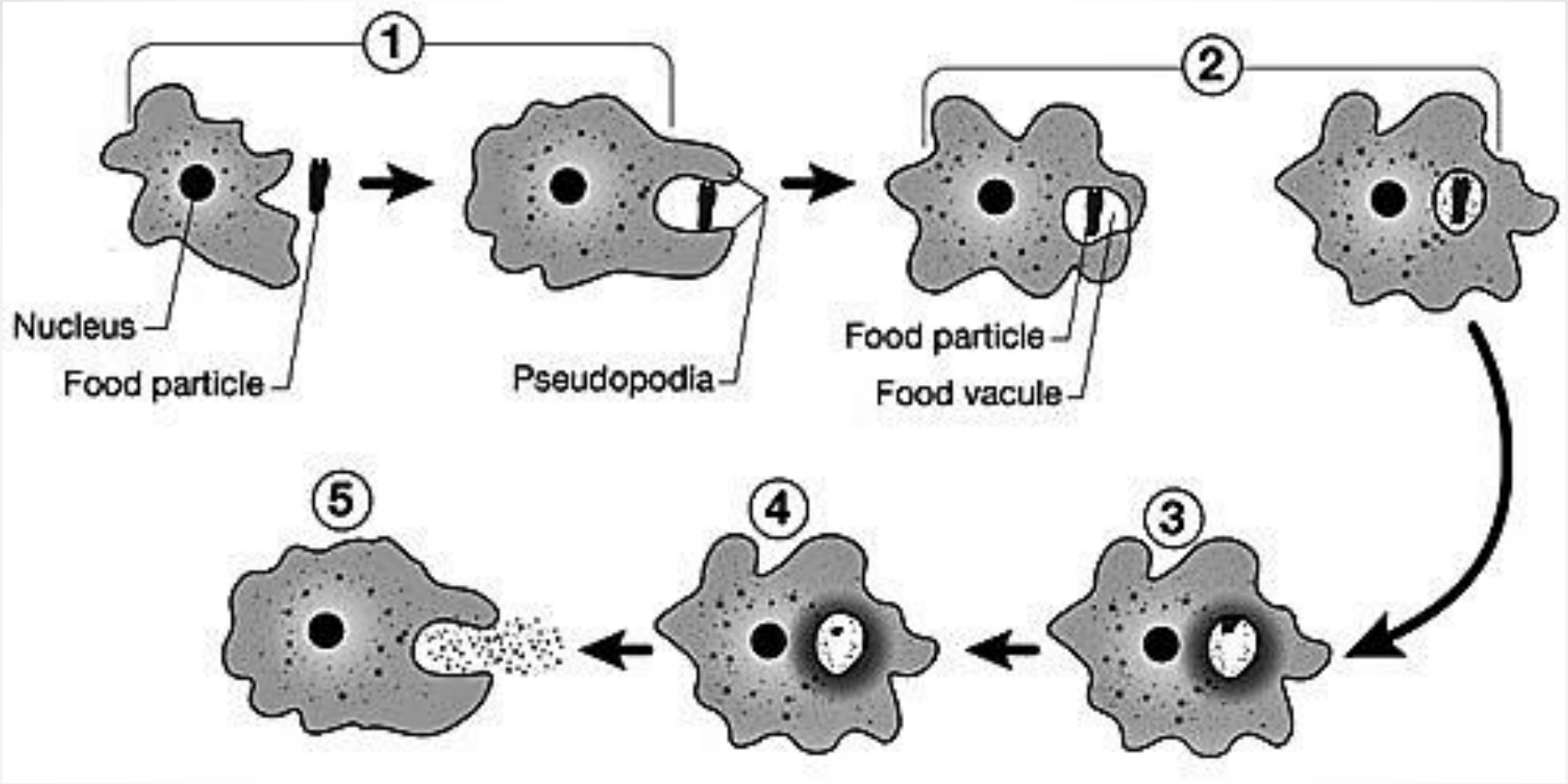
- Amoeboids are microscopic organisms with a jelly-like transparent irregular shape.
- Its size ranges from 2 micrometer to 0.5 cm.

## Habitat:

- They live in water including lakes, ponds, streams, rivers and puddles.
- Some can even live in the bodies of animals.

## Nutrition:

- The amoeba feed through phagocytosis process.
- It stretches out the pseudopod, surrounds a piece of food (mainly bacteria, algae and other protozoa), and pulls it into the rest of the amoeba's body.
- An opening in the membrane allows the food particles, along with drops of water, to enter the cell, where they are enclosed in bubble like chambers called food vacuoles.
- There the food is digested by enzymes and absorbed into the cell.
- The food vacuoles then disappear.




**Nutrition in Amoeba**

## Respiration:

•The membrane allows oxygen to pass into the cell and carbon dioxide to pass out by diffusion.

## Excretion:

- Liquid wastes are expelled through the membrane by diffusion.

## Osmotic regulation:

- Water from the surrounding environment flows through the amoeba's ectoplasm by osmosis process.
- When too much water accumulates in the cell, the excess is enclosed in a structure called a contractile vacuole and squirted back out through the cell membrane.

## Reproduction:

- Amoebas reproduce by a process called binary fission. This means that one amoeba can split in half and make two new amoebas.
- As amoebas get older they increase in size. When big enough they split in half to create two cells that are identical genetically to each other.

## Locomotion:

- Amoeboids move by crawling using pseudopodia.
- Pseudopod is a part of the amoeba's body that it can stretch out and pull itself with.
- Pseudopod is used to help the amoeba to move, and also to eat.

# Kingdom: Animalia

# General Characteristics of Kingdom Animalia

- **Nucleus:** Eukaryotes, have true nuclei in animal cells. Eukaryote cells are more complex than the simpler prokaryote cells found in bacteria.

- **Cellular Structure:**

✓ Multicellular, made up of more than one cell.

✓ No cell wall, plants, fungi, and prokaryote cells have a cell wall, which is a rigid outer layer that gives cells structure. Animal cells do not have this structure. As a result, animal cells are more flexible to change their shapes and movements.

- **Nutrition:** Heterotrophic, which means they can't produce their own food. Members of the Animalia Kingdom must ingest, or eat other organisms.

# Examples Of Kingdom Animalia Phyla

1- Phylum: Porifera

2- Phylum: Cnidaria

3- Phylum: Platyhelminthes

4- Phylum: Nematoda

5- Phylum: Annelida

6- Phylum: Arthropoda

7- Phylum: Mollusca

8- Phylum: Echinodermata

9- Phylum: Chordata

# Phylum: Porifera


PHYLUM PORIFERA
SPONGES

# General Characteristics of Sponges

- **Origin of Name:** The word “Porifera” mainly refers to the pore bearers or pore bearing species.
- **Cellular Structure:** They are the most primitive cell animals.
- **Habitat:** Sponges are mostly marine sessile animals, and a few live in fresh water.
- **Living:** Free-living.

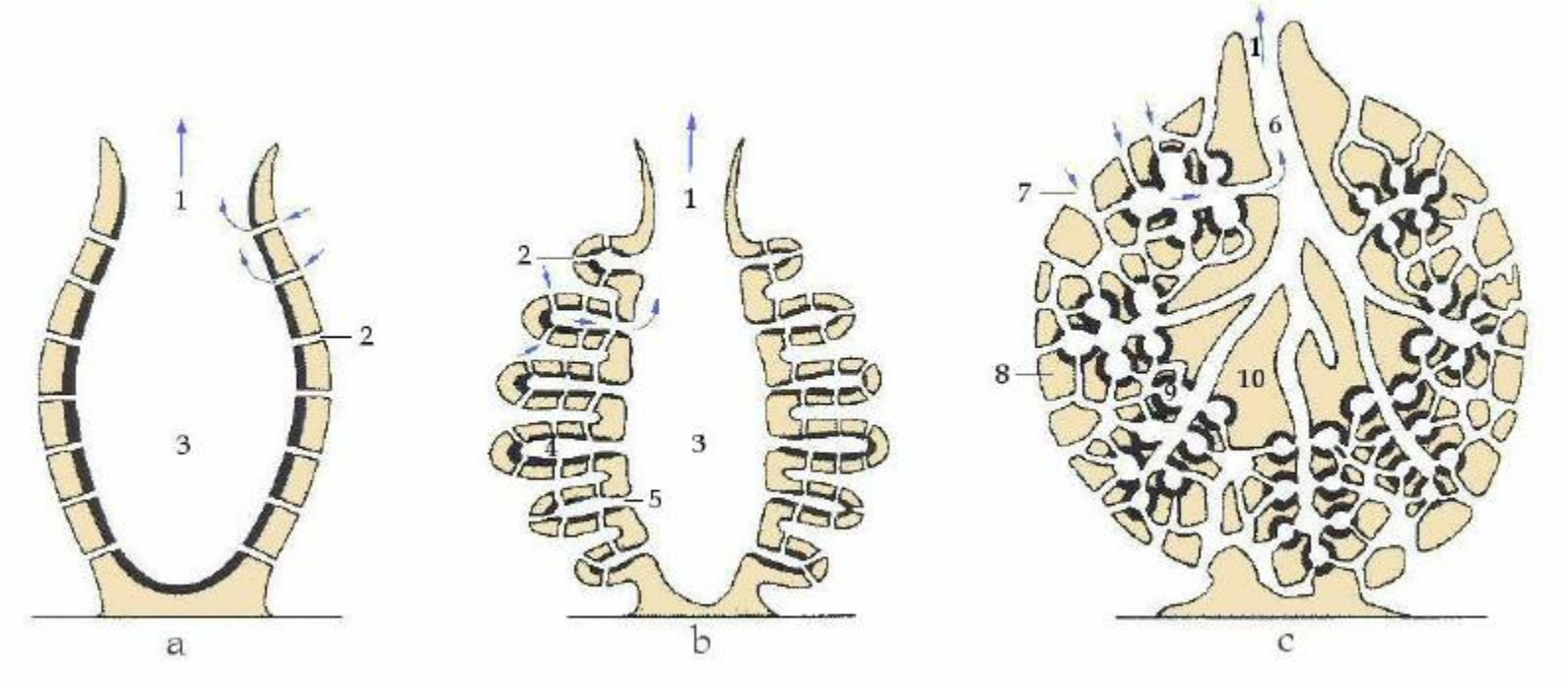
# General Characteristics of Sponges

## ❑Body:

- ✓ The poriferans have a spongy appearance and are therefore called sponges.
- ✓ They vary in form from thin flattened crusts, to vase-shaped, branched, globular or irregularly shaped bodies.
- ✓ The body wall is perforated with many holes in which water flows continuously. Inside the body there is one large cavity called paragastric cavity.
- ✓ They have a skeleton of calcareous or siliceous spicules, or of organic spongin fibres.

- **Nutrition:** They are holozoic and digestion is entirely intracellular.
- **Respiration:** They respire by simple diffusion.
- **Excretion:** They excrete by simple diffusion.
- **Reproduction:** They reproduce asexually by budding or regeneration and sexually by gametes.
- **Sensation:** They have no sensory or nerve cells.
- **Locomotion:** They are sessile animals.

# Types of Sponges




**Ascon type**

**Sycon type**

**Leucon type**

# Examples of Sponges

# Spongia (Leucon type)

Classification

Kingdom: Animalia

Phylum : Porifera

Class : Demospongiae

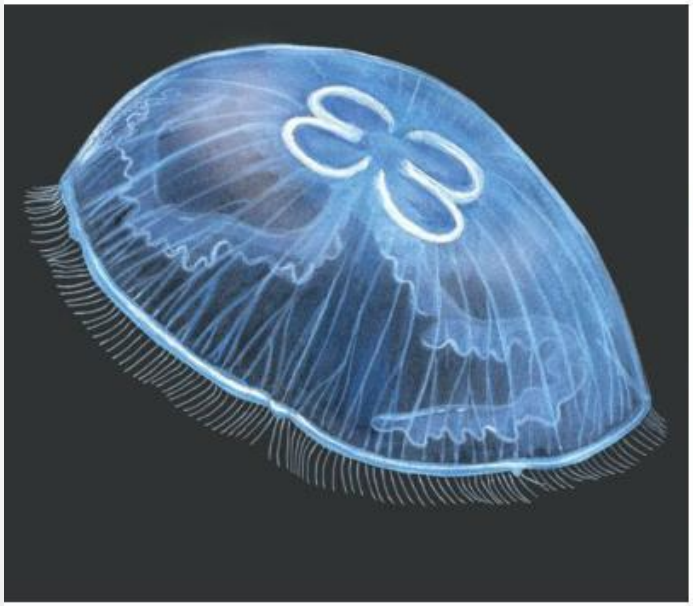
e.g. : *Spongia sp.*

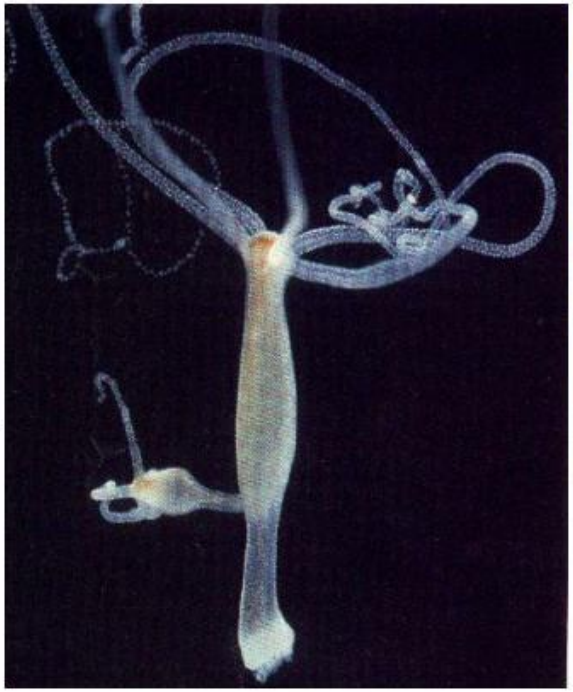
# External Features of Spongia

- This is the most complex types of sponges, where the body wall becomes more folded, resulting in the formation of a complex system of channels, as well as the growth of the choanocytes, forming many small round chambers leading to blocking the paragastric cavity.
- Inhalant pores lead to cavities under the skin and these lead to branched inhalant channels that open into flattened spherical chambers from which exhalant channels lead to a small paragastric cavity that opens to the outside with one or more osculum.
- One of the advantages of this complexity is that it increases the nutritional and respiratory capacity of the sponge.

# Phylum: Cnidaria

# Phylum Cnidaria





# General Characteristics of Cnidaria

- **Origin of Name:** Animals possess characteristic stinging cells, which are not found in any other phylum.

- **Cellular Structure:** Their body is made up of different types of cells arranged in two tissue layers, an outer ectoderm and an inner endoderm, separated by a structure less jelly-like mesoglea.

- **Habitat:** They live in shallow water near the sea-shore of the red sea.

- **Living:** It includes delicate plant-like colonies of zoophytes colorful sea anemones, massive reef-building corals, as well as the free-swimming jellyfishes.

# General Characteristics of Cnidaria

## ❑Body:

- ✓ They are radially symmetrical animals, i.e. if cut lengthwise in any plane passing by the center, the body is divided into two symmetrical halves.
- ✓ There is a single cavity within their body known as gastrovascular cavity or coelenteron. It is a digestive cavity and has a single opening to the outside, the mouth.

❑ **Nutrition:** Digestion is partly extracellular occurring in the gastrovascular cavity, and partly intracellular taking place within food vacuoles inside the endodermal cells.

# General Characteristics of Cnidaria

- **Respiration:** They respire by simple diffusion through the surface of the ectoderm and endoderm.
- **Excretion:** They excrete by simple diffusion through the surface of the ectoderm and endoderm.
- **Reproduction:** They reproduce asexually by budding and sexually by forming gametes.
- **Sensation:** They have a nervous system spread in the form of a nerve network, or a concentrated in rings and nerve cords.
- **Locomotion:** They are simple aquatic animals which are mostly marine and sessile.

# Example of Cnidaria

# Hydra

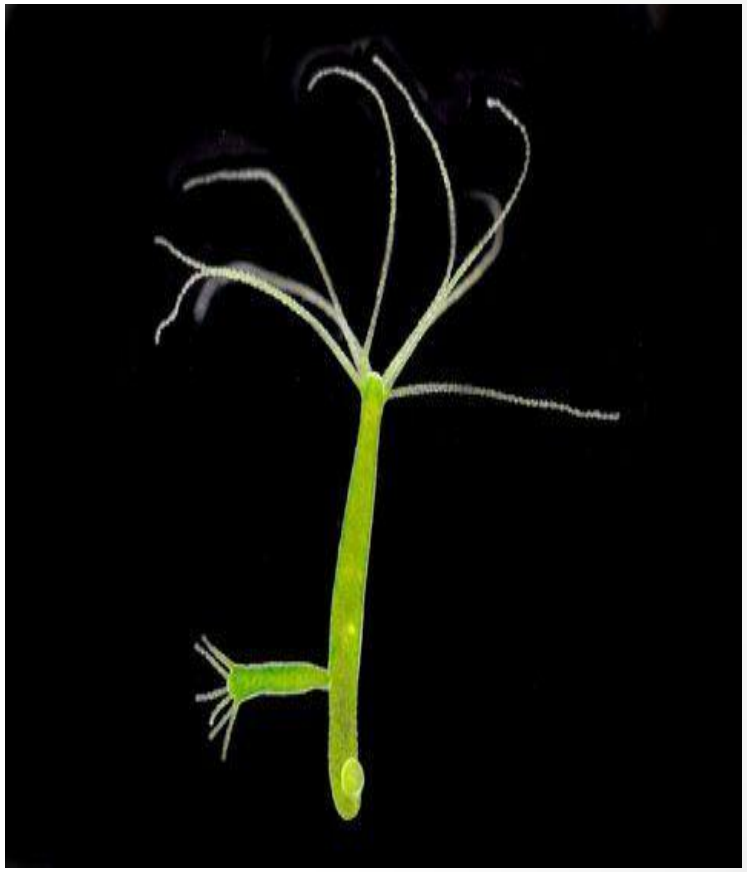
Classification

Kingdom: Animalia

Phylum : Cnidaria

Class : Hydrozoa

e.g. : *Hydra* sp.



- **Habitat:** This is a simple cnidarian which lives attached to rocks and aquatic vegetation in freshwater ponds and streams.

# External Features of Hydra

## ❑Body:

- ✓ Hydra has a small cylindrical body (2-20mm in length) with a closed lower end known as “basal disc” or “foot”.
- ✓ The other end forms a small oral cone on the top of which the mouth is situated.
- ✓ Six to ten slender hollow tentacles arise from around the base of the oral cone. They are very mobile during life and capable of great extension and contraction.
- ✓ The body wall is made up of two cellular layers, an outer ectoderm and an inner endoderm, separated by a structure less jelly-like mesoglea.

## ❑Body:

- ✓ The body of the animal is also very flexible and can be extended into a long slender tube, bent in any direction, or contracted into a very short barrel.
- ✓ Either buds or rounded projections representing several testes or one ovary are sometimes seen on the side of the body.
- ✓ There is a single cavity in the body known as the enteron or gastrovascular cavity. This cavity is extended inside the tentacles.

# Phylum: Platyhelminthes

# PHYLUM PLATYHELMINTHES

"Means flatworm"

# General Characteristics of Platyhelminthes

- **Living:** Platyhelminthes are free-living or parasitic animals.

- **Body:**

- ✓ They are triploblastic acoelomate animals, i.e. they possess no coelom; the spaces between the internal organs are filled by loose parenchyma cells.
- ✓ They have soft dorsoventrally flattened and bilaterally symmetrical bodies, i.e. only one median line can divide the body into two symmetrical halves.
- ✓ The body muscles are well developed, and share in the formation of the body wall.

# General Characteristics of Platyhelminthes

- **Digestive System:** The digestive system, when present, is simple with only a mouth opening, but no anus.
- **Respiratory System:** There is no respiratory system.
- **Excretory System:** The excretory system is essentially formed of basic units, known as flame cells or solenocytes, connected together by minute excretory ducts, leading to the exterior by one or more excretory pore.

# General Characteristics of Platyhelminthes

- **Reproduction:** The majority are hermaphrodite, with complicated reproductive systems.
- **Nervous System:** In addition to the nerve network, they have a centralized nervous system with a pair of cerebral ganglia lying in the anterior region of the body, and connected to one to three pairs of longitudinal nerve cords with transverse commissures.
- **Circulatory System:** There is no circulatory system.

# Example of Platyhelminthes

# Fasciola (Liver flukes)

Classification

Kingdom: Animalia

Phylum : Platyhelminthes

Class : Trematoda

e.g. : *Fasciola gigantica*

- **Habitat:** They are parasitic flukes live in the bile ducts of the liver in sheep, goats, and cattle.

# External Features of Fasciola

## ❑Body:

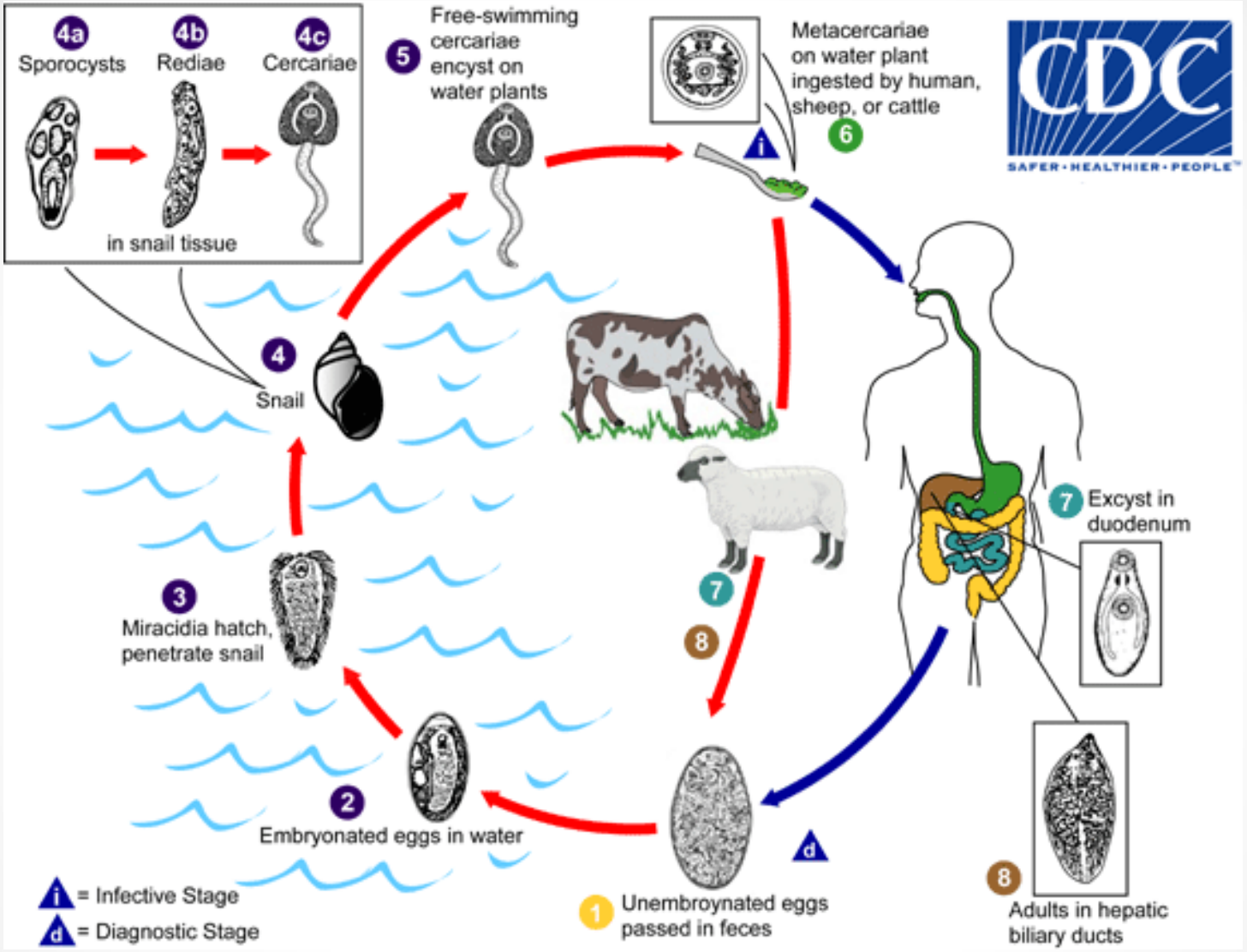
- ✓ They are relatively large flukes, ranging in length from 25-75 mm in length and 10-15 mm in width.
- ✓ It has a leaf-like body which is more flattened along the margins than along the median line.
- ✓ At the anterior end of the worm, there is a distinct conical projection known as the head cone.
- ✓ The posterior end is broadly rounded.
- ✓ Behind the head cone, the body widens gradually to form the shoulders.

## ❑Body:

- ✓ The mouth opening lies at the anterior end, surrounded by a large muscular organ known as the oral sucker.
- ✓ A short distance behind the oral sucker, there is another larger and strong muscular adhesive organ known as the ventral sucker.
- ✓ In between the oral and ventral suckers and along the median line, lies a structure known as genital atrium.
- ✓ A single excretory pore is located at the posterior end of the fluke.

## ❑Body:

- ✓ The body wall consists of a living cytoplasmic layer known as tegument. This layer consists mainly of cytoplasmic extensions of cells known as tegument-forming cells that are embedded in the parenchyma cells.
- ✓ A number of small, sharp spinules protrude from tegument layer.




**Life cycle of liver fluke**

# Phylum: Nematoda

# Phylum Nematoda

# General Characteristics of Nematoda

- **Phylum Size:** This phylum is one of the largest phyla in the animal kingdom.
- **Habitat:** They are found globally in huge numbers in all types of environments, including seabeds, freshwater bottoms, as well as the surface layer of all soil types.
- **Living:** The majority of nematodes are free-living species and there are many parasitic forms that attack all types of plants and animals.

# General Characteristics of Nematoda

## ❑ Body:

- ✓ This phylum includes cylindrical, elongated, unsegmented animals that show lateral symmetry.
- ✓ The body is covered with a thick layer of soft cuticle.
- ✓ There is no coelom, but there is a cavity often referred to as a pseudocoelom that is formed by the intersection of large vacuoles of special cells that occupy the space between the intestine and the body wall.

# General Characteristics of Nematoda

- **Digestive System:** They have a complete digestive system with a mouth and anus.
- **Excretory System:** The excretory system consists mainly of a few (usually two) excretory cells or glands that form two long tubules closed at their posterior ends, while at the front they form a transverse ventral connection leading to a single pore close to the mouth.

# General Characteristics of Nematoda

- **Reproduction:** Sexes are separate, the reproductive organs are usually filamentous (thread-like) and they produce eggs with strong resistant shells. The life cycle is direct, rarely indirect as in filarial worms.
- **Nervous System:** The nervous system consists of a nerve ring around the esophagus, from which six short anterior trunks and six long posterior trunks arise.
- **Muscular System:** The muscular system is well developed, consisting entirely of longitudinal fibres.

# Example of Nematoda

# Ascaris

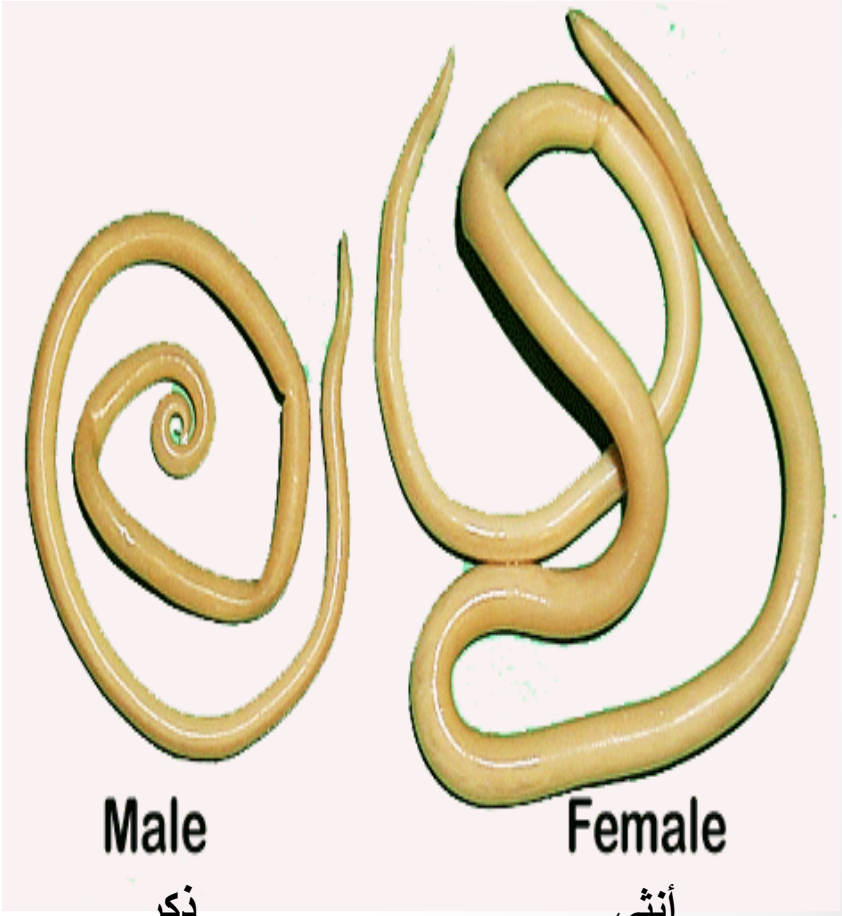
Classification

Kingdom: Animalia

Phylum : Nematoda

Class : Chromadorea

e.g. : *Ascaris lumbricoides*



- **Living:** It is one of the most important human intestinal parasites in Egypt. It infects the human intestines in all parts of the world except in cold and dry climates.

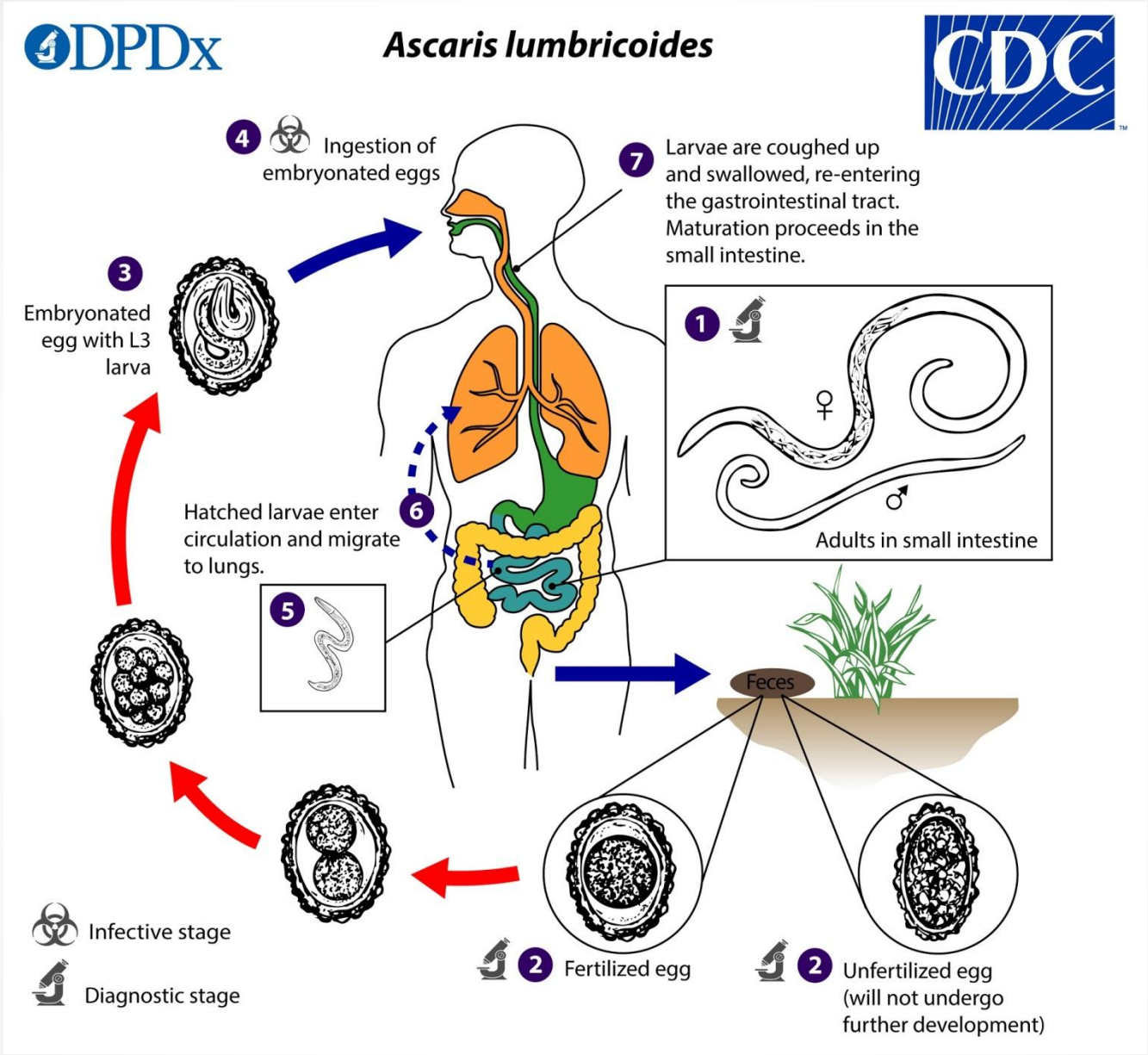
# External Features of Ascaris

## ❑Body:

- ✓ Elongated cylindrical, females (20-35 cm) longer than males (15-30 cm).
- ✓ The body wall consists of cuticle, epidermis, and a single layer of muscle cells.
- ✓ The male is characterized by a curved hind end bearing a slit-like cloacal opening from which a pair of copulatory spicules protrude.
- ✓ The position of the excretory ducts is marked by two broad dark lateral lines, while the position of the main nerve cords is marked by white dorsal and ventral lines.

## ❑Body:

- ✓ The mouth opening is located at the anterior end of the worm, and the excretory hole is located on the ventral side about 2 mm posterior to the anterior end.
- ✓ In females, the genital opening is located on the ventral side at the end of the first third of the body, and the anus is located near the posterior end of the worm.
- ✓ In males, the cloacal opening is located near the posterior end of the worm.




**Life cycle of Ascaris**