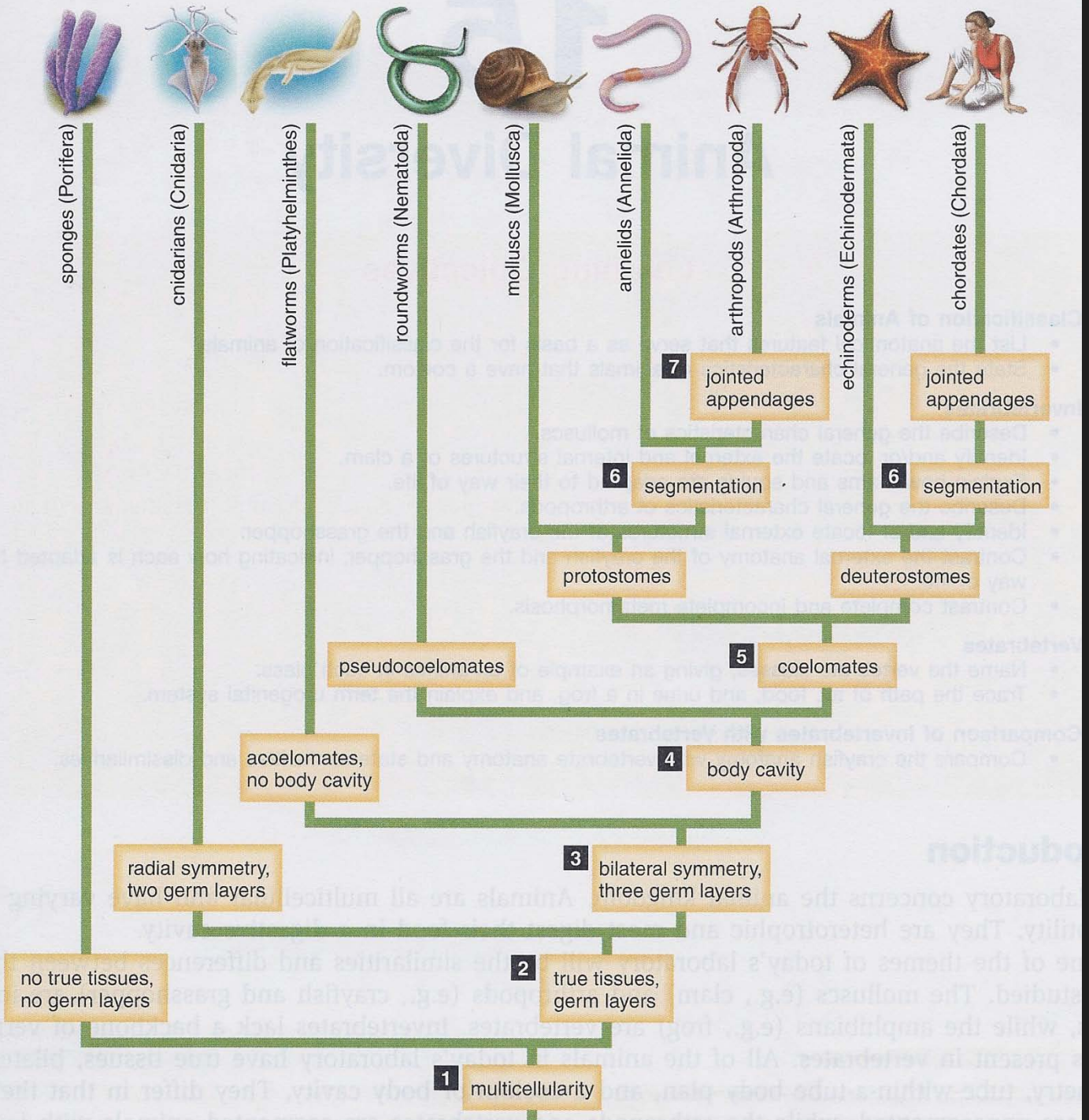
# Lab 9:
# Animal Diversity


sponges (Porifera)
cnidarians (Cnidaria)
flatworms (Platyhelminthes)
roundworms (Nematoda)
molluscs (Mollusca)
annelids (Annelida)
arthropods (Arthropoda)
echinoderms (Echinodermata)
chordates (Chordata)
7 jointed appendages
jointed appendages
6 segmentation
6 segmentation
protostomes
deuterostomes
pseudocoelomates
5 coelomates
acoelomates, no body cavity
4 body cavity
radial symmetry, two germ layers
3 bilateral symmetry, three germ layers
no true tissues, no germ layers
2 true tissues, germ layers
1 multicellularity

# Anatomical Features of Classification

- Level of organization
- Germ Layers
- Symmetry
- Body Plan
- Coelom
- Segmentation

# Levels of organization

Level of organization of an animal.

Cellular – Cells are not organized

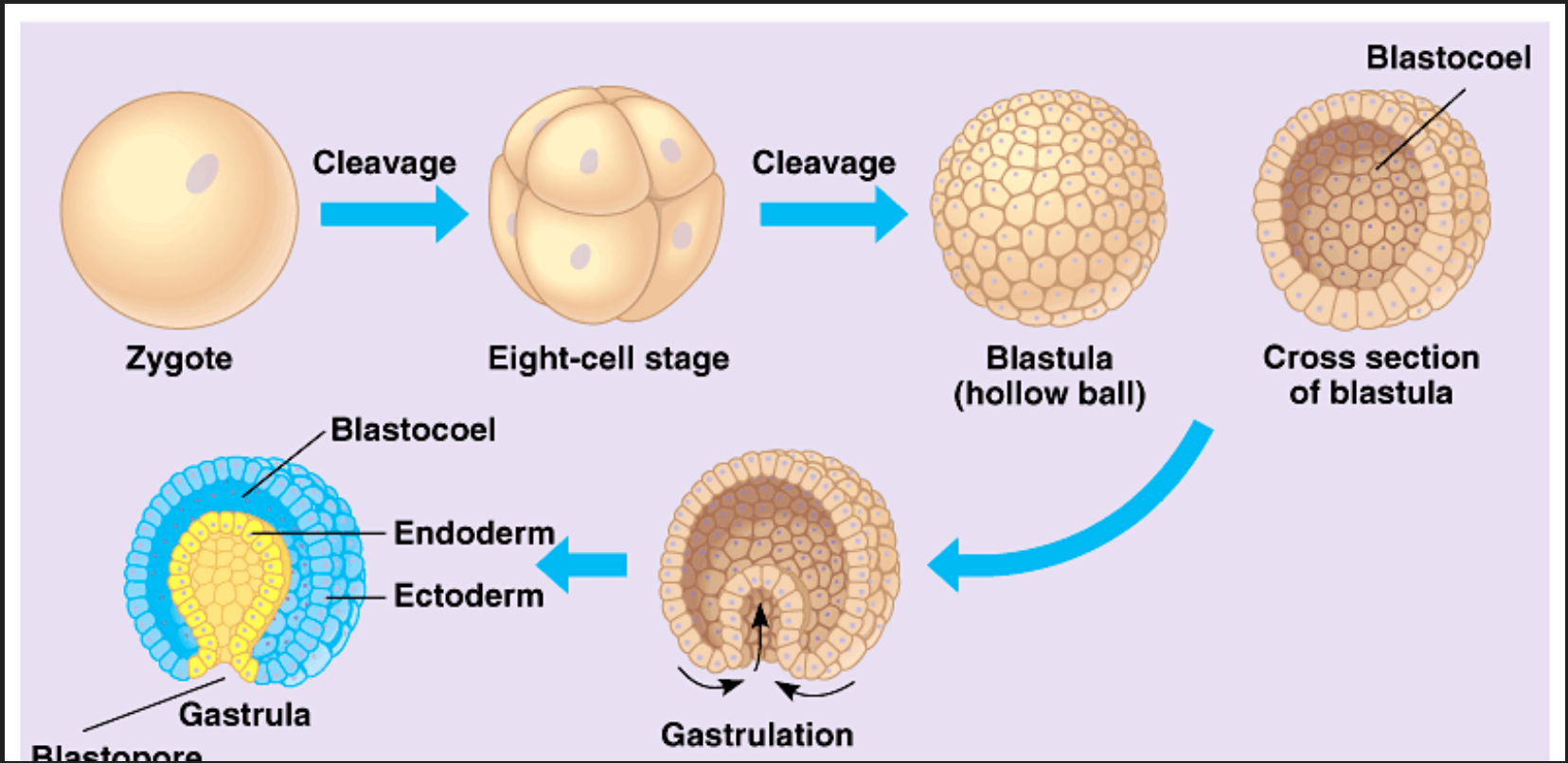
Tissues – Cells organized into tissues

Organs – Tissues organized into organs

Organs Systems – Organs organized into systems

# Germ layers

As an animal embryo develops it may create layers of cells, which will later form tissues.



# Germ layers

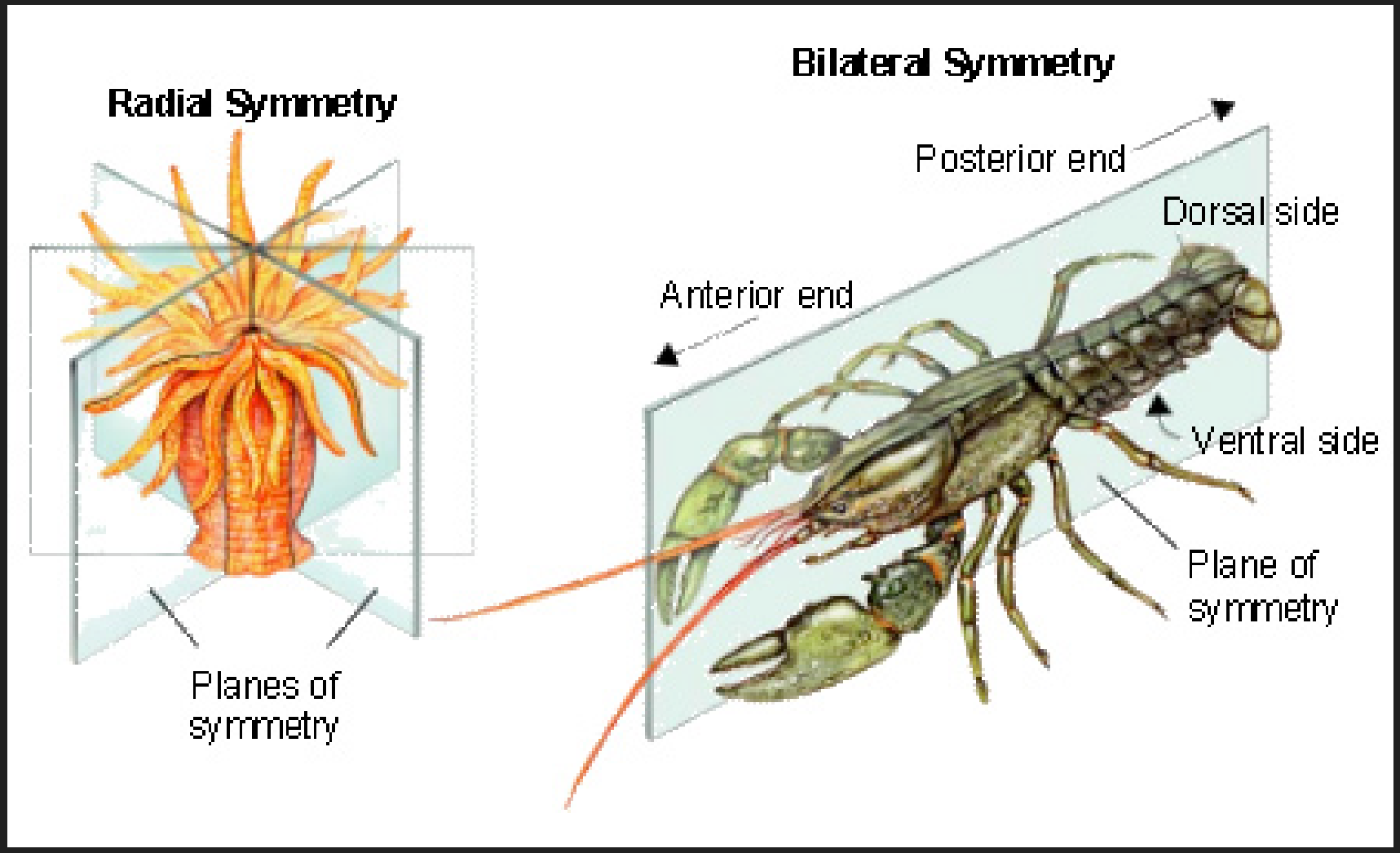
There are three possible germ layers:

- Ectoderm (ecto=“outside”)
- Mesoderm (meso=“middle”) – for organs!
- Endoderm (endo=“inside”)

Animals can either have:

- none (no germ layers)
- two germ layers (ecto & endo)
- three germ layers

# Body symmetry



# Body Plan

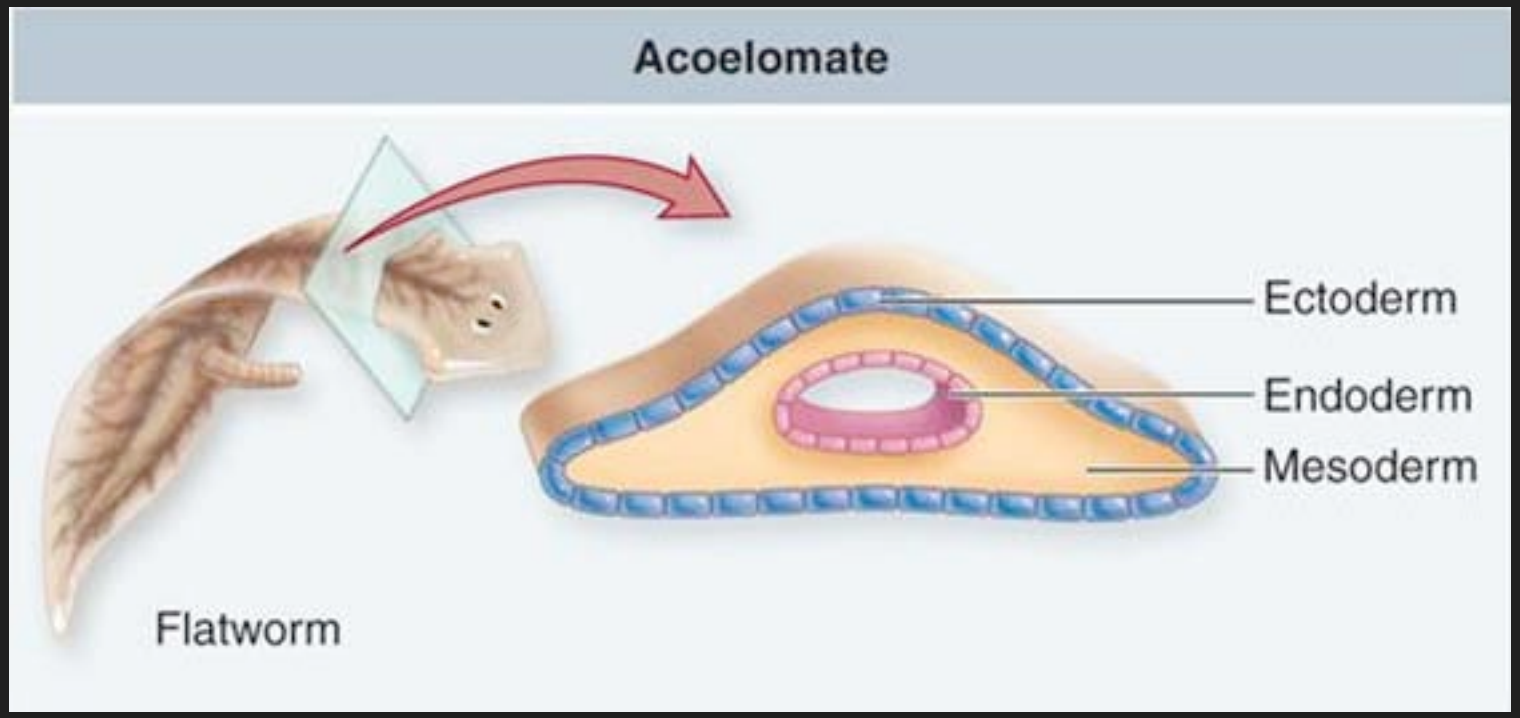
Food intake and waste disposal in animals generally follows two methods:

- Sac plan: A single digestive cavity with only one opening. Food enters and waste exits by same opening.
- Tube-within-a-tube plan: Separate openings for food intake and waste exit. Digestive system is more specialized.

# Coelom (body cavity)

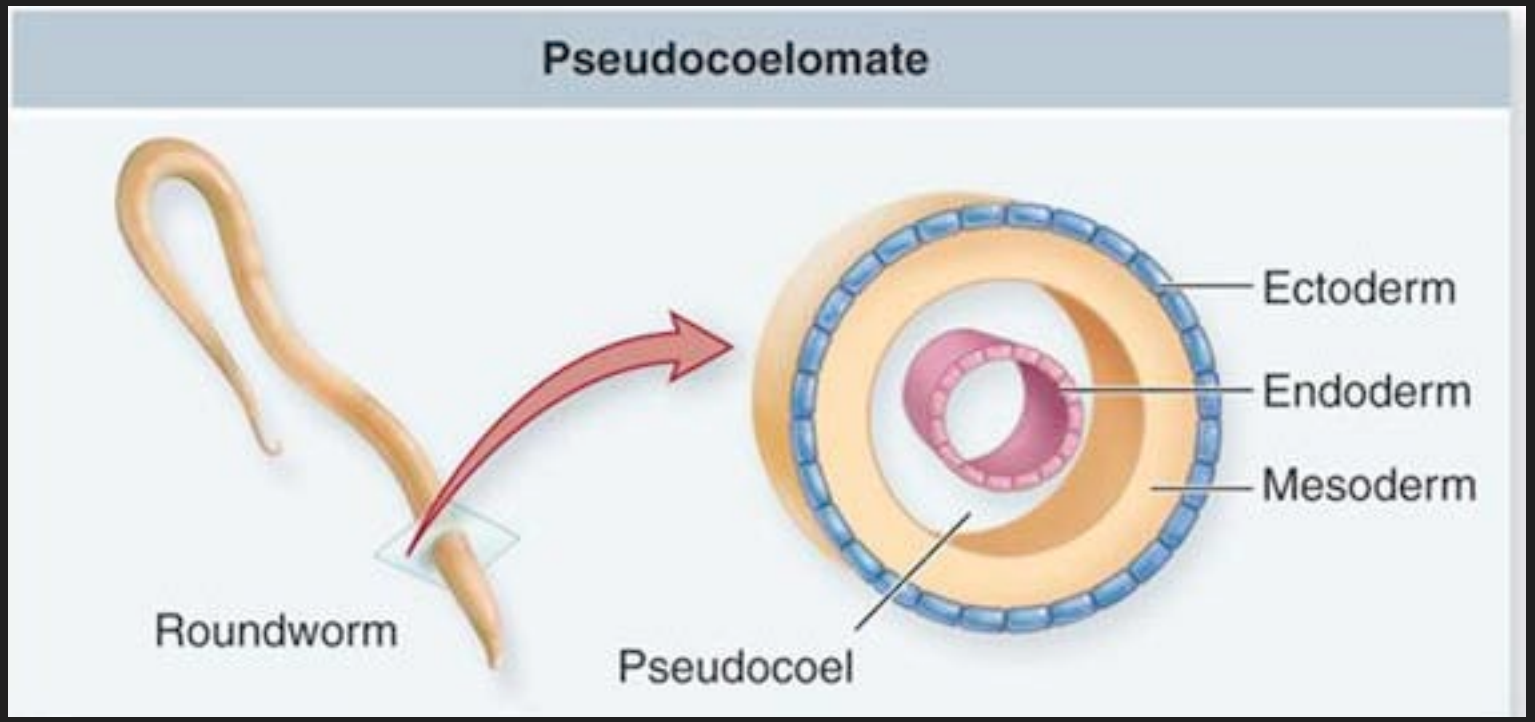
Three types of organisms:

1. Acoelomates: no fluid-filled body cavity



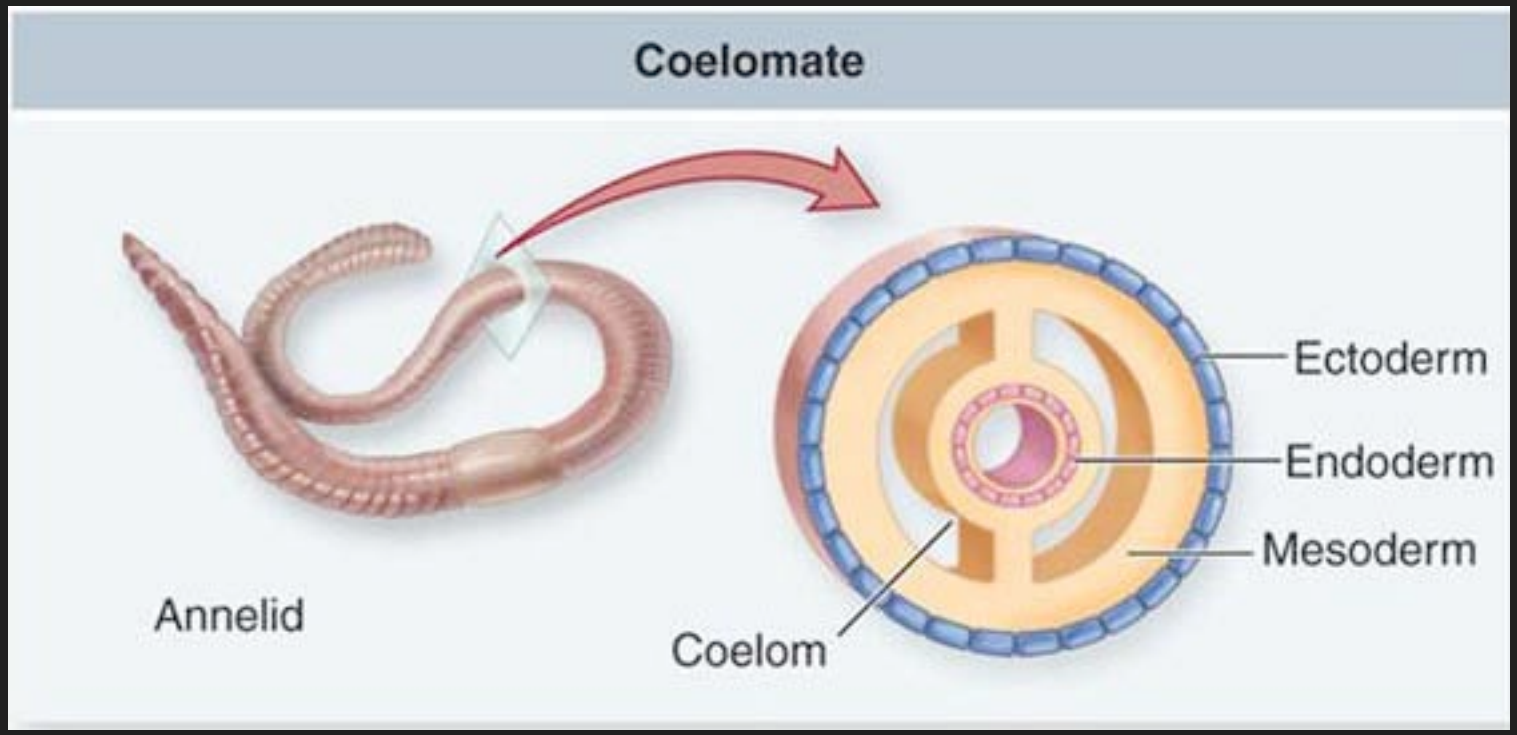
# Coelom (body cavity)

2. Pseudocoelomates: false coelom because it is incompletely lined with mesoderm



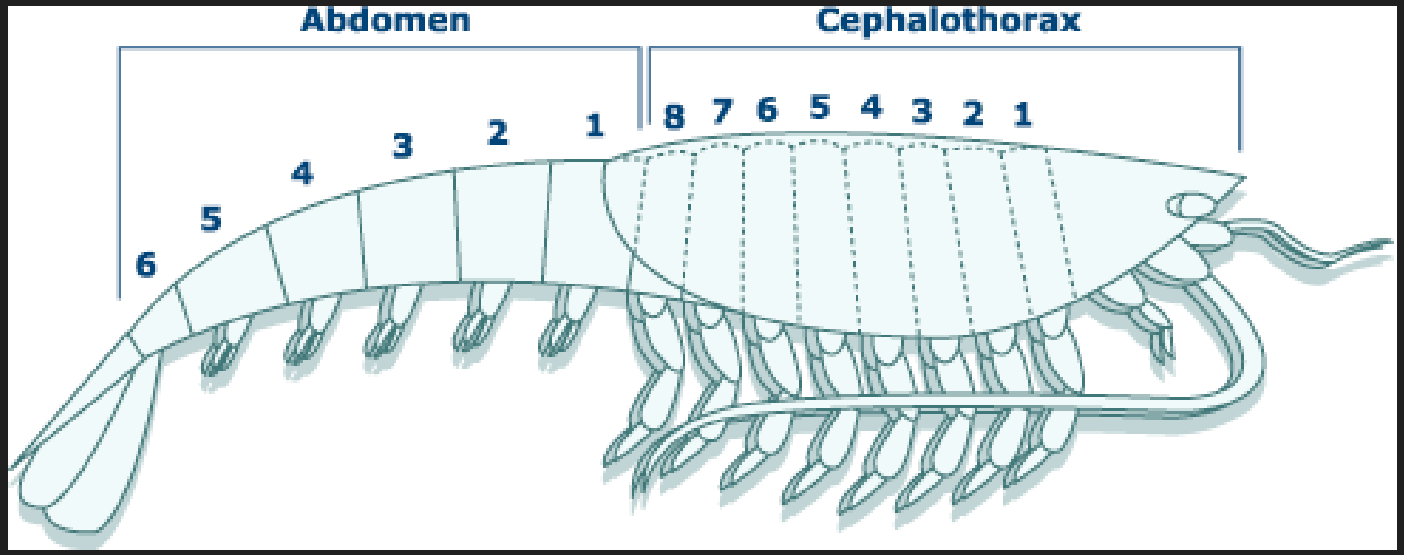
# Coelom (body cavity)

3. Coelomate: true coelom, fluid filled body cavity completely lined with mesoderm



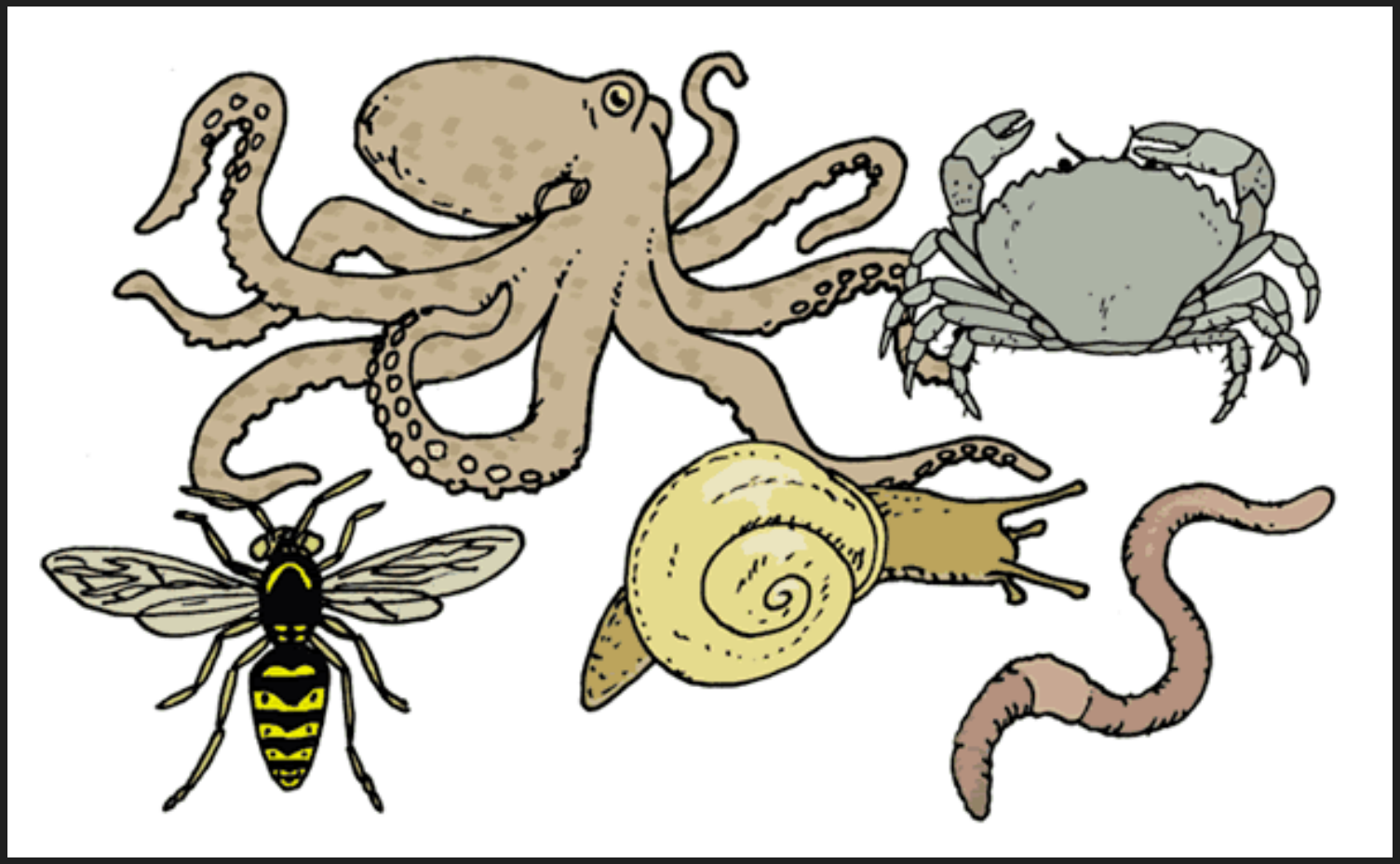
# Segmentation

Segmentation: body plan where the majority of the animal is composed of repeating sections (although sections can have specialized functions)



# Invertebrates vs. vertebrates

- Invertebrates don’t have a backbone

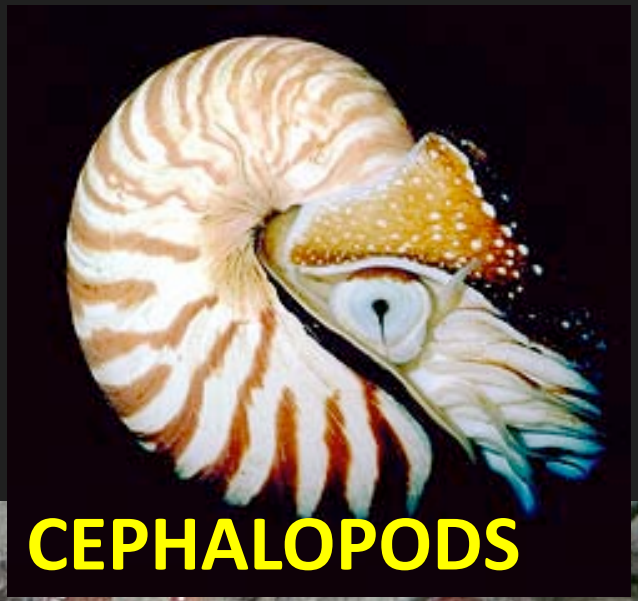


# Anatomical axis terms

- Anterior – the “front” end; if there is a head, it is on this end of the body
- Posterior – the “tail end”

- Ventral – the underside of the body, the abdominals are on this side of a human
- Dorsal – the “back”

# Molluscs



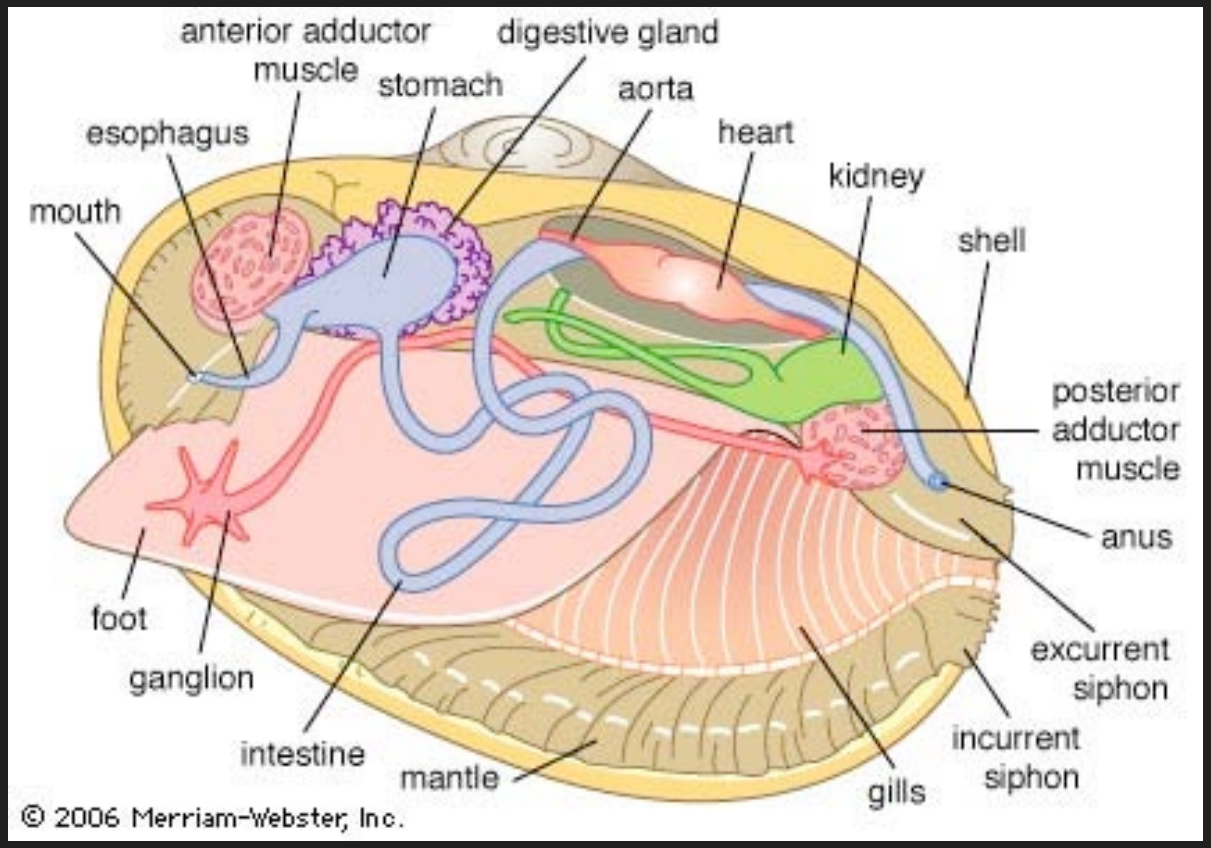
# Molluscs

- All molluscs have at least 3 main body parts:
  - Foot: ventral muscle used for locomotion
  - Visceral mass: includes internal organs
  - Mantle: tissue that encloses visceral mass and may secrete a shell.

# Clams

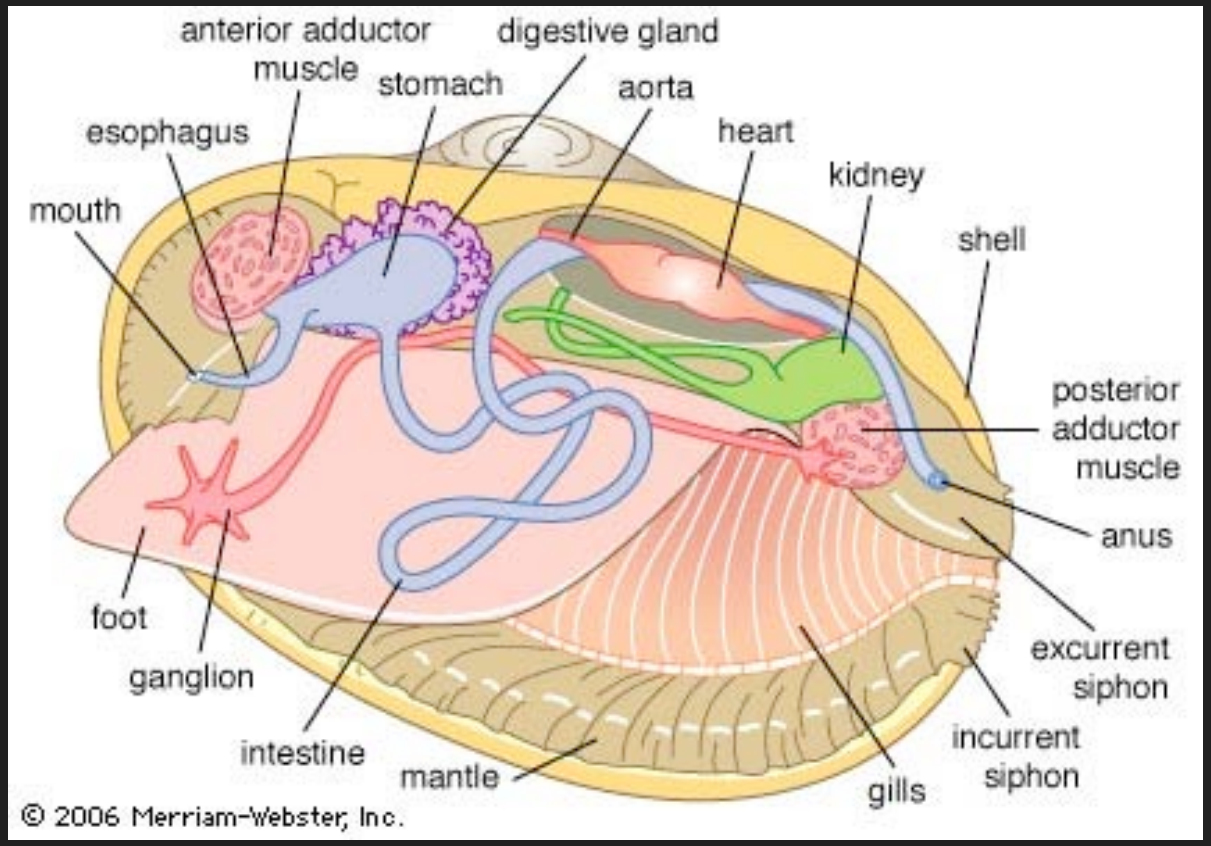
- Bivalves: two-sided hinged shell
- Sessile: stationary, does not travel
- Filter feeders: feeding strategy that filters matter and food particles from water that flows into the organism.

# Clams



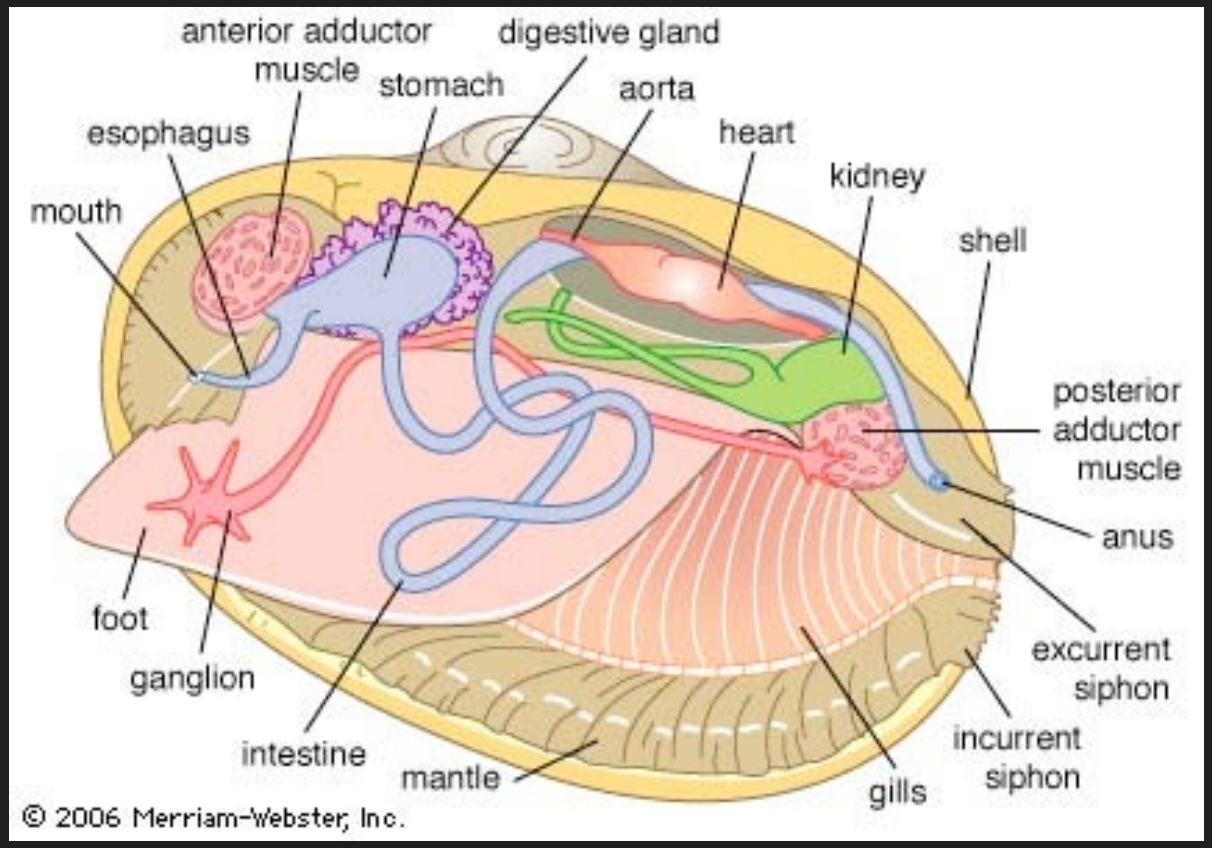

- Adductor muscles: control the opening and closing of the two valves (each clam shell)

# Clams



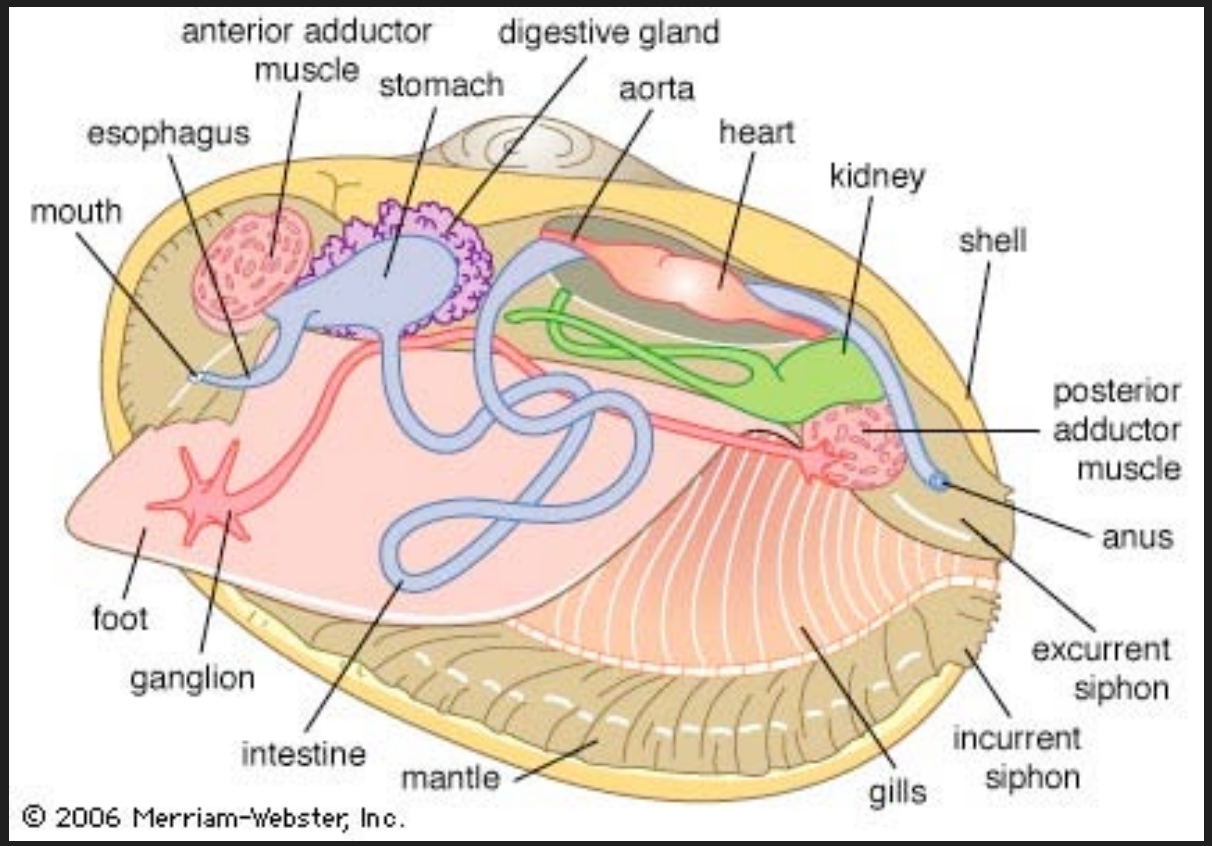

- Incurrent siphon: water enters
- Excurrent siphon: water exits

# Clams




- Gills: filter out both food and oxygen from the water flowing through

# Clams

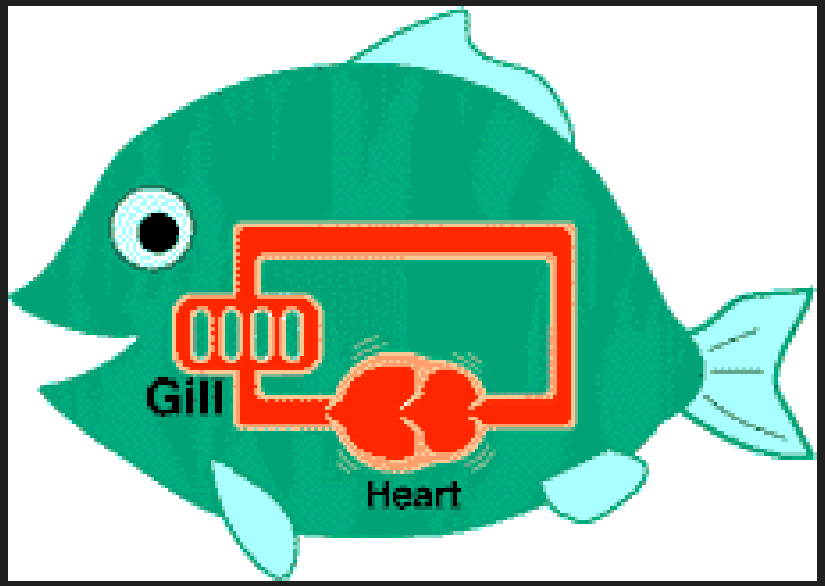


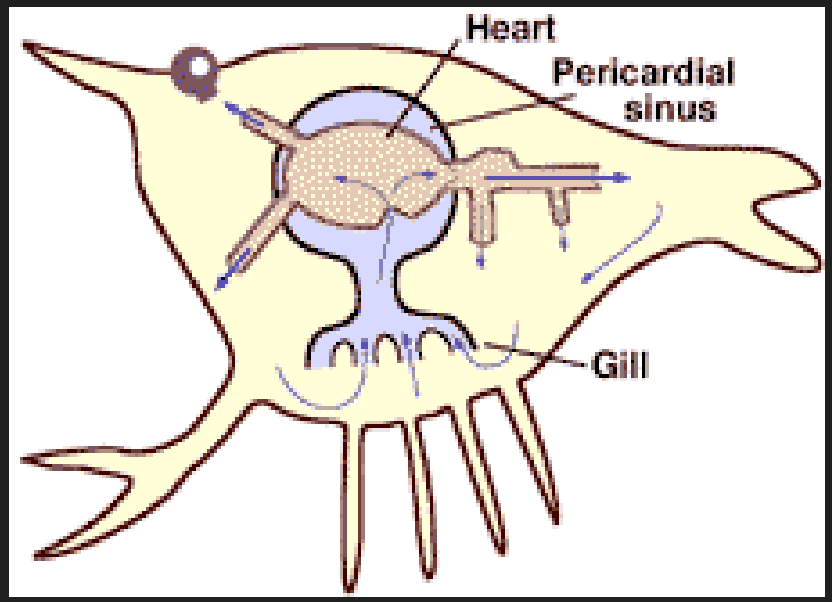

- Ganglion: nerve clusters (no brain)

# Cephalization

- Evolved trait where nervous tissue becomes concentrated on one end of the body
  - Leads to the formation of a head (and brain)
  - Sensory organs (often eyes, sometimes nose)
  - Connected to a evolution of bilateral symmetry!

# Closed vs. open circulatory system




**Closed Circulatory System:**

Blood stays in the blood vessels, high pressure, blood circulates quickly

**Open Circulatory System:**

Blood leaves blood vessels and bathes organs, low pressure, blood circulates very slowly

# Arthropods

- Invertebrate with hard exoskeleton
- Paired, jointed appendages (arms and legs)
- Segmented
- Coelomates

# Today's Lab

- 15.1 Classification of Animals
  - Circle features possessed by all the animals that will be studied today (can do this at the end)

# Today's Lab

- 15.2 Invertebrates – all exercises
  - Anatomy of a clam: dissection
  - Anatomy of a squid: prepared specimen
  - Diversity of arthropods
  - Anatomy of crayfish: NO DISSECTION, don't toss
  - Anatomy of grasshopper: NO DISSECTION, ditto^

# Today's Lab

- 15.3 – Anatomy of frog: SKIP (p. 199-204)
- 15.4 – Comparison of Invertebrates with Vertebrates

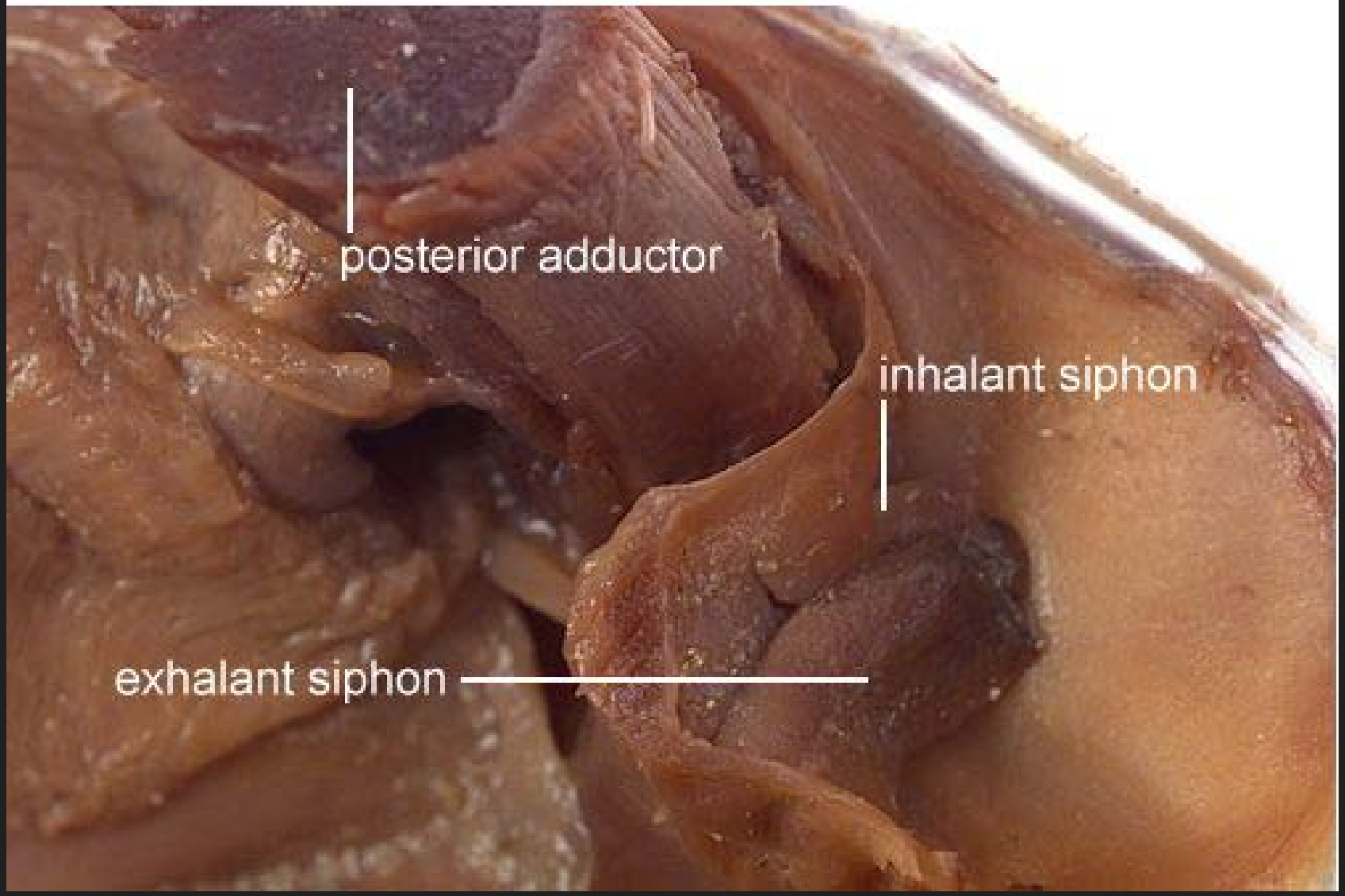
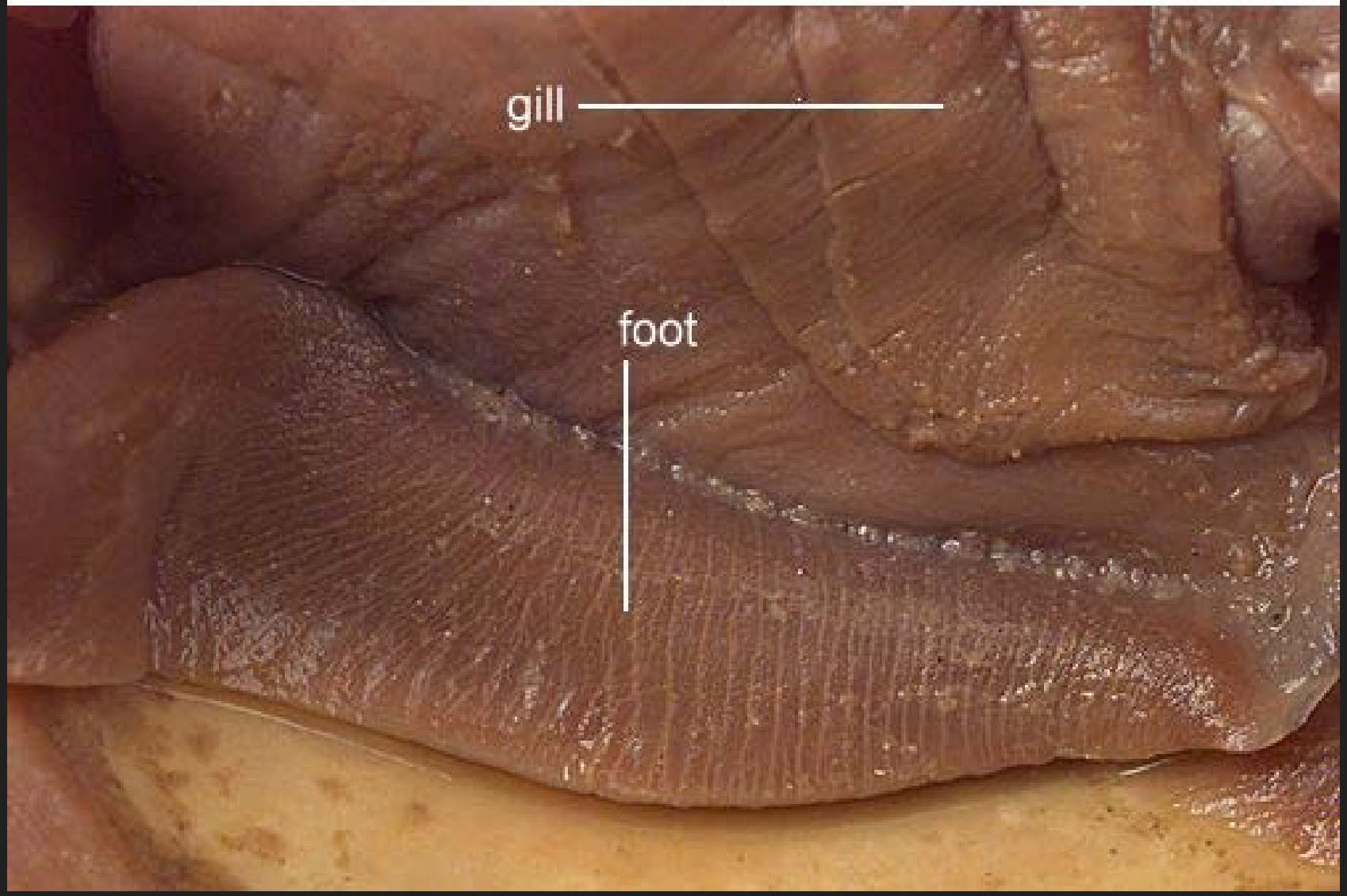
# REMINDERS

Next class:

- We have a quiz on labs 8 and 9 (evolution and animal diversity)
- We start pig dissections – wear appropriate clothing.

Gills
Labial palps
Mantle
Foot

# Clam - Siphons (Close Up)



# Clam - Foot (Close Up)