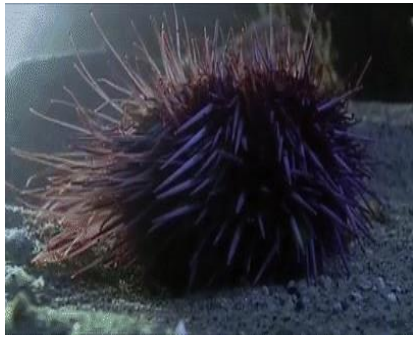
Go to the "Slide Show" shade above

Click on "Play from Beginning"

Kingdom Animalia II
Phylum Flatworms to Echinoderms

Learning CTR Online



Chapter 27: Kingdom Animalia II

WARM-UP

What kind of body cavity do porifera and cnidaria have?

What kind of symmetry do porifera and cnidaria have?

What kind of cell tissues do porifera and cnidaria have?

Life Forms of cnidaria

?: mouth directed upward; example?

?: mouth directed downward; example?

WARM-UP

What kind of body cavity do porifera and cnidaria have?

acoelomate

What kind of symmetry do porifera and cnidaria have?

asymmetry & radial symmetry

What kind of cell tissues do porifera and cnidaria have?

both are diploblastic (endo- & ectoderm)

Life Forms of cnidaria

next slide

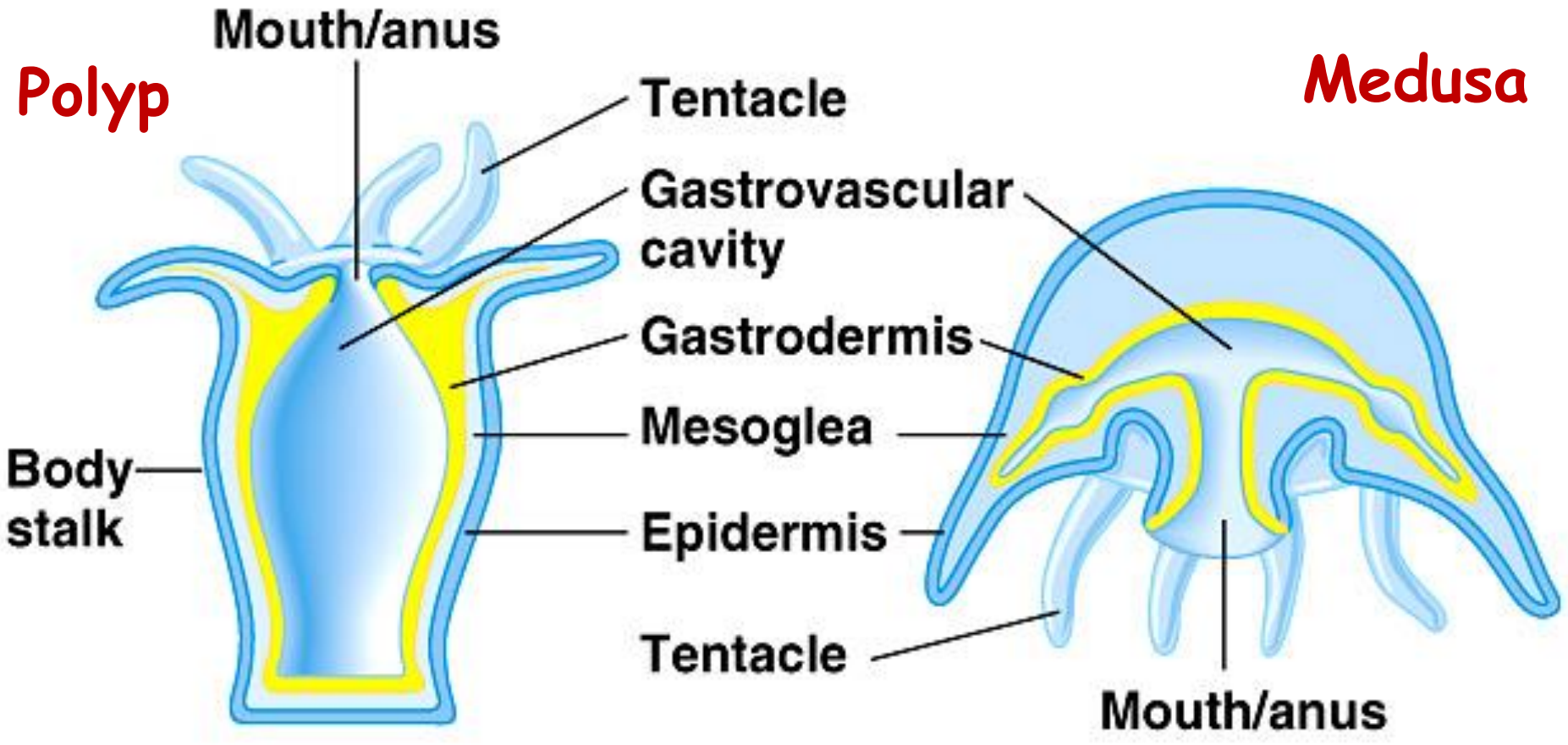
WARM-UP

Phylum Cnidaria

Life Forms

POLYP: mouth directed upward; hydra, Coral

MEDUSA: mouth directed downward; Jellyfish



Lesson Objectives

By the end of this lesson, you should be able to:

- Understand and explain the general features of invertebrate animals (non-chordates), including flatworms, roundworms, mollusks, annelids, arthropods, and echinoderms.
- General Features include:

  Phylum Examples of organisms Location

  Symmetry Body plan (tissue layers)

  Coelom relationship (acoelomate, pseudocoelomate, coelomate)

  Protostome or deuterostome Reproduction

  Special features

- **Science Practice:** Lab 3–Kingdom Dichotomous Key

Phylum Platyhelminthes







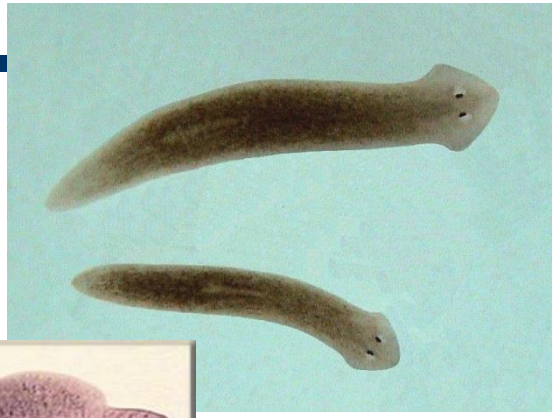









Flatworms:
Phylum Platyhelminthes



Diversity:

- **Free-living** in **freshwater**; **Planaria**
- **Parasitic** in a **host**; **Flukes and Tapeworms**

Bilateral Symmetry

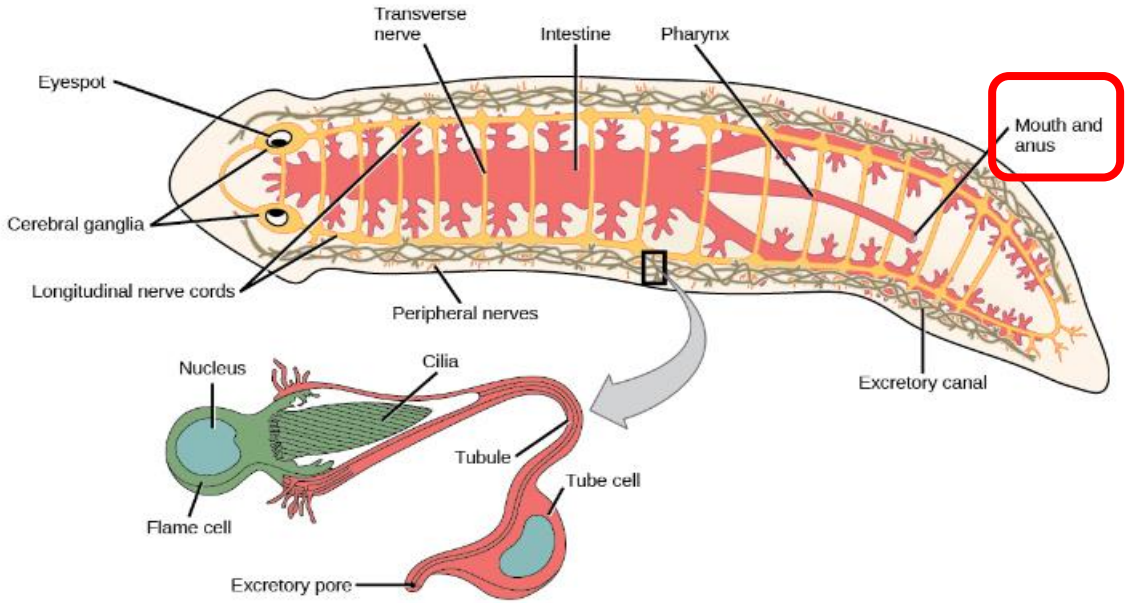
Organ organization level

Have all **3 tissue layers** (triploblastic → endoderm, mesoderm, ectoderm).

Flatworms:
Phylum Platyhelminthes

Protostomes:

- "**Mouth First**" animals.
- The planarian is a flatworm that has a gastrovascular cavity with one opening that serves as both mouth and anus.



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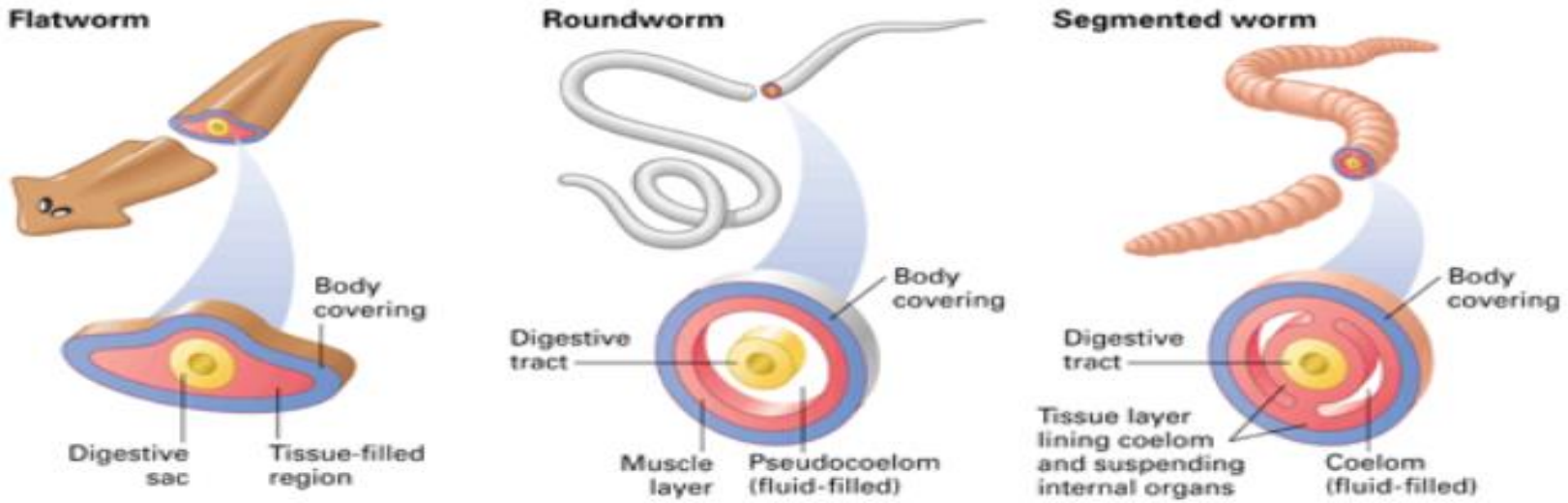
Flatworms (Platyhelminthes) General Features

No body cavity – ACOELOMATE (that's why they are Flat ☺)

- *The space between the gut and the body wall, when present, is filled with a spongy organ tissue of mesodermal cells through which tissue fluids may percolate.*

First appearance of **Cephalization (head).**



Reproduction in Flatworms:
Phylum Platyhelminthes

- **Free-Living Flatworms**
- Predators or Scavengers

Asexual Reproduction:

- Pinch in half and regenerate the missing parts ("Fission").

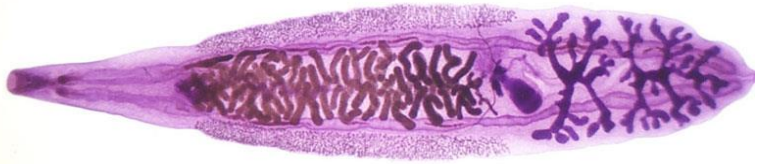
Sexual Reproduction:

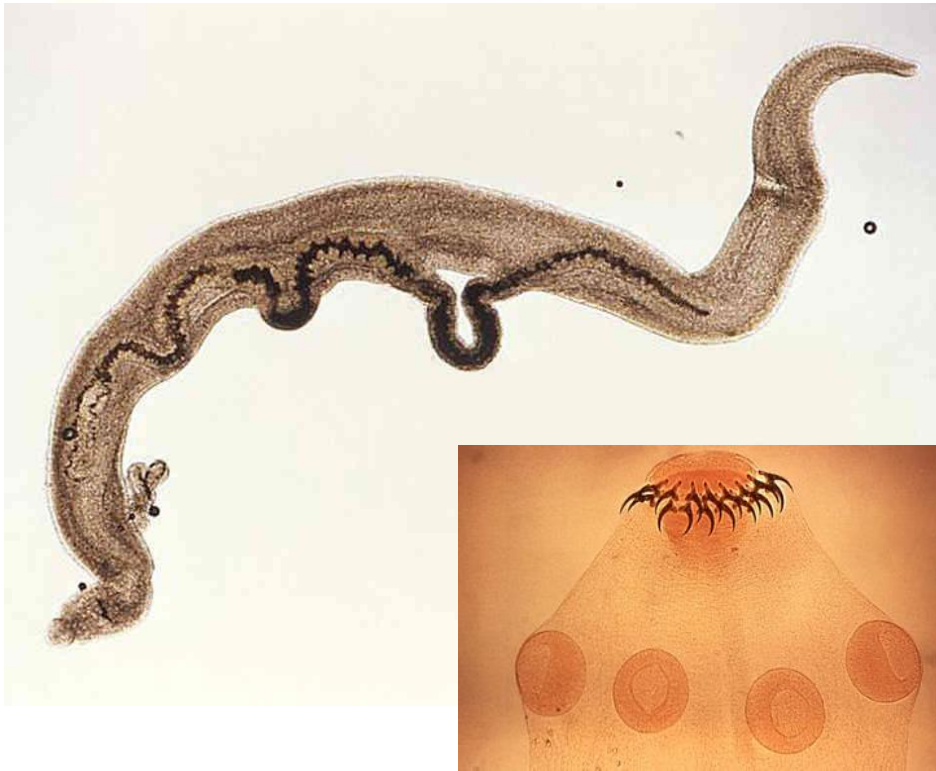
- **Hermaphrodites**: each organism possesses both male and female organs.
- **Cross fertilization**

Flatworms:
Phylum Platyhelminthes

Flukes:

- Parasites of various vertebrates.
- Suckers to attach to their host.
- Feeds on blood and other host tissues.
- *Schistosoma* (Blood Flukes)
  - Nearly 800,000 people die each year from this disease.
  - Middle East, Asia, Africa





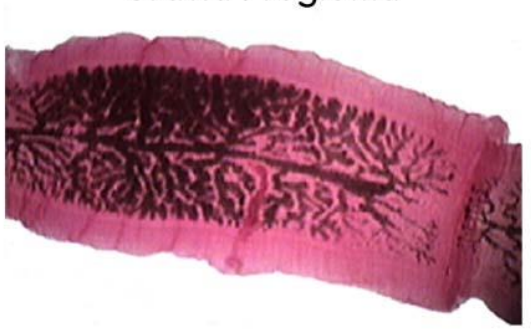
Flatworms:
Phylum Platyhelminthes

Tapeworms:

- Are parasitic.
- Have no mouth.
- Inhabits the digestive tracts of vertebrates.
- Absorbs nutrients from the host's intestines.
- Ribbon-like body with repeated units.

Tapeworm

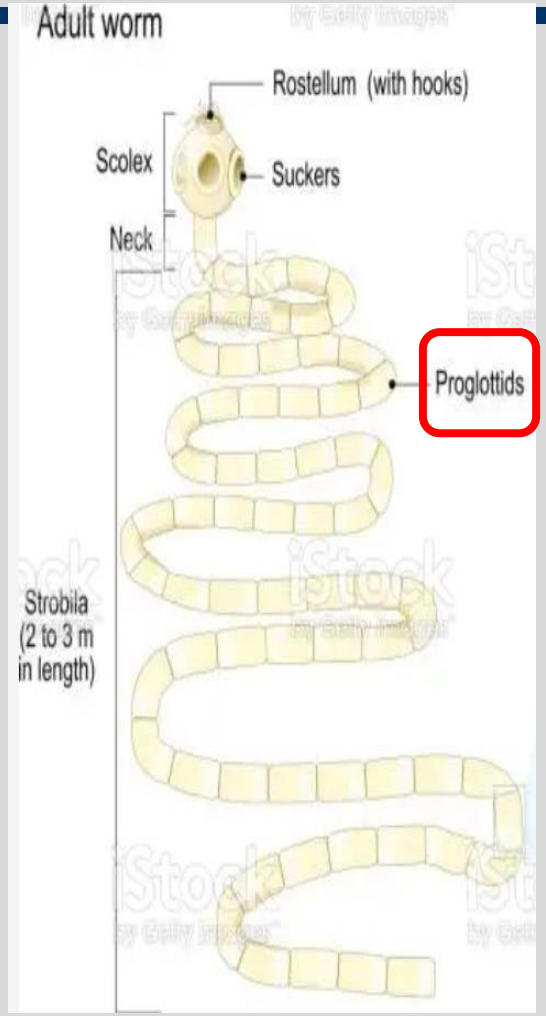
Gravid Proglottid

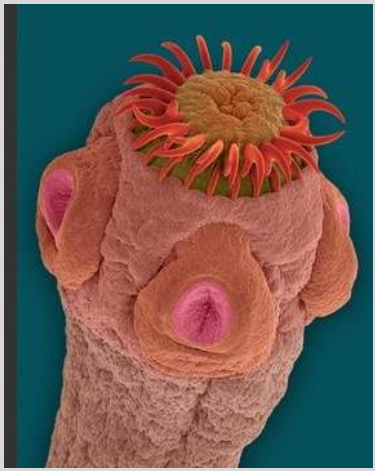


Flatworms:
Phylum Platyhelminthes

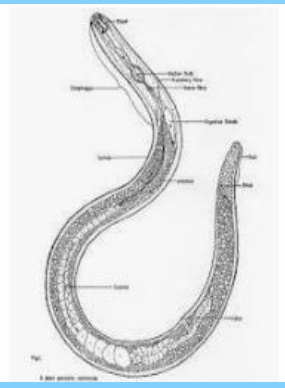
Tapeworms:

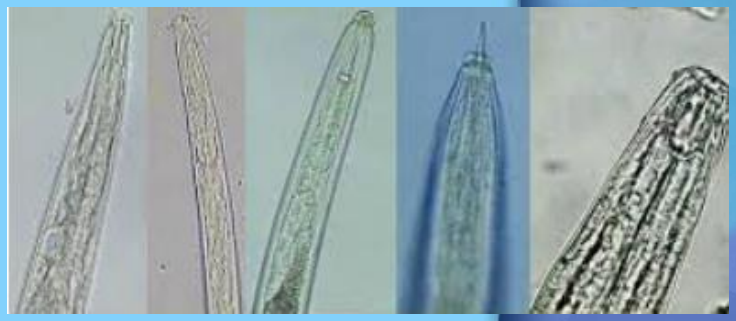
- Anterior **Scolex**, which bears hooks and suckers that grasp the host.
- Behind the scolex, a series of reproductive units (**Proglottids**) that are full of ripe eggs that pass out of the host's body.
- When a new host swallows the reproductive structures in contaminated water, the eggs hatch into larvae that colonize and mature in the host's body.





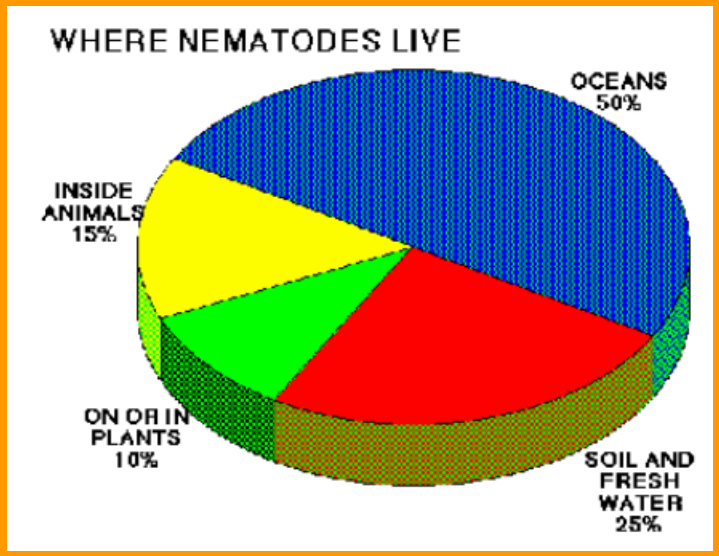
Phylum Nematoda





Roundworms:
Phylum Nematoda

Nematodes are the most numerous multicellular animals on earth.



A handful of soil will contain thousands of the microscopic worms, many are parasites of insects, plants, or animals.

Some are free-living, but most are parasitic (pinworms, ascaris, hookworms, heartworms).

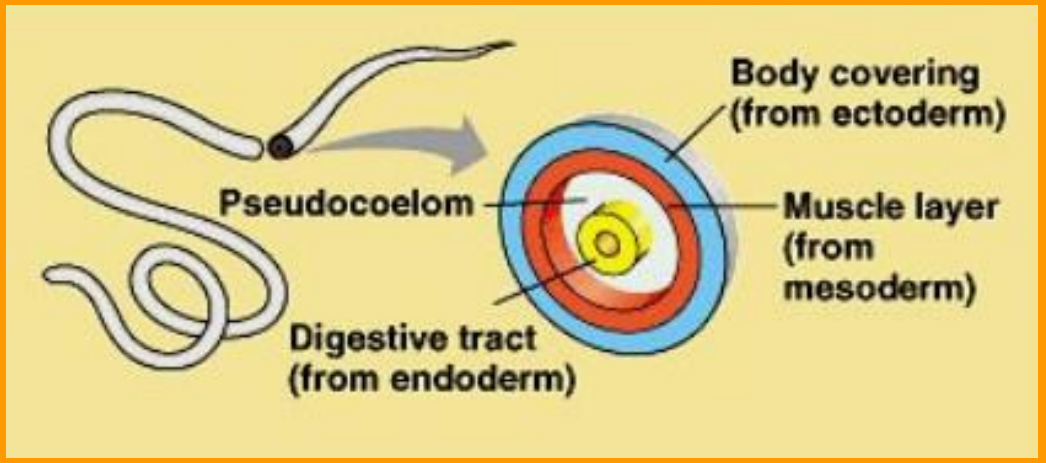
Roundworms:
Phylum Nematoda

Unsegmented Worms

Bilateral Symmetry

Three Tissue Layers

- "triploblastic"
- endo-, meso-, ectoderm



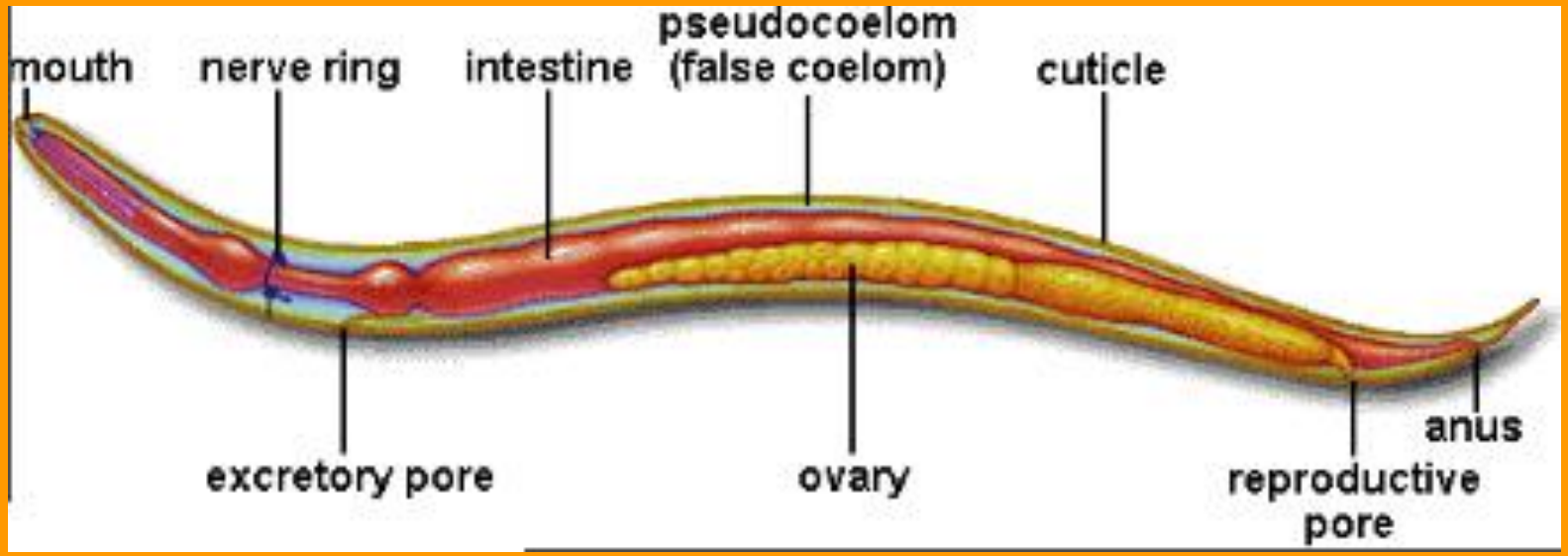
Roundworms [Phylum Nematoda]

Protostome

"**Mouth First**" animals.

Complete digestive tract

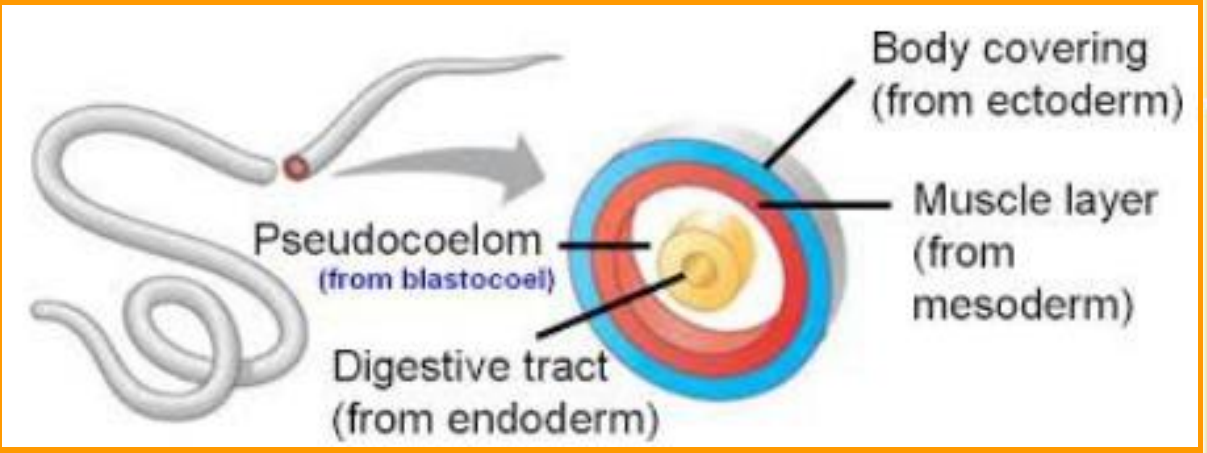
- (one way: mouth → intestine → anus)
- (two openings: Mouth and Anus)

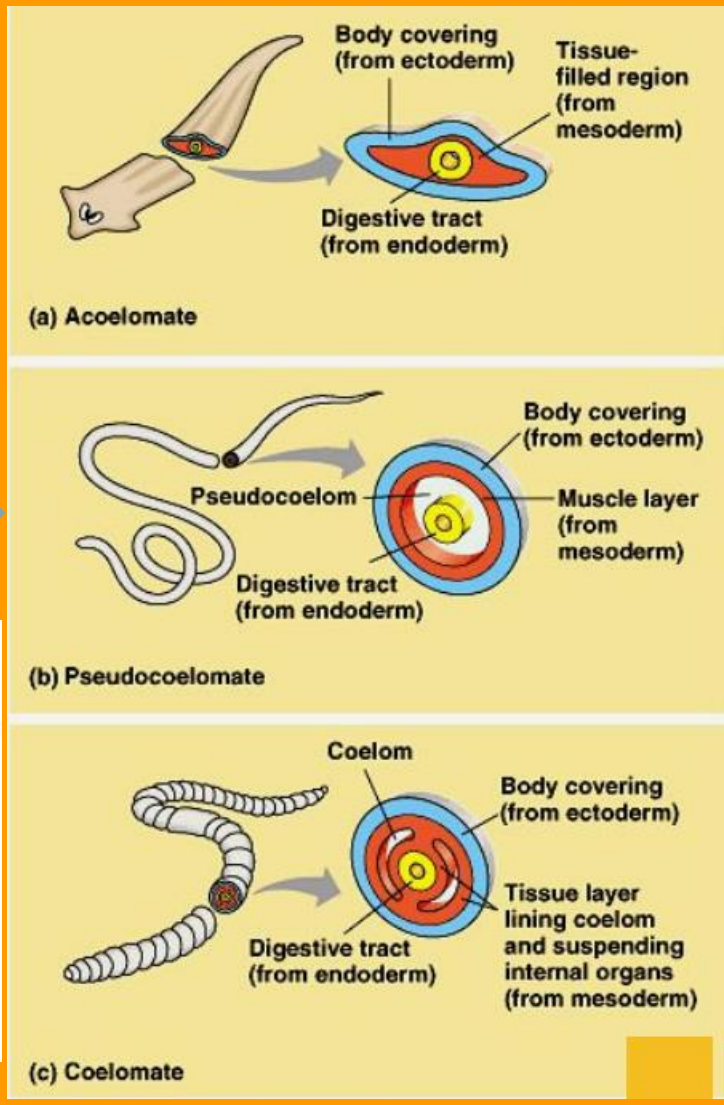


Roundworms:
Phylum Nematoda

PSEUDOCOELOMATES

- **Fluid-filled body cavity that functions to distribute nutrients (not fully mesoderm).**





Roundworms:
Phylum Nematoda

Cephalization: anterior end has a Brain.

Formation of Muscle & Nervous Tissue.

Reproduce asexually & sexually

- **Parthenogenesis → (asexual)** new individual developed without fertilization from one gamete.
- **Hermaphrodite (both male and female gametes).**
- **Separate male and female organisms (fertilization).**

The most familiar nematodes are parasites such as **pinworms**, **hookworms**, **heartworms**, and the ***Trichinella*** worms that are transmitted by eating undercooked pork.

Good hygiene, proper disposal of sewage, thorough cooking of meat, and regular deworming of pets usually protect people from parasitic roundworms.

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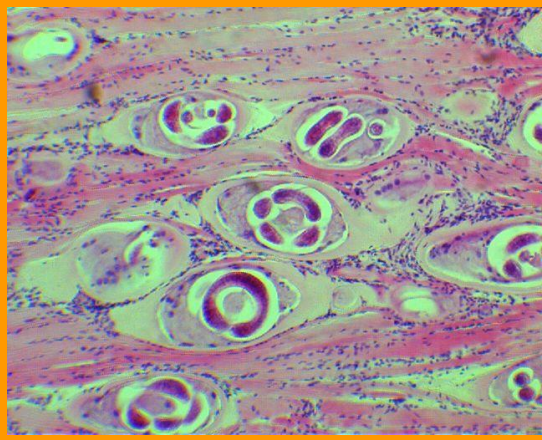
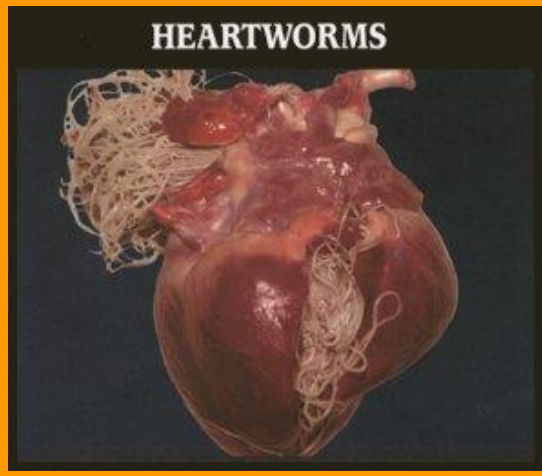
(3:32) **Roundworms (Helminthes)**
General Features



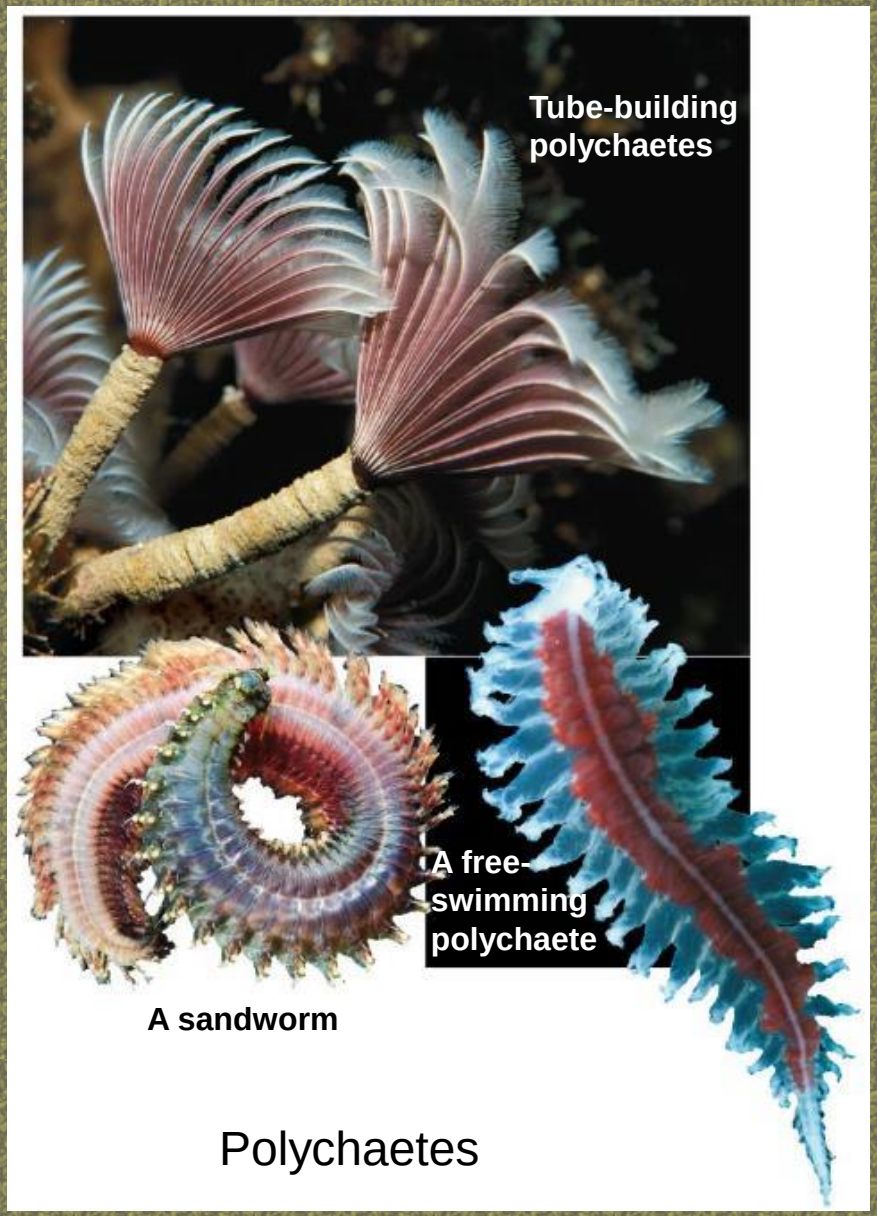


Phylum Annelida

(Segmented Worms)

Phylum Annelida
(Segmented Worms)

"Classes"



Phylum Annelida
(Segmented Worms)

Inhabit marine, fresh water, and moist terrestrial environments.

Bilateral symmetry. Anterior/posterior ends.

Triploblastic → (PROTOSTOMES – mouth first)

Show Segmentation, the subdivision of the body along its length into a series of repeated parts.

Three Classes of Annelids:

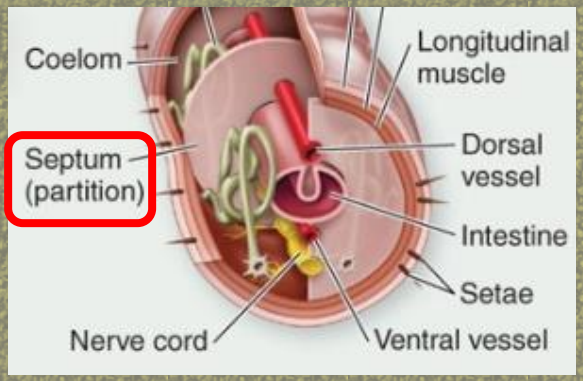
Earthworms, Polychaetes, Leeches

Phylum Annelida

(Segmented Worms)

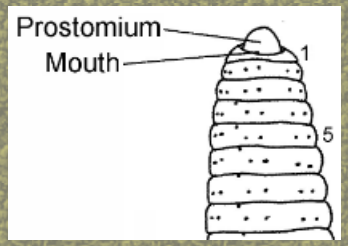
True coelom → (coelomates)

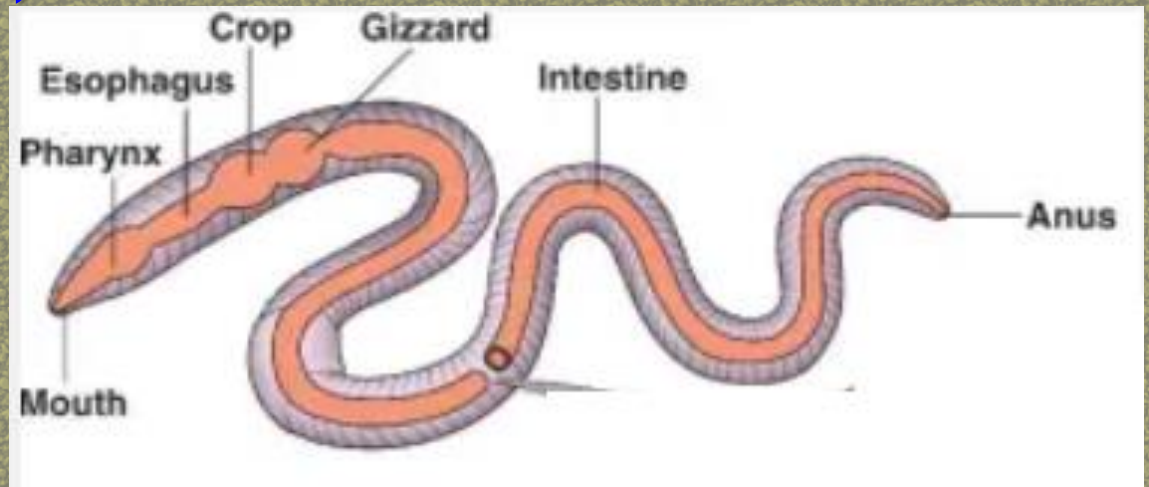
Coelom divided by septa



One way digestion

Prostomium → mouth → pharynx → esophagus → crop (storage) → gizzard (mechanical digestion) → intestine (absorption) → anus

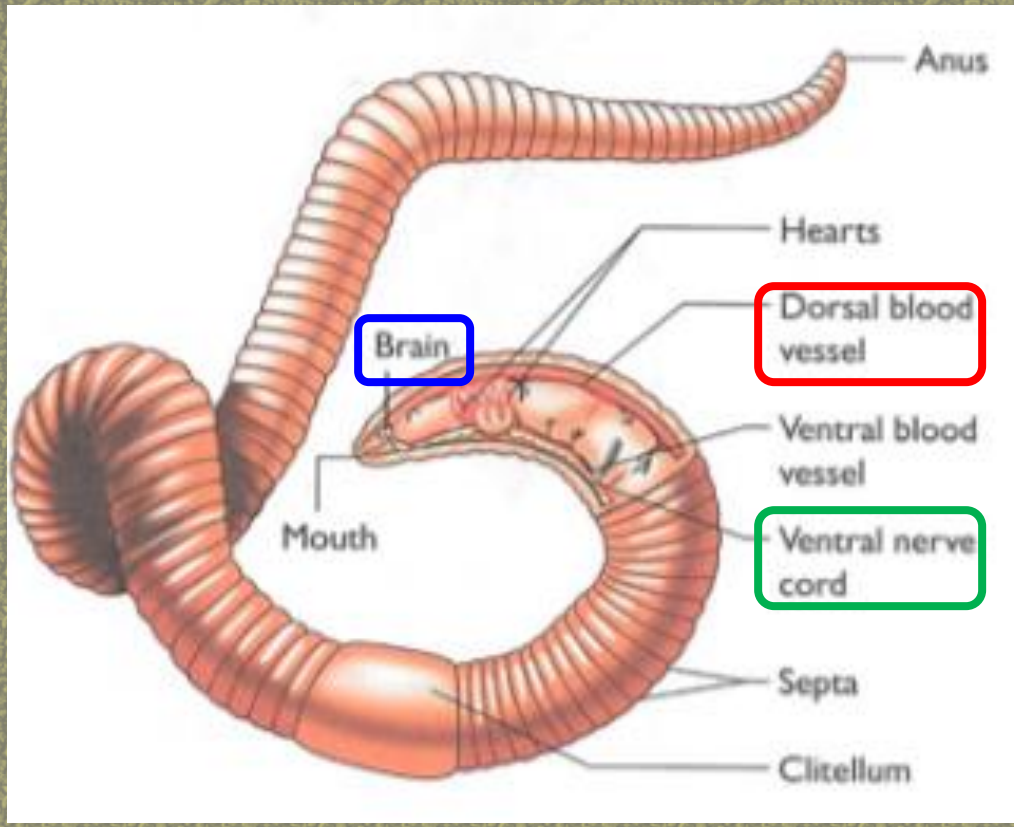




Phylum Annelida
(Segmented Worms)

Have a **Closed Circulatory System** in which blood remains enclosed in vessels throughout the body.

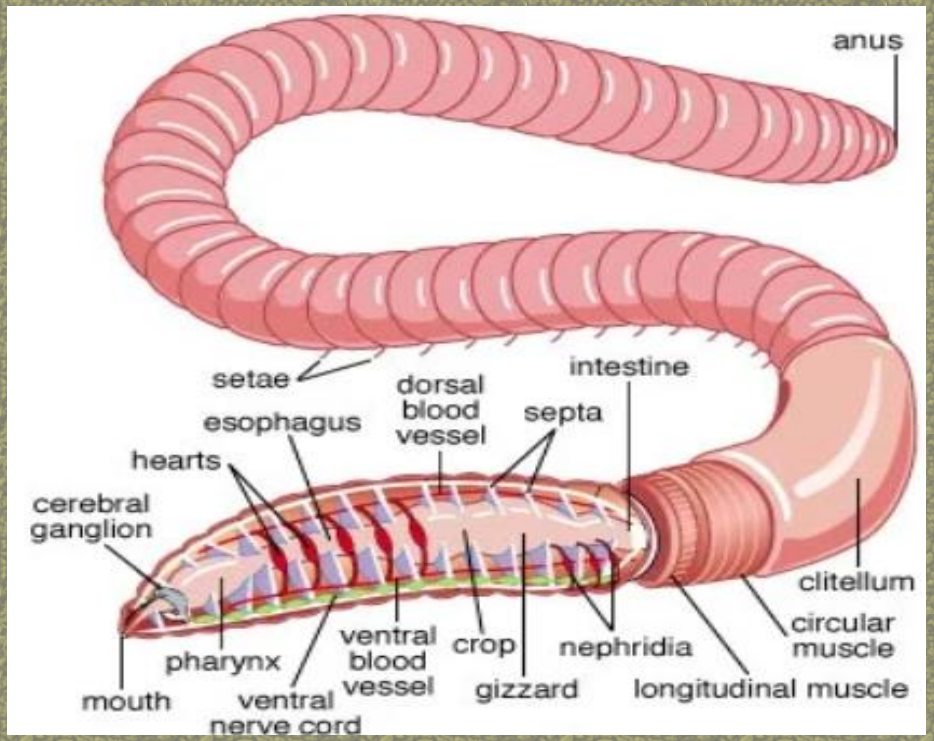
Many other invertebrates, such as mollusks and arthropods, have an open circulatory system in which blood is pumped through vessels into open body cavities.

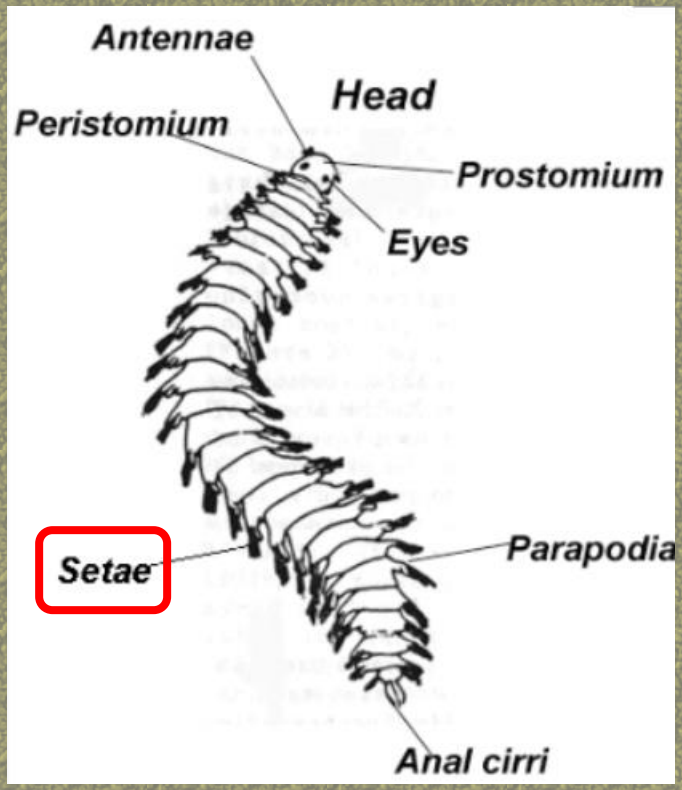


Have a **Nervous system** that includes a **simple brain** and ventral **nerve cord.**

Phylum Annelida
(Segmented Worms)

Skin is primary gas exchange organ in soil dwellers.



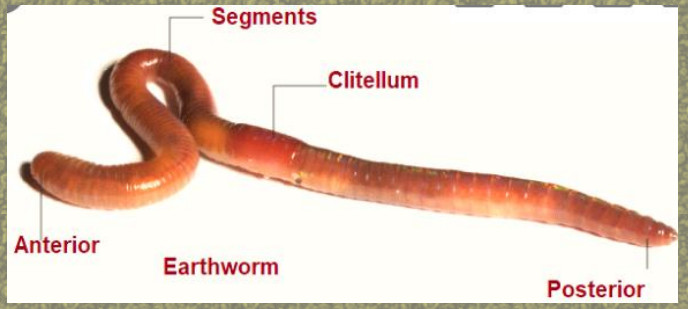


All annelids except leeches also have **chitinous hair-like structures**, called **setae**, projecting from their cuticle. They help, for example, earthworms to attach to the surface and prevent backsliding during peristaltic motion.

Phylum Annelida
(Segmented Worms)

Reproduction

- Reproduce sexually by cross-fertilization, joining at clitellum.
- Often hermaphroditic.
- Many reproduce asexually by budding.



Dioecious / Hermaphroditic (each individual has the reproductive organs of both sexes), but do not fertilize themselves.

The clitellum appears as a thickened sleeve or saddle a few segments in length within the anterior third region of the worm. The clitellum secretes an egg capsule, or cocoon.

Annelids have the amazing capacity to regrow segments that break off. This is called regeneration (anterior to clitellum).

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Segmented Worms (Annelids) General Features

Earthworms ingest soil and extract nutrients, aerating soil and improving its texture.

Polychaetes are the largest group of annelids.

Polychaetes search for prey on the seafloor or live in tubes and filter food particles.

Most Leeches are free-living carnivores, but some suck blood. Blood-sucking Leeches:

- **Use razor-like jaws.**
- **Secrete an anesthetic and an anticoagulant.**
- **Suck up to 10 times their own weight in blood.**

	Platyhelminthes	Roundworms	Annelids
Symmetry			
Body Cavity			
Digestion			
Distinguishing Feature			

QUICK CHECK

Give the appropriate term:

All worms are "mouth first".

All worms have 3 developmental tissues.

What does cephalization mean?

	Platyhelminthes	Roundworms	Annelids
Symmetry	bilateral	bilateral	bilateral
Body Cavity	Acoelomate	Pseudocoelomate	Coelomate
Digestion	Two way	One way	One way
	1 opening	Mouth to anus (separate)	
Distinguishing Feature	flattened	Rounded, no segments	segmented

QUICK CHECK

Give the appropriate term:

All worms are "mouth first". protostomes

All worms have 3 developmental tissues.

triploblastic (endo-, meso-, & ectoderm)

What does cephalization mean?

"Anterior" (head) and posterior ends

Phylum Mollusca

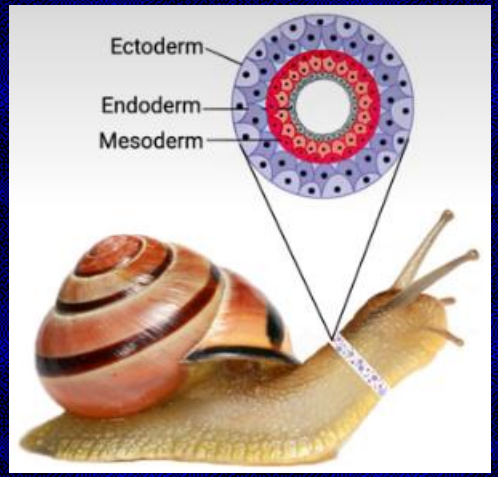
https://somup.com/c36hqYvcx8 (3:02) **Mollusks** General Features

Phylum Mollusca

Mostly marine, although some live in fresh water or land.

BILATERAL symmetry

True COELOM, Complete digestive tract, consisting of **a mouth where food is ingested, a short connecting tube called the esophagus, a stomach which temporarily holds food, an intestine where food digestion and absorption takes place, and the anus.**



PROTOSTOMES that have a Coelom.

Triploblastic (3 tissue layers).

Phylum Mollusca

Mollusks are primarily of separate sexes, and the reproductive organs (gonads) are simple.

Reproduction via parthenogenesis (an unfertilized gamete matures) is also found among gastropods.

Most reproduction, however, is by sexual means.

Slugs and snails are hermaphrodites (possessing both male and female organs), but they must still mate to fertilize their eggs.

External Fertilization.

Phylum Mollusca

Visceral Mass

Soft-bodied portion that contains **internal organs**.

Foot

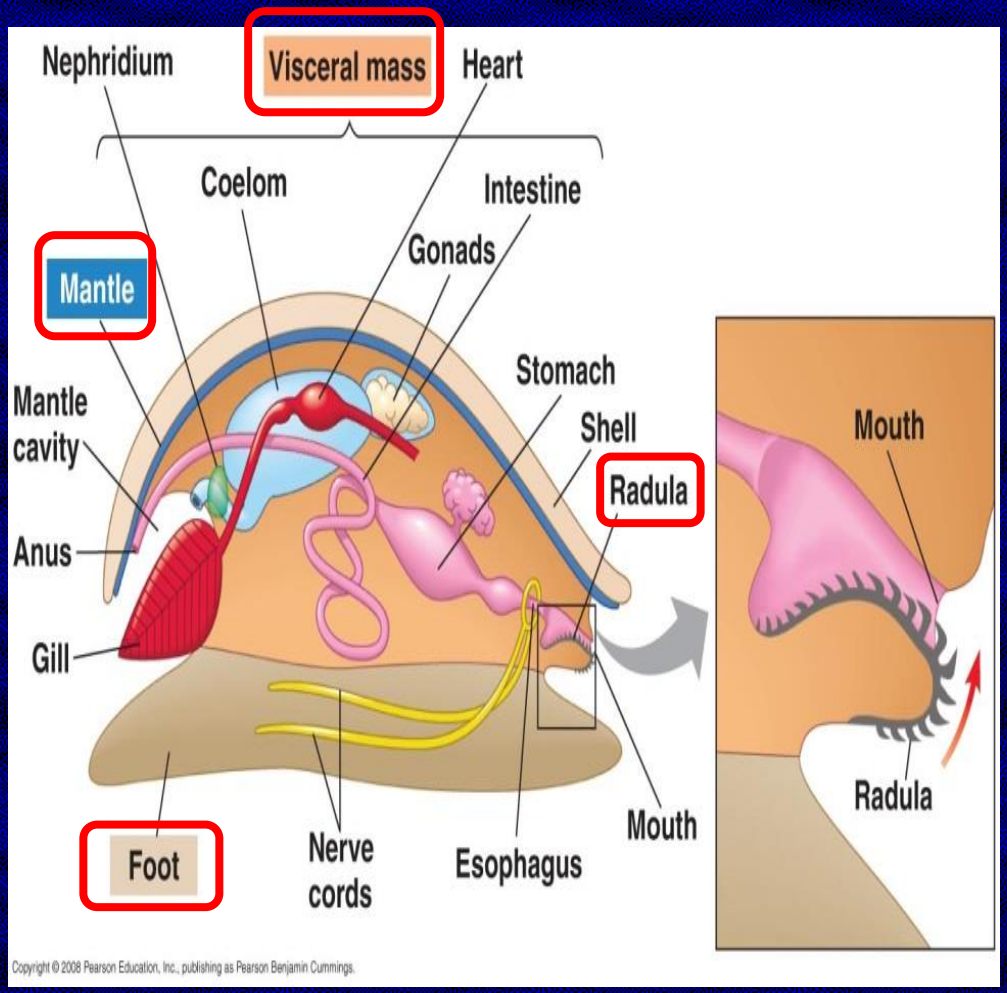
strong, muscular portion: **locomotion**.

Mantle

secretes a **shell** that encloses the **visceral mass**.

Radula

rasping, tongue-like organ bearing rows of **teeth; obtain food**.



Phylum Mollusca

Classes:

- **Bivalves** (clams, mussels)
- **Gastropods** (snails, slugs)
- **Cephalopods** (squids, octopuses)

Phylum Mollusca

Gastropods

The largest group of mollusks and include the **snails and slugs**.

- Found in fresh water, salt water, and terrestrial environments.
- The only mollusks that live on land.
- Often protected by a single, spiral shell.

- **Slugs** have lost their mantle and shell.
- **Sea slugs** have long, colorful projections that function as gills.

Phylum Mollusca

Bivalves

(Clams, Oysters, Scallops, Mussels)

- Shells divided into two halves that are hinged together.
- Sedentary suspension feeders, attached to rocks by strong threads.

Cephalopods

Phylum Mollusca

(Octopus, Squid, Nautilus)

- Fast, agile predators.
- Large BRAINS and sophisticated sense organs, including complex image-focusing EYES.
- SHELLS → large in a nautilus, small & internal in a squid, or missing in an octopus.
- Squid are fast, streamlined predators that use a muscular siphon for jet propulsion.
- The so-called colossal squid, which lives in the ocean depths near Antarctica, is the largest of all invertebrates.

Phylum Arthropoda

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Arthropods General Features

Kingdom Animalia

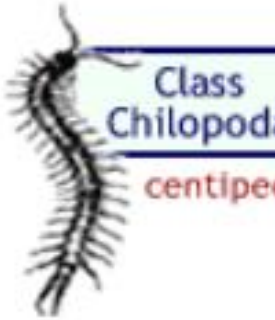
Phylum Arthropoda

Subphyla Trilobita
extinct

Subphylum Crustacea
crabs, crayfish, pillbugs, waterfleas, copepods

Subphylum Uniramia

Class Chilopoda
centipede



Class Diplopoda
millipede

Class Insecta

Orthoptera
grasshoppers

Hymenoptera
bees, wasps, ants

Coleoptera
beetles

Diptera
flies & mosquitoes

Lepidoptera
butterflies & moths

Subphylum Chelicerata

Class Xiphosura
horseshoe crabs

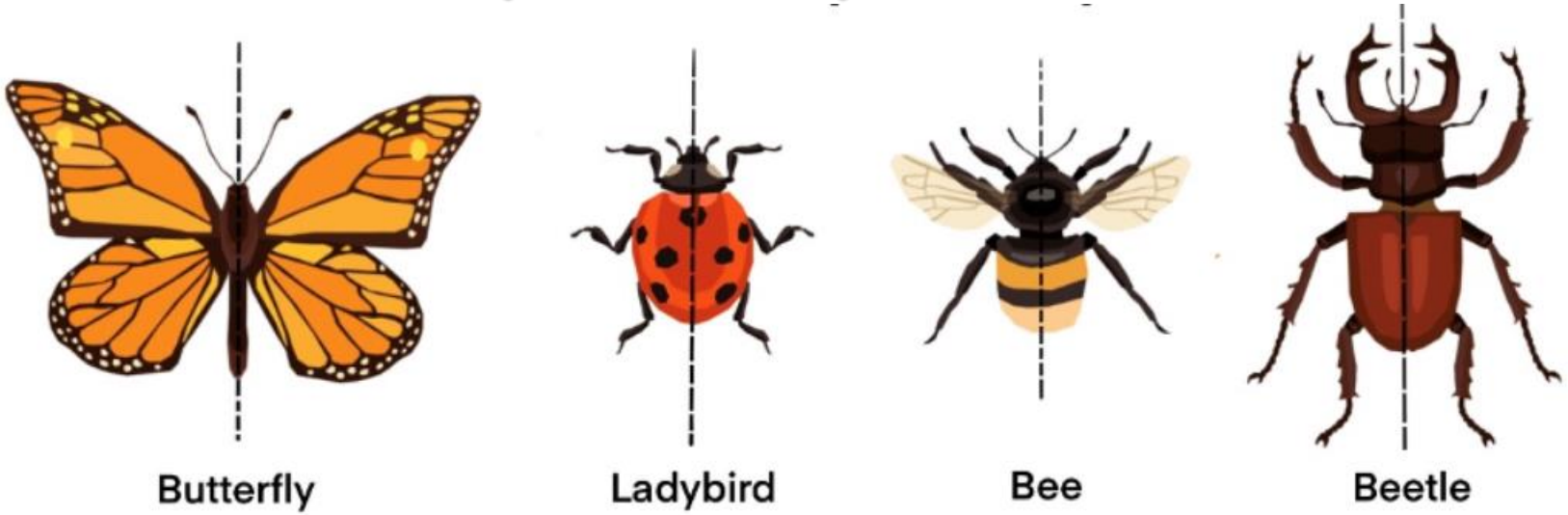
Class Arachnida
spiders, scorpions, ticks

*not all insect orders shown

Invertebrates

Live virtually everywhere.

Bilateral Symmetry

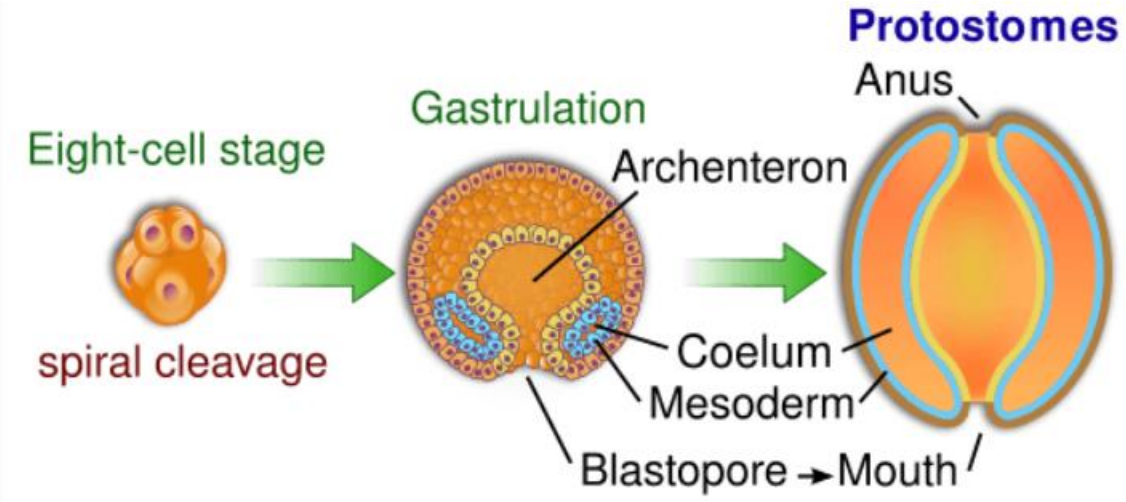


Triploblastic (ecto-, meso-, endoderm tissues)

Protostomes ("Mouth First" development)

Coelomates (coelom)

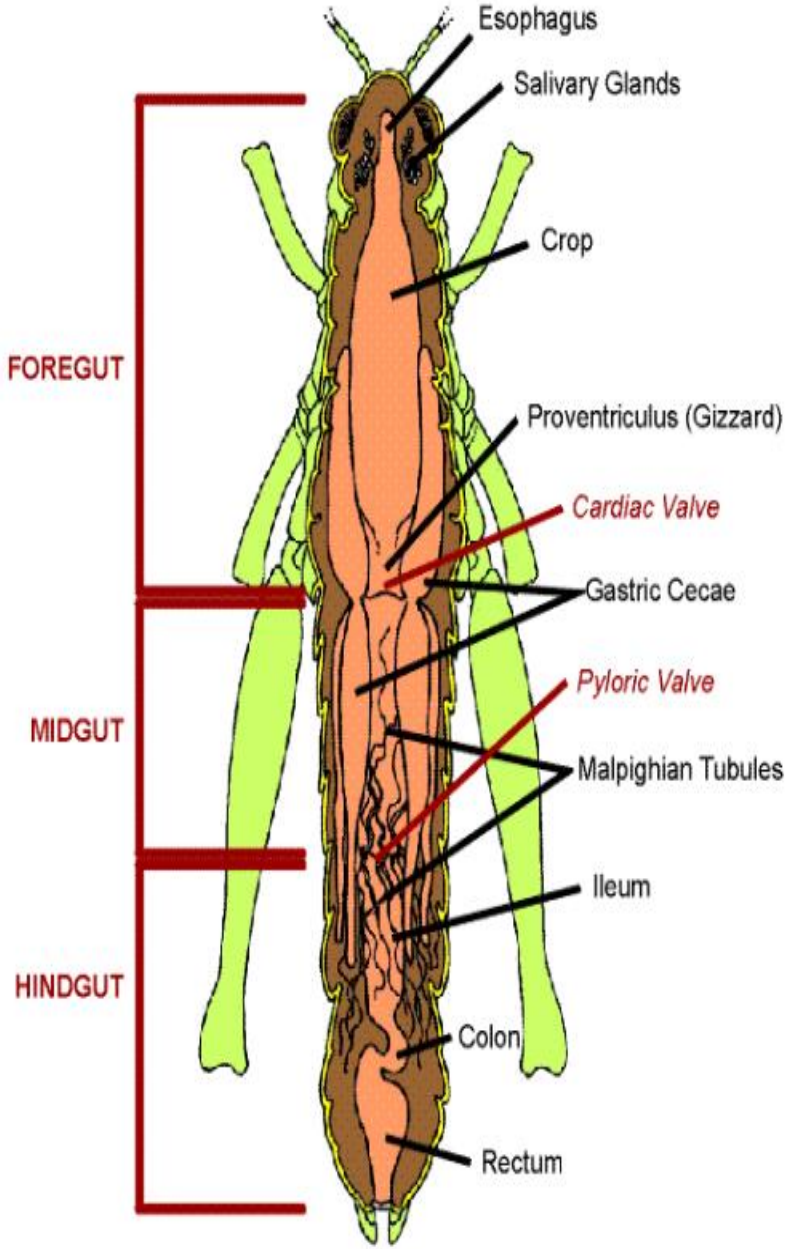
- Coelom works as a shock absorber and protects from any kind of mechanical shock.
- The coelomic fluid acts as a hydrostatic skeleton.
- The coelomocyte cells support the immune system.
- The coelomic fluid helps in gaseous transport and transport of nutrients and waste products.
- Coelom gives the extra space required by organs to develop and function.



One Way Digestion

with Accessory Glands

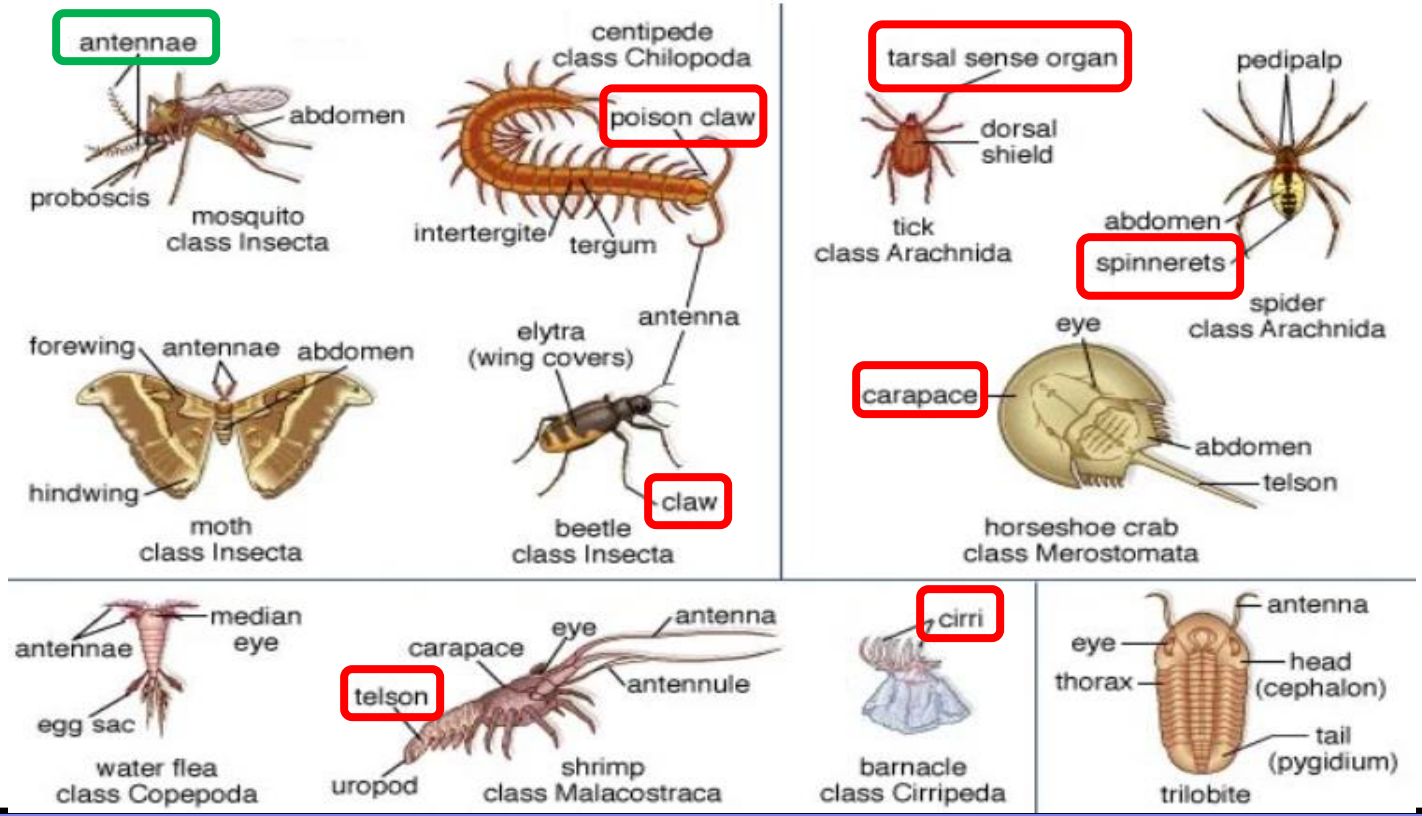
- Mouth & parts (entrance)
- Salivary glands (lubricate).
- Crop (storage).
- Gizzard (grinding – mechanical digestion).
- Stomach (chemical digestion)
- Gastric Ceca (digestive glands in stomach).
- Intestine (absorption)
- Rectum (stores waste)
- Anus (exit)



Arthropods are extremely diverse – over 1 million species discovered (most are insects).

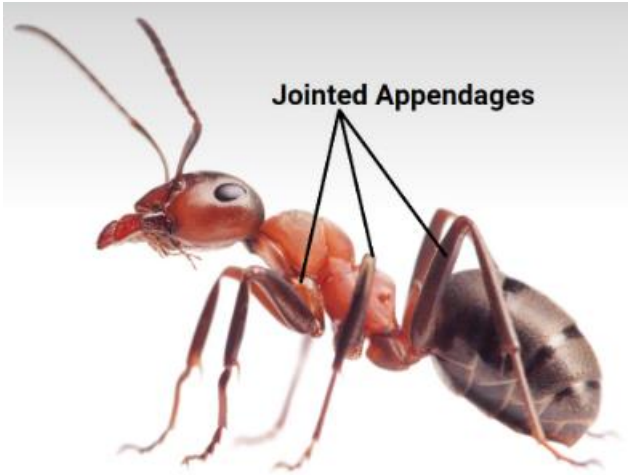
Accessory Organs aide in ingestion, digestion, excretion, hearing, sensory organs, reproduction.

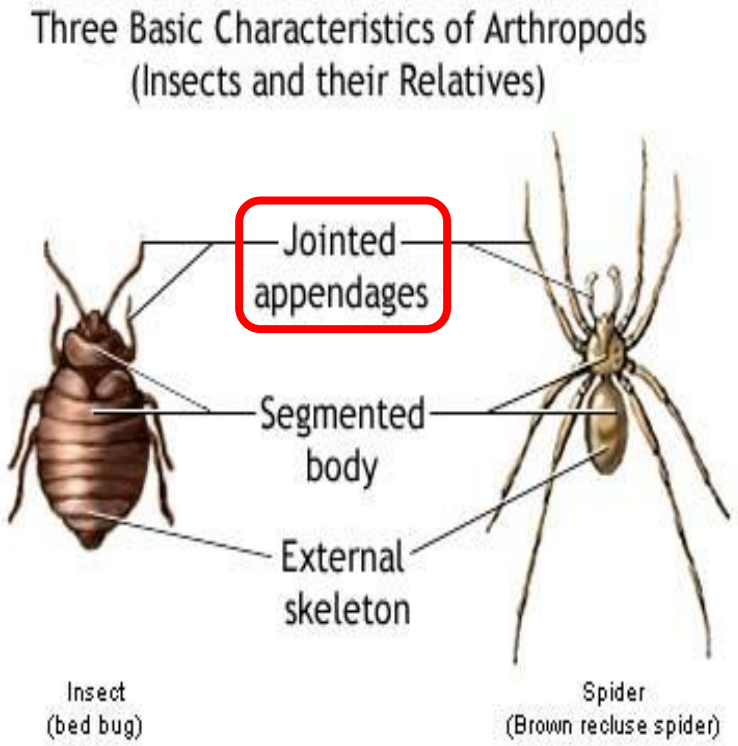
Specialized mouth parts (touch, taste); compound eyes, antennae.



Jointed Appendages

- Hollow tubes moved by muscles.
- Help in locomotion, food gathering, and reproduction.





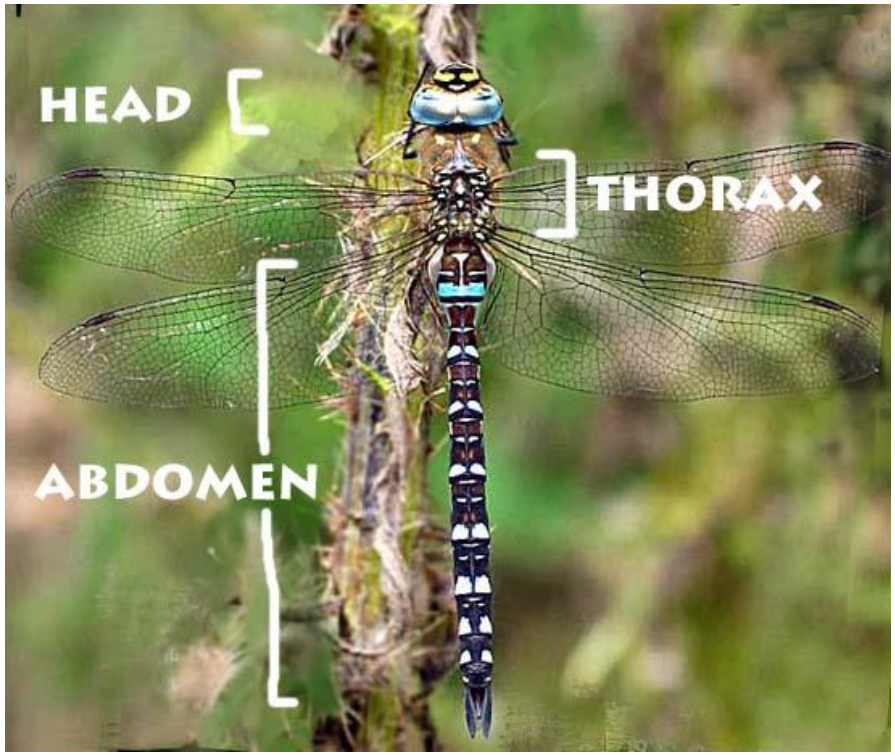
Exoskeleton

Rigid, but jointed; composed of **Chitin** (polysaccharide).

- Protection, prevention of desiccation, attachment for muscles, locomotion.
- Because it is hard and non-expandable, they undergo **Molting**, shedding of the exoskeleton, as they grow larger.

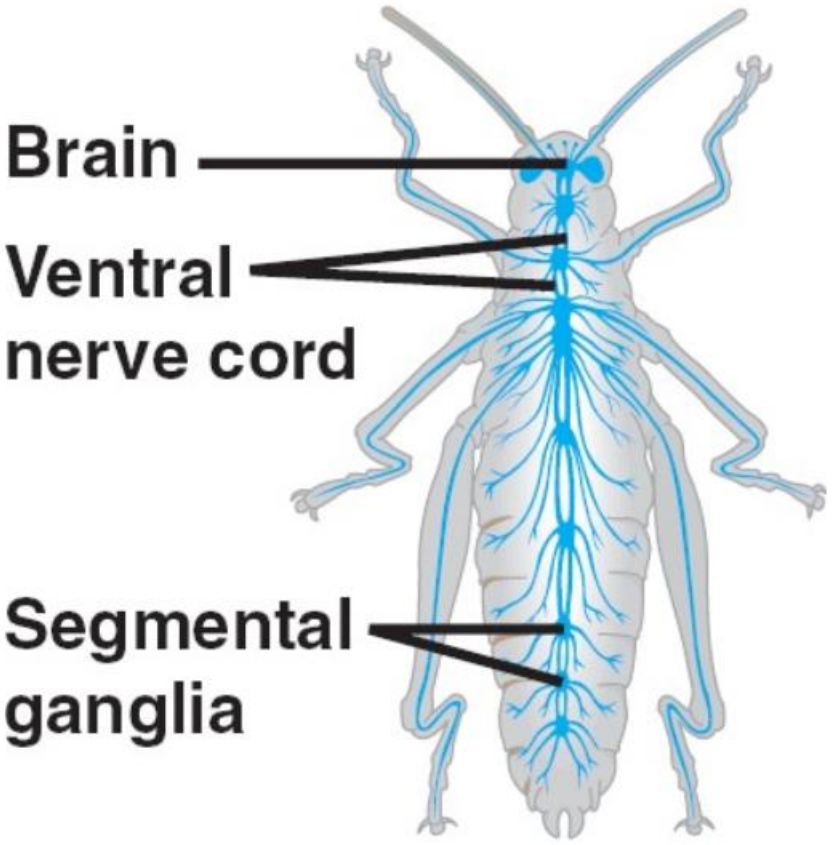
Segmented Body

- In some species, repeating units of the body have a pair of jointed appendages.
- In others, segments are fused into **head, thorax, and abdomen.**

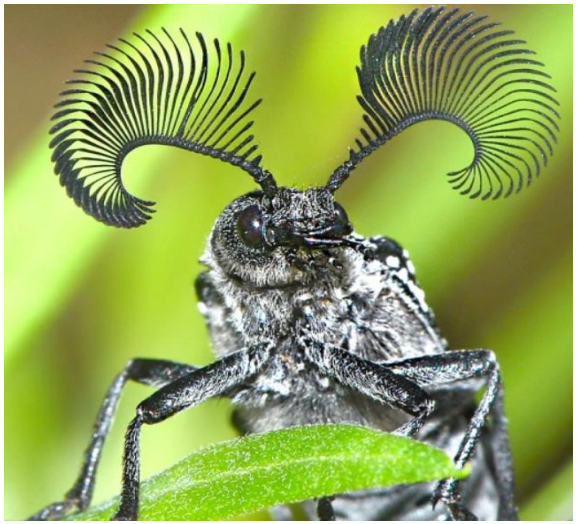


Well-developed Nervous System

- Brain and Ventral Nerve Chord.
- Head bears various types of sense organs, including compound and simple eyes.
- Many have well-developed touch, smell, taste, balance, and hearing capabilities.
- Display many complex behaviors and communication skills.

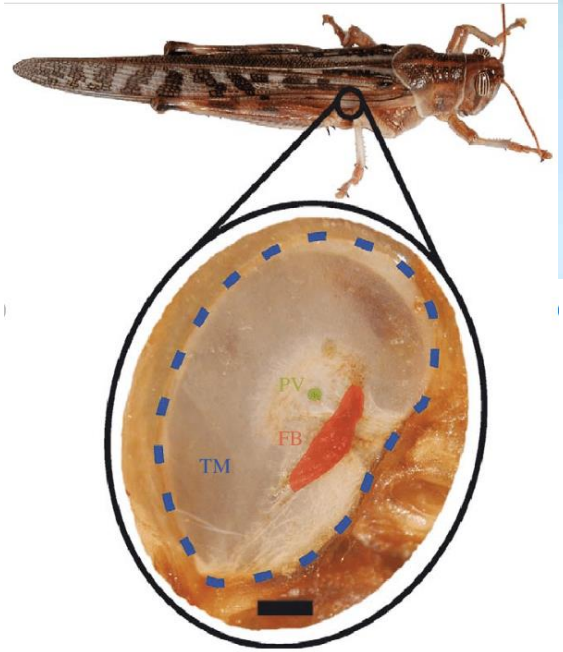


Compound Eyes



Antennae

Hairs

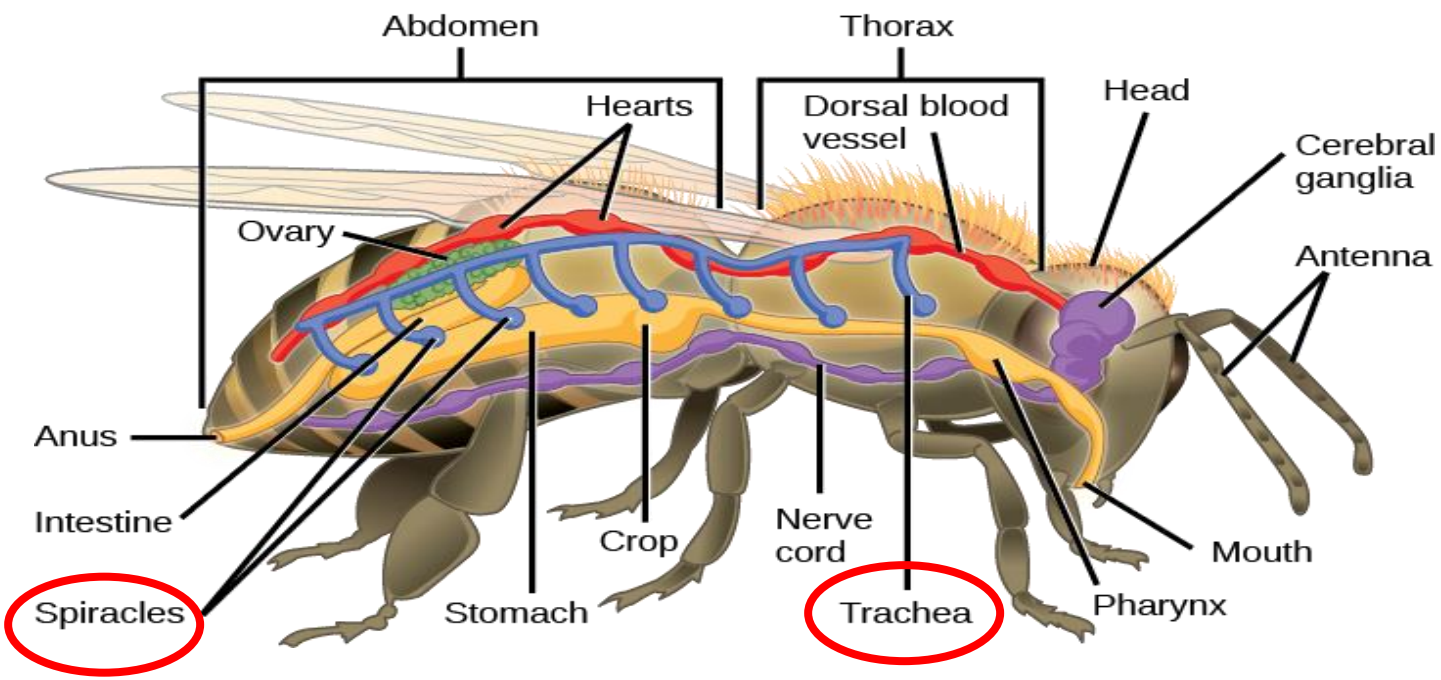


Tympanic Membrane (hearing)

Good Looks

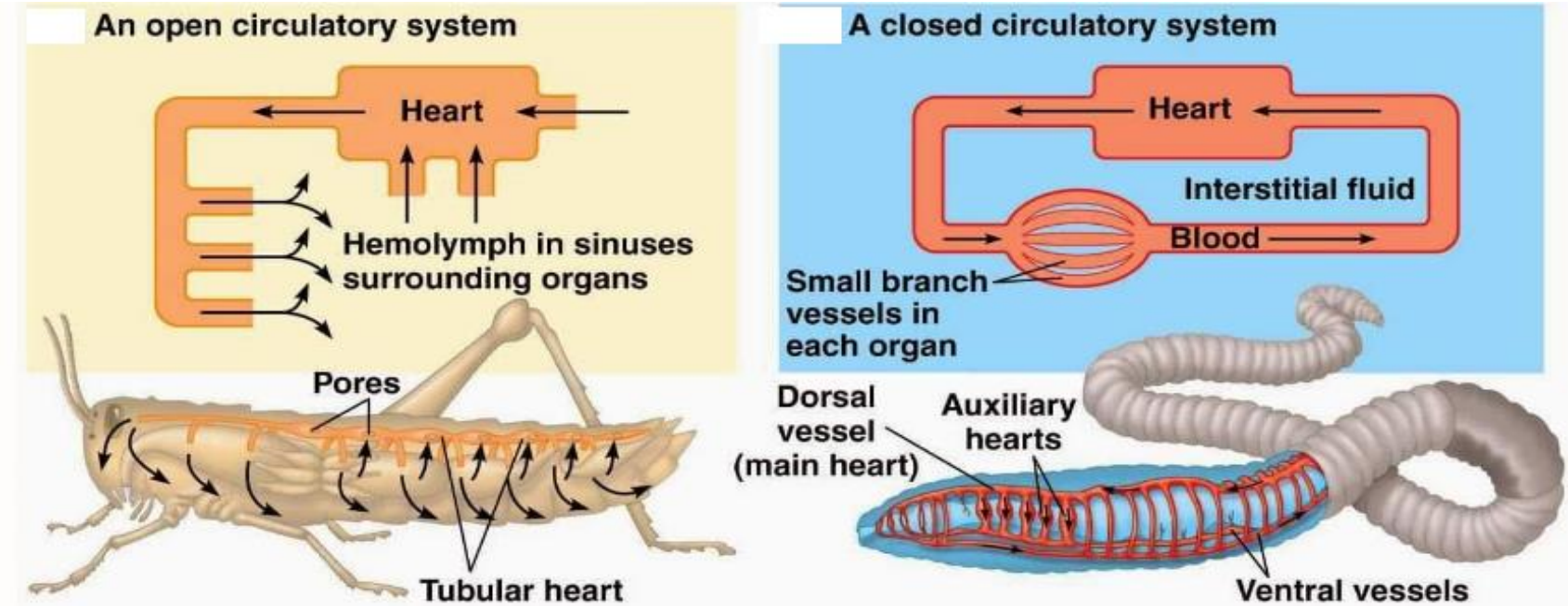
Respiratory Organs

Tracheae – air tubes with **spiracles** to allow air to enter the trachea.



Open Circulatory System

The Circulatory System is **Open**, with a dorsal heart pumping blood that circulates freely around the animal's organs.

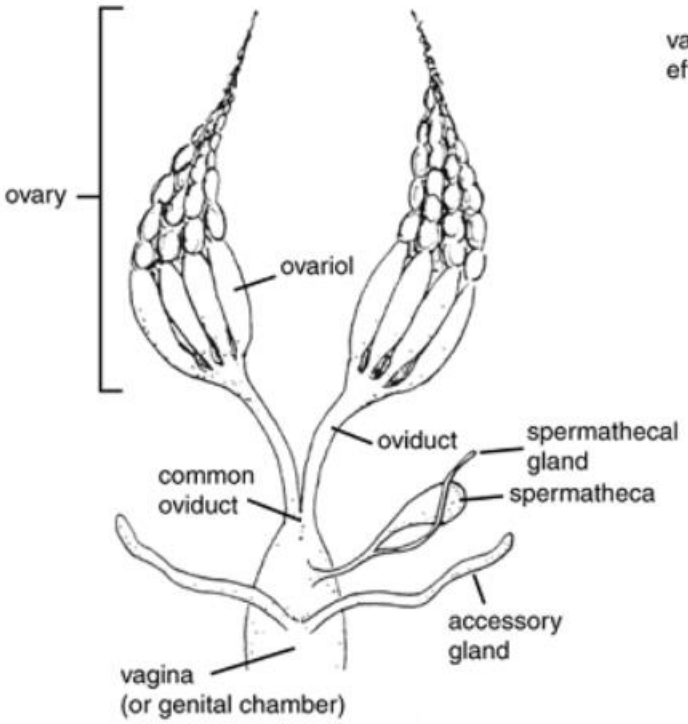


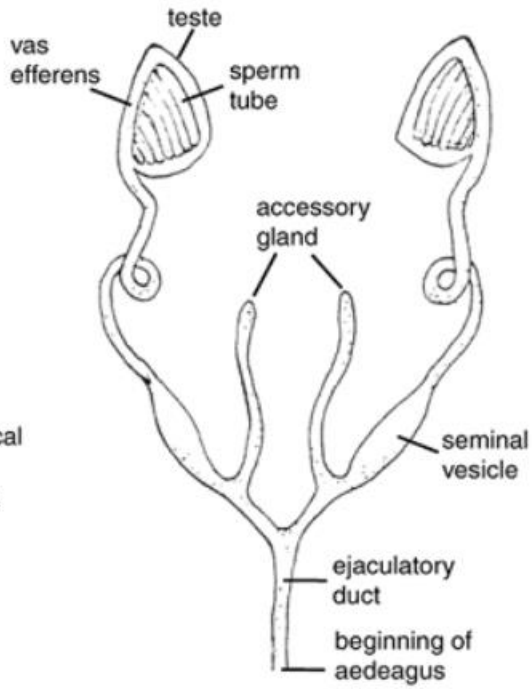
Reproduction

Most arthropods are either male (sperm) or female (egg), and they undergo internal fertilization.

Most fertilization is internal.

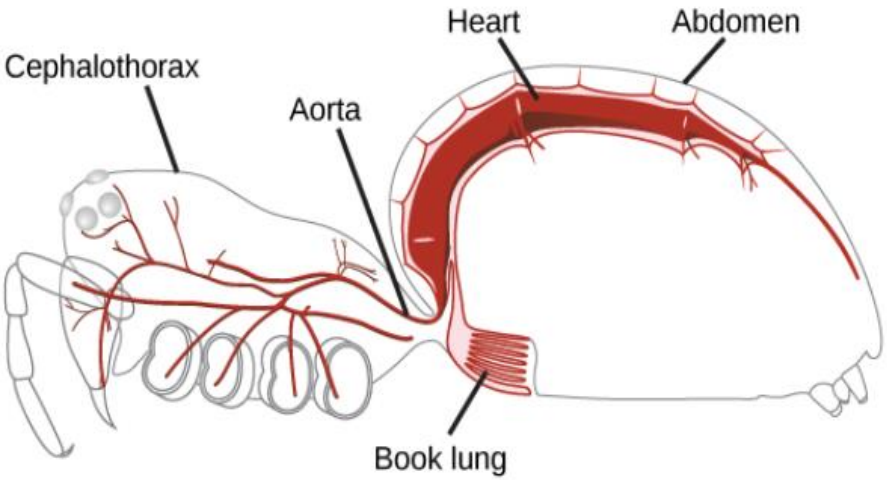
Parthenogenesis (asexual) – offspring develops from unfertilized egg.

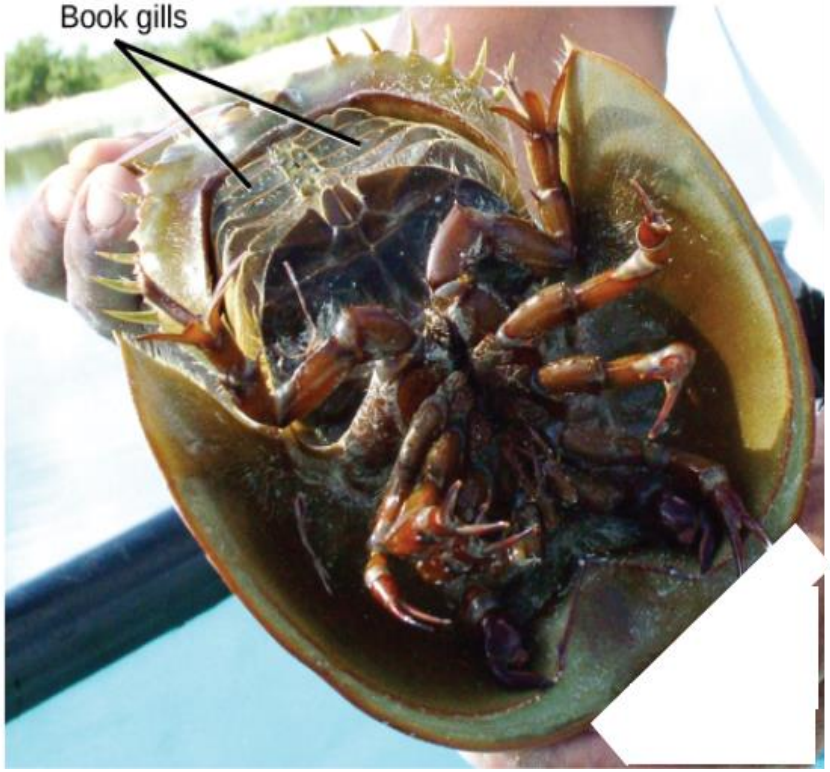




Gills - Arachnids

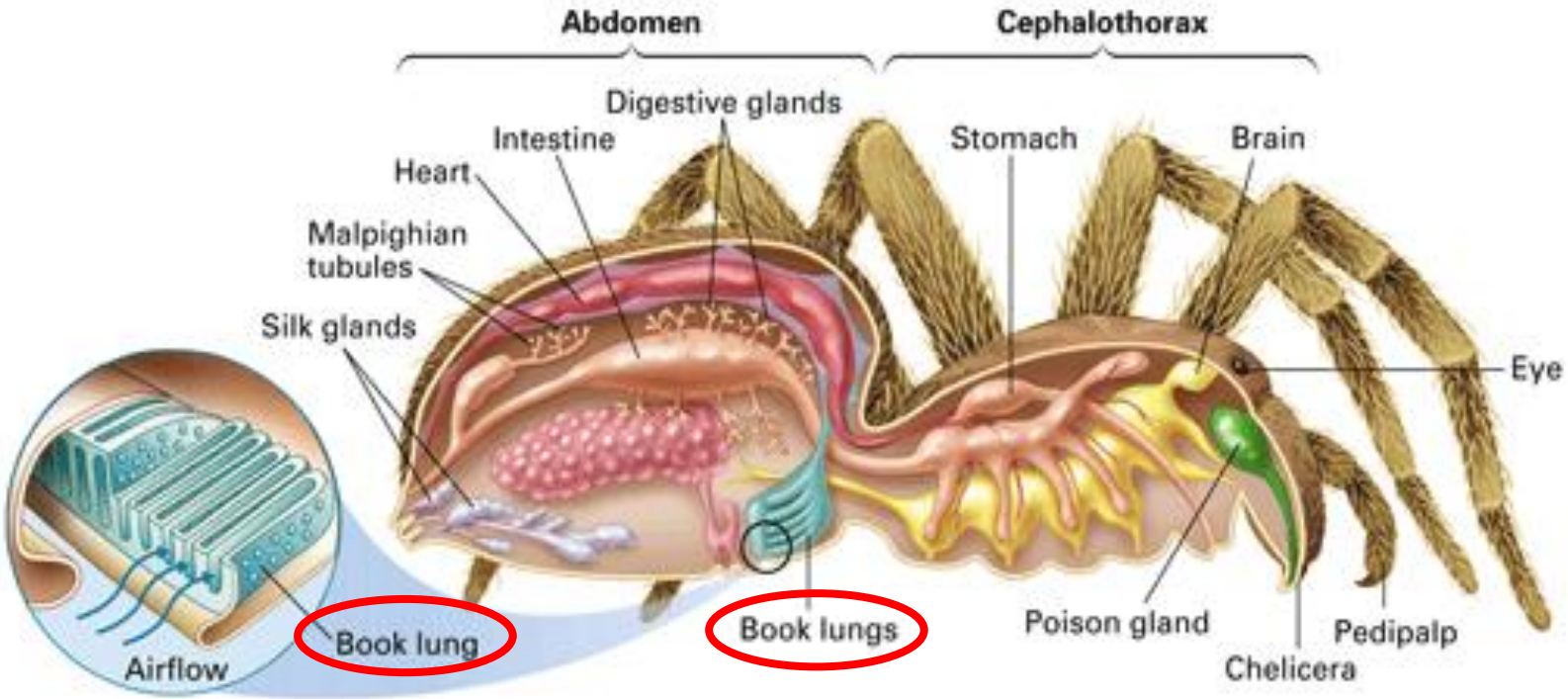
Gills are found in marine arthropods and greatly increase the efficiency of gas exchange.





Book Lungs – Arachnids

RESPIRATORY organs used for atmospheric gas exchange that are present in many arachnids, such as scorpions and spiders.



Main Groups

Chelicerates (arachnids)

Myriapods (Millipedes & Centipedes)

Crustaceans (crabs)

Hexapods (Insects)

Chelicerates

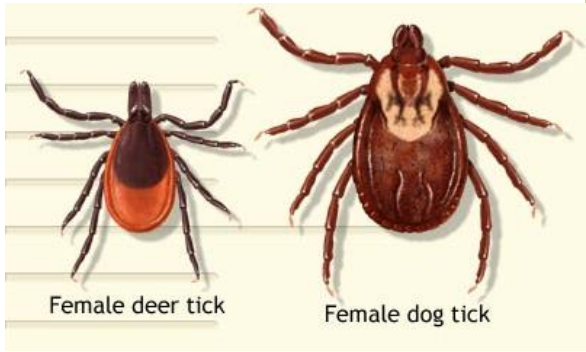
Spiders, Scorpions, Ticks, Mites, Harvestmen (*"Daddy Longlegs"*), Horseshoe Crabs

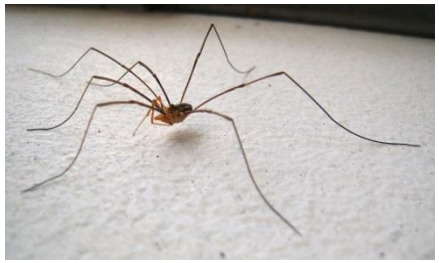
CHELICERAE: Pincher-like mouthparts

NO antennae

Two body regions: Cephalothorax and Abdomen

Four pairs of legs





Chelicerates

Spiders inject venom into their prey and digest the food externally before sucking it into the stomach.

Spiders use Silk Threads for all sorts of purposes, from lining their nests to catching prey.

Presence of "Book Lungs" that aid in gas exchange.

Chelicerates

Ticks and mites are parasites.

Ticks suck the blood of vertebrates and sometimes transmit diseases, such as Rocky Mountain Spotted Fever or Lyme Disease.

Chiggers, the larvae of certain mites, feed on the skin of vertebrates.

Millipedes & Centipedes

Terrestrial Creatures identified by the number of jointed legs per body segment.

Millipedes are herbivores that have two pairs of short legs per body segment.

Centipedes are carnivores that have one pair of legs per body segment.

Myriapods

Crustaceans

Mostly marine arthropods, that include barnacles, shrimps, lobsters, and crabs.

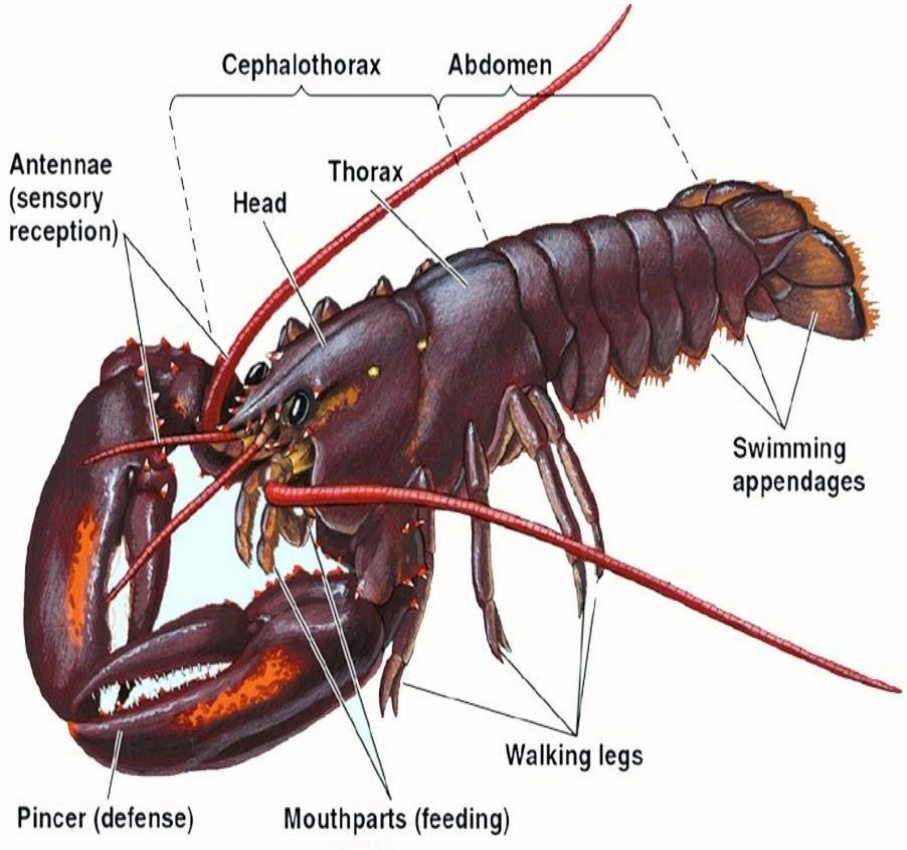
Freshwater: Crayfish

Terrestrial: Pillbugs

Head has a pair of compound eyes and 4 pairs of body appendages.

- Two pairs of Antennae.
- Complex mouthparts used in feeding.

Play a vital role in the food chain (Ex. Krill eaten by large marine mammals).



Insects

"Entomology" (Study of Insects)

Largest group of Arthropods

Remarkable behavior adaptations; Ex. Social Insects: Ants, Bees, Termites

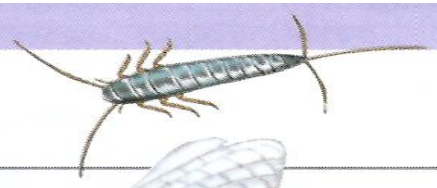
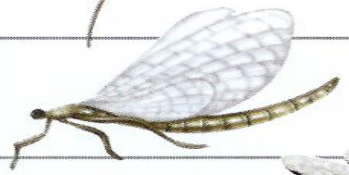
Body: Head, Thorax, Abdomen.

Mandibles and One pair of Antennae present.

SIX Legs attached to the Thorax and Two pairs of Wings. HEXAPODS.

Insects

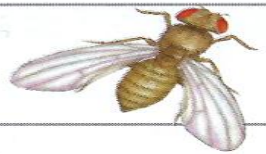
Order	Examples
Thysanura	Silverfish
Ephemeroptera	Mayflies
Odonata	Dragonflies and damselflies
Orthoptera	Roaches, crickets, grasshoppers
Phthiraptera	Lice
Hemiptera	Cicadas, aphids
Coleoptera	Beetles
Hymenoptera	Ants, wasps, bees
Lepidoptera	Moths, butterflies
Diptera	True flies
Siphonaptera	Fleas

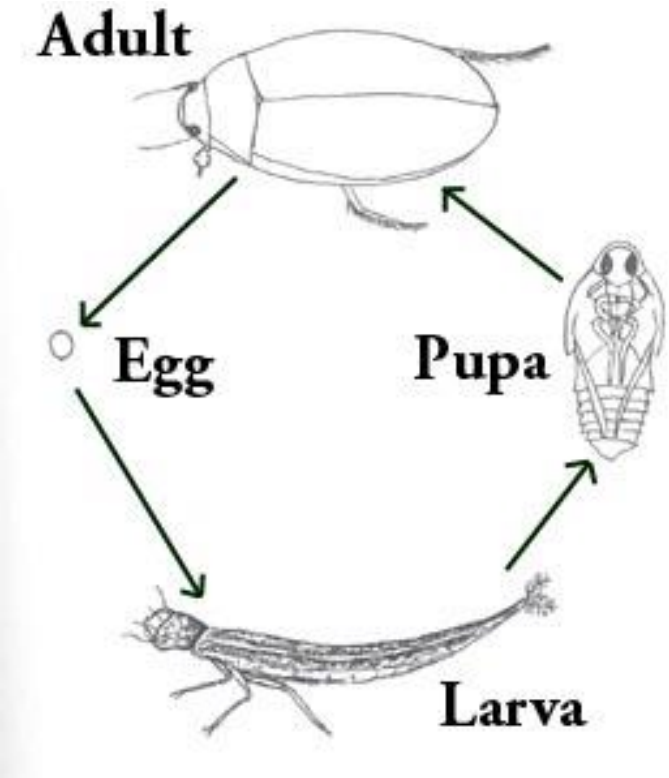









Metamorphosis



CHANGE IN FORM FROM EGG TO ADULT.

Complete Metamorphosis

Larva

Pupa

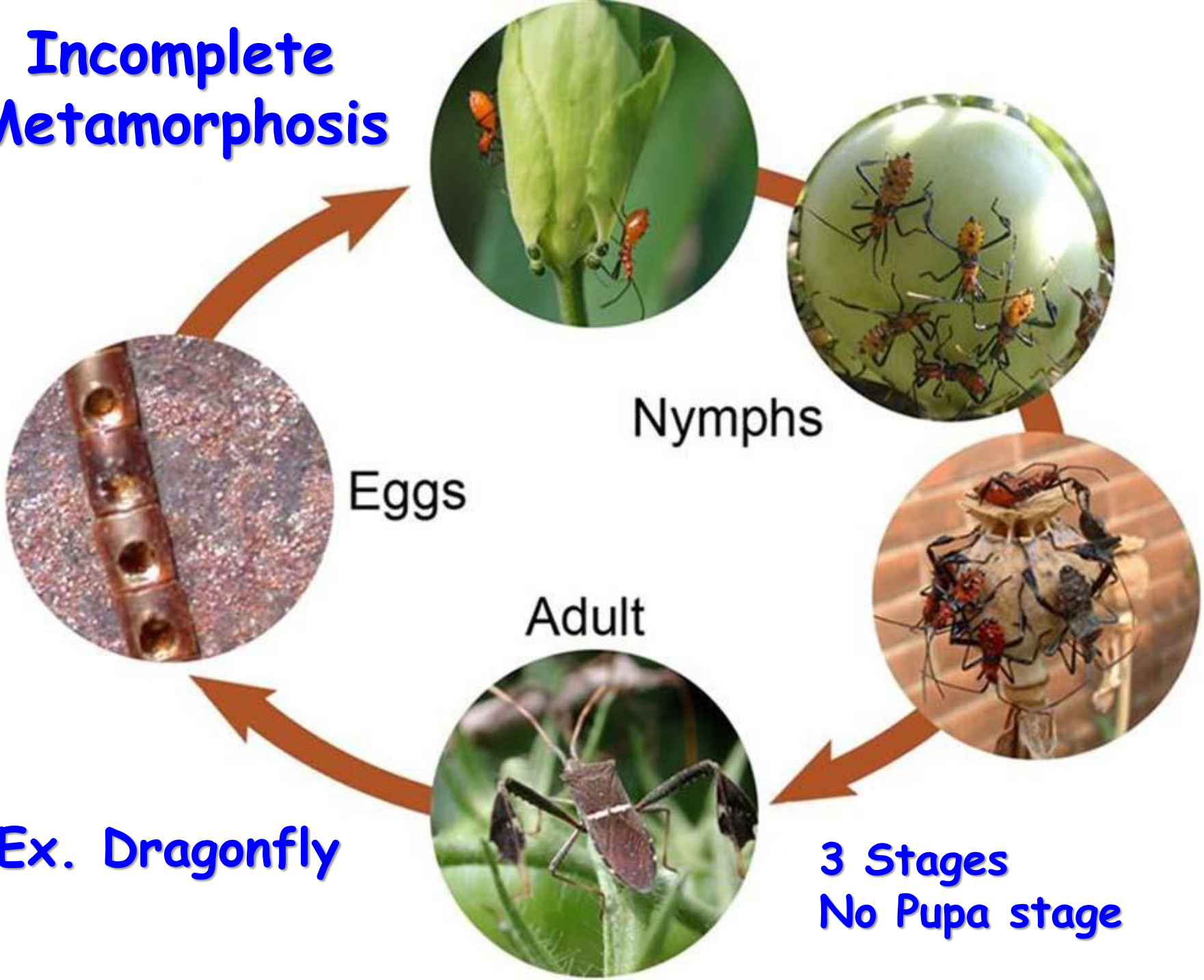
Adult

Eggs

Ex. Butterfly

4 stages that all look different

Incomplete Metamorphosis



Ex. Dragonfly

3 Stages
No Pupa stage

Phylum Echinodermata

Phylum Echinodermata

Echinodermata means "spiny skin".

Echinoderms usually inhabit shallow. coastal waters and ocean trenches.

Phylum Echinodermata

Sea Stars

Sea Urchins

Sand Dollars

Sea Cucumbers

Phylum Echinodermata

Marine Habitat.

Slow-moving or **Sessile.**

Radially symmetrical as adults (body divided in 5 parts).

Triploblastic & **DEUTEROSTOMES** ("anus first" development … along with chordates).

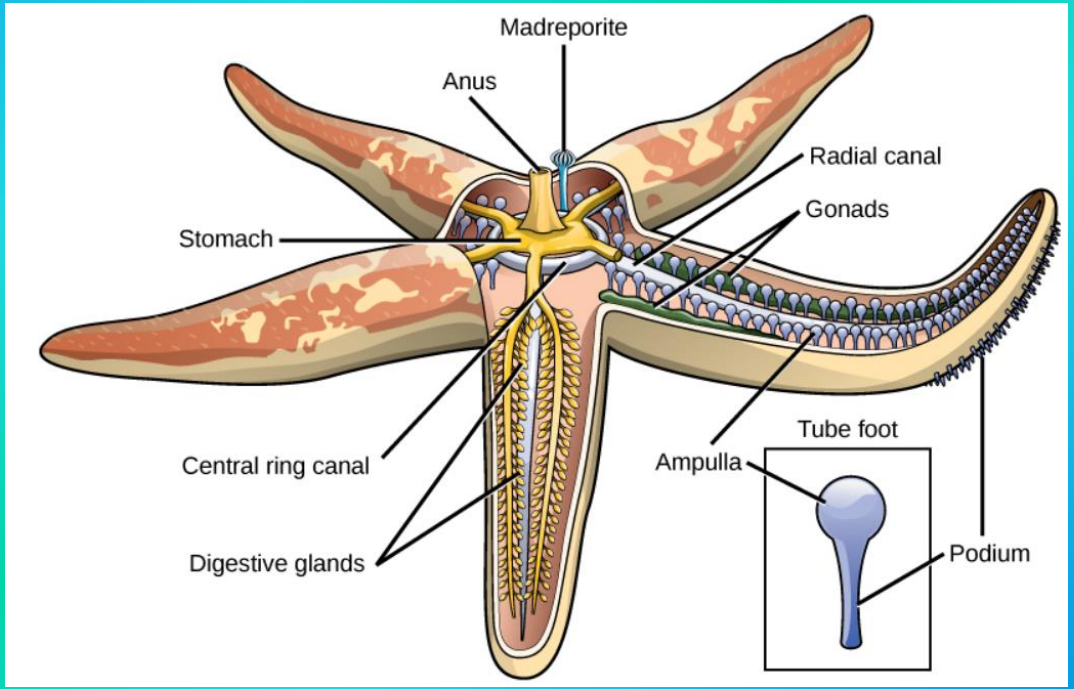
Have an **endoskeleton** of hard calcium-containing plates under a thin skin.

Water Vascular System

Echinoderms have a unique system for gas exchange, nutrient circulation, and locomotion called the water vascular system.

The system consists of a central ring canal and radial canals extending along each arm.

Water circulates through these structures allowing for gas, nutrient, and waste exchange.



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(8:08) **Echinoderms** General Features

Phylum Echinodermata

Reproduction

in echinoderms is **typically by external fertilization**; eggs and sperm are freely discharged into the water.

Echinoderms are capable of asexual reproduction by fission by cloning themselves to produce 2 embryos.

They also have the ability to **regenerate** lost arms.

	Mollusks	Arthropods	Echinoderms
Symmetry			
Digestion development			
skeleton			
Distinguishing Feature			
These phyla are all invertebrates (no backbone)			

TRY IT

Define "parthenogenesis".

Name the 4 main groups of Arthropods.

	Mollusks	Arthropods	Echinoderms
Symmetry			
Digestion development			
skeleton			
Distinguishing Feature			
These phyla are all invertebrates (no backbone)			

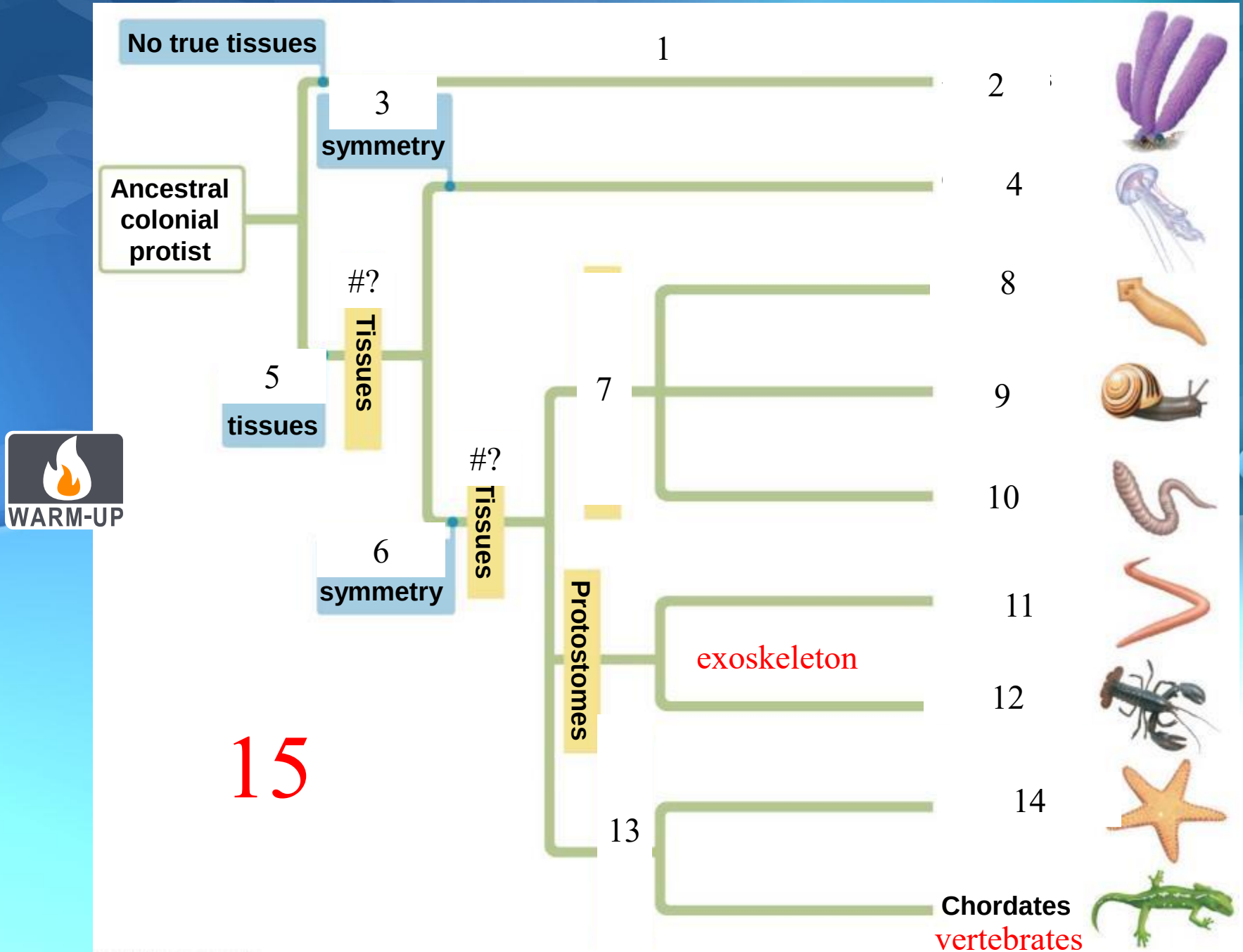
TRY IT

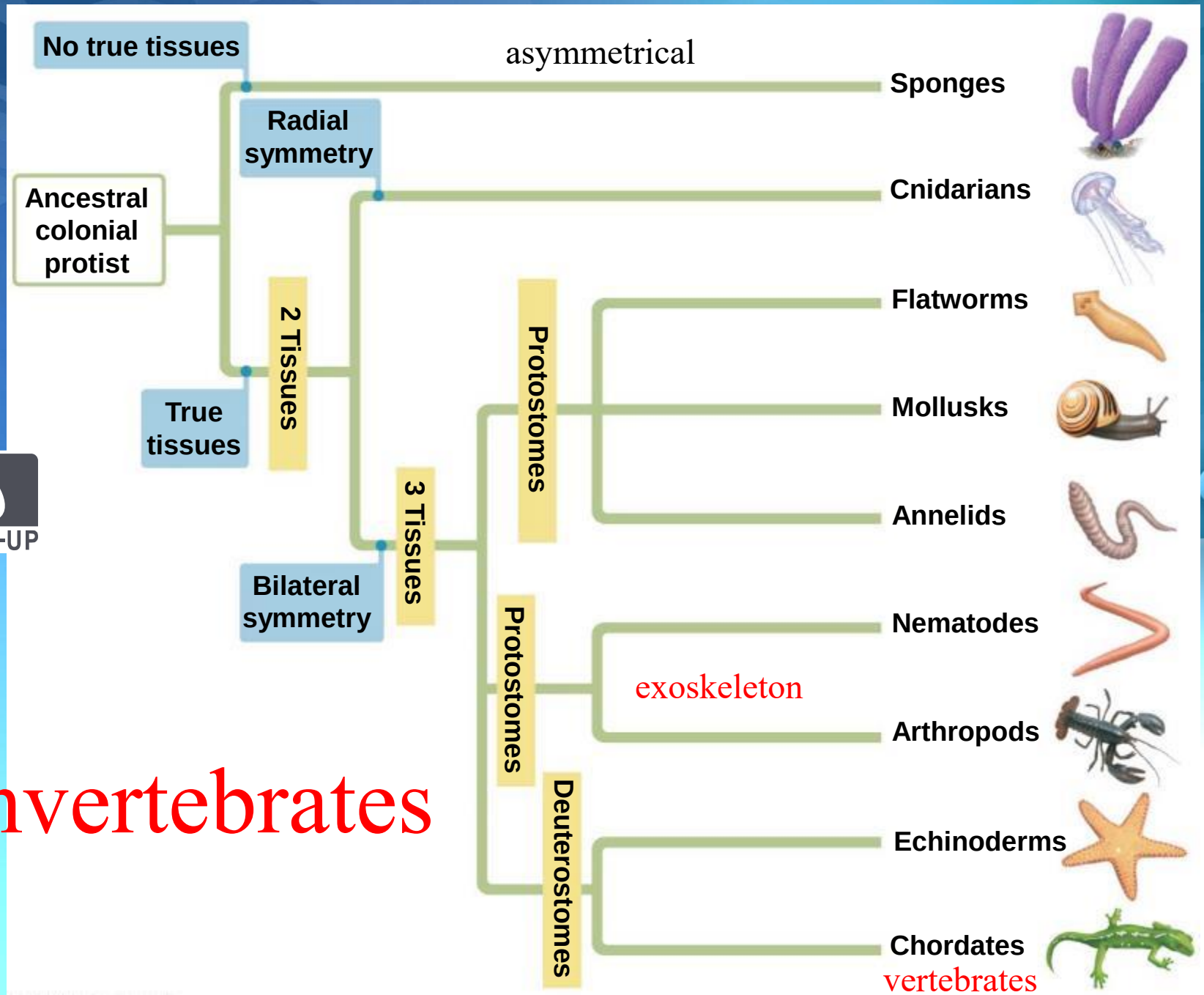
Define "parthenogenesis".

Asexual reproduction from unfertilized egg.

Name the 4 main groups of Arthropods.

Chelicerates (arachnids/spiders); myriapods (millipeds, centipedes); crustaceans (crabs); hexapods (insects)


No true tissues
1
3
symmetry
Ancestral colonial protist
#?
Tissues
5
tissues
#?
Tissues
6
symmetry
7
Protostomes
exoskeleton
13
2
4
8
9
10
11
12
14
Chordates
vertebrates
WARM-UP
15



WARM-UP

Invertebrates