

- 1) Mollusks
- 2) Echinoderms
- 3) Arthropods

Covered in classes from May 23rd, 2014- May 29th, 2014

Mollusks

- *Molluscus* = soft
- Soft-bodied animals that usually have an internal or external shell.
- Includes snails, slugs, clams, squids, and octopi.
- True coelom
- Complex, interrelated organ systems



- The body plan of most mollusks have 4 main parts:

1) foot

http://www.youtube.com/watch?v=48_MU9NH2rc

2) mantle

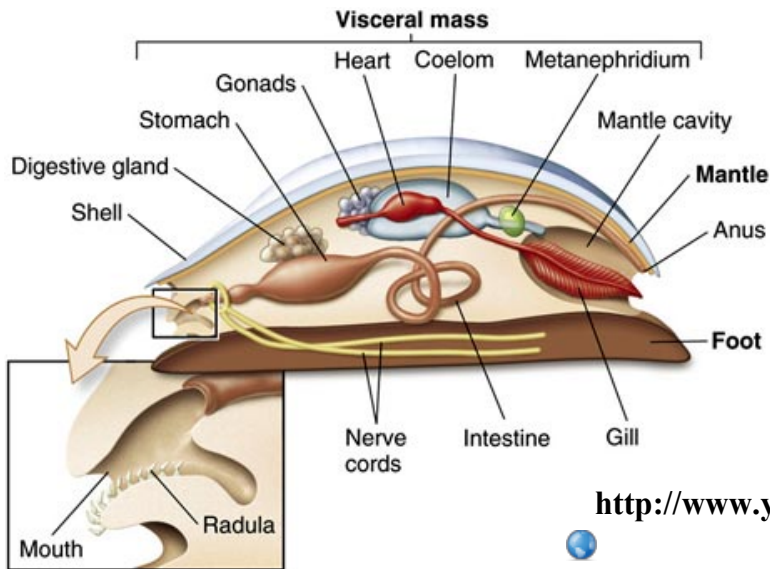
<http://www.youtube.com/watch?v=HHEdT0Vevus>

3) shell

<http://www.youtube.com/watch?v=XDEHn4fBPhA&feature=related>

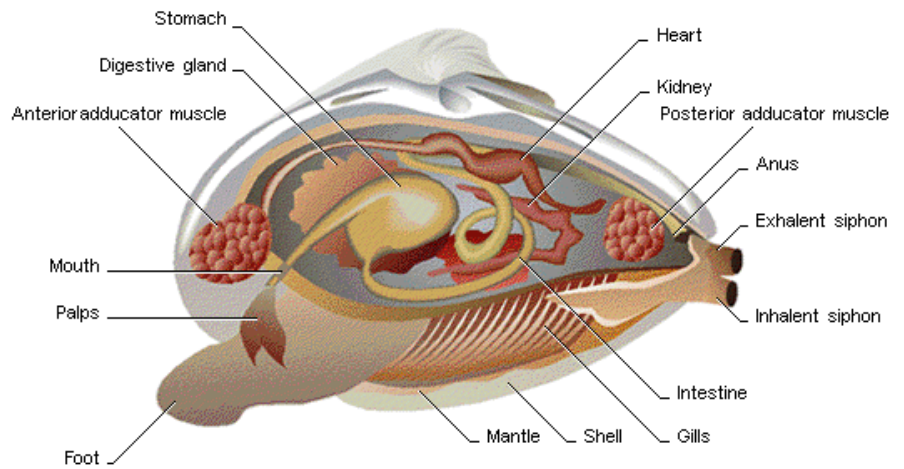
4) visceral mass

- Foot: muscular; may be used for crawling, burrowing, or tentacles for capturing prey
- Mantle: thin tissue layer that covers the body (cloak)
- Shell: made by glands in the mantle that secrete calcium carbonate
- Visceral mass: internal organs



<http://www.youtube.com/watch?v=osl0i84cJNl&feature=related>

http://www.youtube.com/watch?v=tp0dgI_2f-g



Feeding

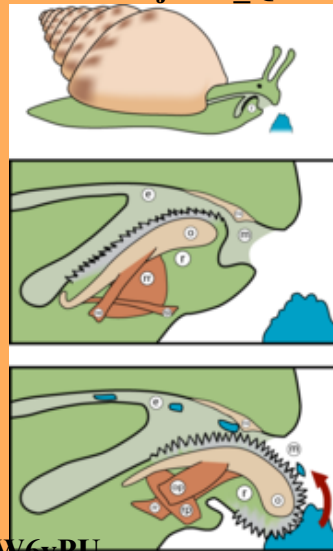
<http://www.youtube.com/watch?v=7fUMtwfTqa0>

- Many (snails, slugs) use radula: flexible, tongue-shaped structure with hundreds of tiny teeth to scrape food, or drill into other animals
- Octopus: sharp jaws to eat prey
- Clams, oysters, scallops: filter feeders; use siphon - tubelike structure through which water flows

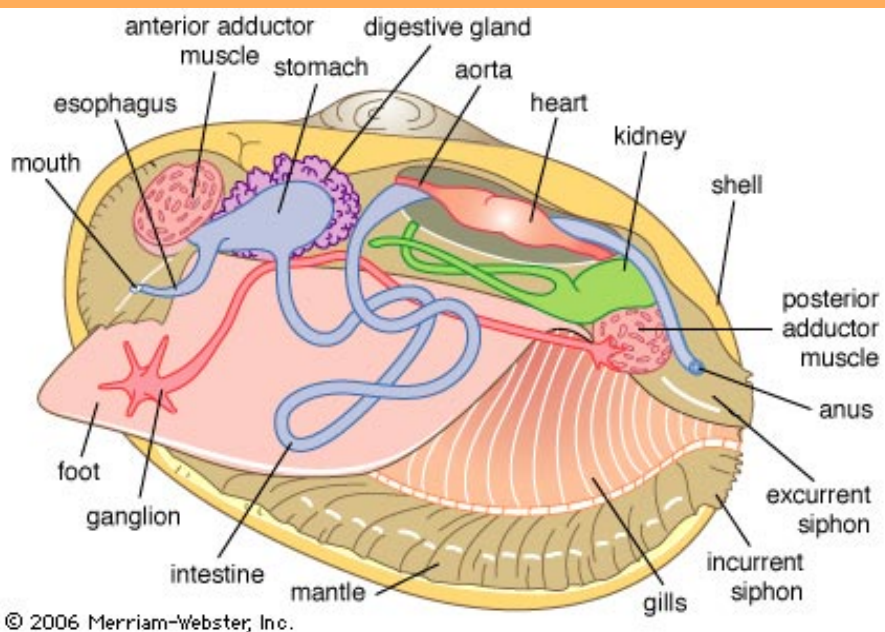
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Radula

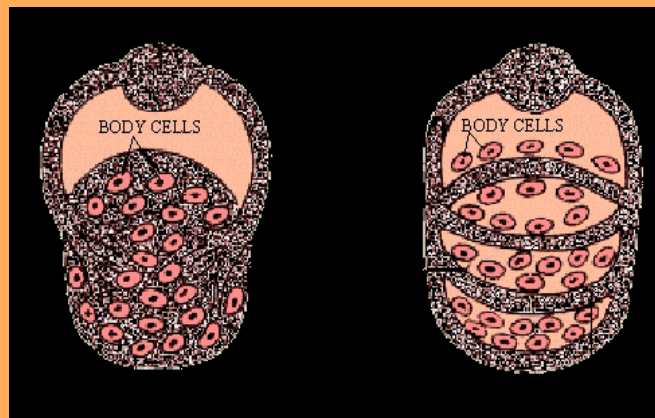


<http://www.youtube.com/watch?v=Sv8OnlW6vPU>



Respiration/Circulation/Excretion

- **Aquatic mollusks** use gills
- **Land mollusks** use mantle cavity; large surface area lined with blood vessels is kept moist and oxygen diffuses across.
- Open circulatory system: (snails, clams) blood is pumped through vessels by a simple heart and works its way into the sinuses; blood then passes to the gills, where oxygen and carbon dioxide are exchanged.
- Closed circulatory system: (octopi, squid) capable of transporting blood faster



Response

- Clams ([bivalves](#)): simple nervous system, small ganglia, nerve cords and simple sense organs (eyespots, chemical receptors)
- [Octopi](#): active predators; most highly developed nervous system of all invertebrates; well-developed brains; capable of complex behaviour, such as opening jars, responding to rewards.

Reproduction

- Variety of methods; snails and bivalves reproduce sexually by external fertilization
- External fertilization: large number of eggs are released into the water, then fertilized by sperm; develop into free-swimming larvae.
- Tentacled mollusks: internal fertilization
- Some are hermaphrodites

Octopus.asf



<http://www.youtube.com/watch?v=ocWF6d0neIY&feature=related>

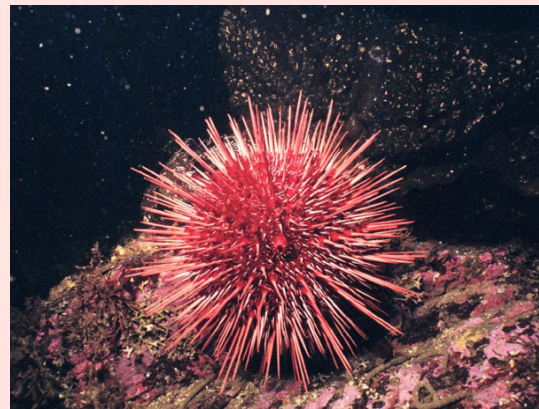


<http://www.youtube.com/watch?v=VLLQOK1gZE4&feature=related>



Echinoderms

- "Echino" = spiny; "dermis" = skin
- The skin of these animals is stretched over an endoskeleton, or internal skeleton formed of hardened plates.
- These plates give them an irregular, bumpy texture.



sea stars



sea urchins



sand dollars



Echinoderms include:

sea lillies



sea cucumbers



brittle stars

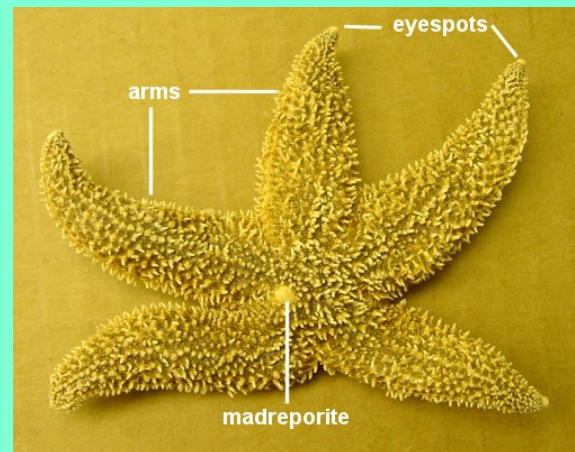
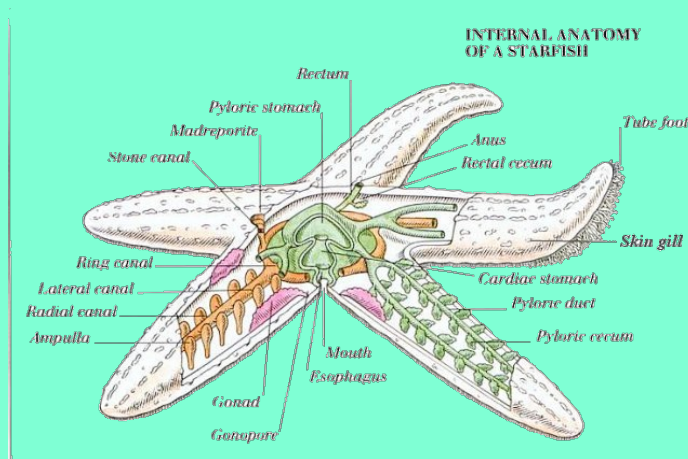




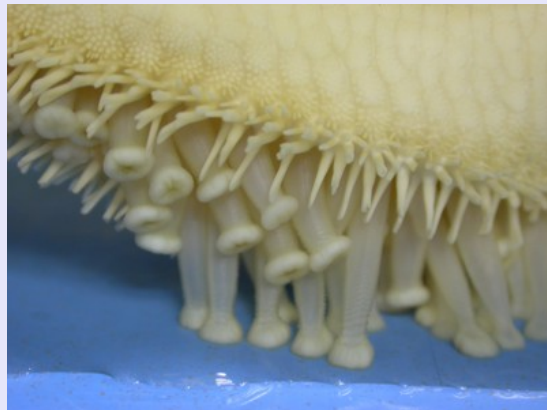
- Echinoderms typically have no anterior or posterior end and lack cephalization.
- They have one side with a mouth (oral surface) and the other side is called the aboral surface.
- Most adults have five-part radial symmetry.
- Echinoderms are actually more closely related to humans and other vertebrates than to simple animals like cnidarians.

Form and Function in Echinoderms

- Echinoderms have a water vascular system, which carries out respiration, circulation and excretion.
- The fluid-filled tubes connect to the outside through a madreporite.
- In sea stars, the madreporite connects to an internal ring canal, which branches out into radial canals in each segment.



- Each radial canal is connected to hundreds of tube feet, which act like tiny suction cups.
- Muscles pull on the suckers of tube feet, allowing the animal to move and pry open shelled prey like clams.



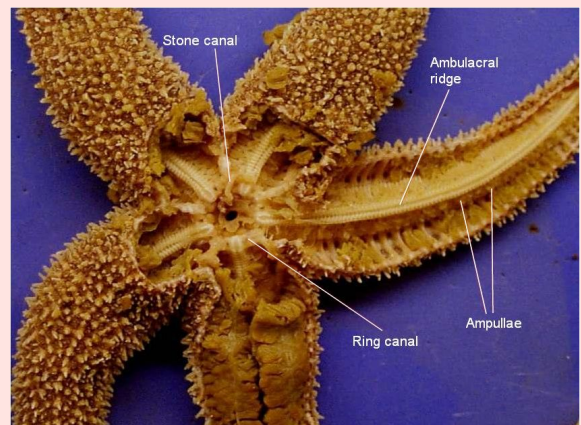
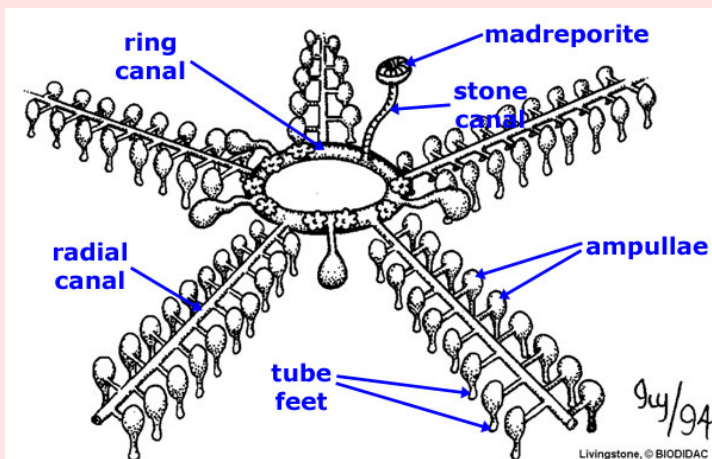
Feeding

<http://www.youtube.com/watch?v=A100m5EpfFI>

- Sea Stars: pry open mollusks like mussels and clams; once the shell is open, they push out their stomachs and secrete enzymes which digest the mollusk in its own shell.
- Sea Urchins: scrape algae from rocks
- Sea Cucumbers: move over ocean floor feeding on detritus
- Sea Lilies: use tube feet to capture floating plankton

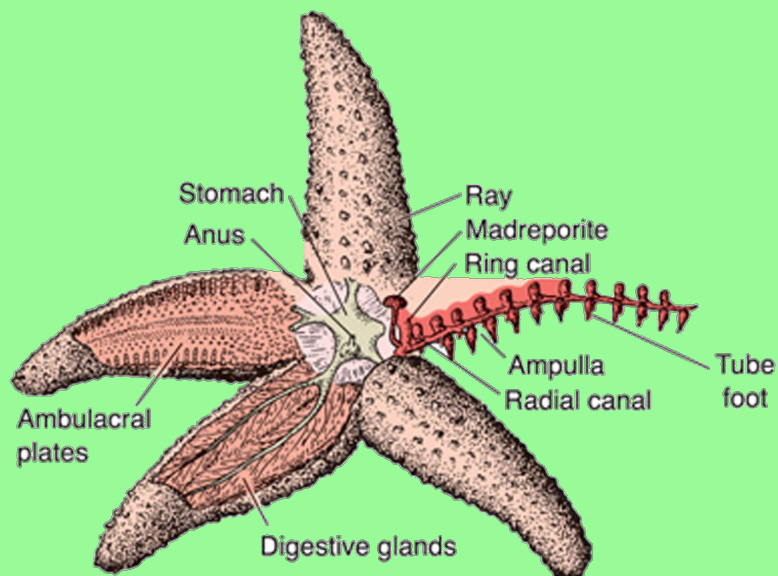
Respiration & Circulation

- Mainly rely on the water vascular system which carries water, oxygen, food and wastes.
- The thin surface of tube feet also allows gas exchange.



Excretion

- Digestive waste is released as feces through the anus.
- Other cellular wastes pass directly into the water through the tube feet and skin gills.

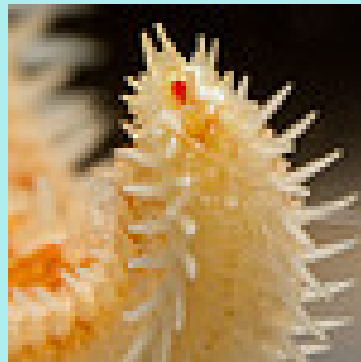


Response

- Do not have a highly developed nervous system.
- Most have some scattered sensory cells to respond to light, gravity and chemicals.
- A nerve ring surrounds the mouth and radial nerves extend into the segments.



<http://www.youtube.com/watch?v=aCxKFc3XtJs>



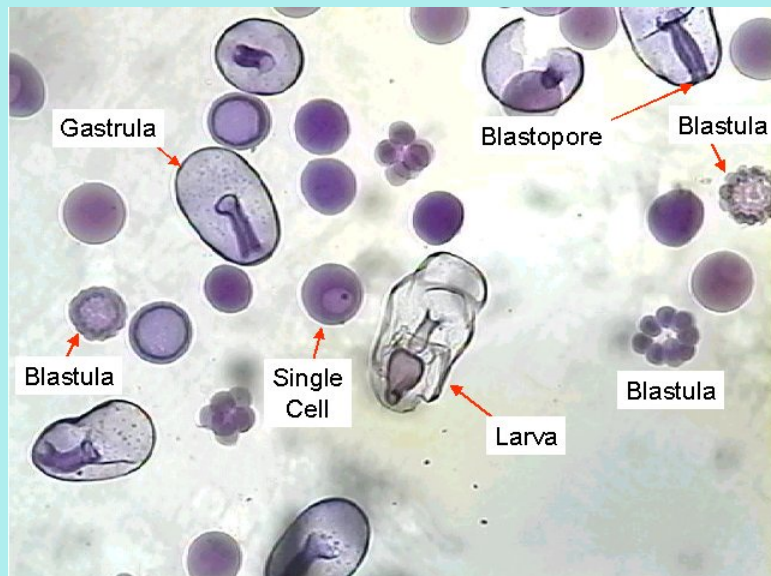
Movement

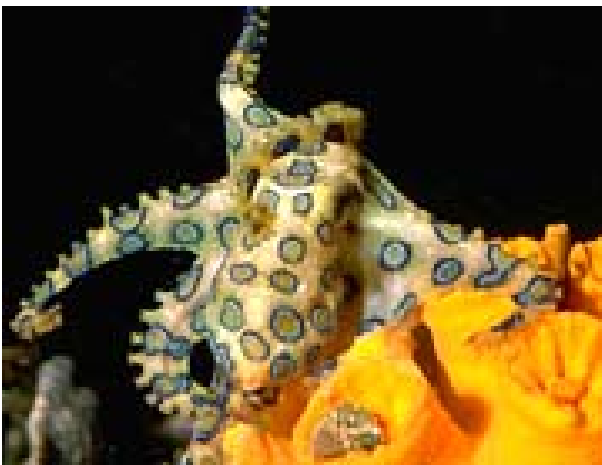
- Most use their tube feet to move.
- **Sand Dollars / Sea Urchins** : movable spines connected to the endoskeleton
- **Sea Stars / Brittle Stars** : flexible joints allow the arms to move
- **Sea Cucumbers** : soft, muscular body wall allows them to crawl

 planet Earth

Reproduction

- External Fertilization: sperm and eggs are produced and released into the open water.
- Larva (which have bilateral symmetry) develop, and then swim to the ocean floor where they grow into adults.





Page 708

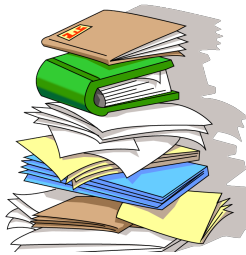
1, 2, 3, 4,
5, and 6



Page 738

1, 2, 3, 4

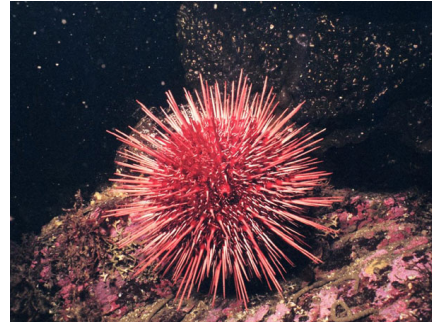
Read p. 737 - 738 and list three key characteristics of each group of Echinoderms.





Crown-of-thorns starfish





Mollusks Review

- 1) p. 707 Analyzing Data # 1 - 5
- 2) p. 708 Section Assessment
Questions #1 - 6

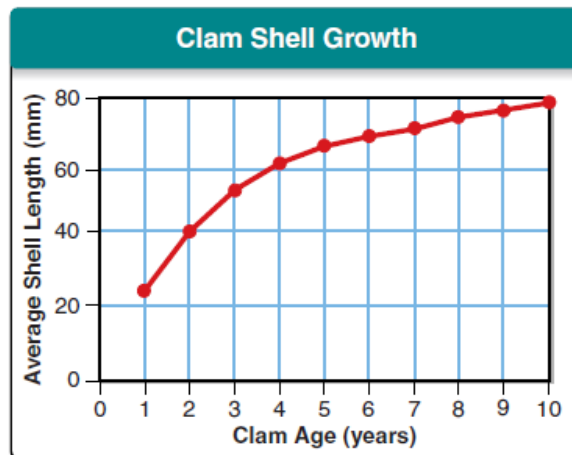
Analyzing Data

Raising Clams

Aquaculture is the growth of aquatic animals and plants for use by humans. In one example of aquaculture, hard clams are first grown in commercial hatcheries under very favorable conditions. The young clams are then removed from the hatcheries and placed into the mud beds of creeks, where they develop into adults. At that time, the size of the young clams is around 40 millimeters.

Because Georgian clams grow so quickly, they are ideal for aquaculture. Unlike the hard clams in the northeastern United States that grow only during the warm months, Georgian hard clams grow year-round. As a result, the Georgian clams grow to market size in less than half the time that the northeastern clams need to grow. The graph shows how clam shells grow over a period of 10 years.

1. **Using Tables and Graphs** Approximately how many years does it take clams to reach a size at which they can be removed from hatcheries and put in creeks?



2. **Applying Concepts** How does climate affect the growth of most clams?
3. **Using Tables and Graphs** How much did the clams grow during the first 5 years? The next 5?
4. **Formulating Hypotheses** Formulate a hypothesis to explain the slower growth rate from years 5 to 10.
5. **Drawing Conclusions** What general trends do you observe about growth from the graph?

Answers

1. Approximately 2 years
2. Most clams grow only during warm months.
3. The clams grew to about 68 mm during the first five years. They grew an additional 12 mm, to 80 mm, during the next five years.
4. Sample hypothesis: The older the clam, the less frequently its cells divide.
5. Clam growth is greatest in the first four or five years. Then, it levels off to a slow but steady growth.

27-4 Section Assessment

1. A mollusk is a soft-bodied animal that usually has an internal or external shell.
2. Foot, mantle, shell, visceral mass. Descriptions should agree with information on page 702.
3. Gastropods—shell-less or one shell, ventral foot; bivalves—two shells; cephalopods—head attached to foot.
4. Land snails respire using a mantle cavity lined with blood vessels. This lining must be kept moist.
5. Cephalopods exhibit complex behavior and can locate a variety of prey. Students should describe cephalopods' complex sense organs.
6. In an open circulatory system, blood leaves the vessels and moves through sinuses. In a closed circulatory system, blood is contained within vessels. A closed circulatory system supports greater oxygen needs because blood moves quickly.

Arthropods

- Arthropods have a segmented body, a tough exoskeleton and jointed appendages.
- Exoskeleton: made from protein and chitin; great variation - firm, leathery (caterpillars) to extremely tough, hard (crabs, lobsters)
- Appendages: structures such as legs and antennae that extend from the body wall

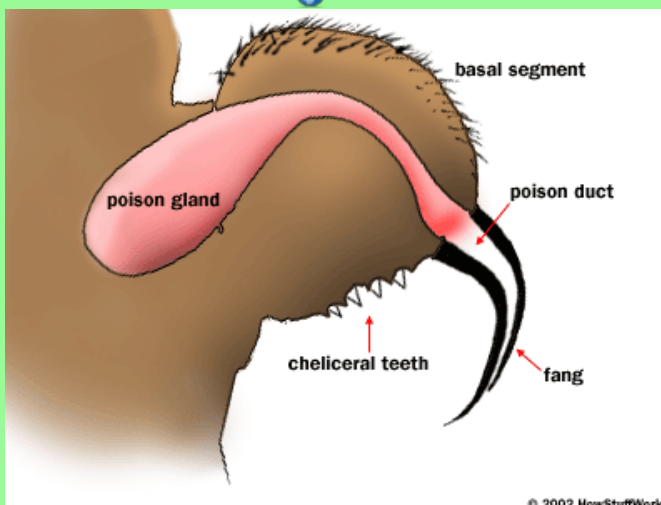


Feeding

http://www.youtube.com/watch?v=srL_O80QcVk

- Include herbivores, carnivores and omnivores.
- Mouthparts (pincers, fangs, jaws) have evolved in ways to enable different species to eat almost any food.

<http://www.youtube.com/watch?v=bRV4d9LCawU>



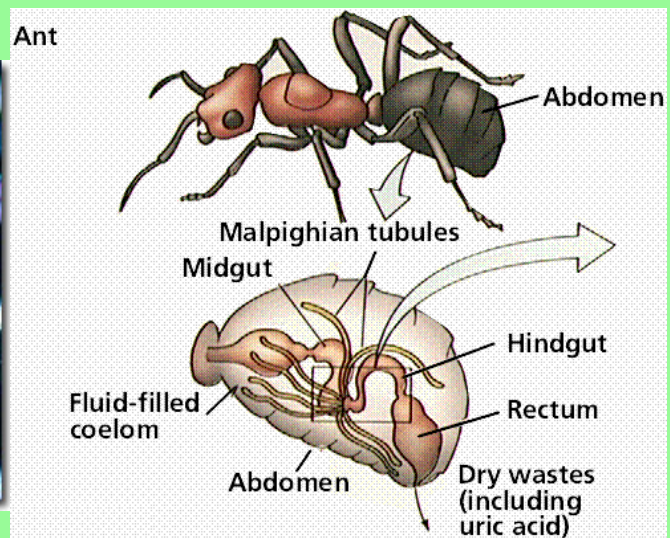
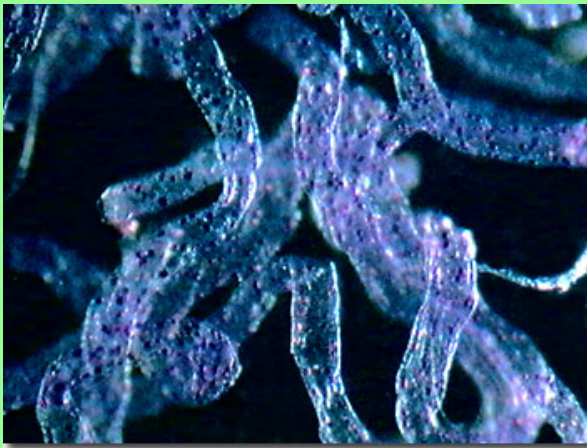
Circulation

- open circulatory system
- well-developed heart pumps blood through arteries that branch and enter tissues
- blood moves into cavities, then collects in large sinus surrounding the heart and re-enters to be pumped through the body



Excretion

- Most dispose of nitrogenous wastes using Malpighian tubules: saclike organs that take out wastes from the blood and add them to digestive wastes (feces) that move through the gut
- Aquatic arthropods, cellular wastes diffuse to the water.



Growth and Development in Arthropods

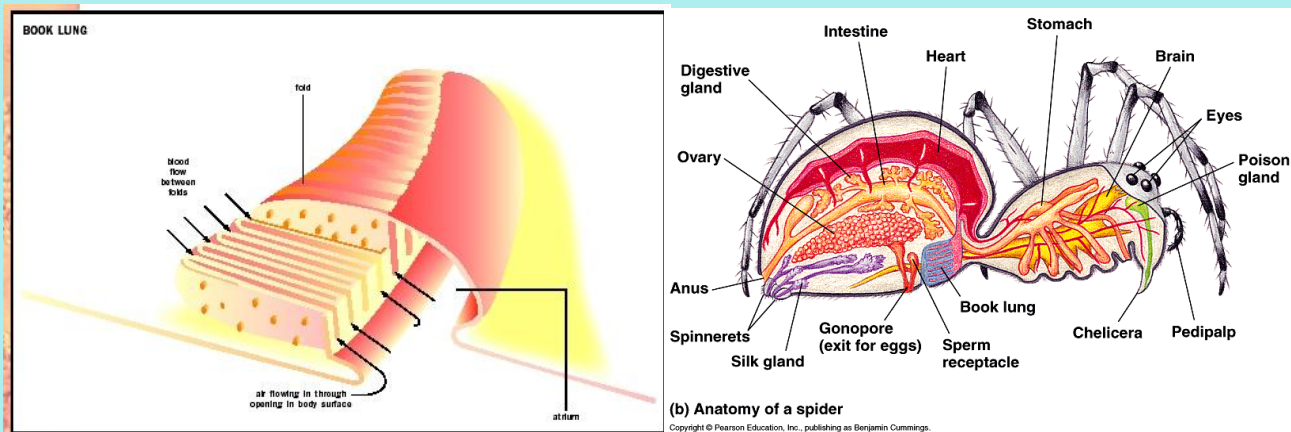
- Exoskeleton does not grow as the animal grows.
- When they outgrow their exoskeletons, arthropods undergo periods of molting.
- Molting: entire exoskeleton is shed and a larger one is made by skin glands to take its place.



<http://www.youtube.com/watch?v=4QIgW639Oog>

Respiration

- Most terrestrial arthropods breathe through a network of branching [tracheal tubes](#).
- Air enters and leaves the tubes through small openings.
- Some have [book lungs](#): organs that have stacked layers of respiratory tissue.



Assignment:

- 1) Read p .720-725
- 2) List the major groups of Arthropods.
- 3) For each group, list at least 4 important features.

Attachments

Octopus.asf

Arthropods.notebook

1.6_Echinoderms[1].notebook