

Gastropods

Period_____ Name_____

1. What does the word *Gastropod* mean?
2. What is torsion, and why is it important to a snail?
3. Describe the snail's circulatory system.
4. Compare the respiration of land snails to aquatic snails.
5. Snails eat with what organism? Describe how this works, use a diagram if necessary.

Class Gastropoda

Etymologically, the word "gastropod" is derived from Ancient Greek *γαστήρ* (*gastér*, stem: *gastr-*) "stomach", and *πούς* (*poús*, stem: *pod-*) "foot", hence stomach-foot, a rather anthropomorphic name based on the fact that to humans it seems that snails and slugs crawl on their bellies. In reality, snails and slugs have all their viscera, including digestive system with stomach, in a hump on the opposite, dorsal side of the body.

Major attributes:

1. Has become asymmetrical through torsion.
 2. Ganglionated nervous system.
 3. Reproduction varies - external fertilization and hermaphroditism.
 4. Most species have a foot, visceral mass, mantle and mantle cavity.
 5. Radula characteristic organ of Gastropoda.
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Description:

The gastropods, which include the snails, whelks, periwinkles, abalones and slugs, are the largest group of mollusks. They have either a single shell or no shell. Gastropods are common in both salt and fresh water and on land. They have become asymmetrical through an anatomical rearrangement called torsion (exemplified by snails). The visceral mass has become coiled and rotated through 180 degrees so that mouth, anus, and gills all face forward and the head can be withdrawn into mantle cavity. In cases where the shell has been lost (terrestrial slugs), the mantle is moved back towards its original position by detorsion.

Respiration and Circulation

Respiration



Flabellina iodinea, a nudibranch. Source: [Wikipedia](#).

have got two of them, usually one ctenidium is reduced. Besides, the stem usually melts with the pallial cavity's roof and the second row of feathers is also reduced, so that only the stem and one row of feathers remain.

Some snail groups secondarily build further gills. Limpets (*Patella*) for example have got several gill filaments in the pallial groove between foot, mantle and shell. The sea slugs called nudibranchs on the other hand have their mantle reduced as well as their gills (together with the pallial cavity). The resulting necessity of skin-based respiration during evolution led to the development of dorsal protrusions of these sea slugs, that are used for breathing and gave the group the name *Nudibranchia*, which means nude gill animals, as their gills are not hidden in the pallial cavity but showing into the water.

[Respiration and circulation](#) of a terrestrial snail (*Helix pomatia*).

► Pictures on the right: Respiratory organs of a fresh water snail (*Asolene megastoma*). Picture source: Stijn Ghesquiere: [applesnail.net](#).



Gill (Ctenidium)

The farthest reaching adaptations concerning the respiration have happened during the evolution of terrestrial snails. The primary gill had to be reduced, as breathing air with gills is impossible. Instead a network of capillary blood vessels on the rear wall of the pallial cavity was developed, that represents a simple lung, as oxygen is able to diffuse into the blood through the capillaries' walls, as well as carbon dioxide is able to leave the blood. Lung snails (*Pulmonata*) are able to close the opening of the pallial cavity by a ring muscle to prevent too high loss of water by evaporation. The process of breathing happens by lowering and rising of the pallial cavity's floor, about the same way as the human diaphragm is used.



Blood vessels of the lung.

Snails of border areas between land and water have achieved further interesting adaptations. [Pond snails](#) (*Lymnaea*) for example are able to fill their pallial cavity with water and to acquire oxygen from it, though they are pulmonate (lung) snails. They do so especially when the pond they live in is frozen. [Ram's horn snails](#) (*Planorbidae*) possess a strongly blooded mantle lobe that serves the water pulmonate snails as additional (accessory) gill, especially to get rid of carbon dioxide.

Circulation



The snails' blood not only serves to transport respiratory gases and nutrients. It also is the antagonist of the retractor muscles. There are on one hand muscles, that withdraw the important parts of the snail, such as Tentacles, as well as all of the snail's body (main retractor muscle), but on the other hand no muscle can push out a tentacle again. That happens by blood pressure. The snail's penis also is pushed out by blood pressure and withdrawn by muscle action after the process of mating. Snails consist of blood to 20 to 50 %, the sea hare's (*Aplysia*) body weight is about 75 % blood.

Ram's horn snail (*Planorbarius corneus*).[\[RN\]](#)

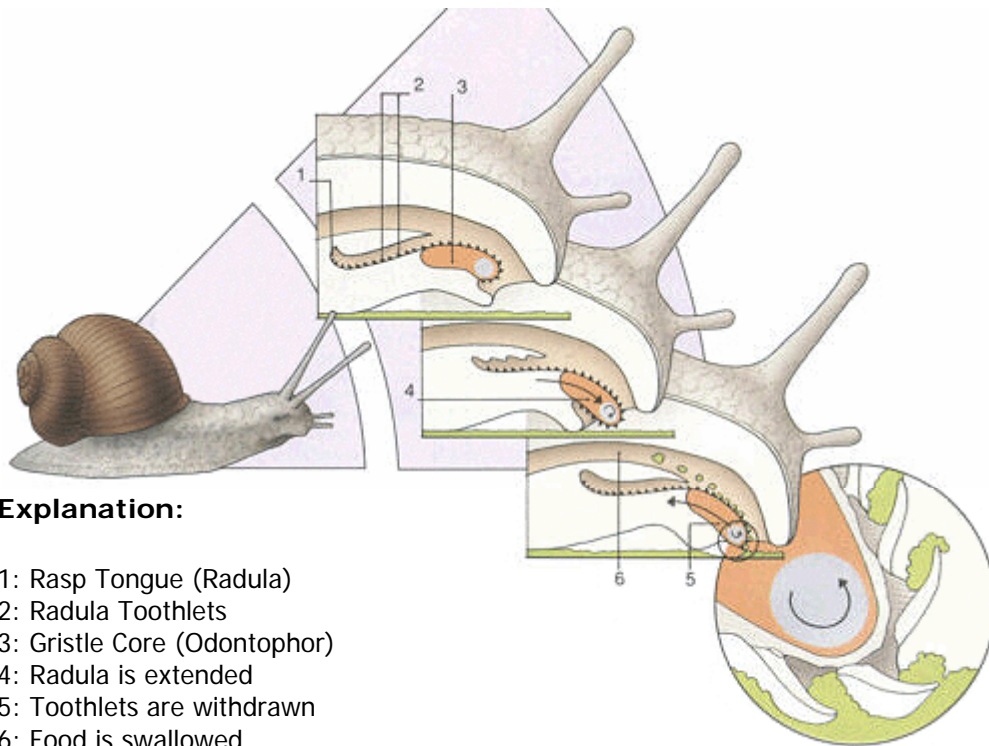
Most snails' blood pigment is haemocyanin. Contrary to haemoglobin, used by vertebrates, haemocyanin works on a complex with copper as oxygen binding atom. That is why snail blood in its oxidised state appears pale blue in colour.

Less often snails also use haemoglobin (the ram's horn snail *Planorbis* does), the blood pigments are different between snail groups. Snails' heart lies near the respiratory organs. Snails with transparent shells, such as *Vitrinidae* ([glass snails](#)) or *Succineidae* ([amber snails](#)) offer the possibility to see the heart without having to kill the snail. Snails usually have two heart chambers, one atrium and one ventricle. Few groups have two atriums, making the heart a three-chambered one. There is a valve between atrium and ventricle to prevent the blood from flowing back. **Snails' circulation basically is open.** The exception are few large blood vessels, that transport blood for example to the visceral sac or to the foot. Besides that the blood circulates freely in so called lacunae or sinuses, body cavities incompletely separated from each other by tissue walls.

Snail's Radula

Snails do not possess any mouthparts, such as a crab's mandibles; neither does it possess a set of teeth like a mammal. Instead, snails have got a specialized food processing organ, common to all molluscs: A rasping tongue or radula. Using it, snails are not able to bite of their food, but to rasp it down. The amounts of cabbage to be destroyed in one night by a sufficient number of slugs bear witness to this organ's efficiency.

A snail's rasping tongue basically resembles a miniature bucket-wheel excavator: An elastic band is moved over a gristle core. Toothlets on the band move through the food and doing so, they rasp particles away and move them to the rear, into the snail's gullet. But a snail does not only use its radula to process food: The radula is also used to clean the shell from rests of dried mucus. When the snails do that, a distinct rasping sound can be heard, if one pricks one's ears.



Explanation:

- 1: Rasp Tongue (Radula)
- 2: Radula Toothlets
- 3: Gristle Core (Odontophor)
- 4: Radula is extended
- 5: Toothlets are withdrawn
- 6: Food is swallowed.

Source: "Enzyklopädie der Natur", Munich 2000.