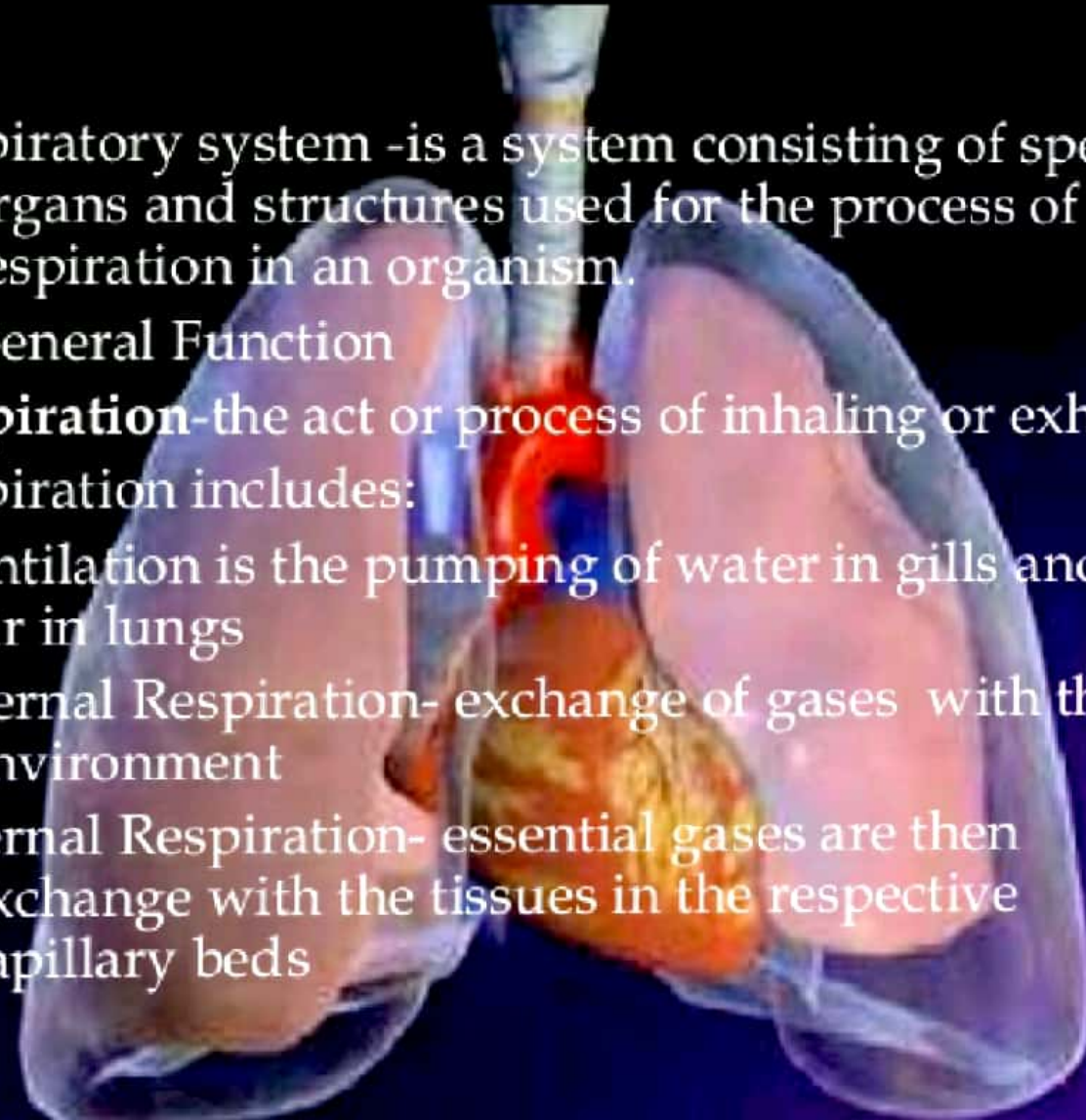


comparative anatomy



Respiratory system -is a system consisting of specific organs and structures used for the process of respiration in an organism.

▣ General Function

Respiration-the act or process of inhaling or exhaling

Respiration includes:

- Ventilation is the pumping of water in gills and of air in lungs
- External Respiration- exchange of gases with the environment
- Internal Respiration- essential gases are then exchange with the tissues in the respective capillary beds

Respiratory Organs

An anatomical illustration of the human respiratory system. It shows the trachea (windpipe) at the top, branching into the bronchi (main airways) which lead to the lungs. The lungs are shown in a light pinkish-purple color, and the heart is visible in the center, colored in shades of orange and red. The entire system is set against a dark blue background.

▣ GILLS

- ❖ Vertebrate gills are designed for water breathing
 - ❖ Mechanism of ventilation depends on whether the gills are located internally or externally
1. INTERNAL GILLS
 2. EXTERNAL GILLS



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Respiratory Organs

An anatomical illustration of the human respiratory system. It shows a pair of lungs, one on each side, with a central heart. The trachea is visible at the top, leading down to the bronchi. The lungs are depicted in a light pinkish-red color, while the heart is shown in a darker red. The background is a dark blue gradient.

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▣ **LUNGS**

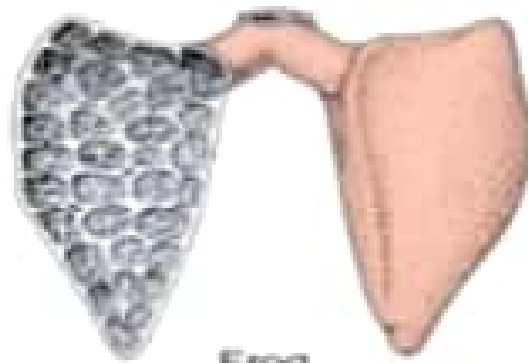
- ❖ Designed for air breathing
- ❖ Elastic bags that lie within the body
- ❖ Volume expands when air is inhaled and decreases when air is exhaled

▣ **GAS BLADDERS**

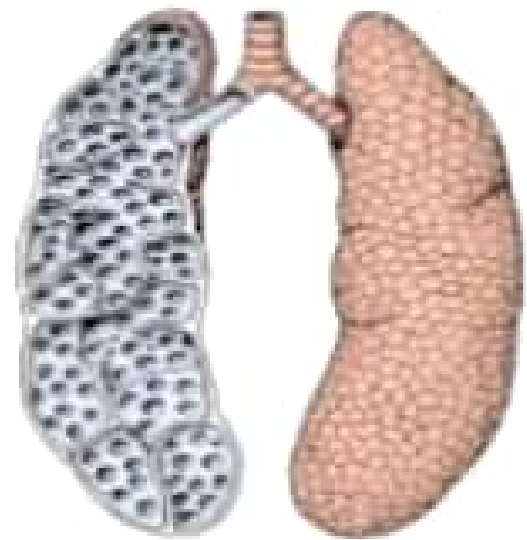
- ❖ Are air filled with the air
- ❖ Swim bladders are used to control the buoyancy of a fish



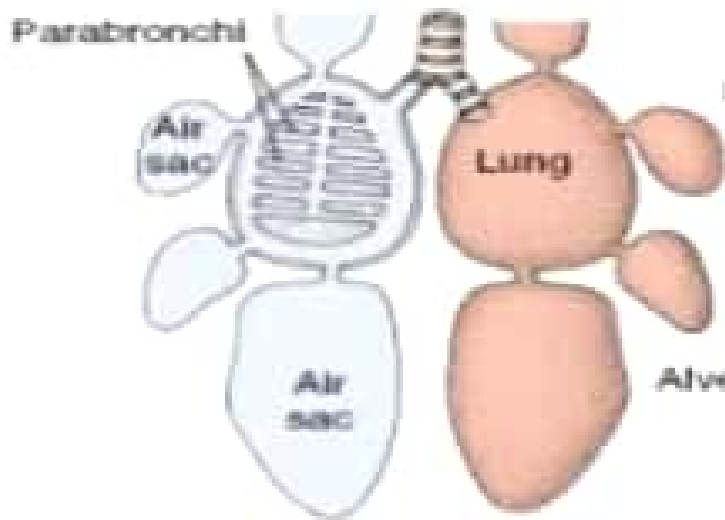
Salamander



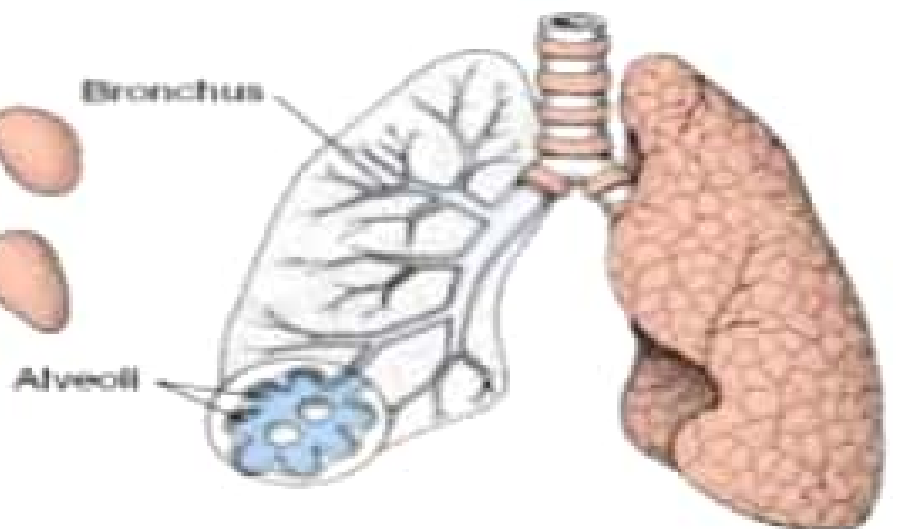
Frog



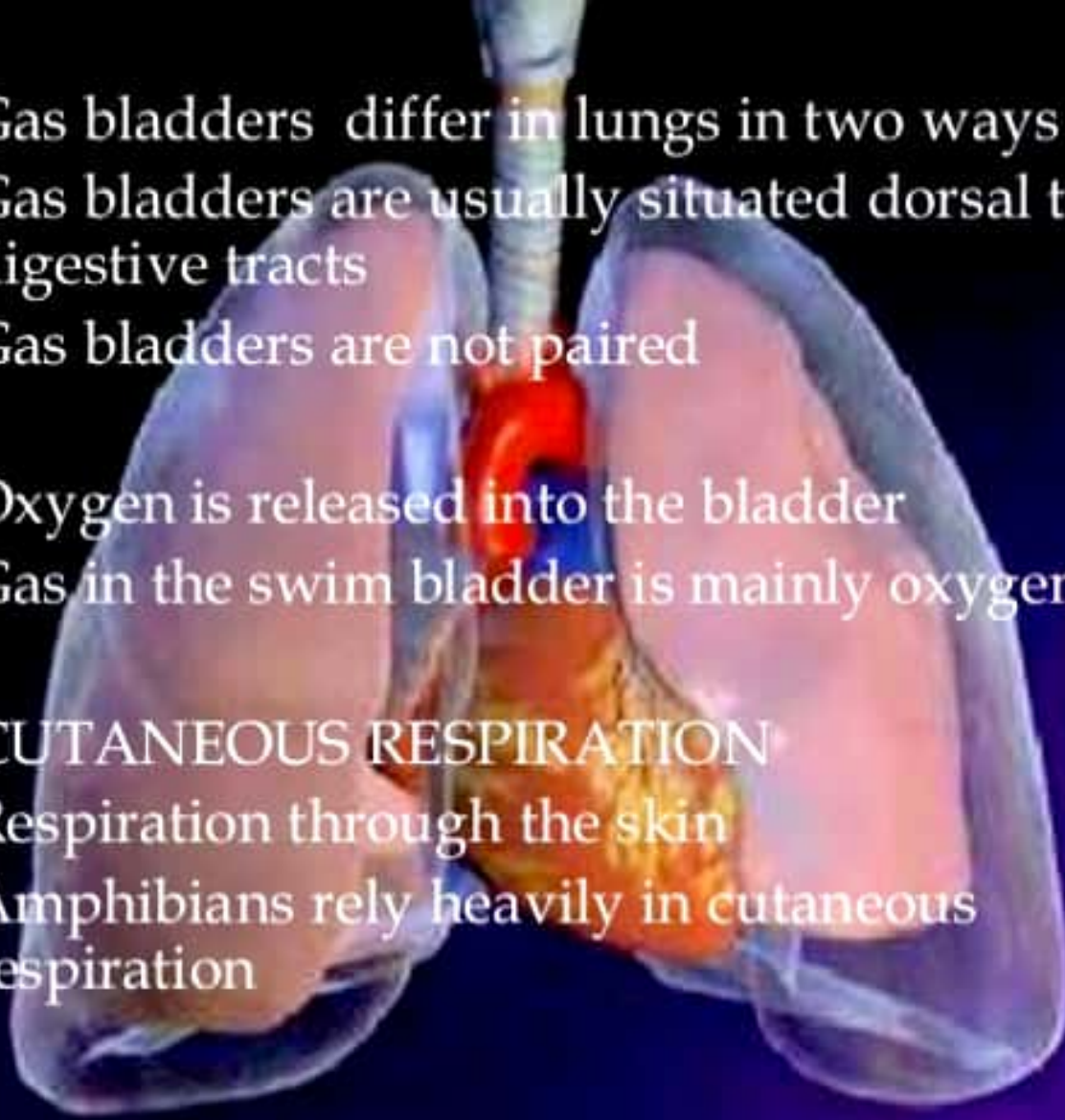
Lizard



Bird



Mammal

- 
- The diagram shows a vertebrate's internal organs. The lungs are large, pinkish-purple structures on either side of the central heart. The heart is a red, multi-chambered organ. Below the heart is a large, yellowish, sac-like structure, likely the swim bladder. The trachea is visible at the top, leading to the lungs. The overall background is dark blue.
- ❖ Gas bladders differ in lungs in two ways
 1. Gas bladders are usually situated dorsal to the digestive tracts
 2. Gas bladders are not paired
 - ❖ Oxygen is released into the bladder
 - ❖ Gas in the swim bladder is mainly oxygen
 - ▣ CUTANEOUS RESPIRATION
 - ❖ Respiration through the skin
 - ❖ Amphibians rely heavily in cutaneous respiration



▣ BREATHING EMBRYOS

- ❖ Chorioallantois in birds acts as respiratory organs in birds
- ❖ It sustains the respiratory needs of the chicken embryo for most of its time in the egg

▣ VENTILATORY MECHANISM

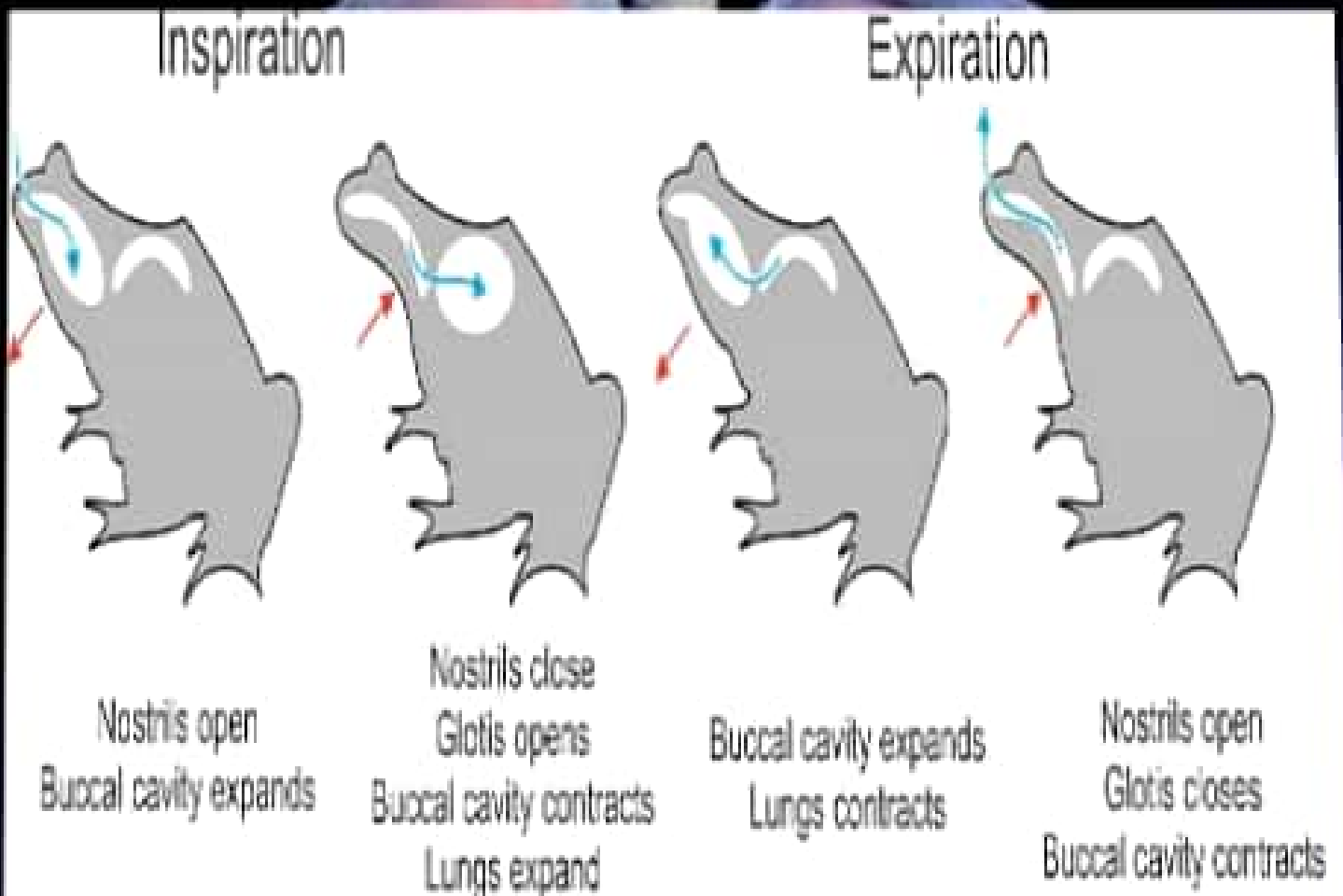
- ❖ CILIA lines the routes along which water current flows

An anatomical illustration of the human respiratory and circulatory systems. The lungs are shown in a light pinkish-purple color, with the heart in the center, colored in shades of red and orange. The trachea is visible at the top, and the diaphragm is partially shown at the bottom. The background is a dark blue gradient.

▣ MUSCULAR MECHANISM

- ❖ Ventilation on vertebrates usually depends much on muscle action
 - ❖ Ram ventilation is a technique by which the fish's own forward locomotion contributes to gill ventilation
1. Water Ventilation: Dual pump
 2. Air ventilation: Pulse pump
 3. Air ventilation: Aspiration pump

Air Ventilation: Pulse pump

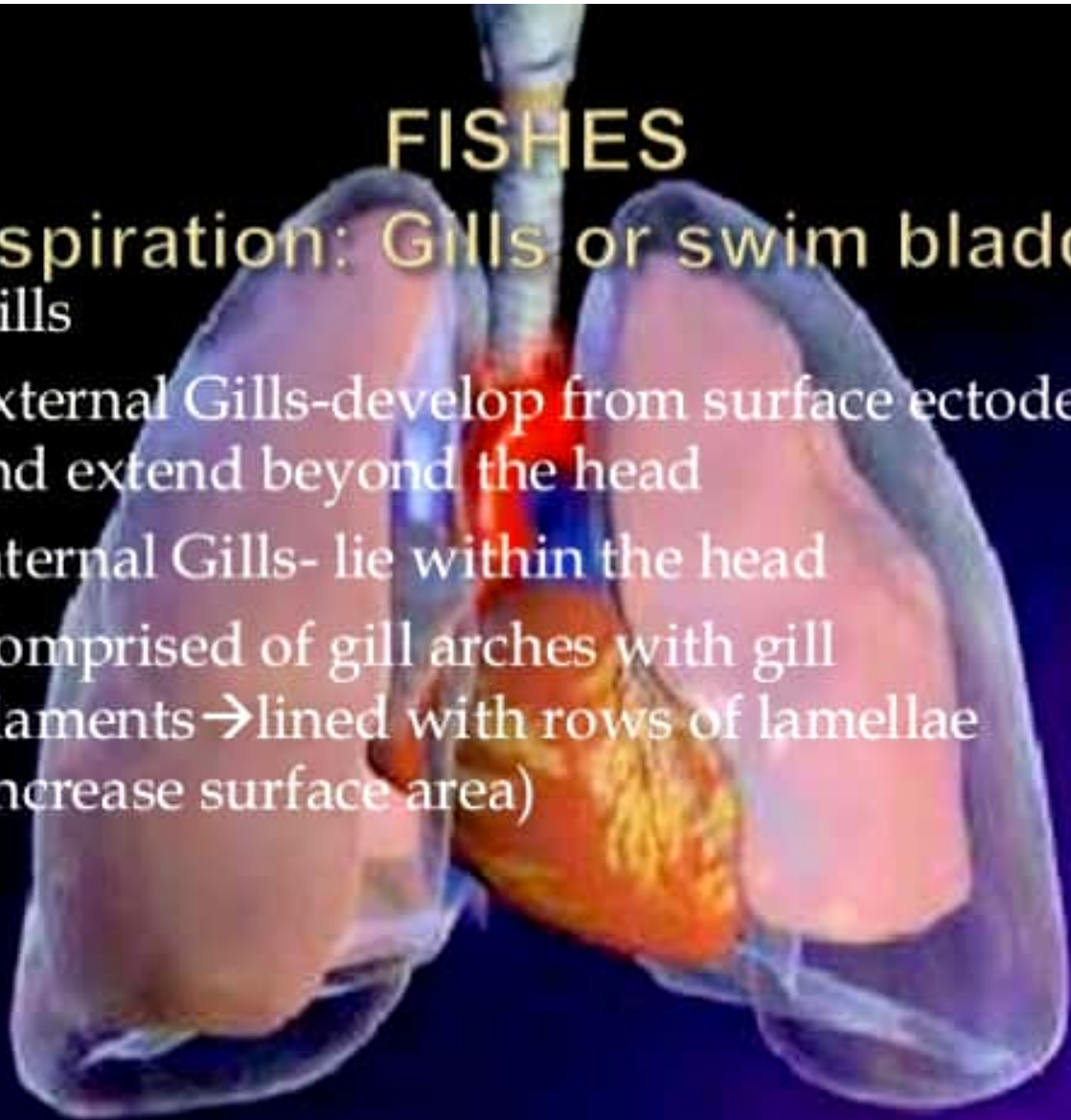


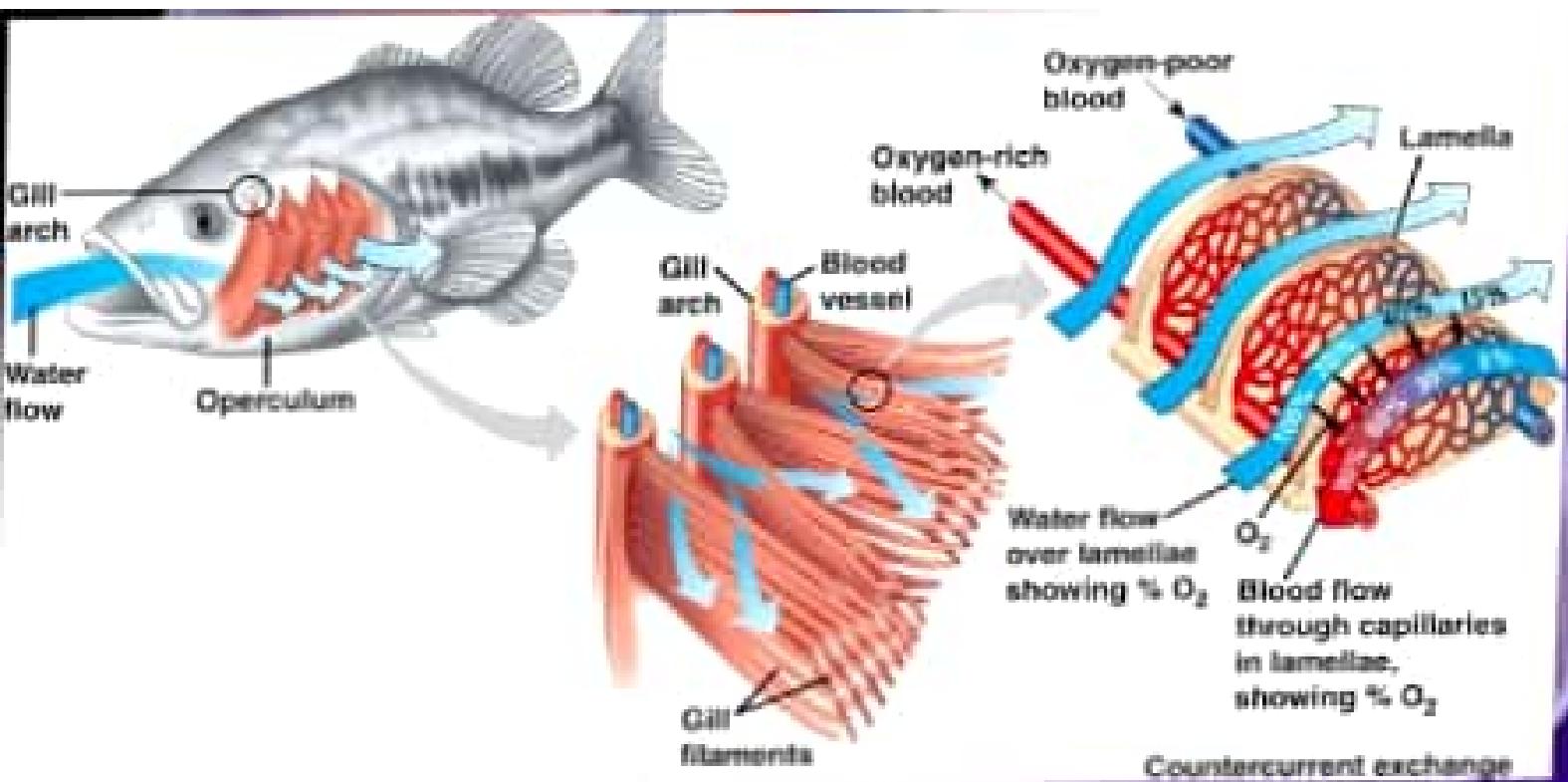
FISHES

Respiration: Gills or swim bladder

▣ Gills

- ❖ External Gills-develop from surface ectoderm and extend beyond the head
- ❖ Internal Gills- lie within the head
- ❖ Comprised of gill arches with gill filaments → lined with rows of lamellae (increase surface area)

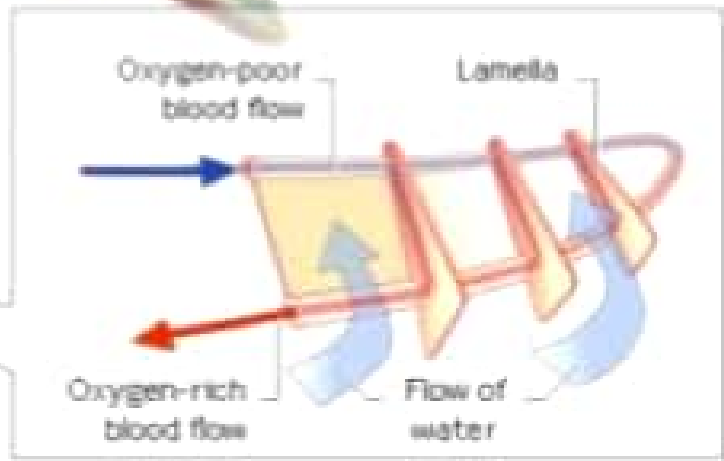
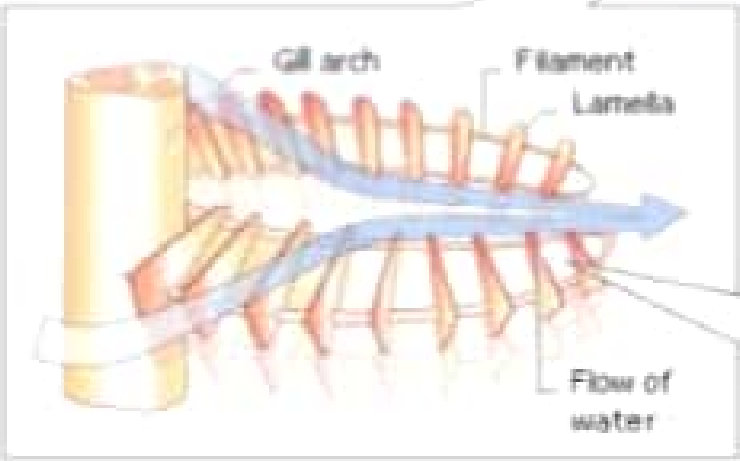
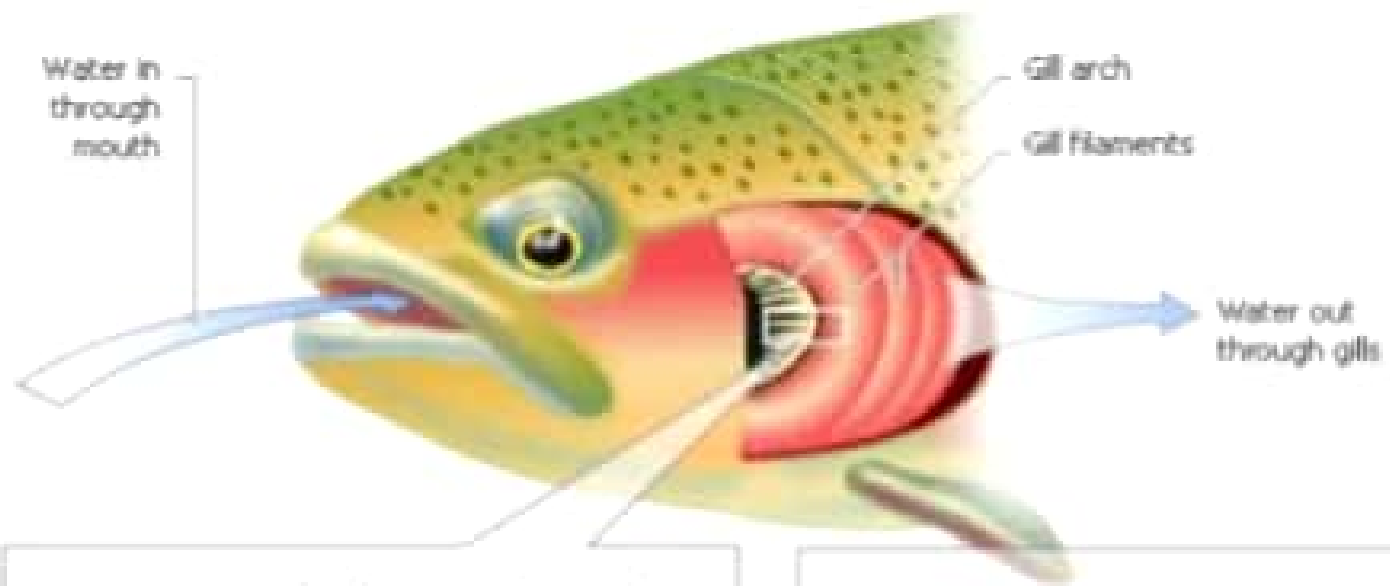




▣ INTERNAL GILLS

- develop from the pharynx as evaginations called pharyngeal pouches
 - Visceral grooves (opposite to the pouches)
 - Closing plates (separates pouches and grooves)
- The general structure of a mature gill is composed of several parts:
 - Gill bars (support the gills)
 - Gill rakers (prevents food particles from entering)
 - Gill rays
 - Gill filaments and Gill lamellae



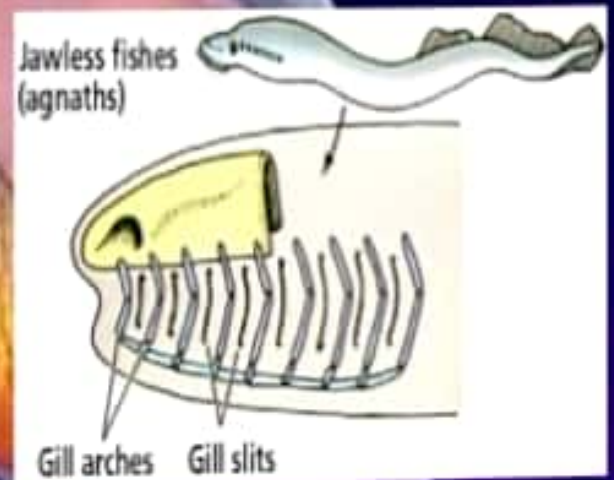


▣ 3 TYPES OF GILL BARS

- ❖ Holobranch
- ❖ Hemibranch
- ❖ Pseudobranch

▣ AGNATHAN

- ❖ Pouched gills
- ❖ 6-15 pairs of gill pouches
- ❖ No gill Slits
- ❖ Hagfishes and lampreys



▣ Cartilaginous fishes

❖ Septal Gills

❖ 5 "naked" gill slits

❖ Shark and rays

▣ Bony Fishes

❖ Opercular gills (operculum)

❖ 5 gill slits

❖ Eels, salmon and milk fish

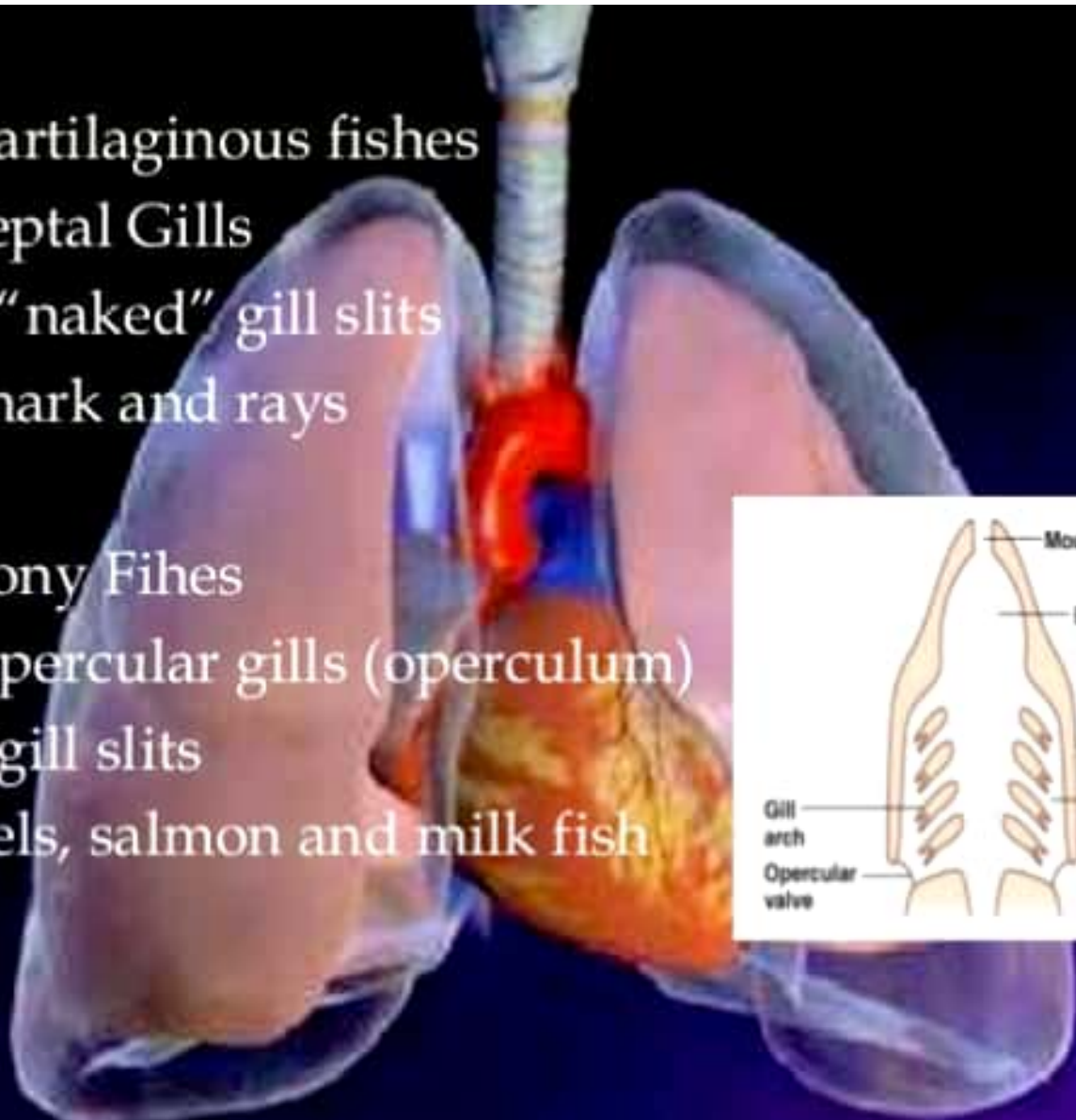
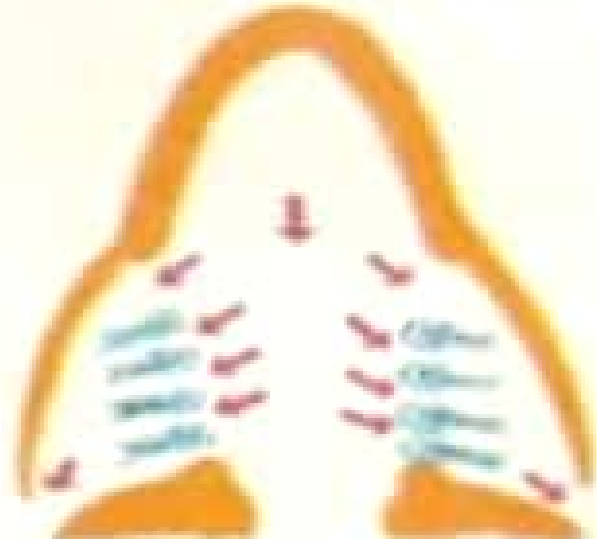


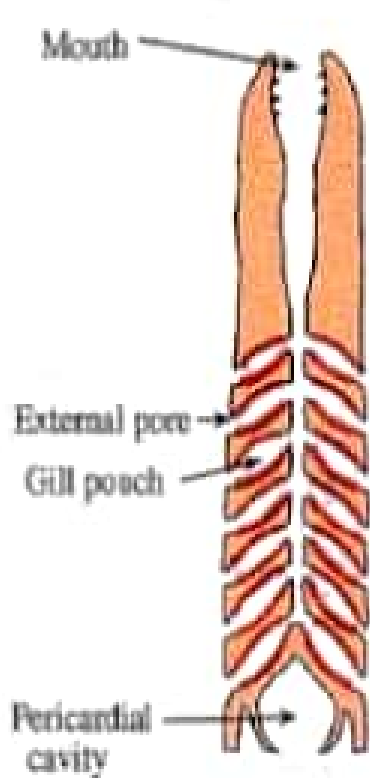
diagram of the circulation of water through the gills (the arrows show the direction of the water)



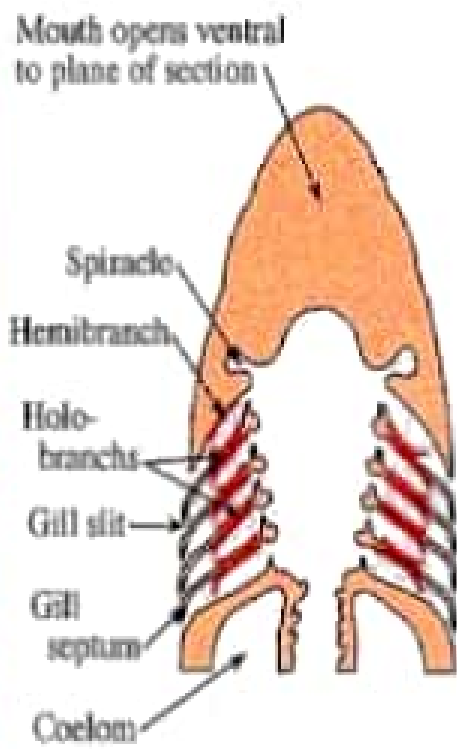
gill system in cartilaginous fish



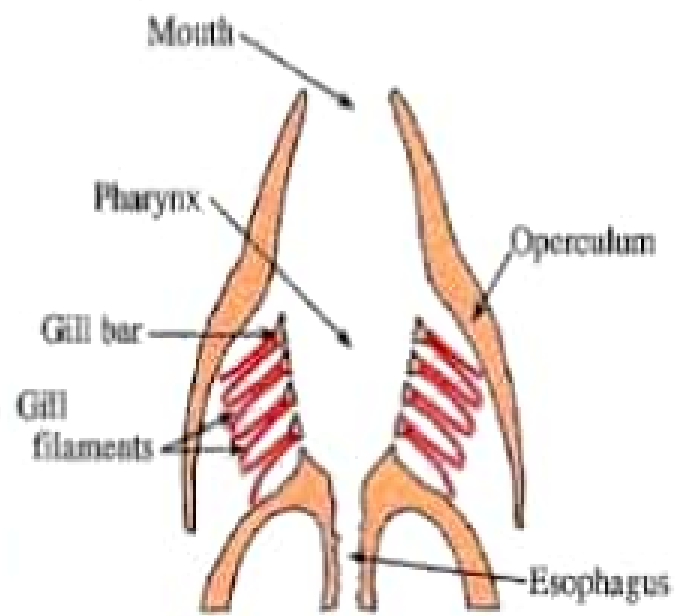
gill system in bony fish



**Pouched gills
(lamprey)**

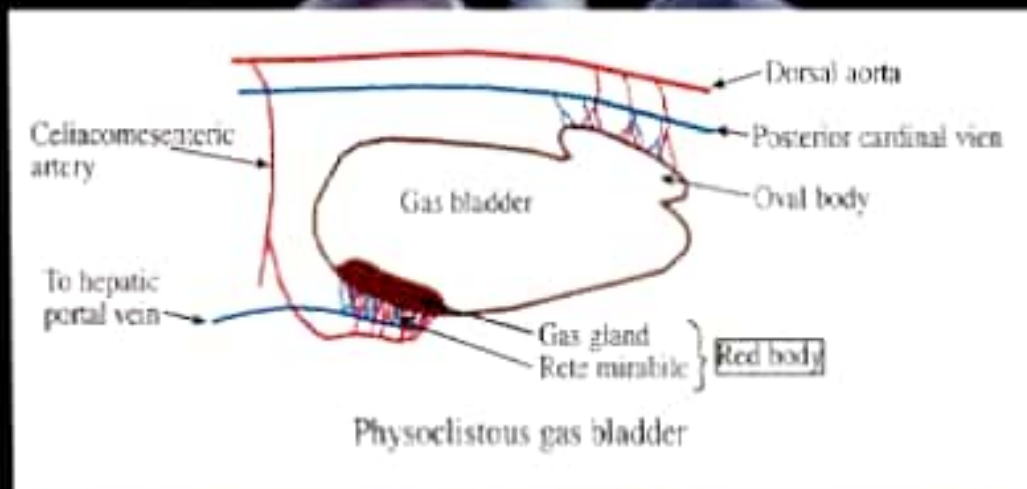


**Septal gills
(shark)**



**Opercular gills
(teleost)**

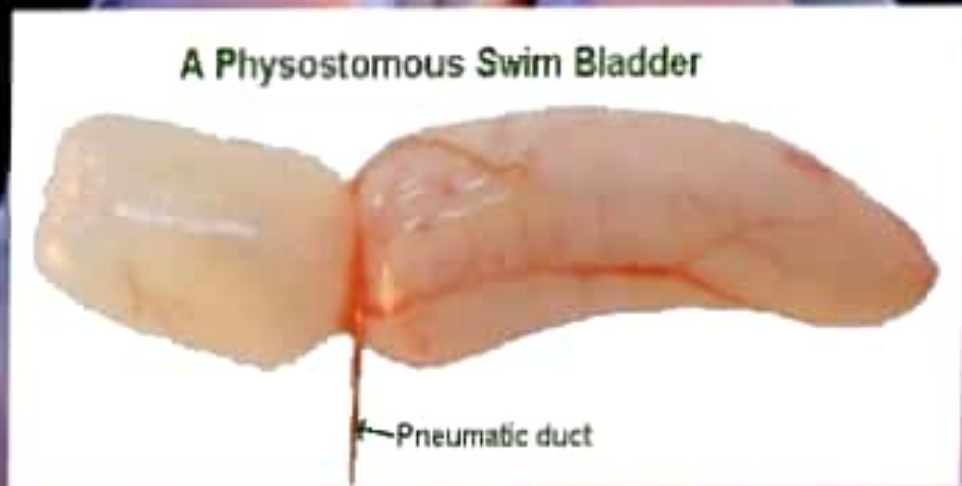
▣ SWIM BLADDERS



Gas or swim bladders of fishes may be located high in the cavity to remain upright

1. Physostomous

- ❖ Function for respiration



2. Physoclitous

- ❖ Do not function for respiration

- ❖ Serves as an hydrostatic organ
- ❖ Oxygen and carbon dioxide are exchanged between the bladder and the blood
- ❖ Also important in hearing and sound production

