

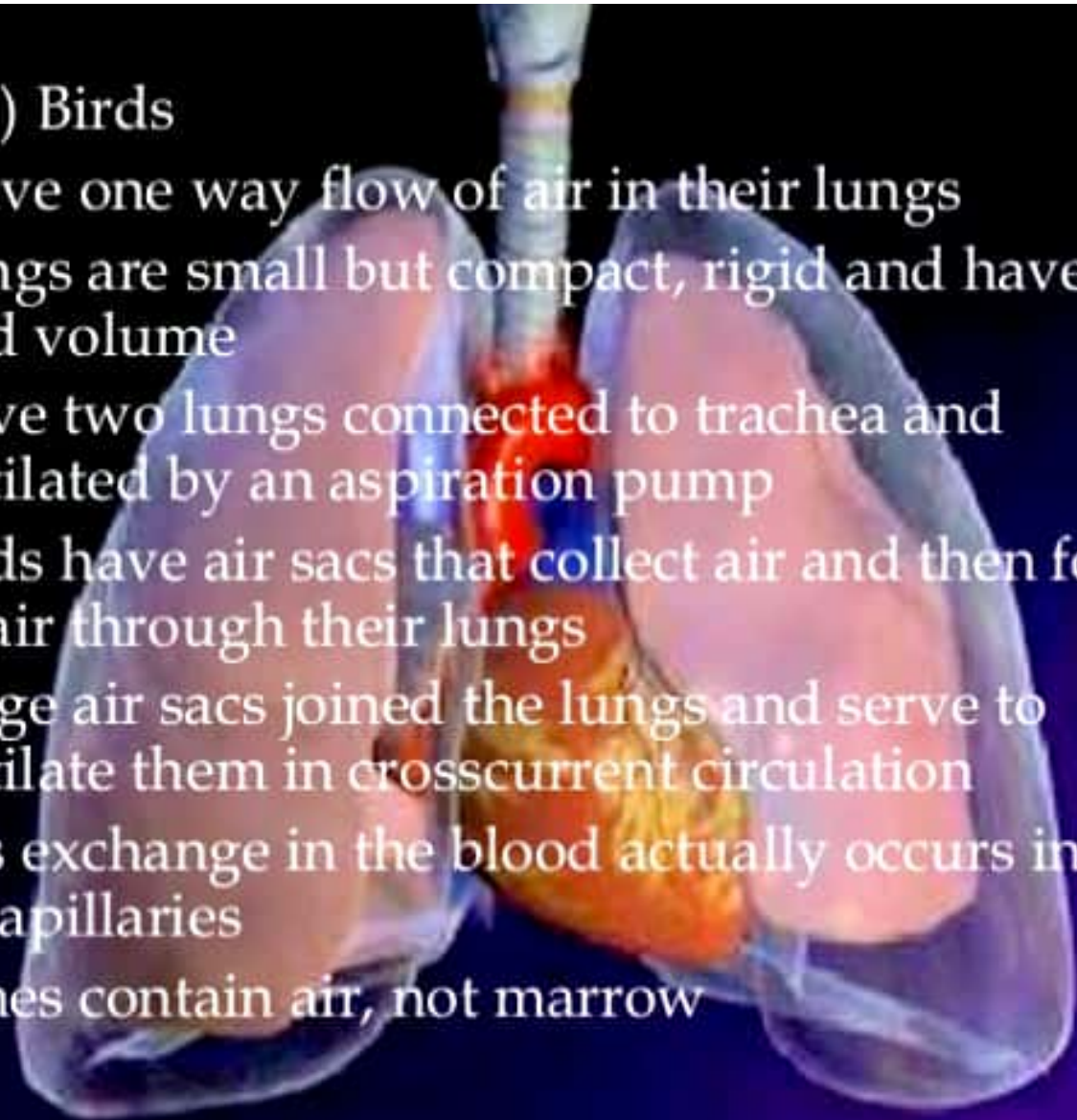
respiratory system 3

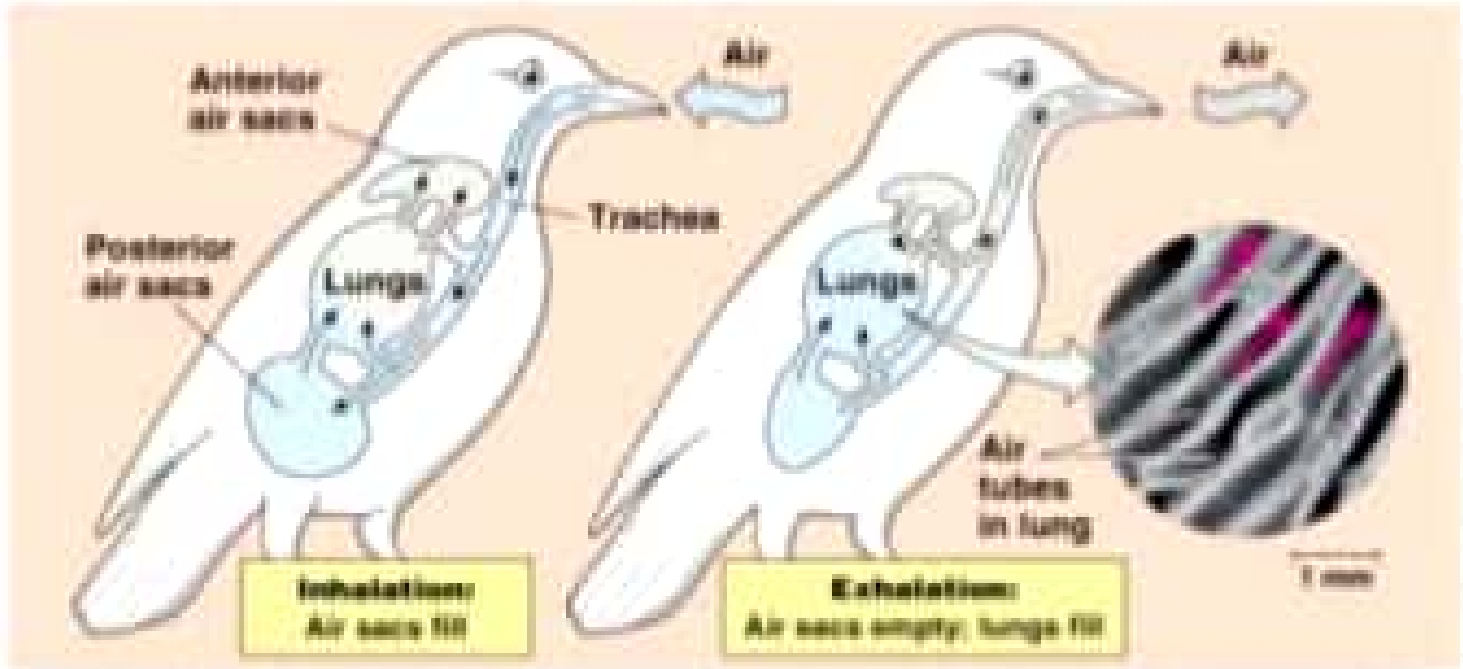
Birds



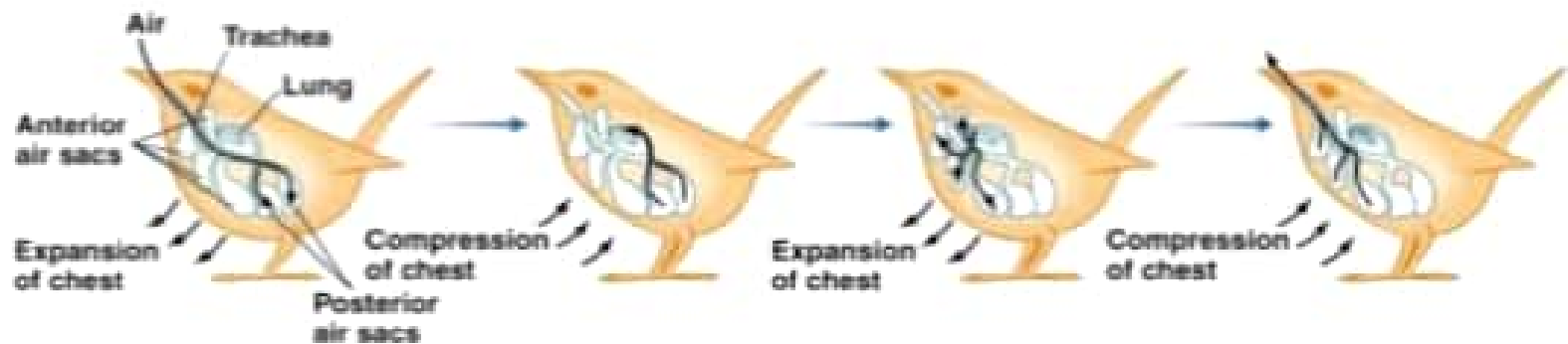
▣ 5.) Birds

- Have one way flow of air in their lungs
- Lungs are small but compact, rigid and have a fixed volume
- Have two lungs connected to trachea and ventilated by an aspiration pump
- Birds have air sacs that collect air and then force the air through their lungs
- Large air sacs joined the lungs and serve to ventilate them in crosscurrent circulation
- Gas exchange in the blood actually occurs in the air capillaries
- Bones contain air, not marrow





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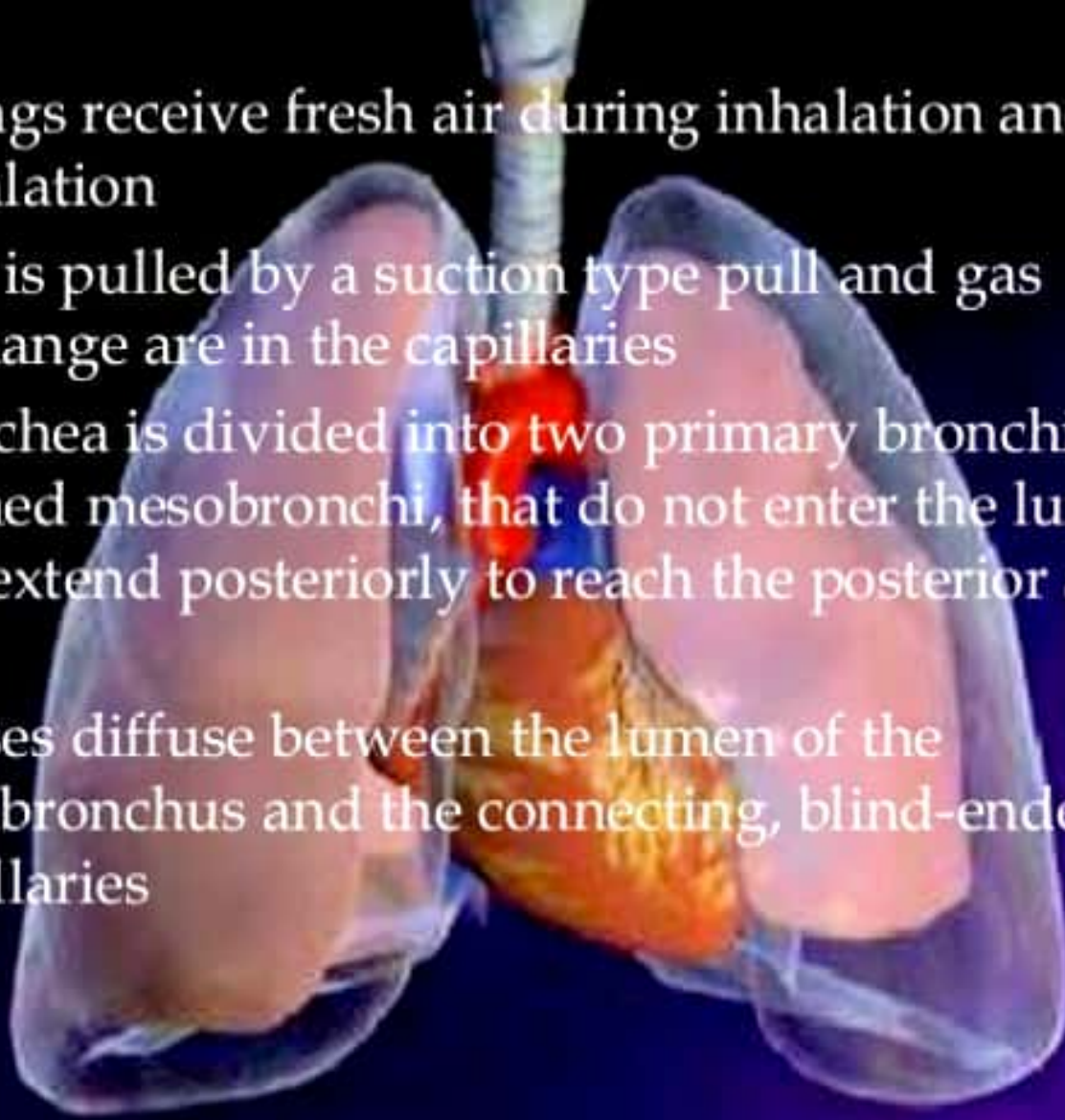
1 Expansion of the chest during the first inhalation causes fresh air to flow through the bronchi to the posterior air sacs.

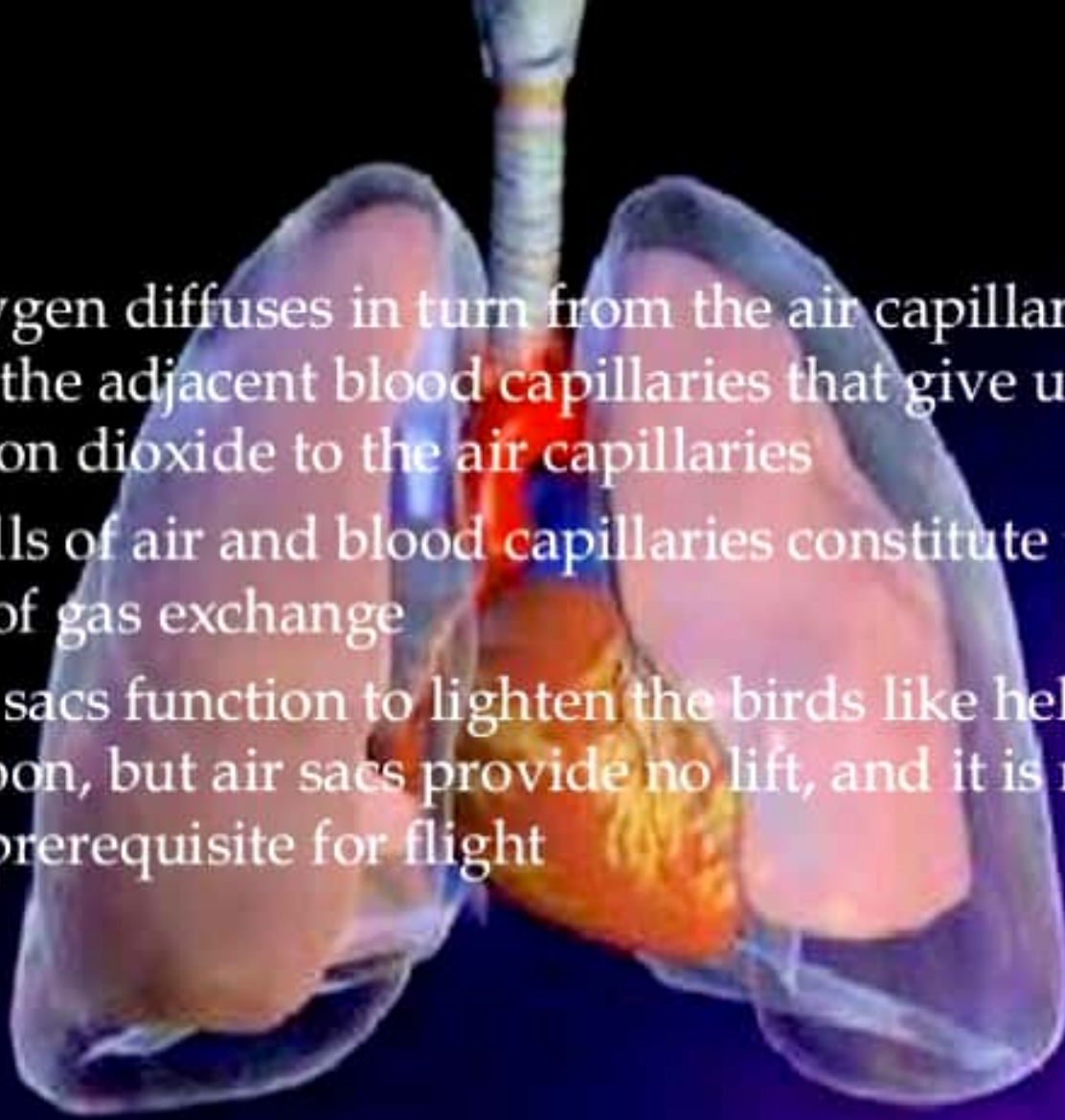
2 Compression of the chest during the first exhalation pushes the fresh air from the posterior air sacs into the lungs.

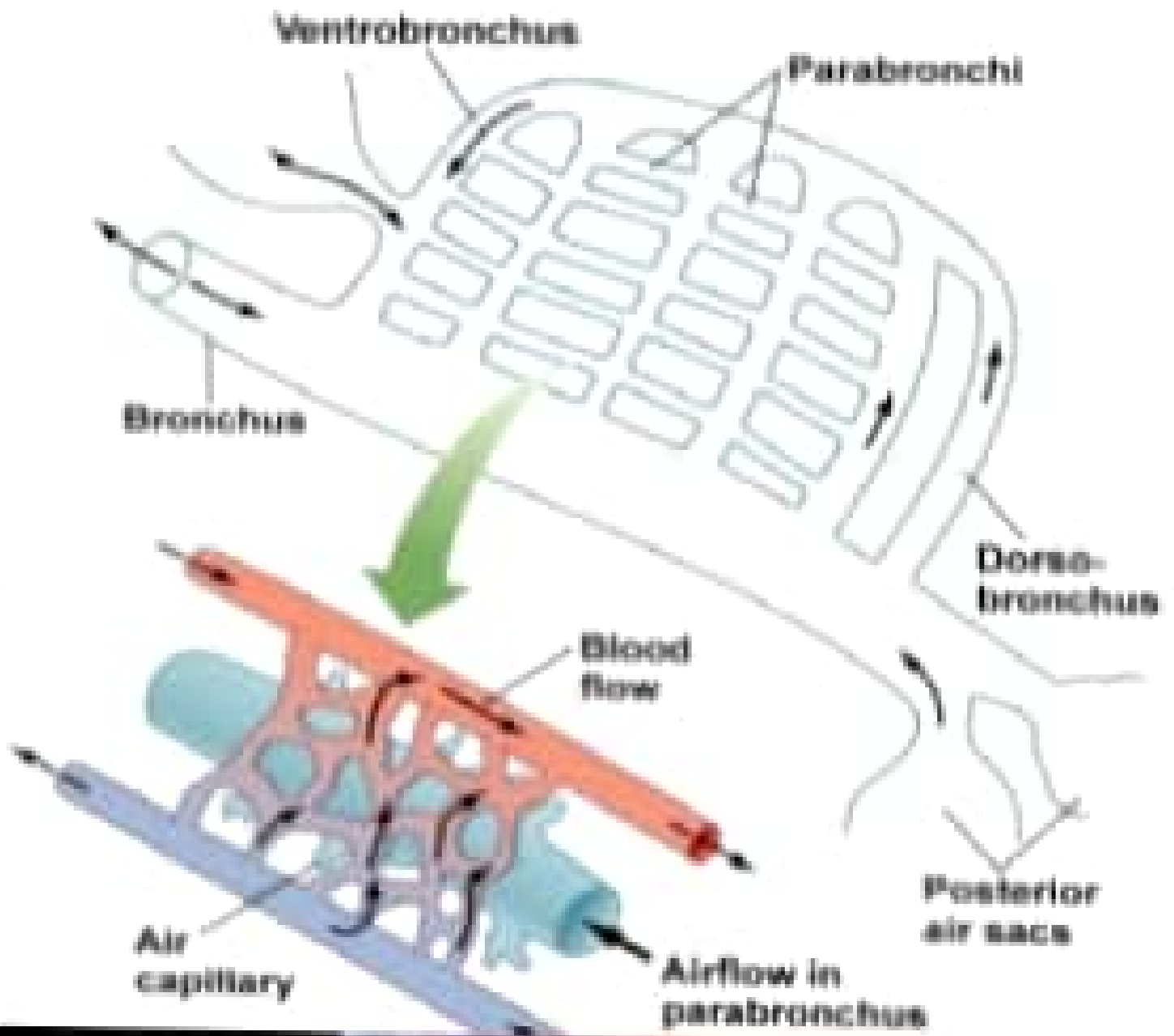
3 Expansion of the chest during the second inhalation causes stale air to flow from the lungs into the anterior air sacs.

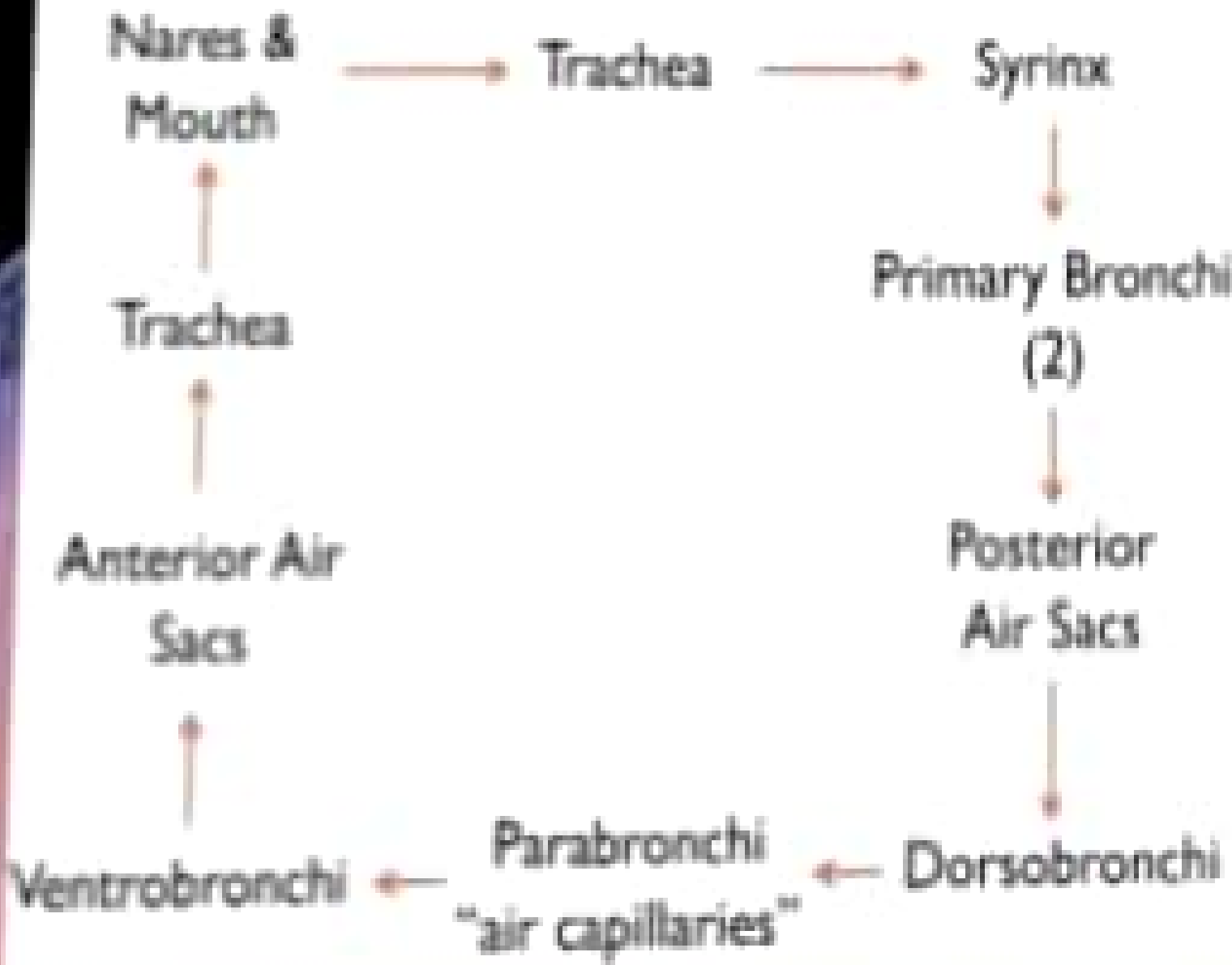
4 Compression of the chest during the second exhalation pushes stale air from the anterior air sacs out via the trachea.

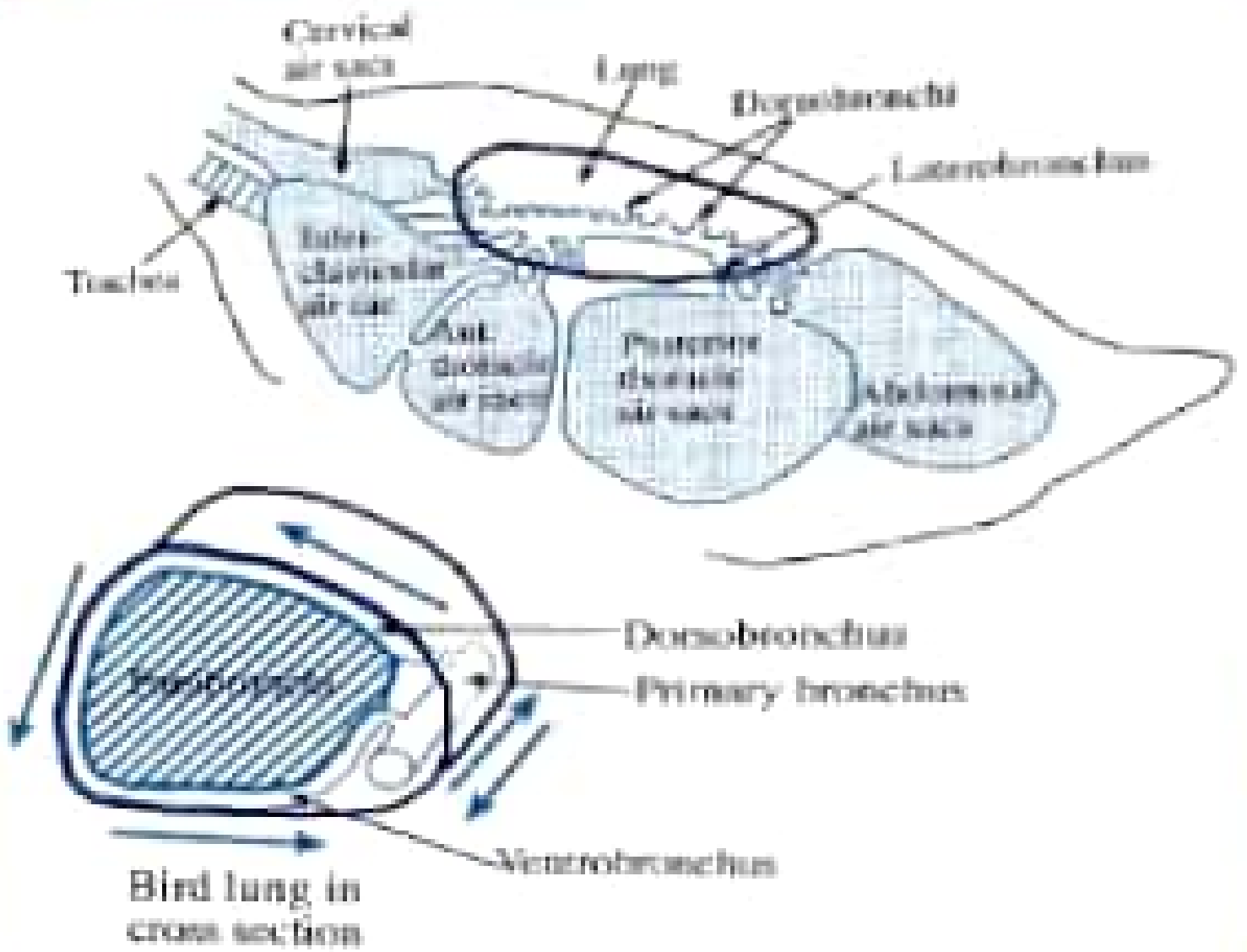
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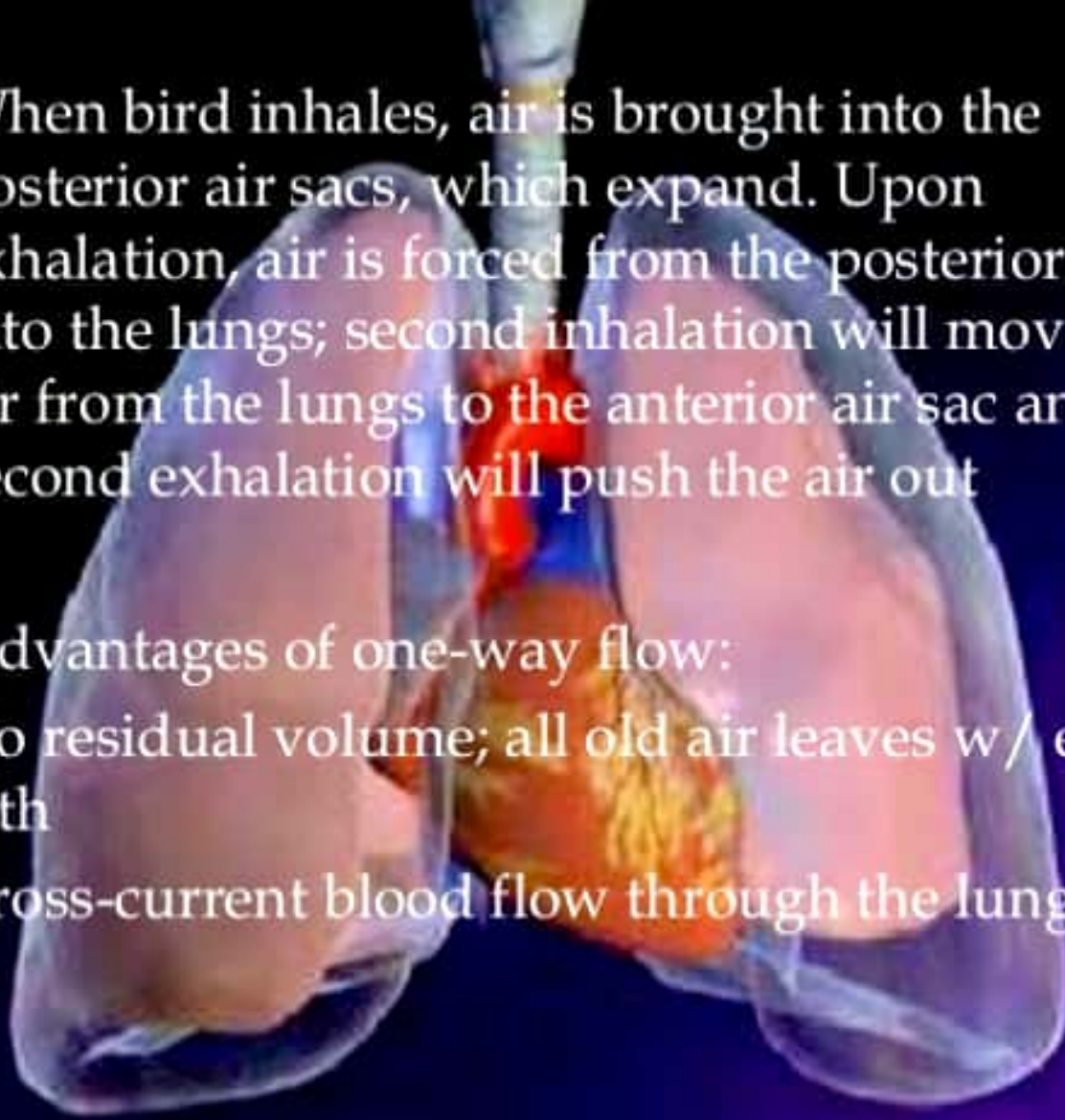
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- An anatomical illustration of the human respiratory system. The trachea is shown at the top, branching into two primary bronchi that lead to the lungs. The lungs are depicted in a light pinkish-red color, with a network of smaller bronchi and capillaries visible. The heart is shown in a reddish-orange color, positioned centrally between the lungs. The background is a dark blue gradient.
- Lungs receive fresh air during inhalation and exhalation
 - Air is pulled by a suction type pull and gas exchange are in the capillaries
 - Trachea is divided into two primary bronchi, termed mesobronchi, that do not enter the lung but extend posteriorly to reach the posterior air sacs
 - Gases diffuse between the lumen of the parabronchus and the connecting, blind-ended air capillaries

- 
- Oxygen diffuses in turn from the air capillaries into the adjacent blood capillaries that give up carbon dioxide to the air capillaries
- Walls of air and blood capillaries constitute the site of gas exchange
- Air sacs function to lighten the birds like helium balloon, but air sacs provide no lift, and it is not the prerequisite for flight







An anatomical diagram of a bird's respiratory system. The trachea is shown at the top, leading to the lungs. The lungs are depicted in a reddish-pink color, with a network of blood vessels visible. Below the lungs are several air sacs, shown in a lighter, translucent color. The diagram illustrates the one-way flow of air through the system.

▣ When bird inhales, air is brought into the posterior air sacs, which expand. Upon exhalation, air is forced from the posterior sacs into the lungs; second inhalation will move the air from the lungs to the anterior air sac and second exhalation will push the air out

▣ Advantages of one-way flow:

1.) No residual volume; all old air leaves w/ each breath

2.) Cross-current blood flow through the lungs

❖ Pattern of Gas Transfer

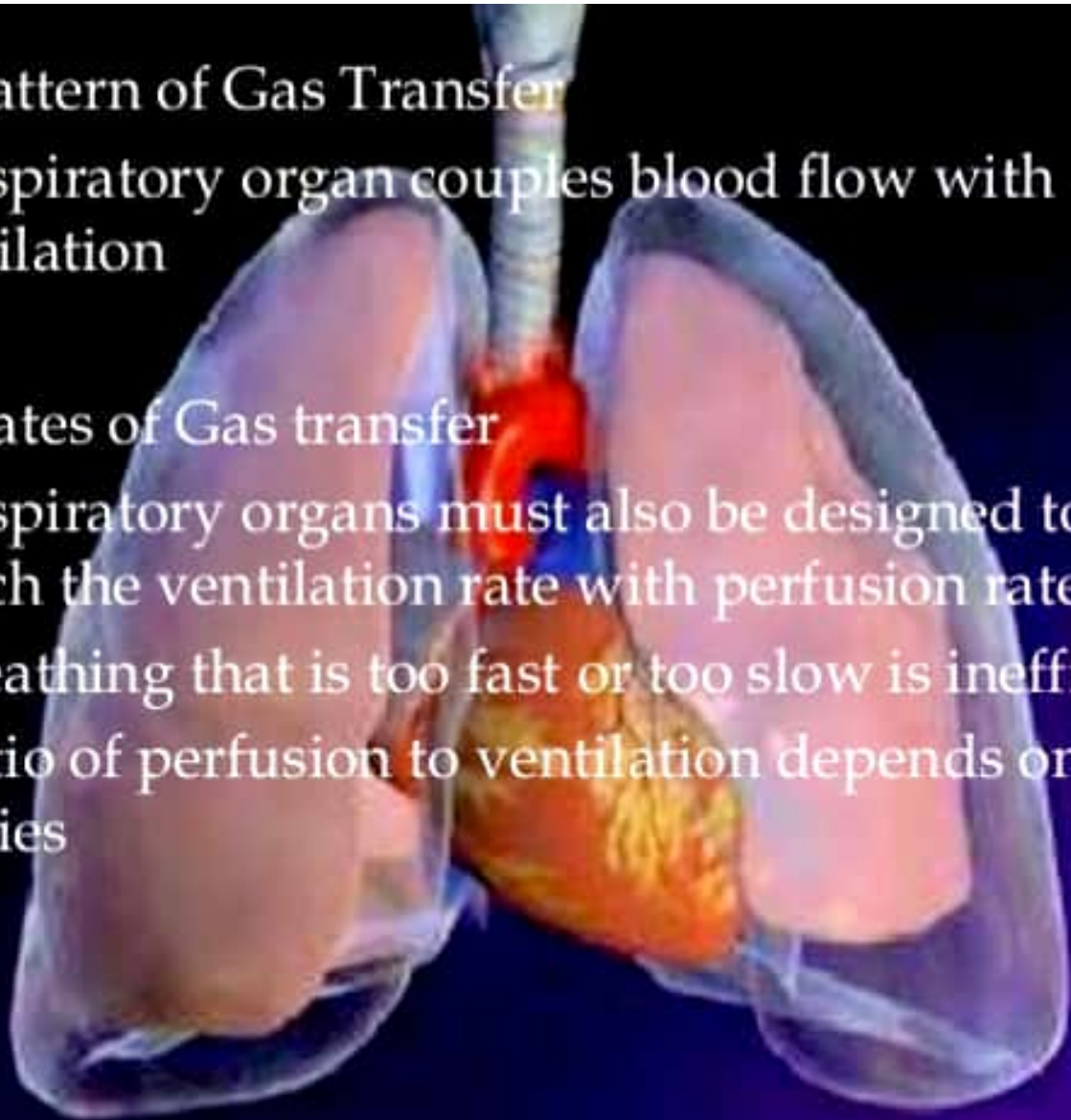
- Respiratory organ couples blood flow with ventilation

❖ Rates of Gas transfer

- Respiratory organs must also be designed to match the ventilation rate with perfusion rate

- Breathing that is too fast or too slow is inefficient

- Ratio of perfusion to ventilation depends on the species



- ▣ Breathing in Water
- Water is considerably denser than air



FISHES

| Cartilaginous Fishes | Bony Fishes (Teleost) | Agnathans |
|----------------------|---------------------------|-------------------------------|
| Septal Gills | Opercular Gills | Pouched Gills |
| 5 "naked" gill slits | Usually have 5 gill slits | 6 to 15 pairs of gill pouches |
| Sharks and Rays | Eels, milkfish, salmon | Hagfishes and Lampreys |

| Reptiles | Amphibians | Birds | Mammals |
|--|--|---|--|
| No vocal cords | Simple saclike lungs | Most of the birds has nine sacs and these are: anterior and posterior sacs | Human breathe through lungs |
| No True Diahragms | Some amphibians have no lungs like Salamander | The typical bird trachea is 2.7 times longer and 1.29 wider than that of similarly-sized animals. | Alveoli- spongy and has a little sac |
| Reptile lungs composed of three and these are: Unicameral, Multicameral and Paucicameral | Skin- Cutaneous Respiration | Avian lungs | Trachea |
| Reptiles are capable of surviving for long periods without breathing. | Many amphibians used gills at least when they are young. | | Bronchi- structure similar to trachea, flexible tubes with stiffening walls of hyaline cartilage |
| | | | Bronchioles |

| BIRD | FISH | MAMMAL | REPTILE | AMPHIBIAN |
|--|---|---|---|---|
| <ul style="list-style-type: none"> • Unidirectional • Lungs • Aspiration pump • Longer and wider trachea compared to mammals • Air sacs | <ul style="list-style-type: none"> • Unidirectional • Gills • Dual pump • 5 to 7 pairs of gills | <ul style="list-style-type: none"> • Bidirectional • Lungs • Aspiration pump • Muscles are used • Air are filtered | <ul style="list-style-type: none"> • Bidirectional • Lungs • Aspiration pump • Much larger lungs than mammals • Can survive for long periods without breathing • Muscles are used | <ul style="list-style-type: none"> • Bidirectional • Lungs and skin • Pulse pump • Simple saclike lungs |