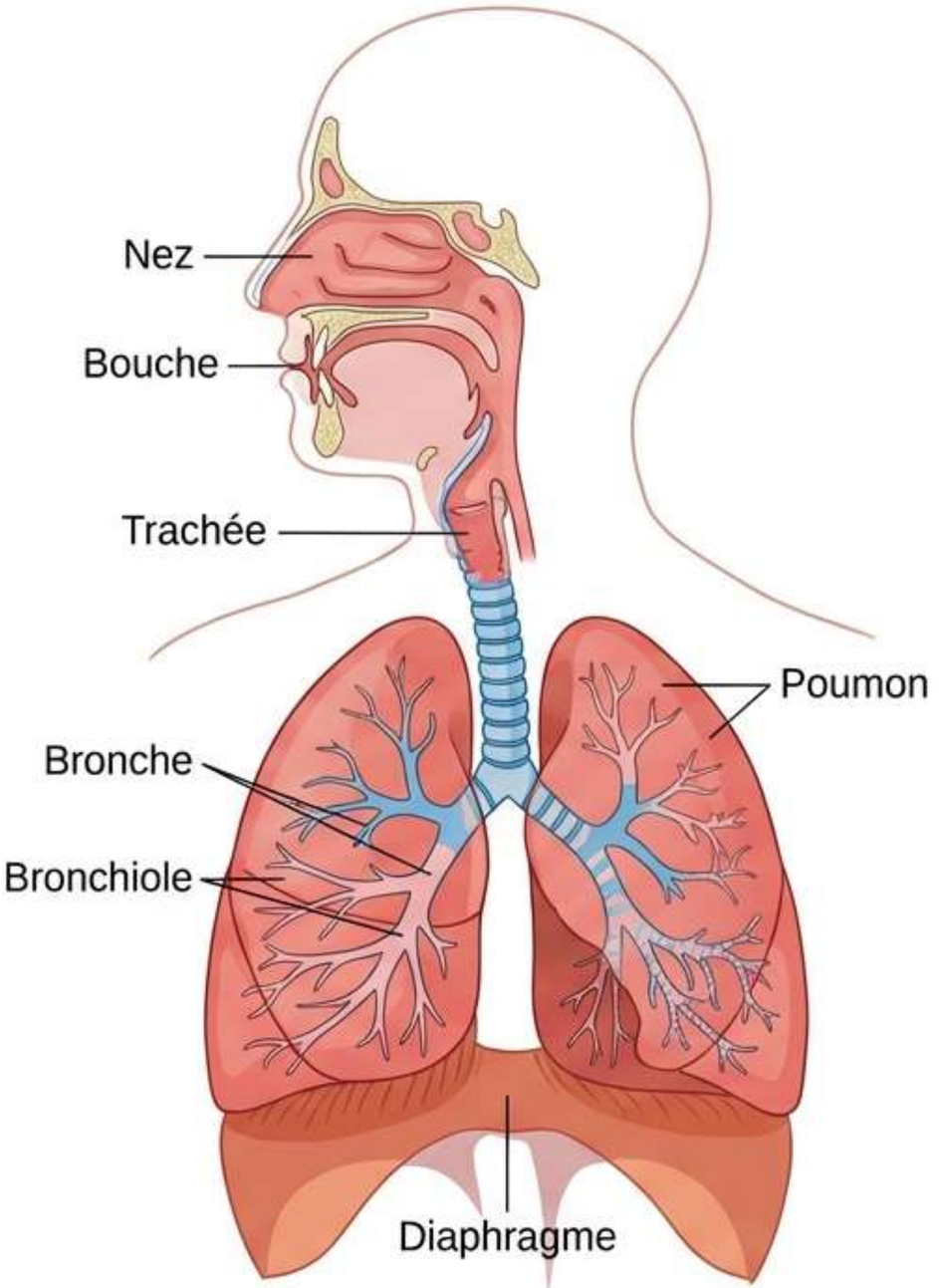
The Respiratory System

Study Guide & Course Objectives

- To know the organs of the respiratory system
- To know the situation of each organ
- To know the function of the respiratory system [Ref: Q12]



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Introduction & General Organization

Function

Ensures gas exchanges with the exterior to supply body cells with **oxygen** (#2E8B57) and eliminate **carbon dioxide** (#2E8B57).

Process:

1. Atmospheric air exchanges gases with blood at the lungs.
2. Blood transports gases to cells.
3. Final exchange occurs between blood and cells.

System Interaction: Requires the functioning of two systems: the respiratory system and the circulatory system.

Organization (3 Parts) [Ref: Q12]

1. **Conductive Part:**
   - **Upper Airways:** Nose, Pharynx, Larynx [Ref: Q6, Q13]
   - **Lower Airways:** Trachea, Bronchi (subdivide until pulmonary alveoli) [Ref: Q8]
2. **Respiratory Part:** Represented by the Lungs [Ref: Q12, Q25, Q35]
3. **Mechanical Part**: Thoracic wall and respiratory muscles [Ref: Q12, Q14, Q15]

- Introduction
- The upper airways
- The lower airways
- Lungs
- The organs of respiratory mechanics:
- The rib cage
- The diaphragm muscle

Upper Airways: The Nose

Definition: A sense organ allowing filtration, heating, and humidification of inspired air. [*Ref:* Q23]

Structure: An osteo-cartilaginous framework lined by mucosa.

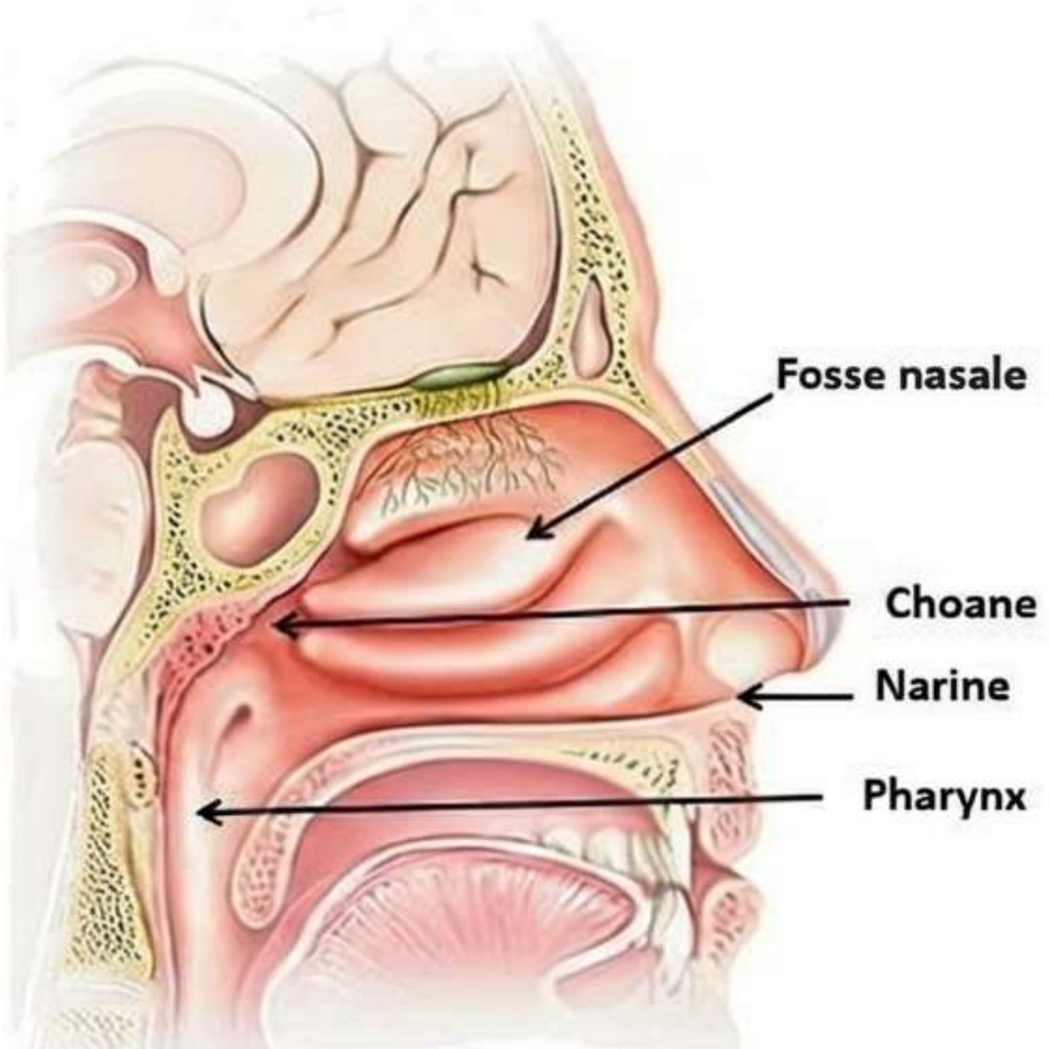
Anatomy:

- **External Part:** The Nostrils—two oval orifices located at the inferior face of the anterior part of the nose. [*Ref:* Q6, Q7]
- **Internal Part:** The Nasal Fossae. [**Ref:** Q1, Q7, Q22, Q40]
  - **Two cavities** separated by a thin sagittal **septum** (in clinical forest green #2E8B57). [*Ref:* Q1, Q22]
  - **Location:** Above buccal cavity, below cranial cavity, inside orbital cavities. [*Ref:* Q1, Q7, Q22]

Communication:

- Communicates with exterior via nostrils. [*Ref:* Q7]
- **Opens posteriorly** into the **Rhinopharynx** (forest green #2E8B57) via the Choanae. [*Ref:* Q1, Q2, Q6, Q7, Q13, Q40]

Functions: Double function — Respiratory and Olfactory. [*Ref:* Q1, Q23, Q40]



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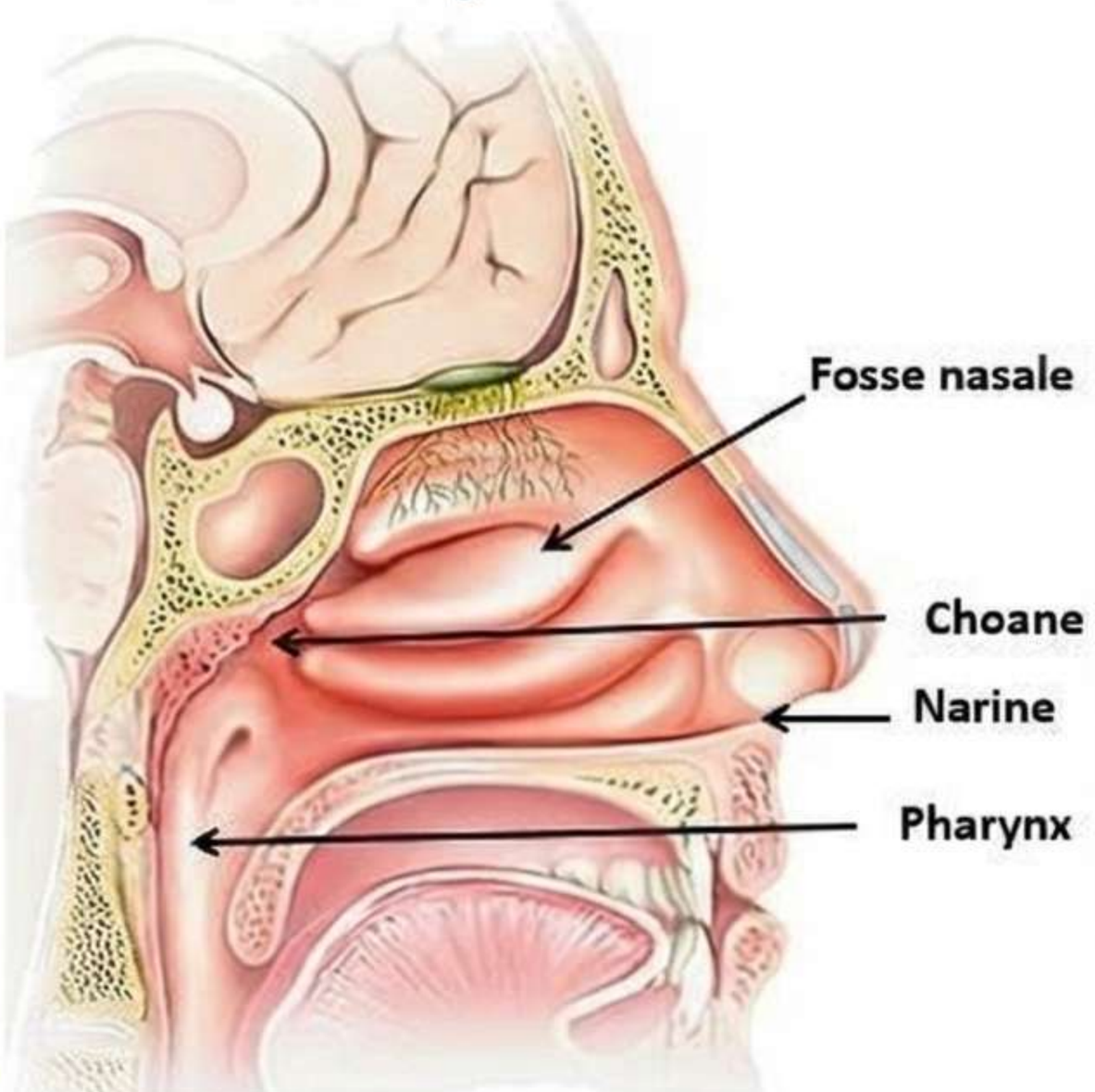
Upper Airways: The Pharynx

Definition:
A musculo-membranous conduit. [Ref: Q2]

Location:
- Extends vertically behind nasal fossae, buccal cavity, and larynx.
- Extent: From base of skull to the 6th cervical vertebra (C6) [Ref: Q2]

Dimensions & Shape:
- Approximately 14 cm long.
- Funnel-shaped; flared at top, dilated in middle, narrowed at bottom.

Function:
- An aerodigestive crossroads connecting:
  - Buccal cavity with Esophagus.
  - Nasal fossae with Larynx. [Ref: Q2, Q13, Q27]



Upper Airways: The Larynx (Anatomy)

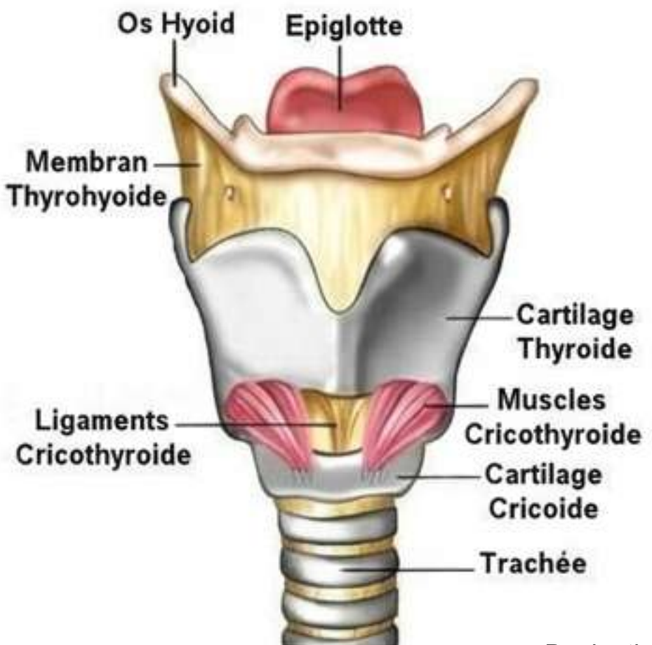
Definition:
A highly differentiated, unpaired, median organ. [Ref: Q3, Q18, Q24]

Location:

- Anterior part of the neck.
- **Corresponds to vertebrae C4, C5, and C6** [Ref: Q18]

Structure:

- Formed by assembly of articulated cartilaginous pieces. [Ref: Q3, Q5, Q24, Q32]
- Important Cartilages:
  - **Thyroid** [Ref: Q3, Q18, Q27, Q33]
  - **Cricoid** [Ref: Q3, Q18, Q27, Q33]
  - **Arytenoids** [Ref: Q3, Q18, Q27]
  - **Epiglottis** [Ref: Q3, Q18, Q27, Q33]



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Upper Airways: The Larynx (Functions & Muscles)

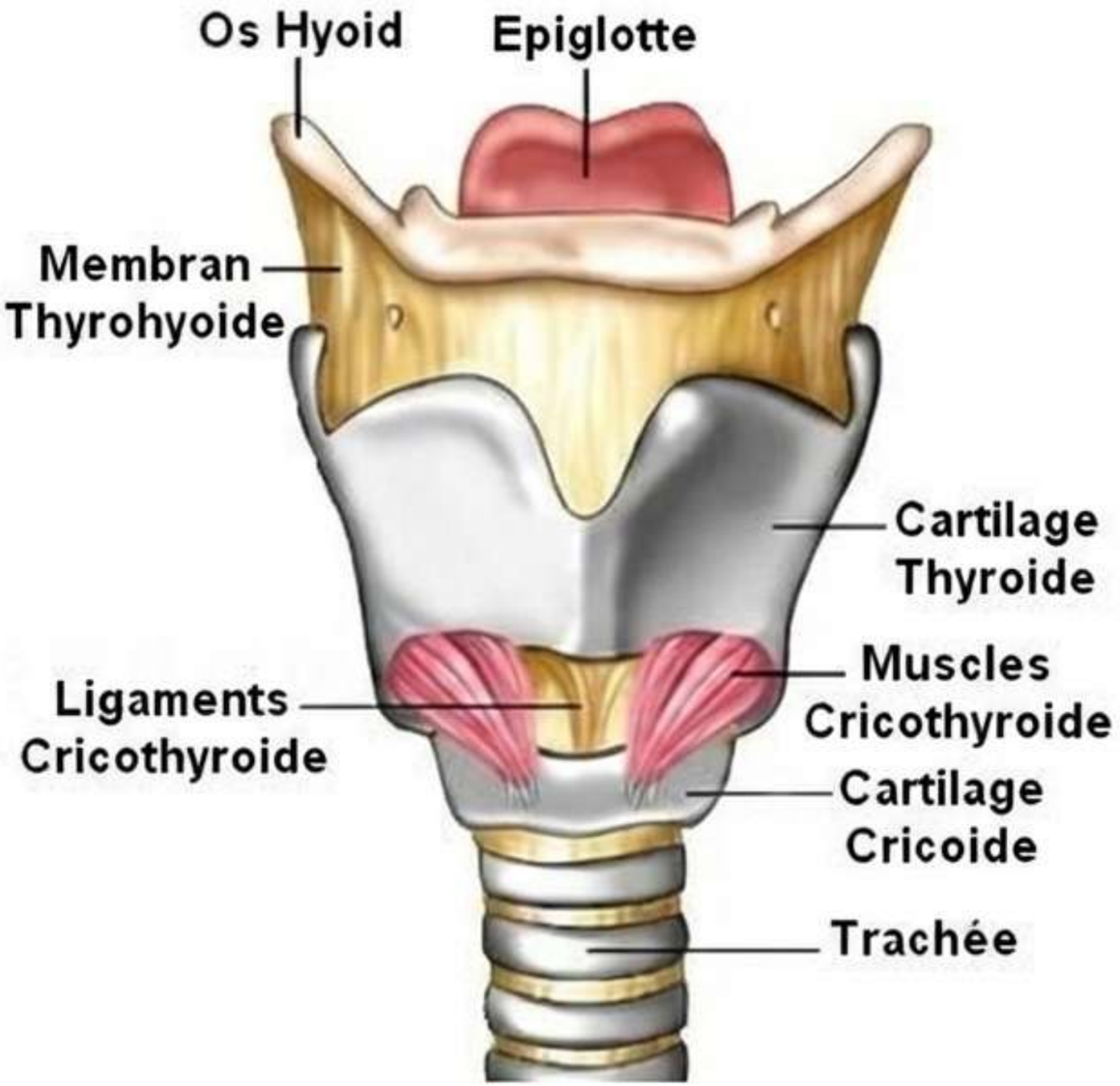
Musculature:

- Contains intrinsic and extrinsic muscular systems allowing mobility of the larynx and cartilages.
- Lining: Covered by a respiratory mucosa. [Ref: Q5]

Functions:

1. **Respiratory Function:** Part of the airway conduit. [Ref: Q6, Q18, Q24, Q27, Q32]

2. **Phonatory Function:** The organ of sound production. [Ref: Q6, Q18, Q24, Q27, Q32]



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Lower Airways: The Trachea (Structure)

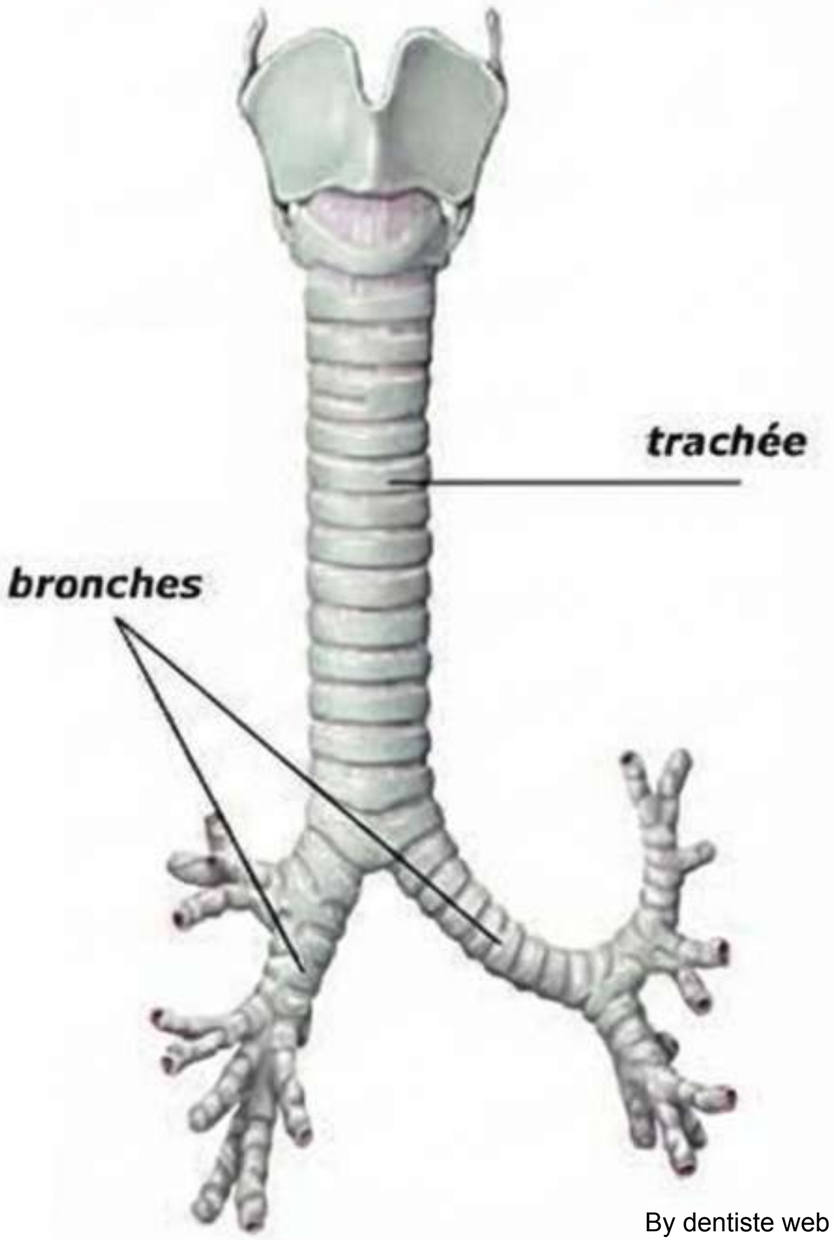
Definition: A fibro-cartilaginous air duct following the larynx. [Ref: Q1, Q13, Q16, Q34, Q39]

Extent:

- **Extends from lower border of C6 to T4 (4th Thoracic Vertebra).** [Ref: Q4, Q16, Q20, Q26, Q28, Q34]

Structure:

- Cylindrical tube flattened posteriorly. [Ref: Q20]
- **Cartilage: Framework of 16 to 20 horseshoe-shaped rings** [Ref: Q34]
- **Posterior:** Completed by fibro-elastic sheath and layer of smooth muscle fibers. [Ref: Q20]
- **Interior:** Lined with a mucous tunic.



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Lower Airways: Tracheal Bifurcation

Location: At the height of the **4th Thoracic Vertebra (T4)** [Ref: Q4, Q26, Q28, Q34]

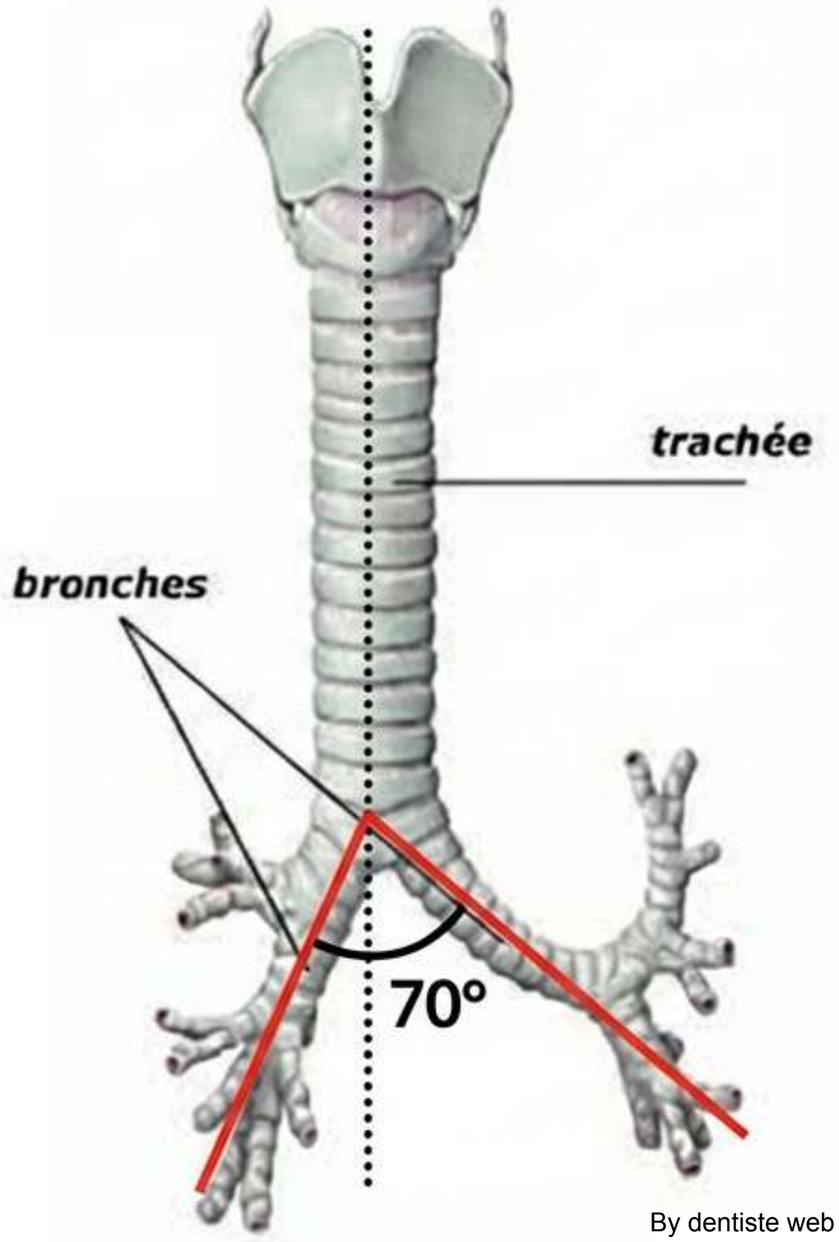
The Carina: The specific name for this bronchial bifurcation. [Ref: Q20]

Geometry:

- The two main bronchi spread from the vertical axis.
- They form an angle of **70°** between them. [Ref: Q30]

Asymmetry:

- **Right Main Bronchus:** Closer to the vertical. [Ref: Q4, Q8, Q26, Q30]
- **Left Main Bronchus:** Deviates more from the vertical. [Ref: Q8, Q26]



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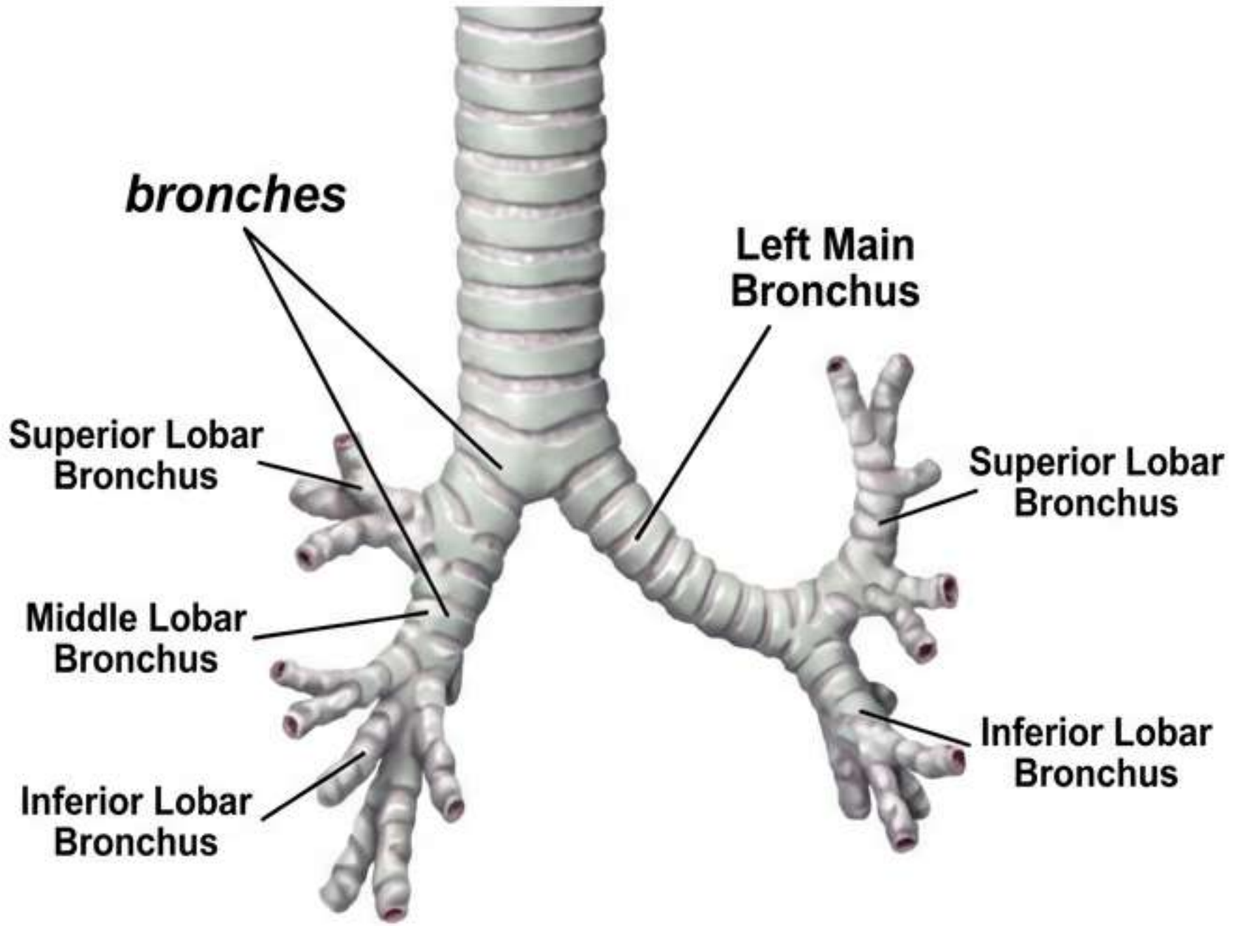
Lower Airways: The Bronchial Tree

Definition:

The trachea terminates by giving two bifurcation bronchi: the Main (Stem) Bronchi. **[Ref: Q4, Q16, Q20, Q26, Q39]**

Divisions:

- **Right Main Bronchus:** Divides into **03 lobar bronchi** (Superior, Middle, Inferior). **[Ref: Q4]**
- **Left Main Bronchus:** Divides into **02 lobar bronchi** (Superior, Inferior).



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Lower Airways: Bronchioles & Alveoli

Ramification: Lobar bronchi branch into bronchioles.

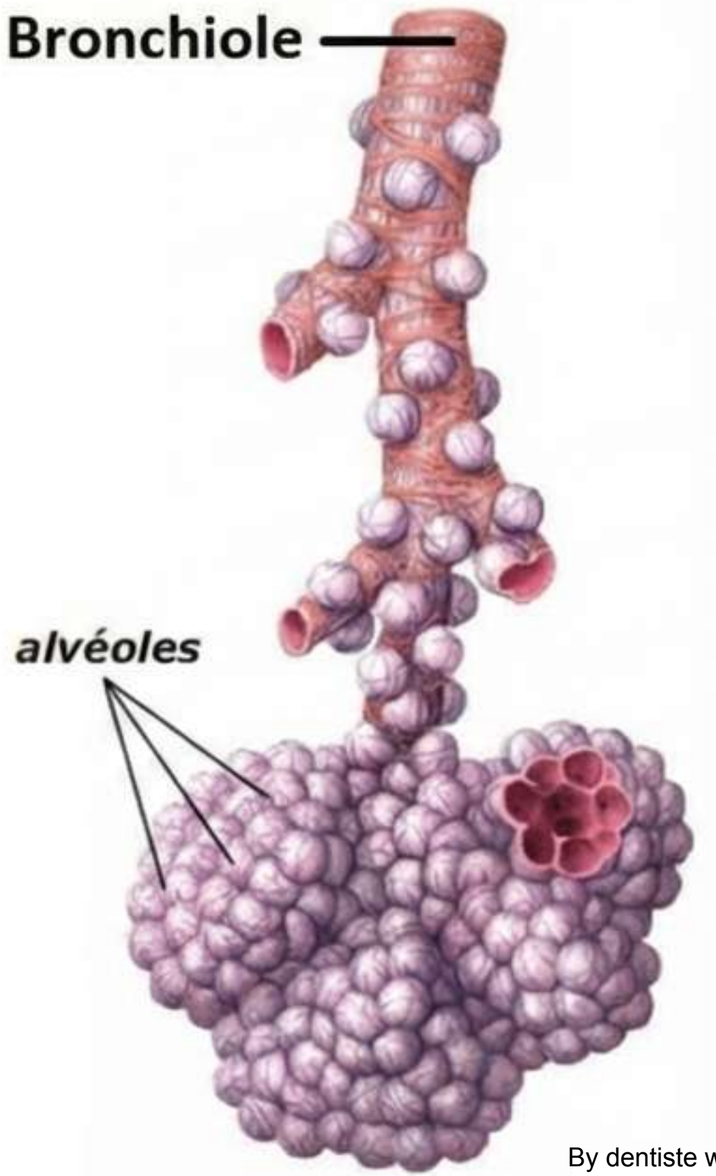
- **Diameter:** Only **1 mm**
- **Structure:** Bronchioles do not contain cartilage. **[Ref: Q12]**

Termination:

- Bronchioles open into small air-filled sacs called **Alveoli**. **[Ref: Q12]**

Function:

- **Alveoli** are the site where respiratory exchanges occur. **[Ref: Q8, Q14, Q25, Q30]**



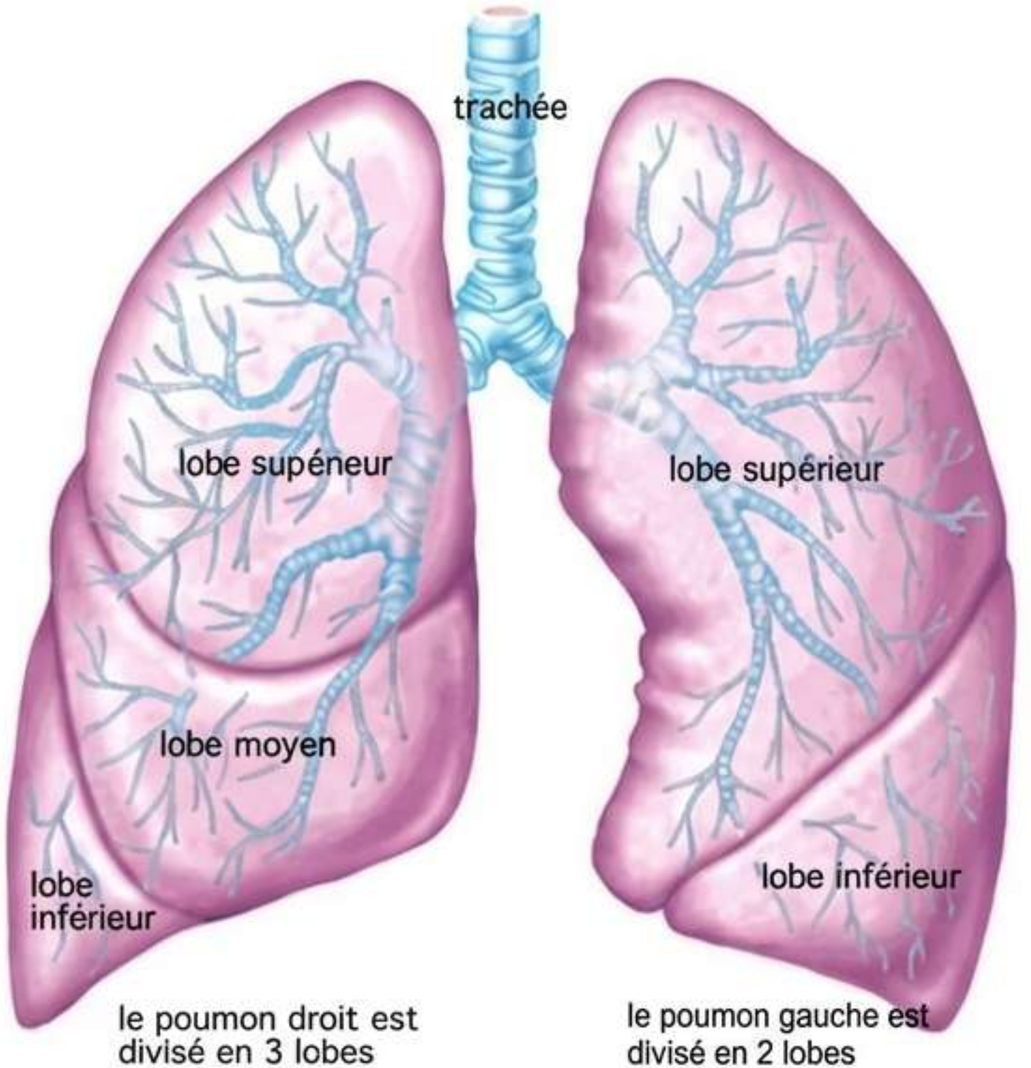
The Lungs: Description & Location

Definition:
Organs of respiration where hematose occurs.
[Ref: Q25, Q29, Q35, Q37]

Physical Properties:
Soft, spongy, elastic, paired but asymmetrical.

Location:

- Situated in pulmonary lodges of the thorax. [Ref: Q29]
- Separated by the Mediastinum (central space of thorax limited by pleuropulmonary cavities) [Ref: Q12, Q29, Q31, Q35]
- Attached to mediastinum by pulmonary pedicles. [Ref: Q29]



The Lungs: Lobes & Segments

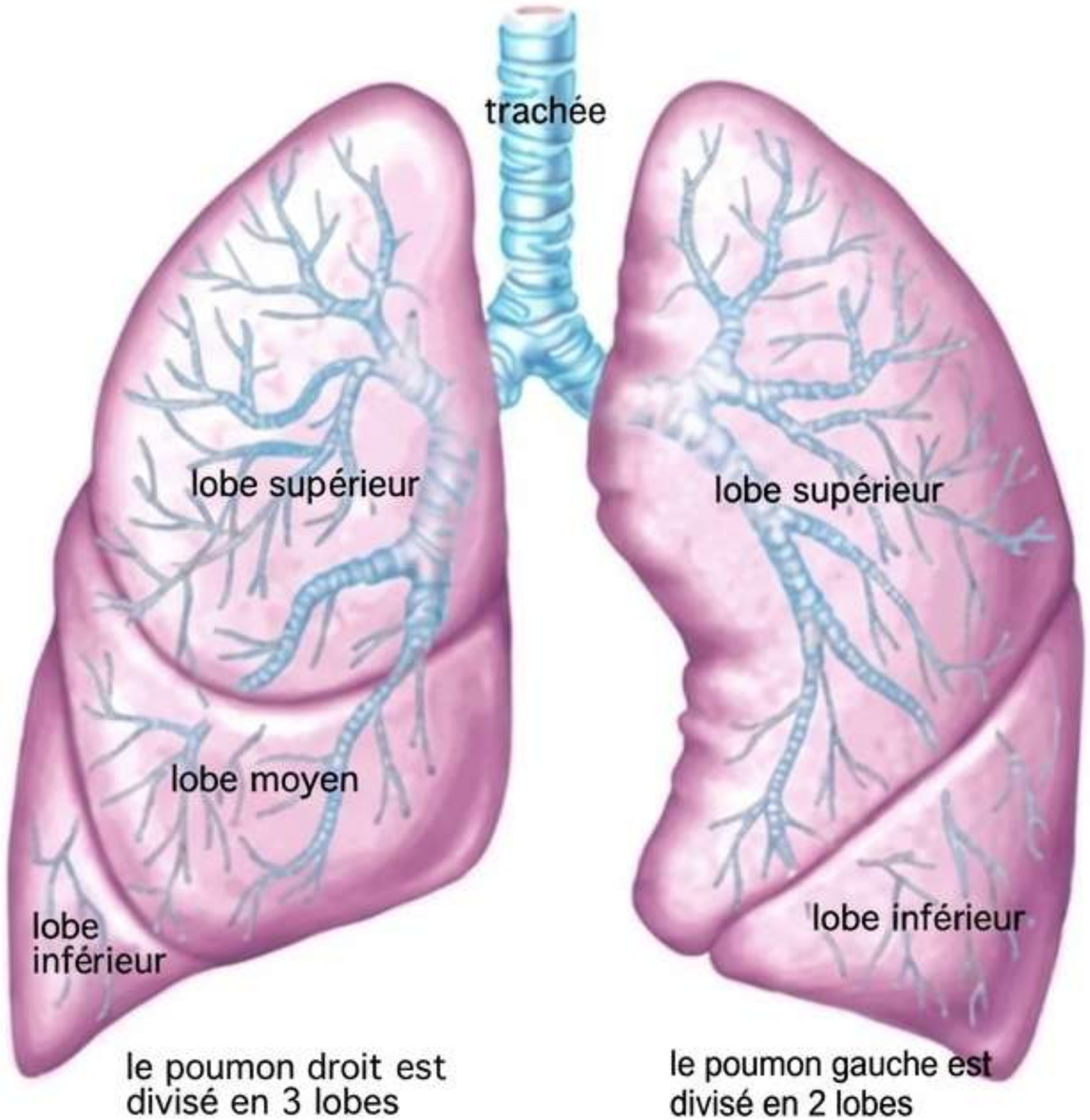
Structure: Lungs are divided into lobes by scissures. [Ref: Q5, Q10, Q25, Q35, Q37]

- **Right Lung:** Has **3 lobes** (Superior, Middle, Inferior). [Ref: Q10, Q12, Q29, Q37]
- **Left Lung:** Has **2 lobes** (Superior, Inferior). [Ref: Q21, Q29]

Segments: Each lobe is further divided into segments. [Ref: Q4, Q25]

The Pleura:

- Lungs are not in direct contact with the rib cage.
- Wrapped in a protective sheath called the **Pleura**. [Ref: Q11, Q19, Q21, Q36, Q38]



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Physiology ogy of Respiration

Primary Function: Hematose (gas exchange) occurs at the level of the lungs. [Ref: Q25, Q29, Q37]

The Respiratory Cycle: An automatic act based on:

- Inspiration: Entry of air **rich in oxygen**.
- Expiration: Exit of air **rich in CO2**. [Ref: Q14]

Frequency:

At rest, average adult respiratory rate is **12 to 20 cycles per minute**.

Mechanics: The Rib Cage

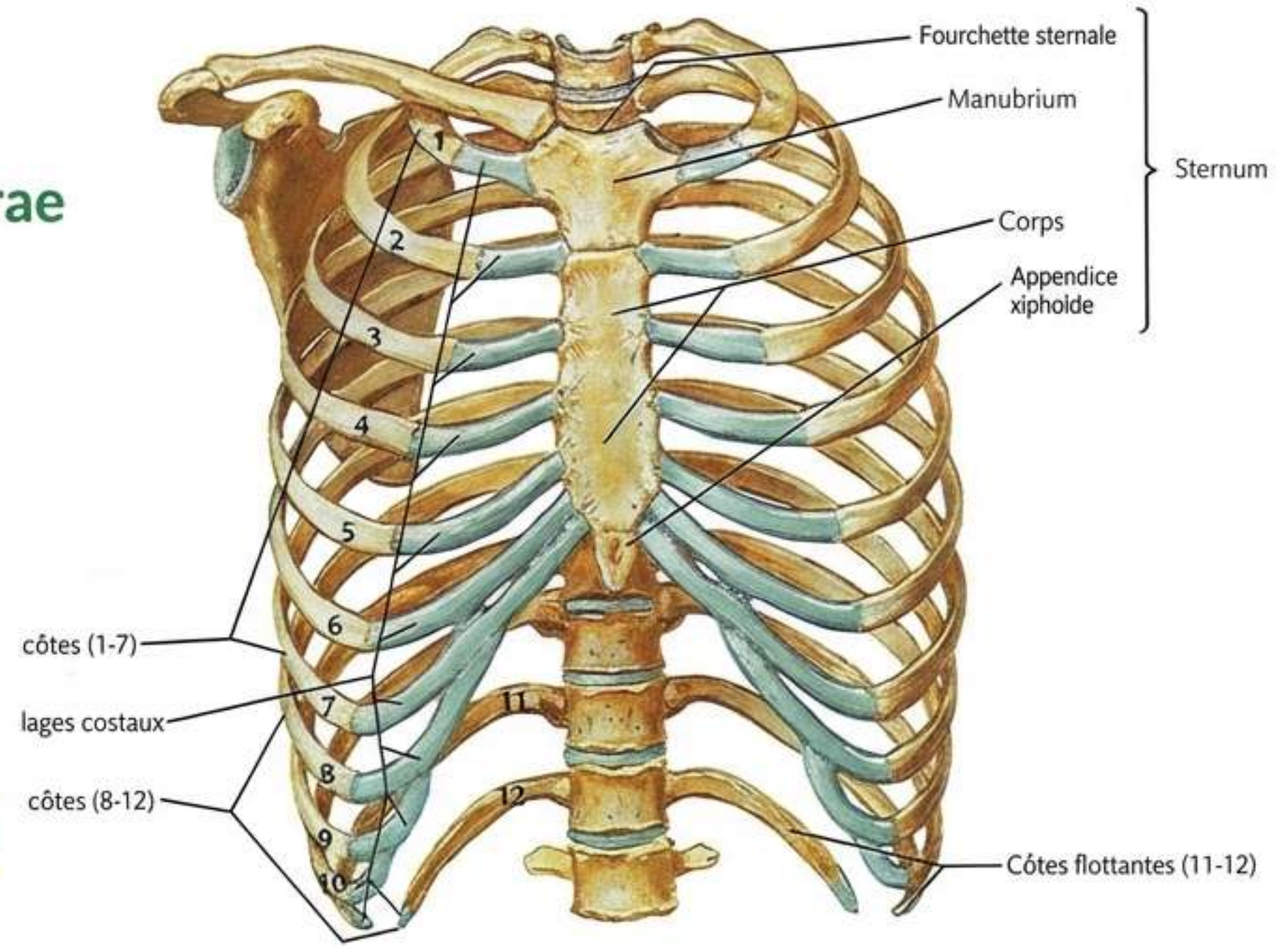
Definition: An osteo-cartilaginous enclosure.

Boundaries:

- **Posterior:** The 12 **thoracic (dorsal) vertebrae** [Ref: Q15]
- **Anterior:** The **Sternum** [Ref: Q15, Q31]
- **Lateral:** The **Ribs (12 pairs)** and costal cartilages [Ref: Q15, Q31]

Mobility: Elements are united by articulations allowing movement. [Ref: Q15]

- **Inspiration:** Elevation of thorax. [Ref: Q14]
- **Expiration:** Lowering of thorax.



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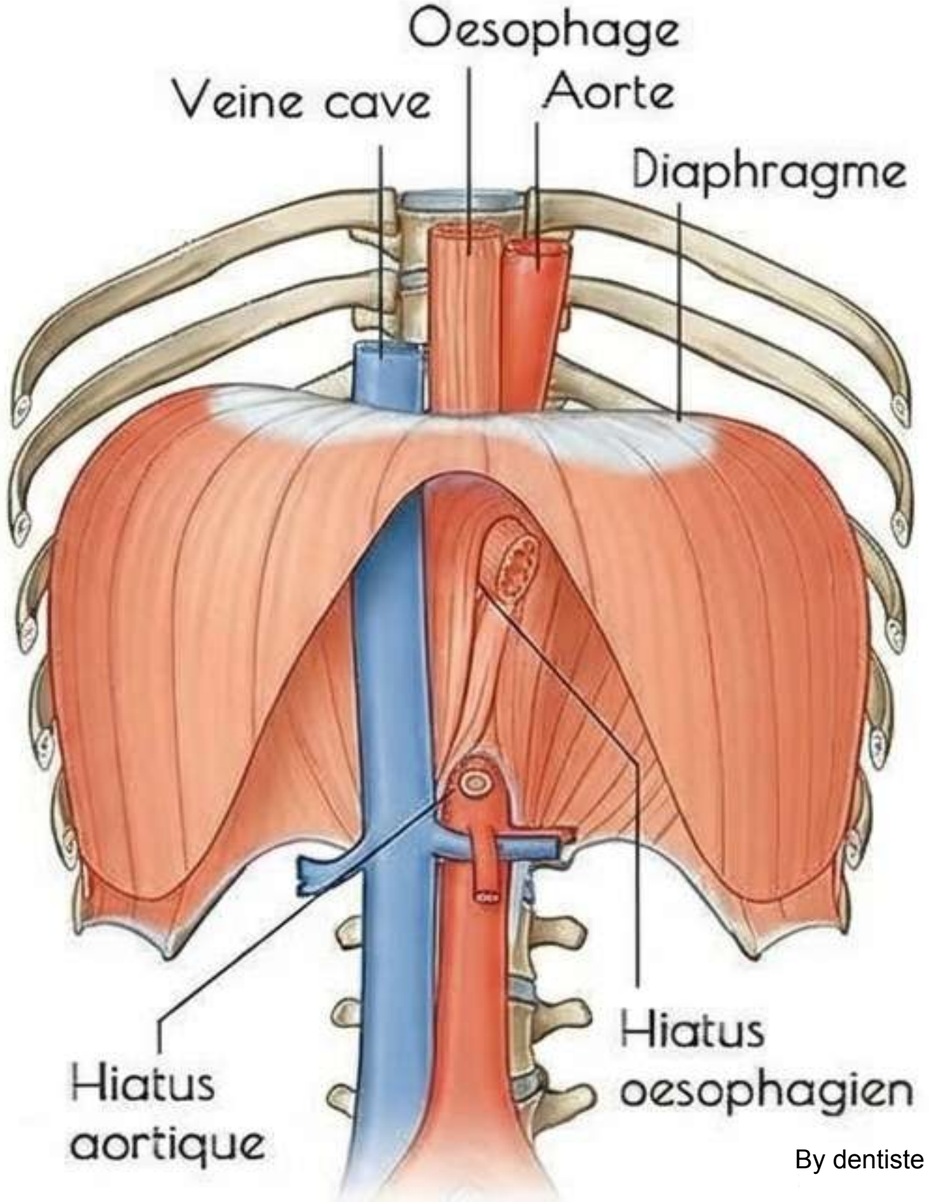
Mechanics: The Diaphragm

Definition:
The principal respiratory muscle. **[Ref: Q14]**

Structure:
- Musculo-aponeurotic partition separating thoracic and abdominal organs.
- Animated by rhythmic contractions.

Function:
- Inspiratory Muscle: Performs **60%** of **clinical** inspiration (accessory muscles do the rest). **[Ref: Q14]**

Characteristics:
- Traversed by various elements at its orifices (hiatus).
- Rich in slow myofibers.
- Innervation: Provided by the Phrenic Nerve.



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References

Bibliography:

1. Kamina. Anatomie clinique tête, cou et dos. 2e édition. Tome 2. Edition Maloine. 2004.
2. Bouchet A, Cuilleret J. Anatomie topographique descriptive et fonctionnellle. *Le système nerveux central, la face, la tête et les organes des sens.* Tome I. 2e édition. Elsevier Masson. 1991.
3. Rouvière H, Delmas A. – Anatomie Humaine – Tome II (tronc) – Edition Masson, 11ème édition, 1981.