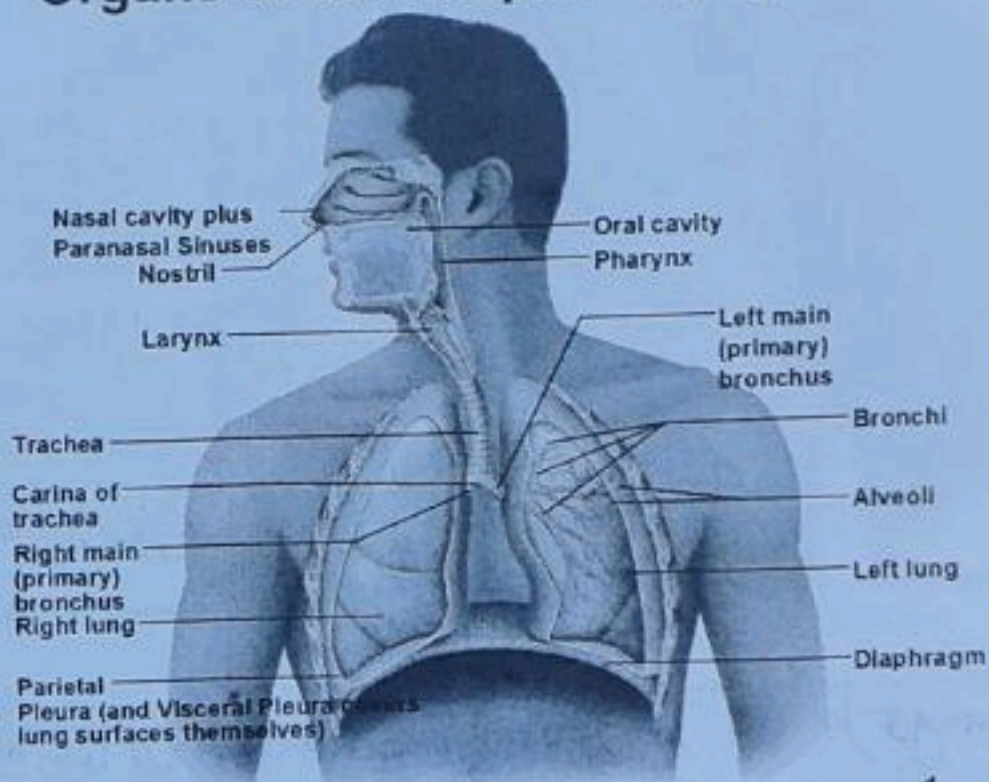


الجهاز التنفسي

The Respiratory System

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(2021)

Organs of the Respiratory System



أقسام الجهاز التنفسي :-

Divisions of the Respiratory System

من حيث المنشأ

■ Structurally: (according to embryological origin)

□ Upper respiratory system

■ Nose, pharynx and associated structures

□ Lower respiratory system

■ Larynx, trachea, bronchi and lungs

من حيث الوظيفة

■ Functionally:

■ Conducting zone – conducts air (توصيل الأكسجين) - بجري الهواء

■ Nose, pharynx, larynx, trachea, bronchi, bronchioles and terminal bronchioles

■ Respiratory zone – site of gas exchange (تبادل الغازات) - المنطقة التنفسية

■ Respiratory bronchioles, alveolar ducts, alveolar sacs, and alveoli

مويعدان هوائيه

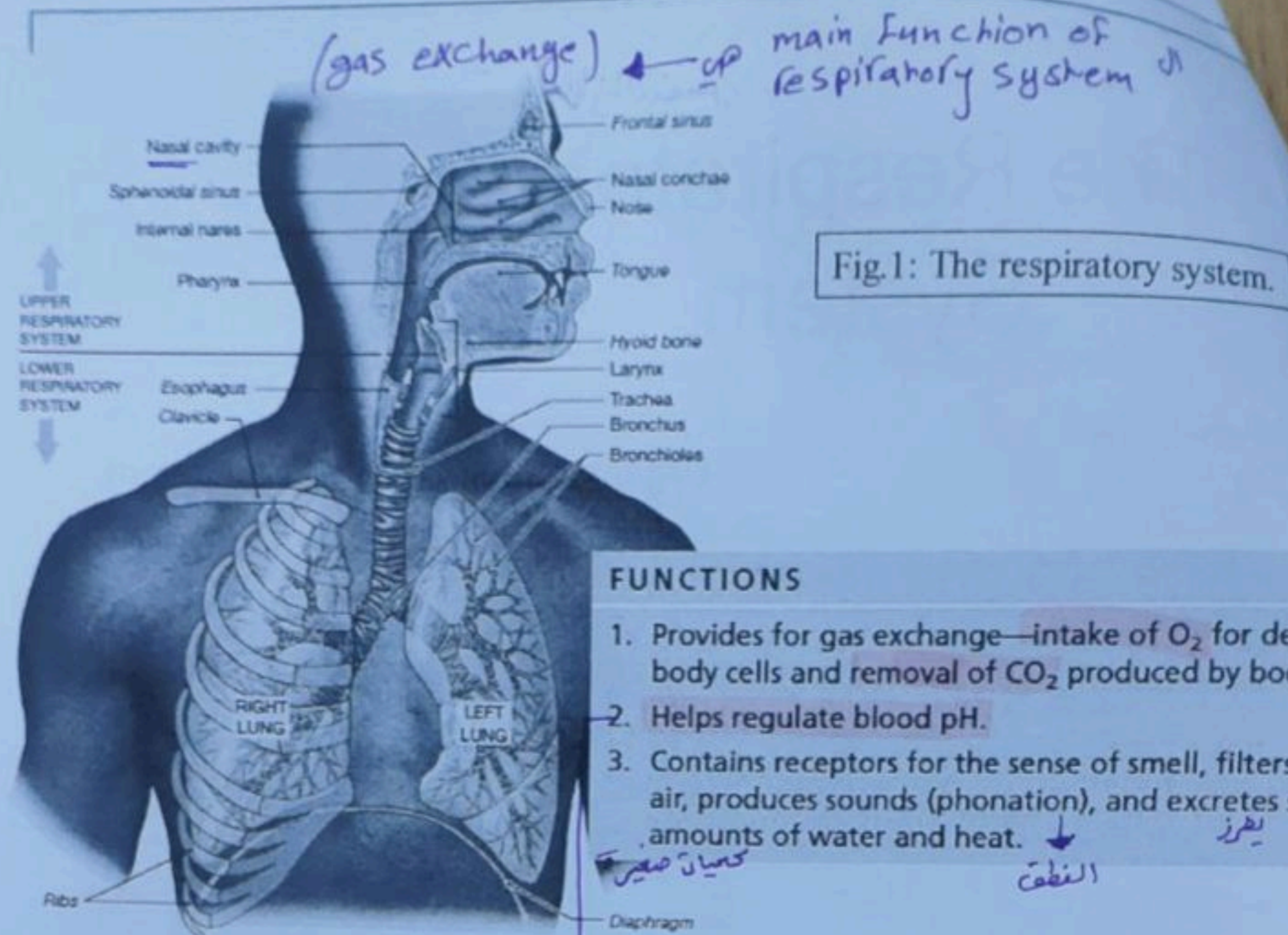
قنوان

السياس

(alveoli) هي تجمع من ال

2

هو المكان التي تسمى فيه gas exchange



في هنا 2 main organs مسؤولة عن ال regulate blood pH ال (Lungs) وال (Kidneys)

3

The Nose

- Consists of the External nose and Internal nose.

- **External nose** – portion visible on face

- Formed of a small bony part – the nasal bones (bridge of the nose) and a larger cartilaginous part.

All covered by muscles and skin.

- Its openings are called the **external nares** or **nostrils**.

- The area just inside the nostrils is called the **vestibule**. Its lower half is lined by skin.

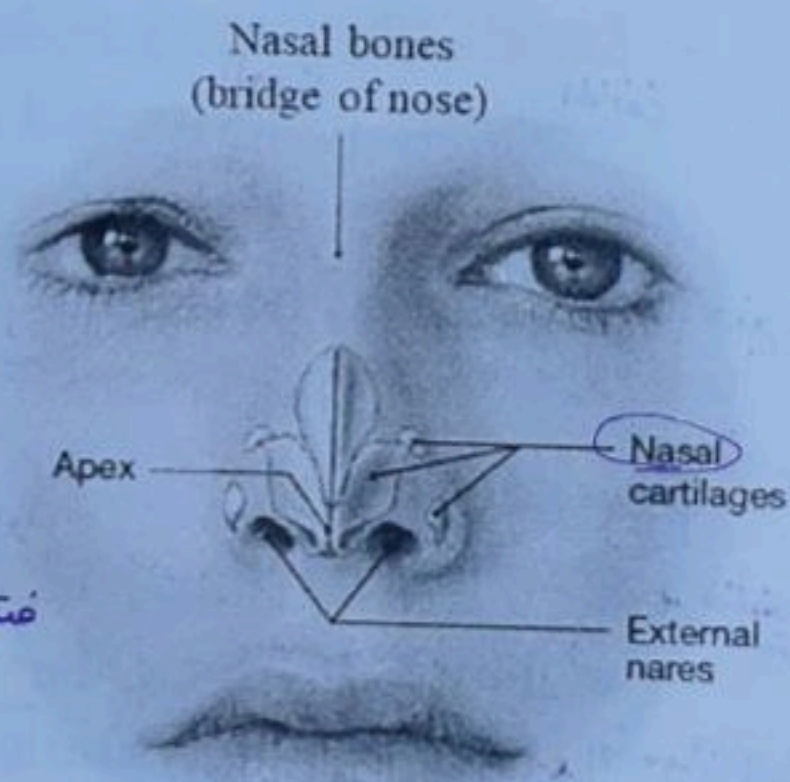


Fig.2: The external nose.

بعد الدخول تبع الهواء والي هو القناة

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Nasal cavity ^{بمناسية}

- **Internal nose** – large cavity beyond the vestibule mostly lined by respiratory epithelium.

- Extends from vestibule to the internal nares or choanae.
- Nasal cavity divided by nasal septum.
- The lateral wall has projections that increase the surface area called conchae. Between these conchae and the lateral wall are small passages called meatuses.
- Ducts from paranasal sinuses and nasolacrimal ducts open into the meatuses of the internal nose.

- Olfactory epithelium responsible for the sense of smell lines the roof of the nasal cavity.

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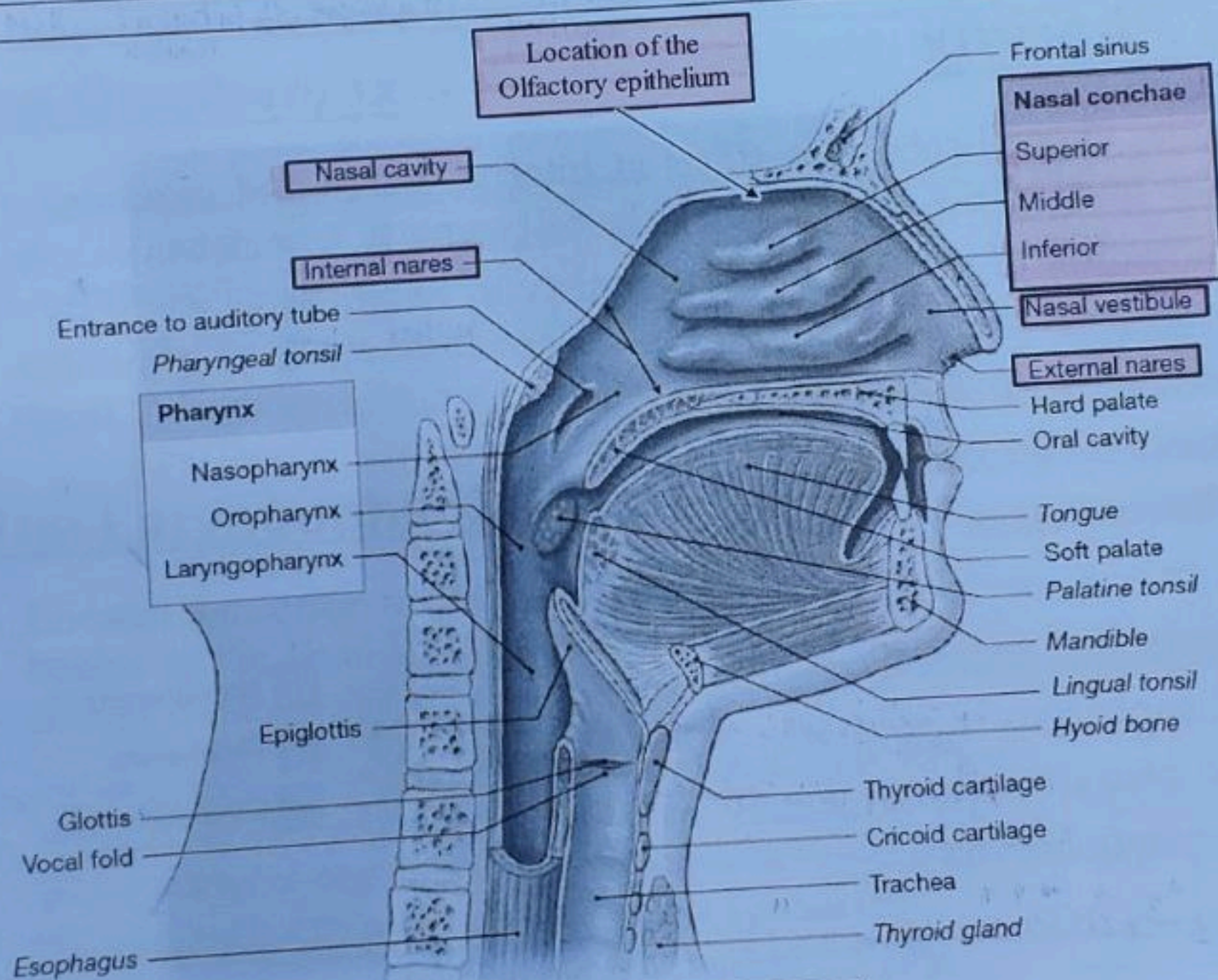


Fig.3: The internal nose (pink boxes).

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Functions of the nose:

1. Warms air coming through the nose due to the rich capillaries of the mucosa of the nose.
 يدفئ
2. Moistens incoming air by the mucus secreted by goblet cells of the mucosa.
 يبلل مخاط
3. Traps and removes dust particles by cilia and hair.
 يحبس ذرات الغبار اهذان شعر
4. Affects quality of voice.
 جودة الصوت
5. Olfactory epithelium responsible for the sense of smell.

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The Pharynx

شكله هزازي المحقان

- Funnel shaped tube that starts at internal nares and extends to the level of the cricoid cartilage of larynx (C6 vertebra).
 (ببيلش من ال internal nares والى صحنه الى nasal cavity)
- Contraction of skeletal muscles assists in swallowing.
 يساعد على البلع
- Functions

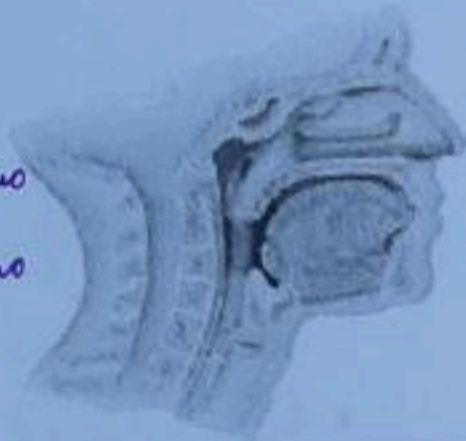
□ Passageway for air and food
 ممر

□ Resonating chamber
 منطقة للصوت (عبارة عن مجوّة)

□ Houses tonsils

3 anatomical regions

- 49 □ Nasopharynx
 مسؤولة عن الهواء في المنطقة العليا
- Oropharynx
 مسؤولة عن نقل الطعام والهواء
- Laryngopharynx
 مسؤولة عن الكحل ونسوي الهواء



- Nasopharynx
- Oropharynx
- Laryngopharynx

Fig.4: Regions of the pharynx.

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The Nasopharynx

Located ^{خلف} posterior to the nasal cavities and above the soft palate → and inferiorly opens into the oropharynx. It's a passageway for air. ^{نقل الهواء}

- Its lateral walls exhibit the opening of the **auditory (Eustachian) tubes**.
- The posterior wall of the nasopharynx has a collection of lymphoid tissue called the **pharyngeal Tonsil (adenoid)**.

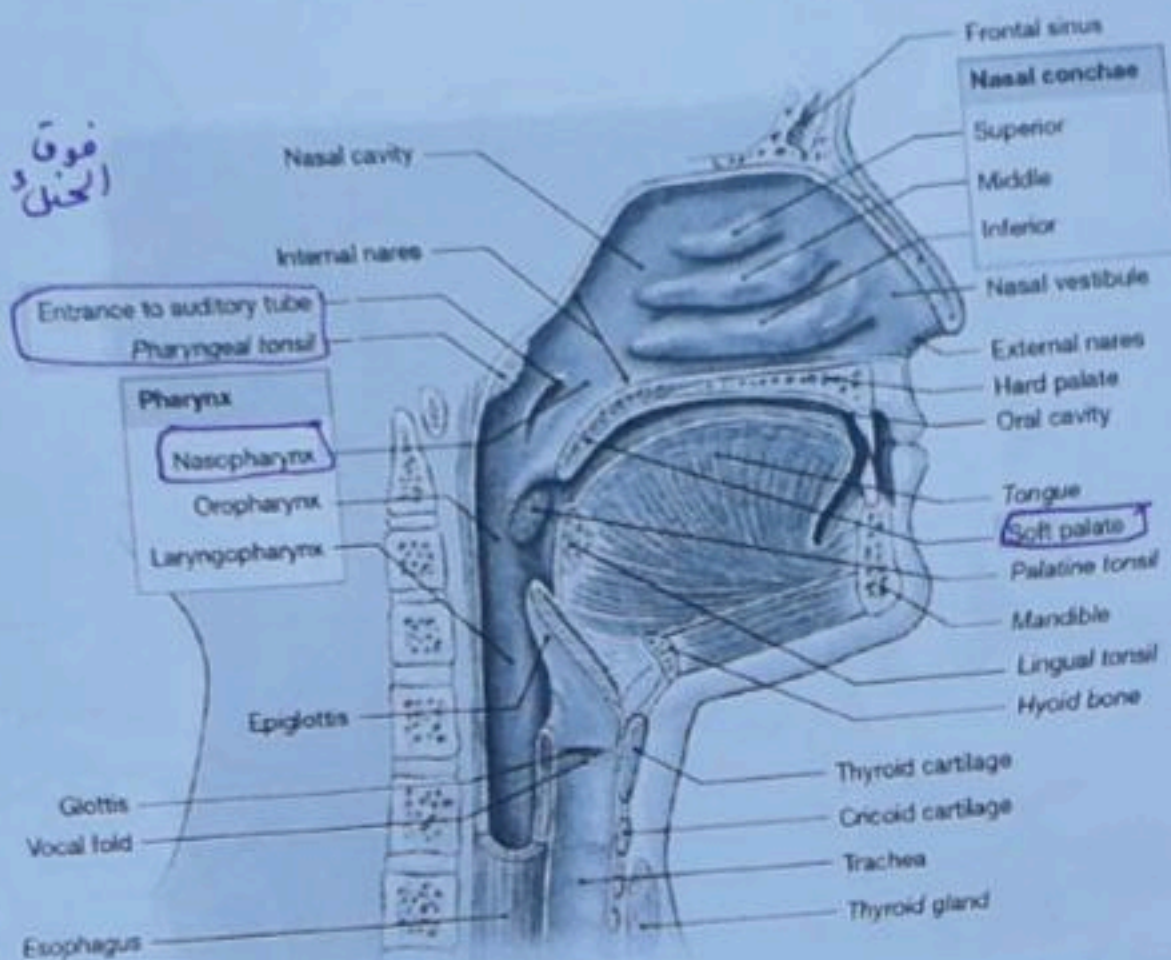


Fig.5: The nasopharynx (yellow boxes).

The Oropharynx

- Located posterior to the oral cavity with which it communicates. It allows passage of both air and food. Inferiorly, it extends to the level of the hyoid bone.
- Anteriorly, in the posterior aspect of the ^{اللسان} tongue, there's the **lingual tonsil**. Anterolaterally, we have the two **palatine tonsils**. ^{من الامام}

The Laryngopharynx

- Located posterior to the ^{الحنجرة} larynx with which it communicates. It begins at the level of the hyoid bone and ends at the level of the cricoid cartilage (C6) where it becomes continuous with esophagus. ^{من مستوى الـ C6}
- Muscles of the pharynx play a part in the process of **deglutition**. These muscles are supplied by the pharyngeal plexus derived from the glossopharyngeal (IX) and vagus (X) nerves. ^{تعمل}

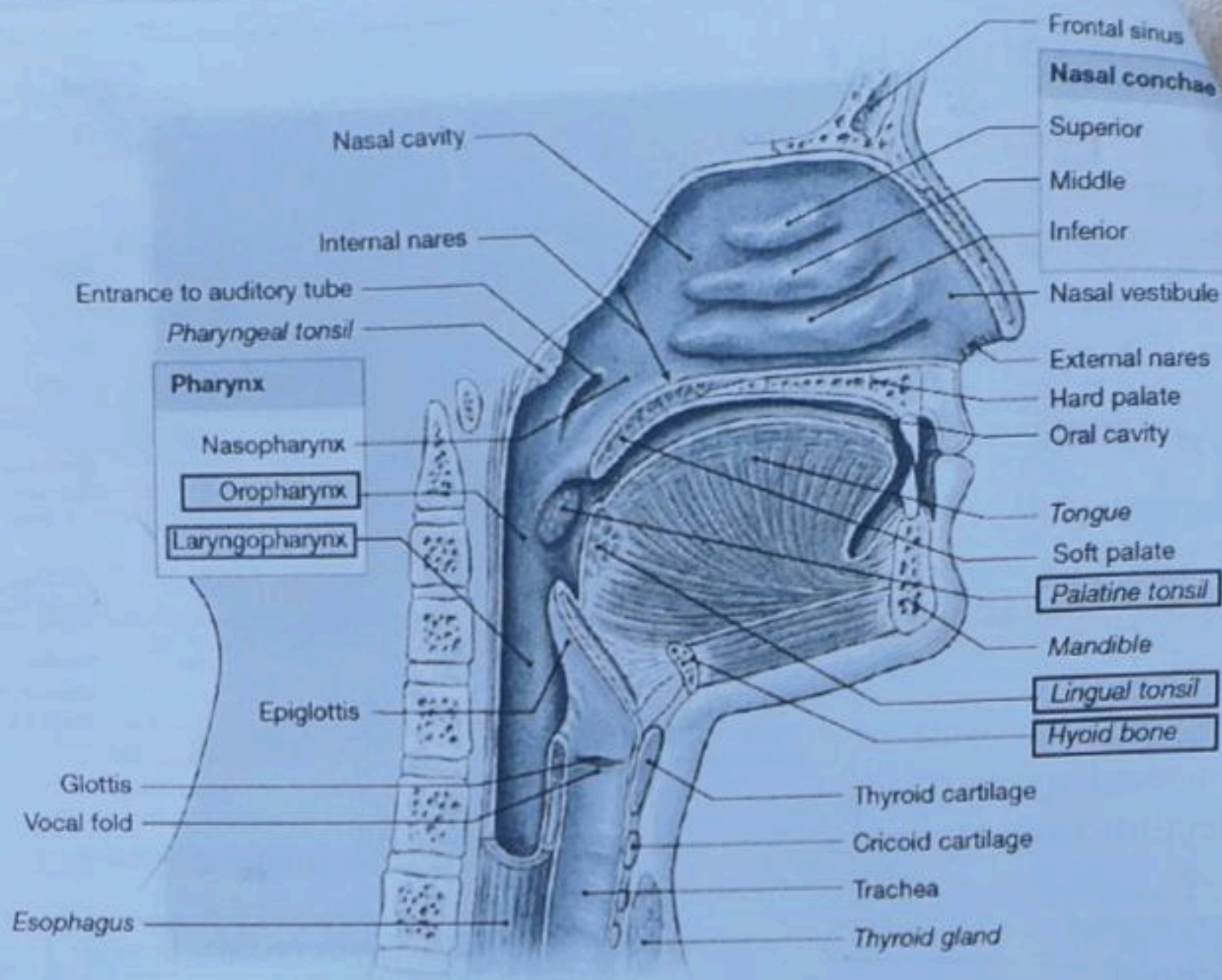


Fig.6: The oropharynx (blue boxes) and the laryngopharynx (brown box).

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The Larynx

انتاج الصوت

- Short passageway connecting laryngopharynx with trachea that's responsible for the production of sound. Its inlet also provides a protective cover for the airway passages.

- It lies in the midline of the neck opposite C4-C6 vertebrae. At the level of C6, it becomes continuous with the trachea.

- The larynx is formed of cartilages held together by ligaments and membranes and moved by muscles.

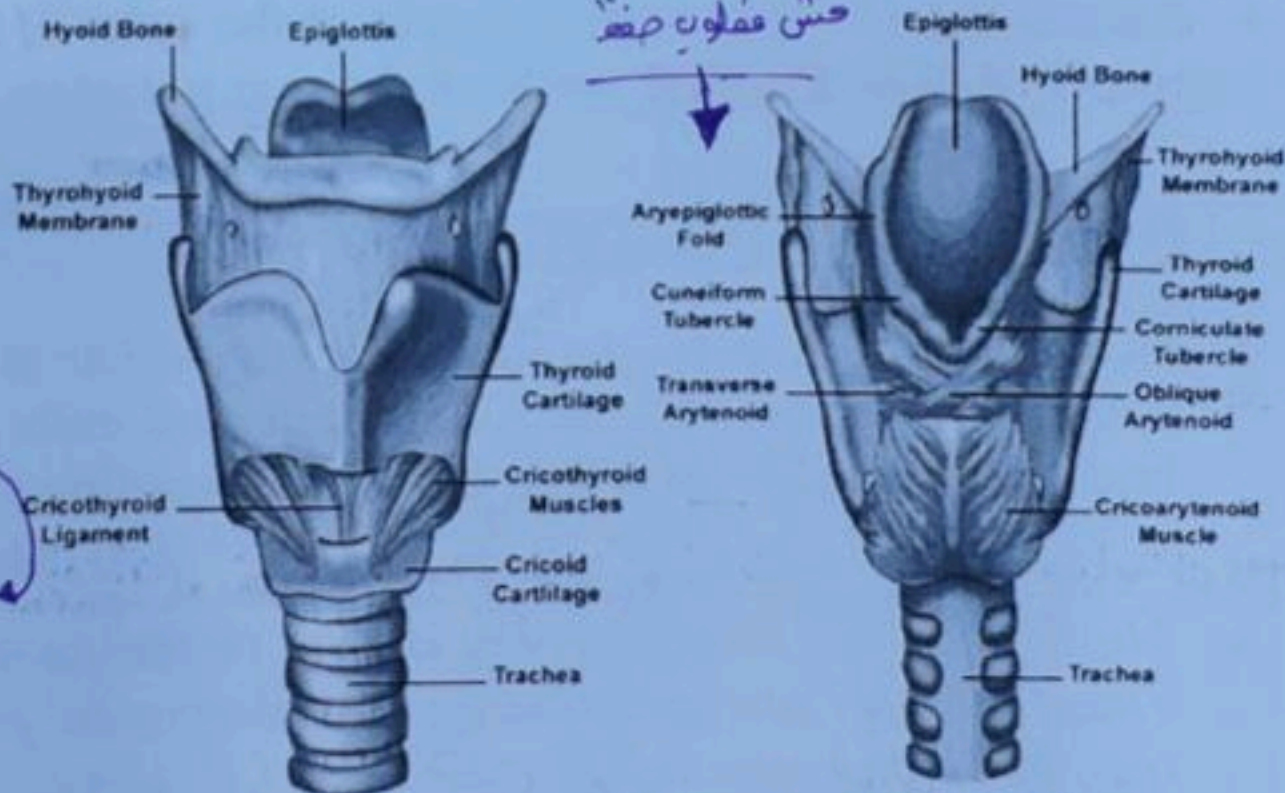


Fig.7: Structure of the larynx. Left, anterior view. Right, posterior views.

Cartilages of the Larynx

Thyroid: single V-shaped cartilage. The largest and forms prominence of the neck called Adam's Apple.

2. **Cricoid:** a single ring shaped cartilage. The lower boundary of the larynx.

3. **Epiglottis:** a leaf-shaped single cartilage that's present at the inlet of the larynx. Closes the larynx when the person swallows.

4. **Arytenoid:** a pair of pyramidal cartilages to which the vocal cords are attached. Movement of these cartilages leads to movement of the cords.

5. **Corniculate** cartilages (pair).

6. **Cuneiform** cartilages (pair).

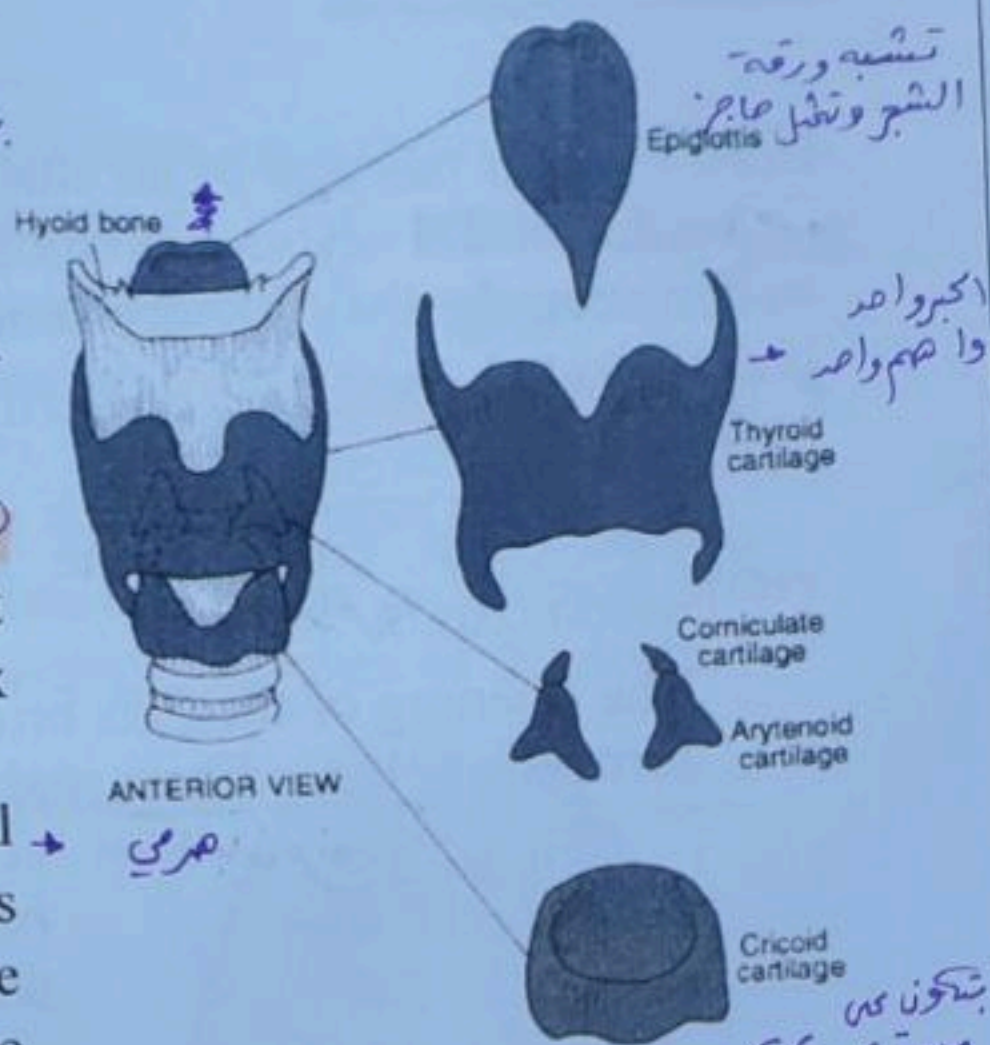


Fig.8: Cartilages of the larynx.

كم عدد ال cartilage التي يكونوا single ؟ 3
كم عدد ال cartilage التي يكونوا pair ؟ 3
pair/partner

Structures of Sound Production

- Mucous membrane of larynx forms 2 folds:
 - **Vestibular folds** (false vocal cords) – superior pair
 - Function in holding breath.
 - **Vocal folds** (true vocal cords) – inferior pair
 - Contain elastic tissue.
 - Muscle contraction pulls elastic ligaments which stretch vocal folds.
 - Passing air vibrates the cords and produces sound.
 - Folds can move apart or together, elongate or shorten.
- Muscles of the larynx are Intrinsic or Extrinsic. The intrinsic muscles are supplied by branches of the vagus (X) nerve.

The Trachea

- A Tubular passage of air that extends from the larynx to superior border of T5 where it divides into right and left primary bronchi. Between the two primary bronchi there's an angle called **carina**.
- 16-20 C-shaped hyaline cartilages are found in the wall to keep the trachea patent.
 - The open part of the C faces posteriorly towards the esophagus.
 - The opening of the C is bridged by a fibromuscular membrane formed of elastic fibers and the smooth **trachealis** muscle.

The Bronchial Tree

- Right and left primary bronchi pass to the corresponding lung.
- Divide to form bronchial tree:
 - Secondary lobar bronchi (one for each lobe), tertiary (segmental) bronchi, bronchioles, terminal bronchioles
- Structural changes with branching:
 - Changes in the epithelium.
 - Cartilage decreases. As it decreases, smooth muscle increases.
- Terminal bronchioles will form Respiratory bronchioles. At this point gas exchange begins to occur.

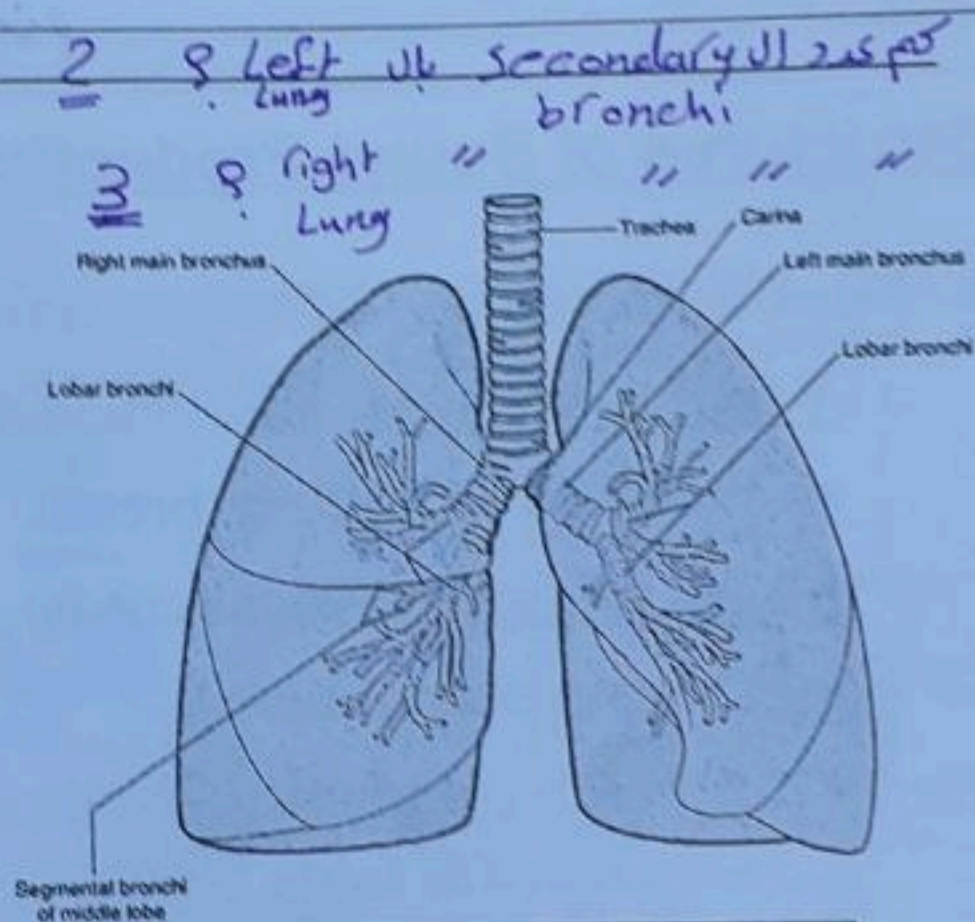


Fig.11: The bronchial tree.

he Lungs

- Two cone shaped organs separated from each other by the **heart** and other structures in the **mediastinum**.
- Each lung is enclosed by the double-layered **pleura** (serous membrane): **Parietal pleura** (lines wall of thoracic cavity) and **visceral pleura** (covers the lungs). A space between them called the **pleural cavity** contains **pleural fluid** to reduce friction.
- Lungs receive (1) deoxygenated blood from the pulmonary artery and (2) oxygenated blood from bronchial branches of the aorta.
- The **right** lung is formed of **three lobes**; whereas, the **left** lung is formed of **two**. The left lung also has a **cardiac notch** in which the heart is situated.

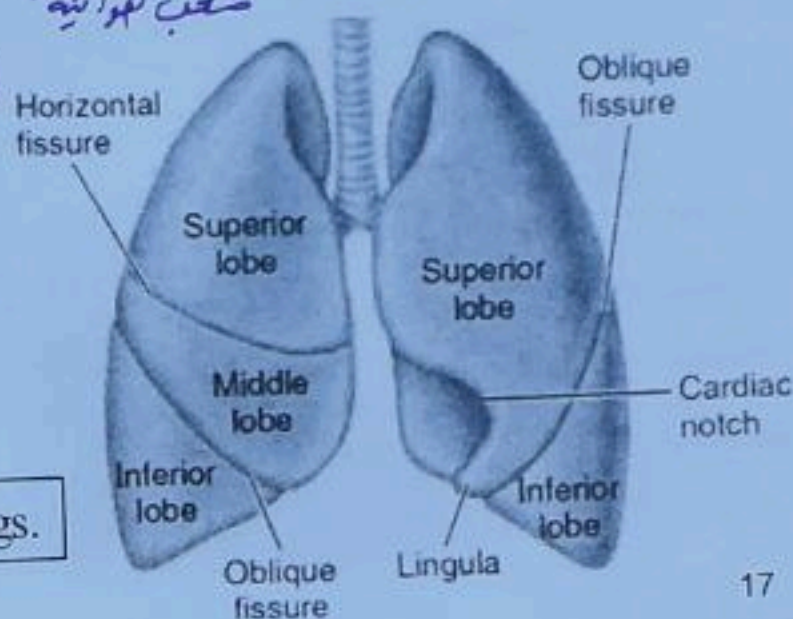


Fig.12: The lungs.

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Alveoli

- Cup-shaped outpouching
- Alveolar cells:
 - Type I alveolar cells (simple squamous) – main site of gas exchange.
 - Type II alveolar cells – secrete **surfactant factor** which reduces tendency to collapse.
 - Macrophages
- Respiratory membrane**: a very thin cellular membrane separating **air** from **blood** and across which **gas exchange** occurs:
 - Alveolar wall – type I alveolar cells
 - Epithelium basement membrane
 - Capillary basement membrane
 - Capillary endothelium

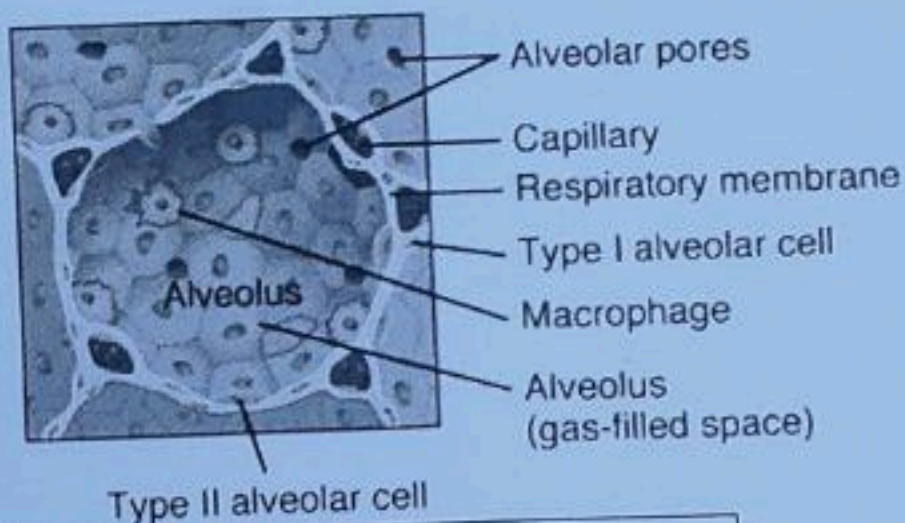


Fig.13: Above, alveolar cells. Below, the respiratory membrane.

