The module:

Respiratory System

Session 1 : **Lecture : 2**

Title: ***Anatomy and Histology of the respiratory system***

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Clinically oriented anatomy by Moore and Dalley
Greys anatomy for students by Drake
Color atlas of histology by Leslie

THE RESPIRATORY SYSTEM

(ANATOMY & HISTOLOGY)

Objectives:

- 1.Description of the main functional units of the respiratory system and its division into upper and lower respiratory tracts.
- 2. Description of the component parts of the upper & lower respiratory tracts and their general functions.
- 3. Description of the structure of each part of the respiratory tract.

LO1

Functions:

The Respiratory System is mainly concerned

1. **gaseous exchange** which occurs in the lungs at the blood-air barrier between the blood contained in the capillaries and the inspired air in the lungs.
2. Parts of the system are also concerned with the **sense of smell**,
3. **sense of taste**, **phonation** (production of sound)
4. **excretion of water** through exhaled air.

LO1

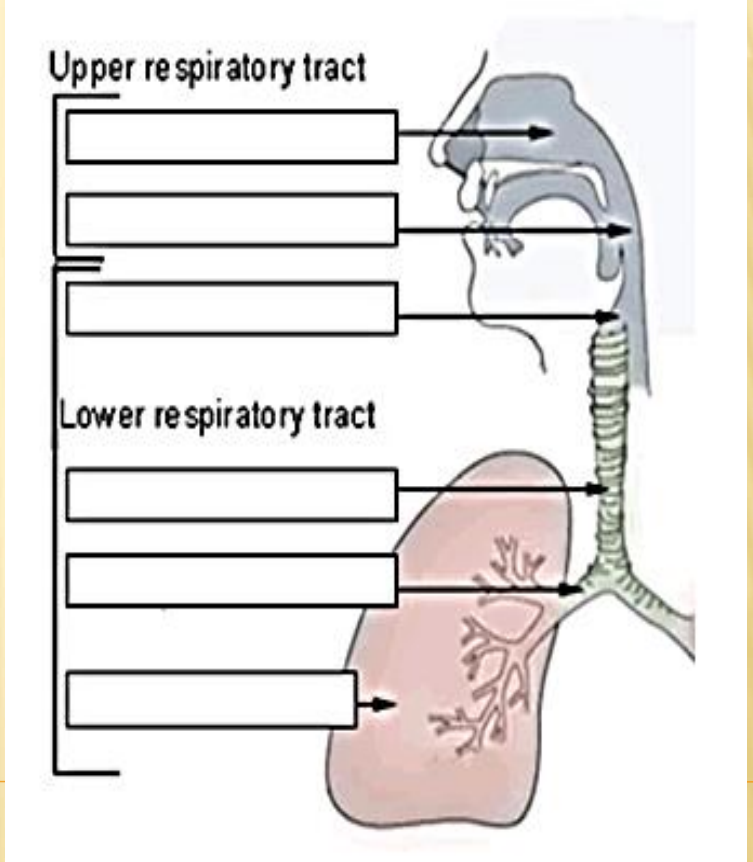
Respiratory system is composed of:

- **The upper respiratory tract** consists of:

Nose and nasal cavity
Pharynx
Larynx

- **The lower respiratory tract** consists of:

Trachea, Bronchi, and Bronchioles



Respiratory System include:

LO1

- **Conducting portion**

includes the nose, nasal cavity, pharynx, larynx, trachea, and smaller airways, from the primary bronchi to the terminal bronchioles

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- **Respiratory portion.**

composed of small airways called respiratory bronchioles and alveolar ducts as well as air sacs called alveoli

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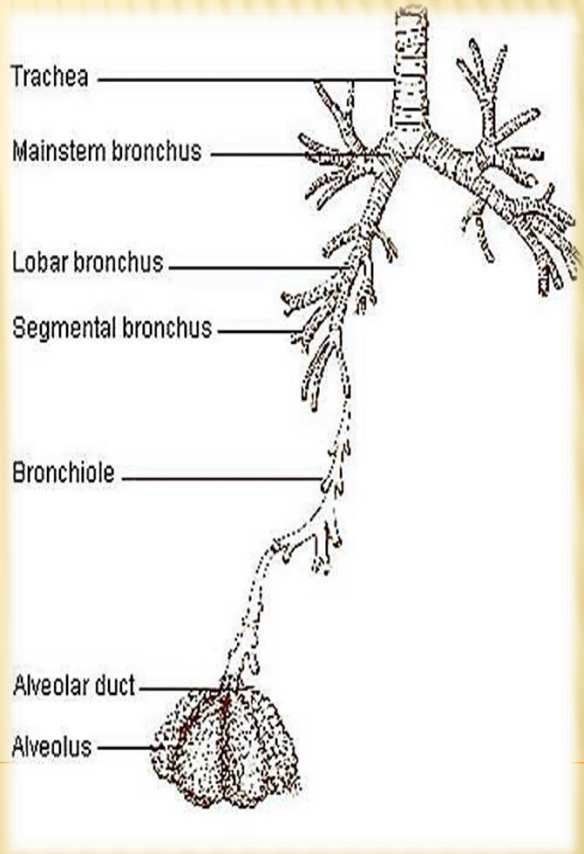
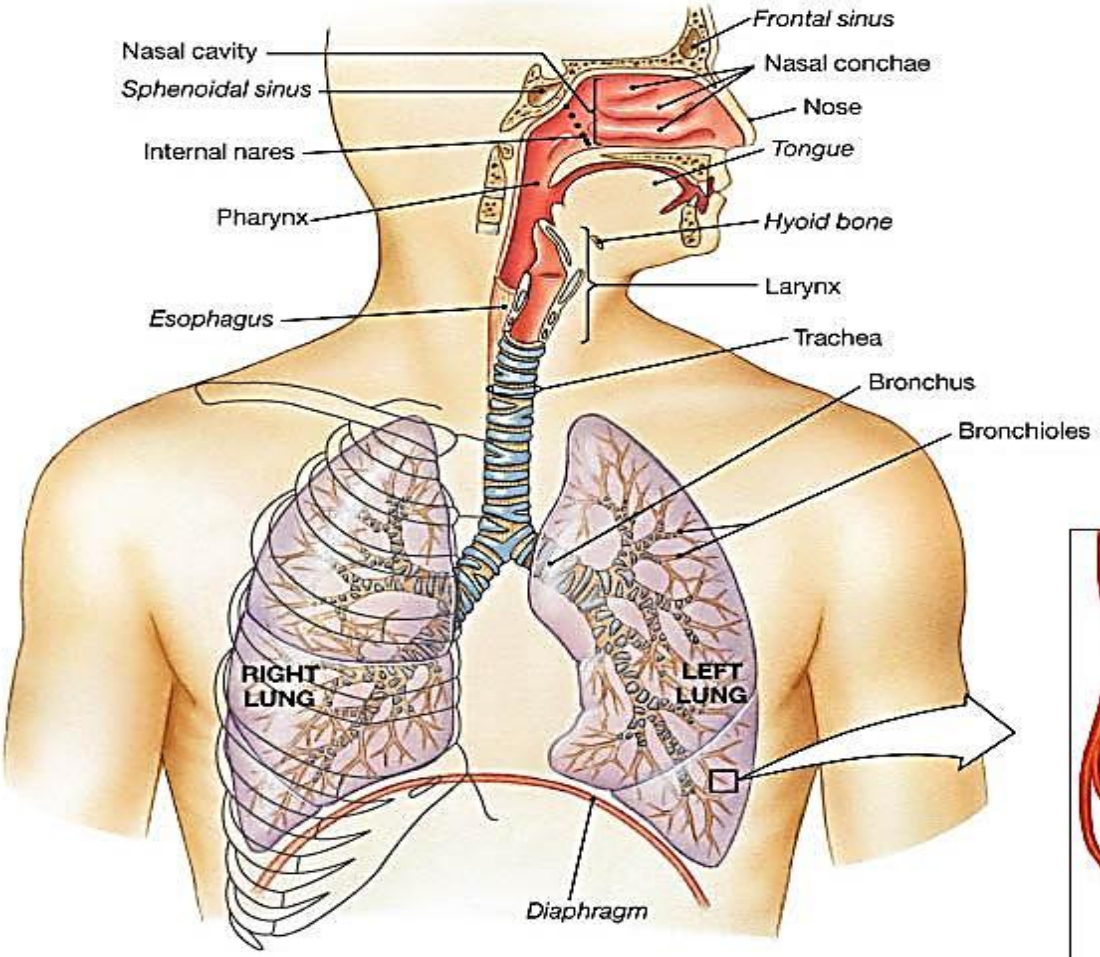
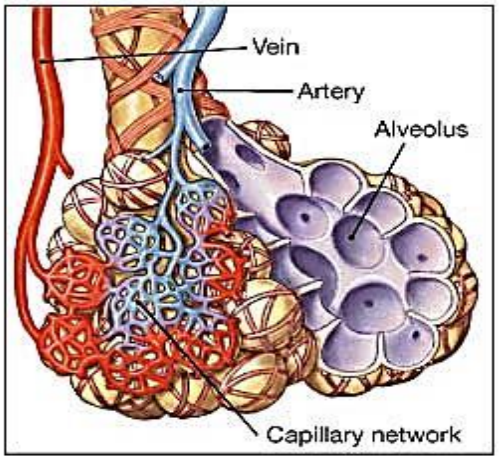


The conducting portion tranport air
The respiratoty portion carries gas exchange

LO1


Frontal sinus
Nasal cavity
Nasal conchae
Sphenoidal sinus
Nose
Internal nares
Tongue
Pharynx
Hyoid bone
Larynx
Esophagus
Trachea
Bronchus
Bronchioles
RIGHT LUNG
LEFT LUNG
Diaphragm


Vein
Artery
Alveolus
Capillary network

LO2

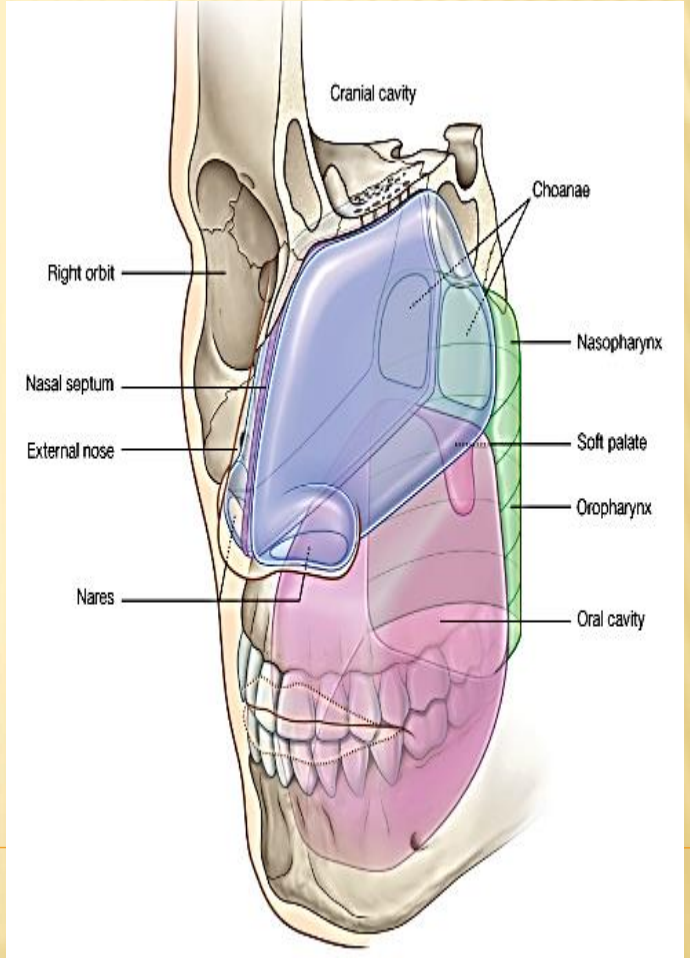
The Nose :

- Consists of:
- External nose and nasal cavity.

The external nose extends from nares onto the front of the face

- Bony part consists of nasal bones and parts of maxillae and frontal bones.

- Cartilaginous part consists of Septal and Alar cartilages



Nasal cavity:

LO2

❖ **Four walled pyramidal space.**

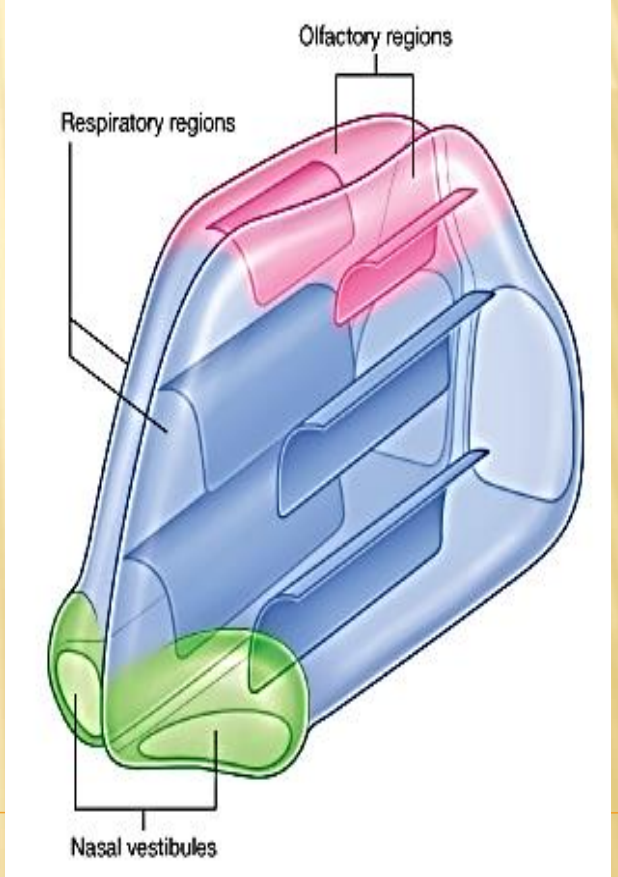
Each nasal cavity consists of three general regions-

1. The nasal vestibule,
2. The respiratory region
3. The olfactory region.

Nasal vestibule is a small dilated space just internal to the naris ,lined by skin and contains hair follicles.

Respiratory region is the largest part of the nasal cavity, has a rich neurovascular supply, and is lined by respiratory epithelium composed mainly of ciliated and mucous cells.

Olfactory region is small, situated at the apex of each nasal cavity, and lined by olfactory epithelium, and contains the olfactory receptors.

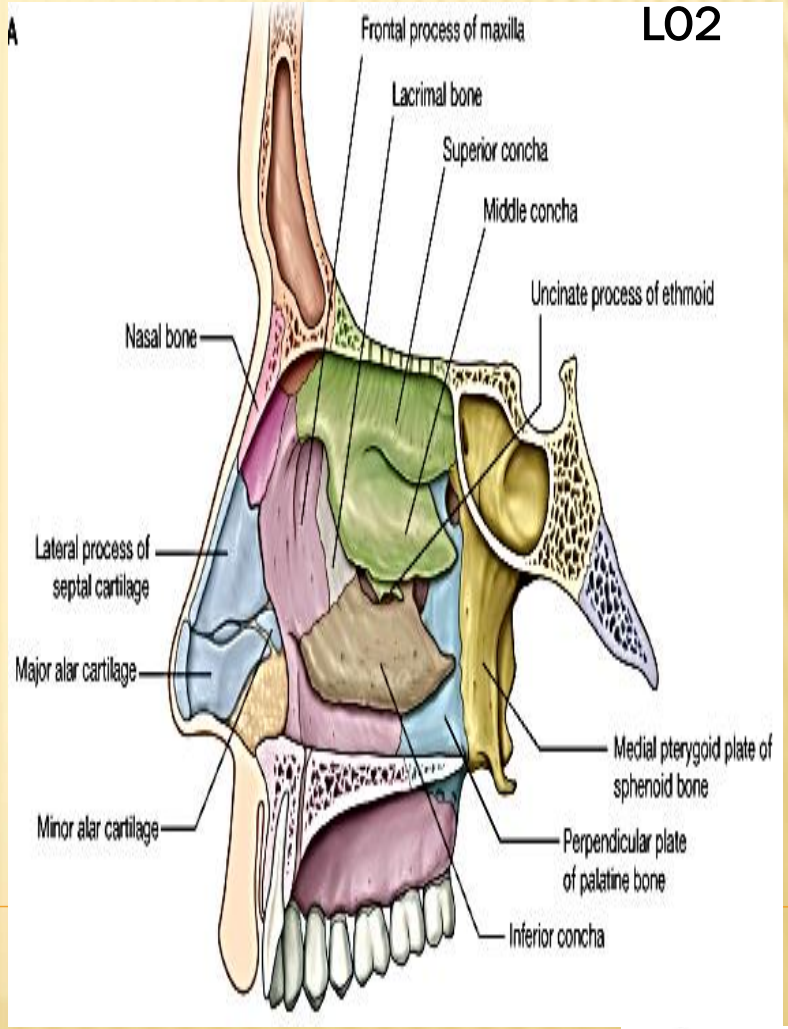


: Nasal Conchae

LO2

Def:
folds in the mucous membrane that increase air turbulence and ensures that most air contacts the mucous membranes. superior , middle and inferior

The inferior, middle, and superior conchae extend medially across the nasal cavity, separating it into four air channels, an inferior, middle, and superior meatus, and a spheno-ethmoidal recess.

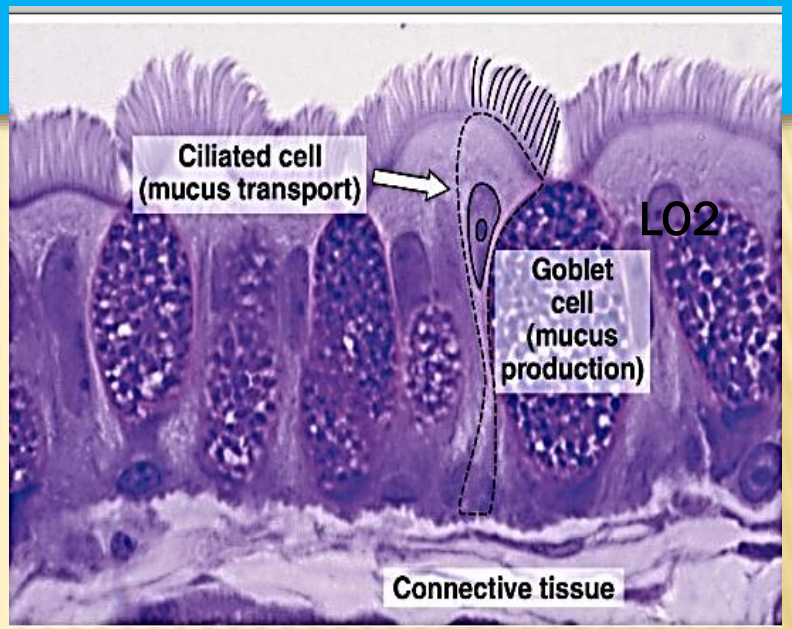


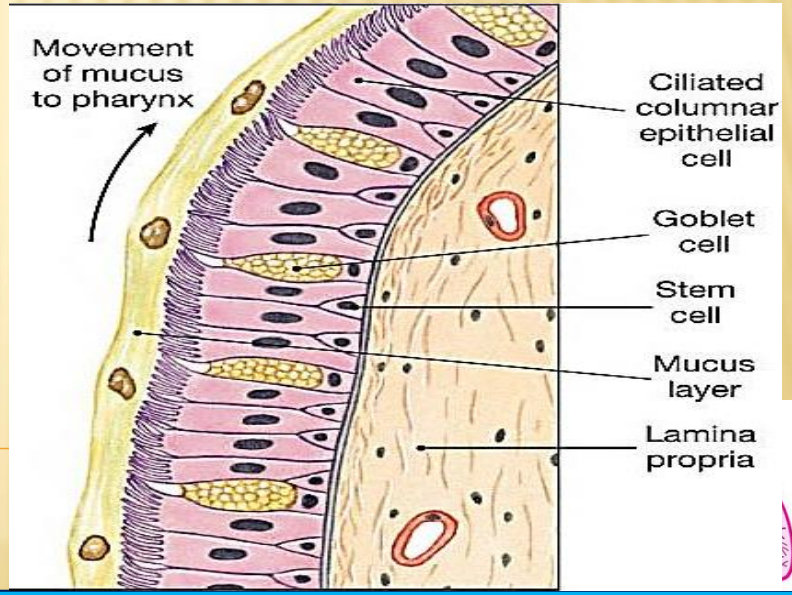
:Respiratory mucosa LO2

Most of the **conducting** portion is lined with ciliated pseudostratified columnar epithelium that contains a rich population of goblet cells and is known as **respiratory epithelium**.

Mucus can trap contaminants.

Cilia move mucus up towards mouth.

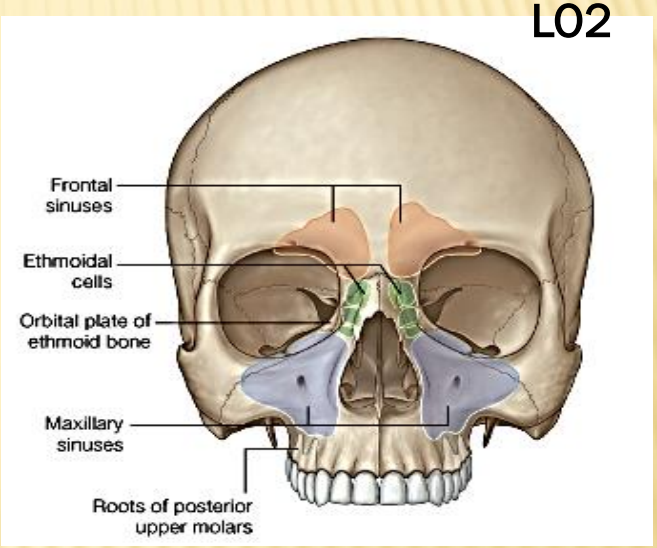


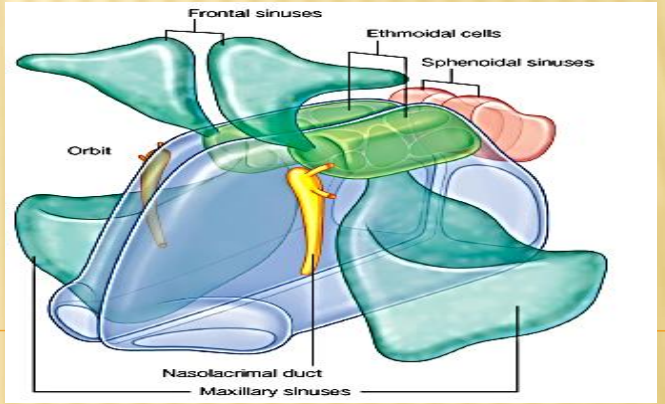


: Paranasal Sinuses

LO2

- They are closed cavities in the frontal, maxillary, ethmoid, and sphenoid bones.
- They are lined with a thinner respiratory epithelium that contains few goblet cells.
- They communicate with the nasal cavity through small openings.





The mucus produced in these cavities drains into the nasal passages as a result of the activity of its ciliated epithelial cells.

: Communication with nasal cavity

LO2

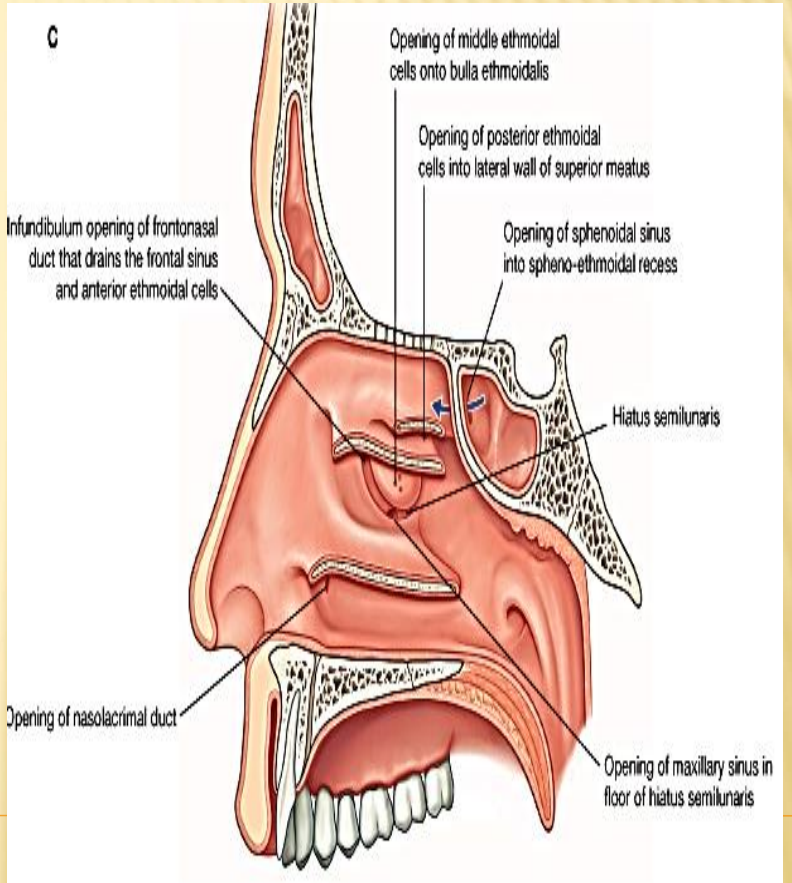
The **frontal sinus** drains through **frontonasal duct** to the semilunar hiatus of the **middle nasal meatus**.

The **sphenoidal sinus** drains into the **sphenoethmoidal recess.**

The **anterior and middle ethmoidal sinuses** drain directly into the **middle meatus**

The posterior one drains to **superior meatus**.

The **maxillary sinus** drains into the **middle nasal meatus**.

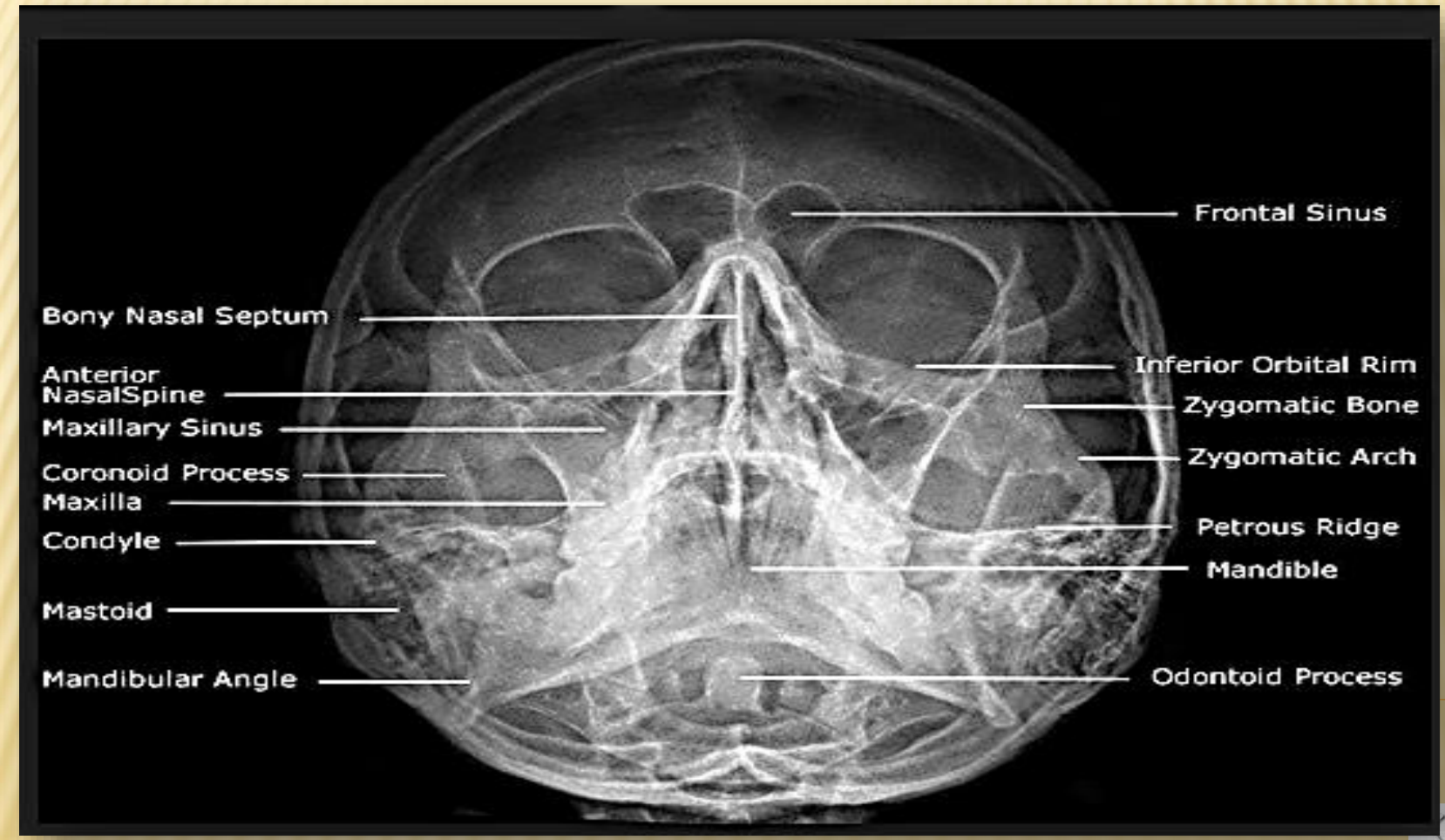


:Functions of the Paranasal sinuses

LO2

1. Decrease skull bone weight.
2. Warm, moisten and filter incoming air.
3. Add resonance to voice.
4. Regulation of intranasal pressure.
5. Increasing surface area for olfaction.
6. Absorbing shock.

: Paranasal sinuses X-ray



LO3

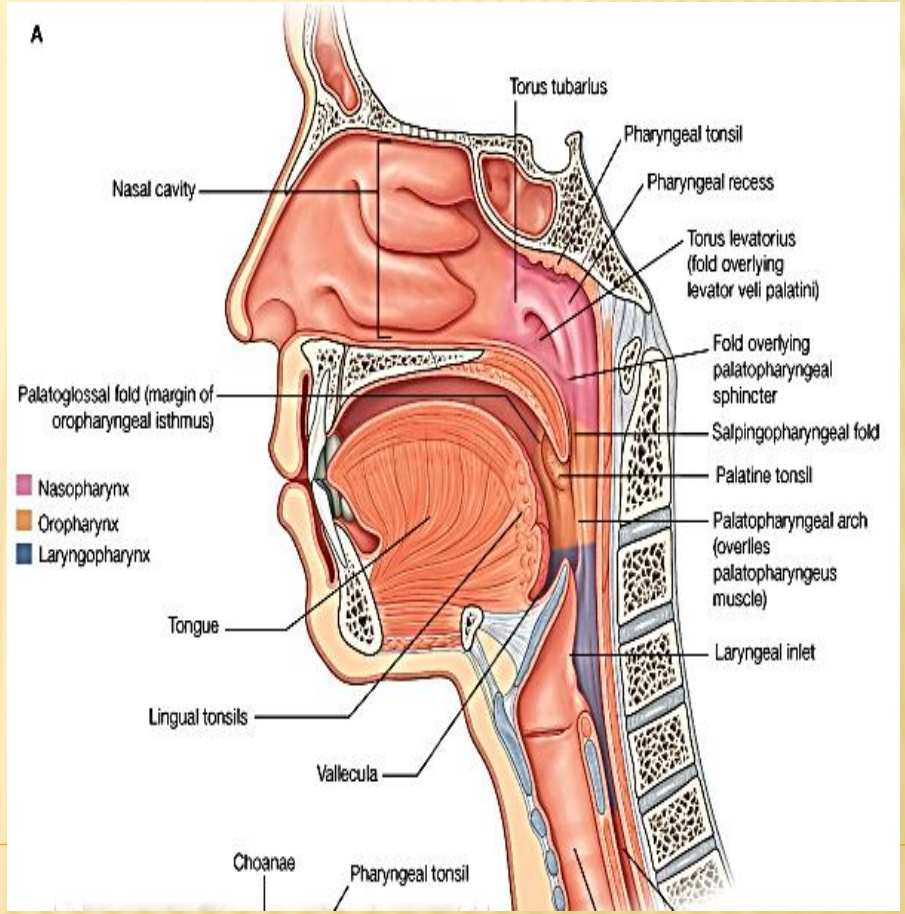
: Pharynx

- **Def:**

a musculo-fascial half cylinder that links the oral and nasal cavities in the head to the larynx and esophagus in the neck.

- **The pharyngeal cavity is a common pathway for air and 'food'.**
- **It is divided into three parts:**

1. **Nasopharynx**
2. **Oropharynx**
3. **Laryngopharynx**



LO3

:Histology of pharyngeal mucosa

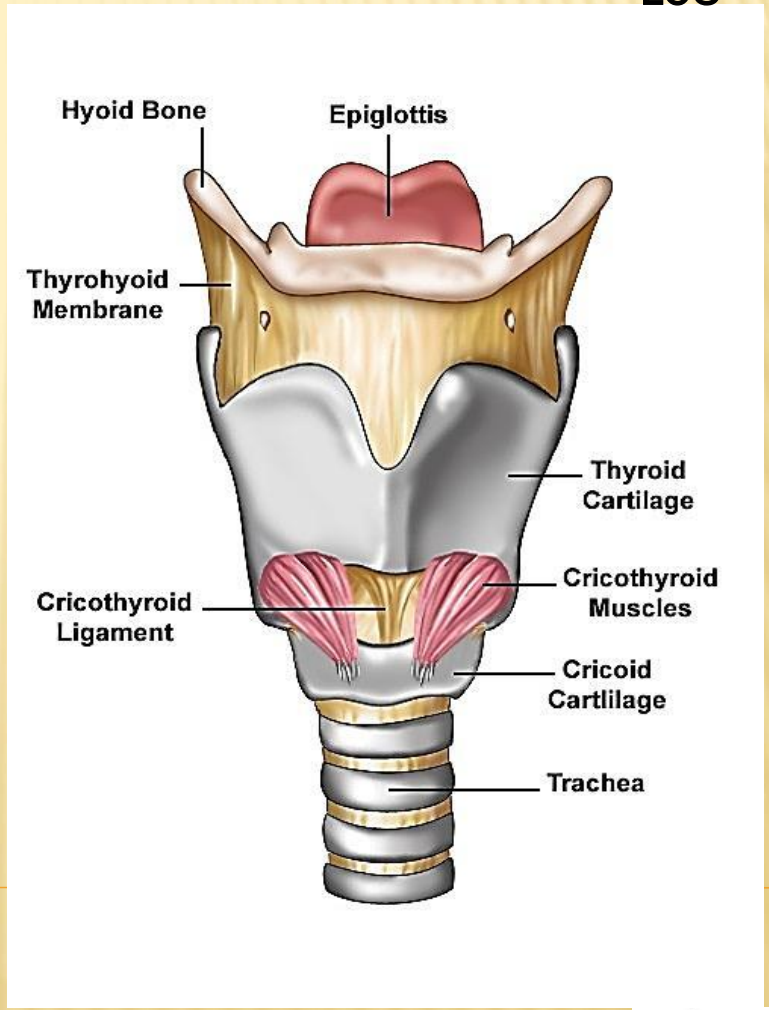
- **Superio**r-most region of the nasopharynx is covered with **pseudostratified ciliated columnar epithelium**.
- **Posterior** nasopharynx wall also houses a single pharyngeal tonsil (commonly called the **adenoids**).
- The oropharynx contains **non-keratinized stratified squamous epithelium.**
- **Palatine tonsils** are on the lateral wall between the arches, and the **lingual tonsils** are at the base of the tongue.
- **Laryngopharynx** lined with a **nonkeratinized stratified squamous epithelium**

LO3

:Larynx

- Def: It is a cylindrical musculo-ligamentous structure with a cartilaginous framework that caps the lower respiratory tract.

- The larynx is both a valve (or sphincter) to close the lower respiratory tract, and a voice box.
- Supported by a framework of **nine** pieces of cartilage (three individual pieces and three cartilage pairs) that are held in place by ligaments and muscles.



LO3

: *Laryngeal Cartilages*

- **Nine C-rings** of cartilage form the framework of the larynx
- **Thyroid cartilage** – (1) Adam's apple, hyaline, anterior attachment of vocal folds.
- **Epiglottis –** (1) elastic cartilage.
- **Cricoid cartilage** – (1) ring-shaped, hyaline.
- **Arytenoid cartilages** – (2) hyaline, posterior attachment of vocal folds.
- **Cuneiform cartilages** - (2) hyaline.
- **Corniculate cartilages** - (2) hyaline.

L03

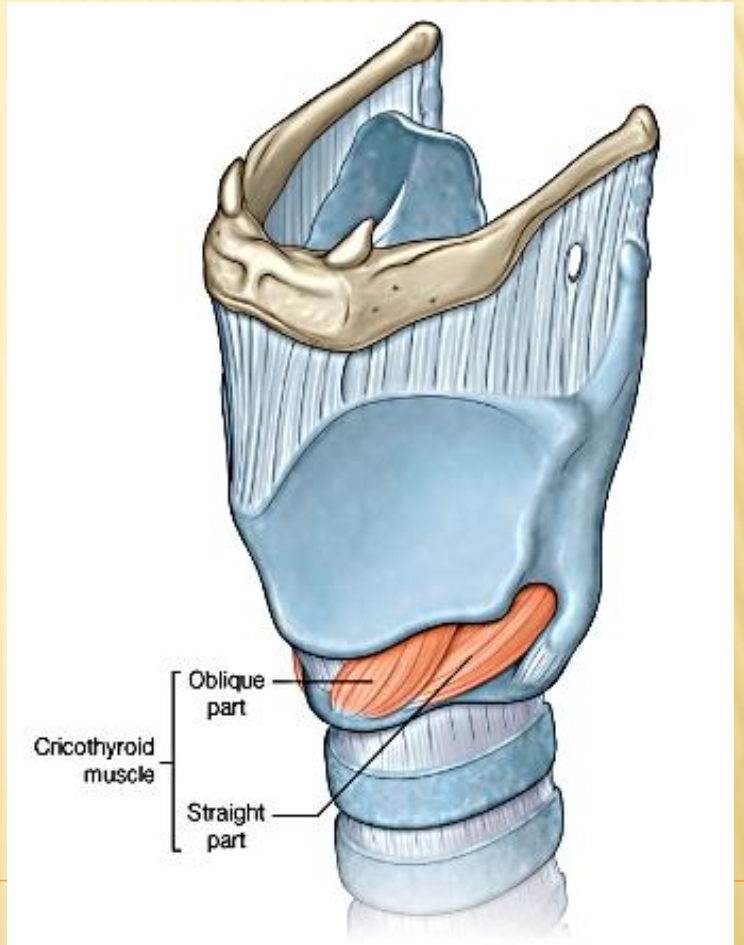
:Functions

Muscular walls : aid in voice production and the swallowing reflex.

Glottis – the superior opening of the larynx.

Epiglottis – prevents food and drink from entering airway when swallowing.

The lining epithelium is pseudostratified ciliated columnar epithelium



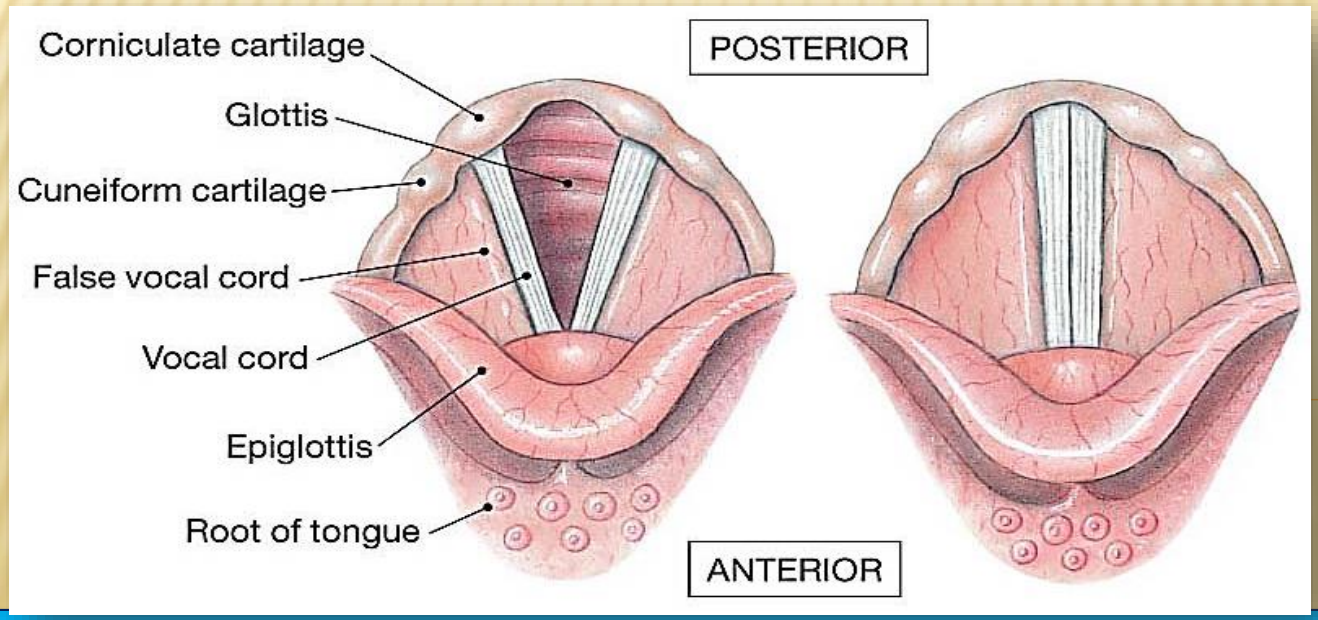
:Sound Production

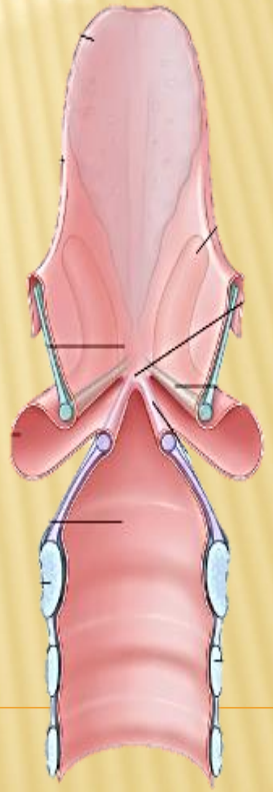
LO3

- **The cavity of larynx has two folds (ligaments):**

a. **Upper Vestibular folds = false vocal folds.**
b. **Lower Vestibular folds = True vocal folds**
produce voice when air passes between them.

- **The tension, length, and position of the vocal folds determine the quality of the sound**





False vocal folds have no role in voice production but protect the lower folds

: Mechanism of sound production

LO3

- Intermittent release of exhaled air through the vocal folds
- Loudness – depends on the force with which air is exhaled through the cords
- Pharynx, oral cavity, nasal cavity, paranasal sinuses act as **resonating chambers** that add quality to the sound
- Muscles of the face, tongue, and lips help with **expression of words**