

THE RESPIRATORY SYSTEM & THE SKIN LECTURE 5

**1ST YEAR-BIOLOGY SUBJECT –
LABORATORY SCIENCE
DEPARTMENTS**

**ALZAHRAA UNIVERSITY – COLLEGE
OF PHARMACY**

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Learning objectives

Upon completion of this lecture you should be able to

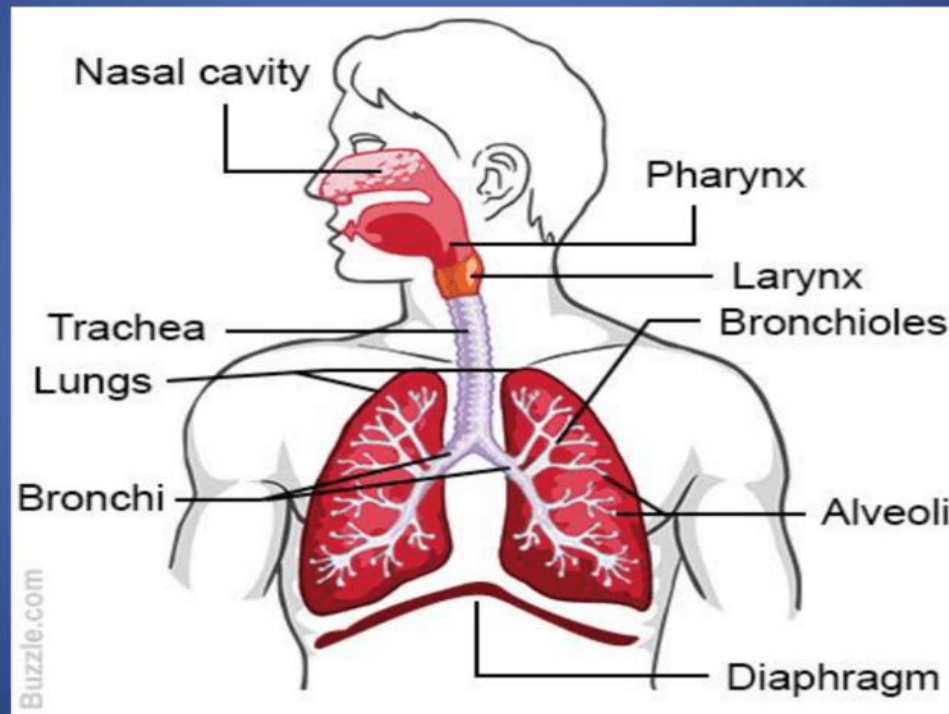
- 1. Identify the structures of the human respiratory system**
- 2. Identify the structures of upper respiratory tract & Lower respiratory tract**
- 3. Summarize the role of respiratory system in the body**
- 4. Understand the Mechanism of Breathing**
- 5. Summarize the function the skin**

Introduction

- The respiratory system plays a crucial role in maintaining homeostasis by providing oxygen to the body and removing carbon dioxide.
- It consists of various structures and processes that work together to
 1. ***ensure efficient gas exchange***
 2. ***regulate acid-base balance***
 3. ***and facilitate vocalization.***

Organs of the respiratory system

THE RESPIRATORY SYSTEM



The respiratory system can be divided anatomically into

❖ upper respiratory tract

- 1) **nose and Nasal Cavity**
- 2) **Pharynx**
- 3) **Larynx**

❖ Lower respiratory tract

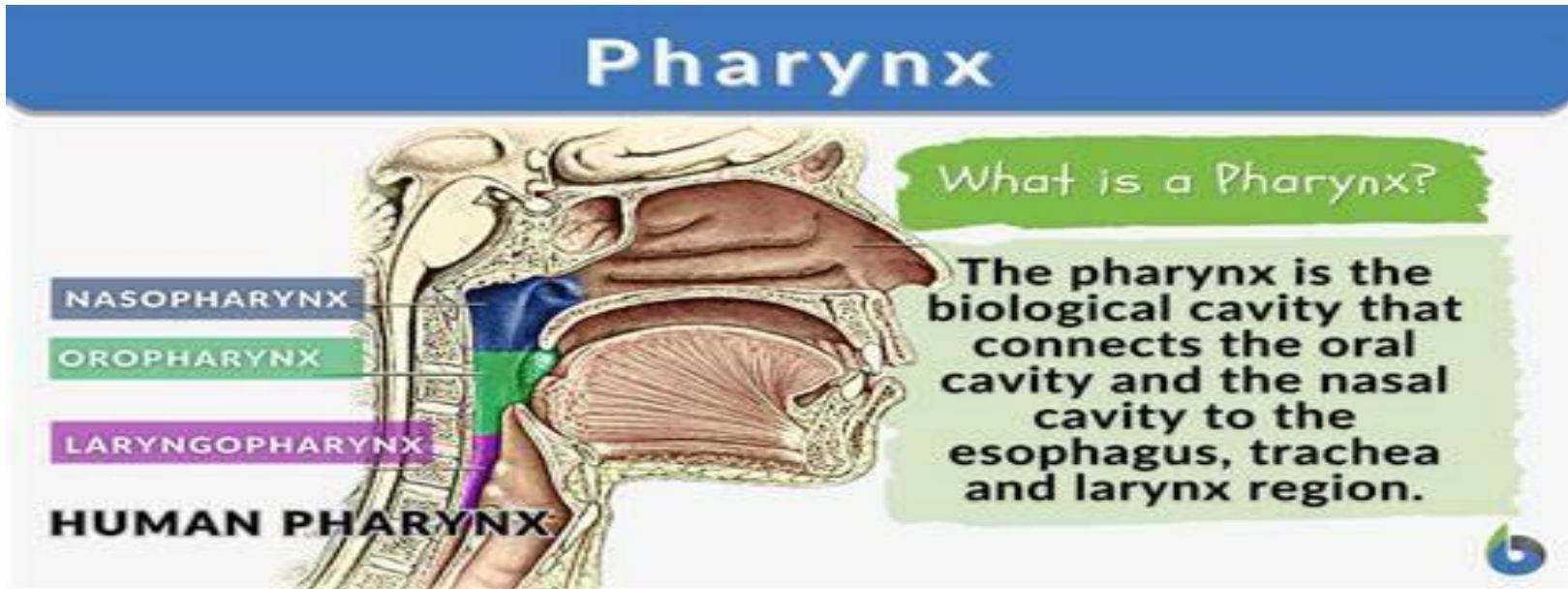
- 1) **Trachea**
- 2) **Bronchi**
- 3) **Lung**
- 4) **alveoli**

1- upper respiratory tract

- **Nose and Nasal Cavity:**

- The entry point for air, where it is filtered, warmed, and moistened.
 - The mucous membranes trap particles and pathogens.
 - - Contains olfactory receptors for the sense of smell.
- - **Pharynx:** A muscular tube that connects the nasal cavity and mouth to the larynx and esophagus.
 - It plays a role in both the respiratory and digestive systems.

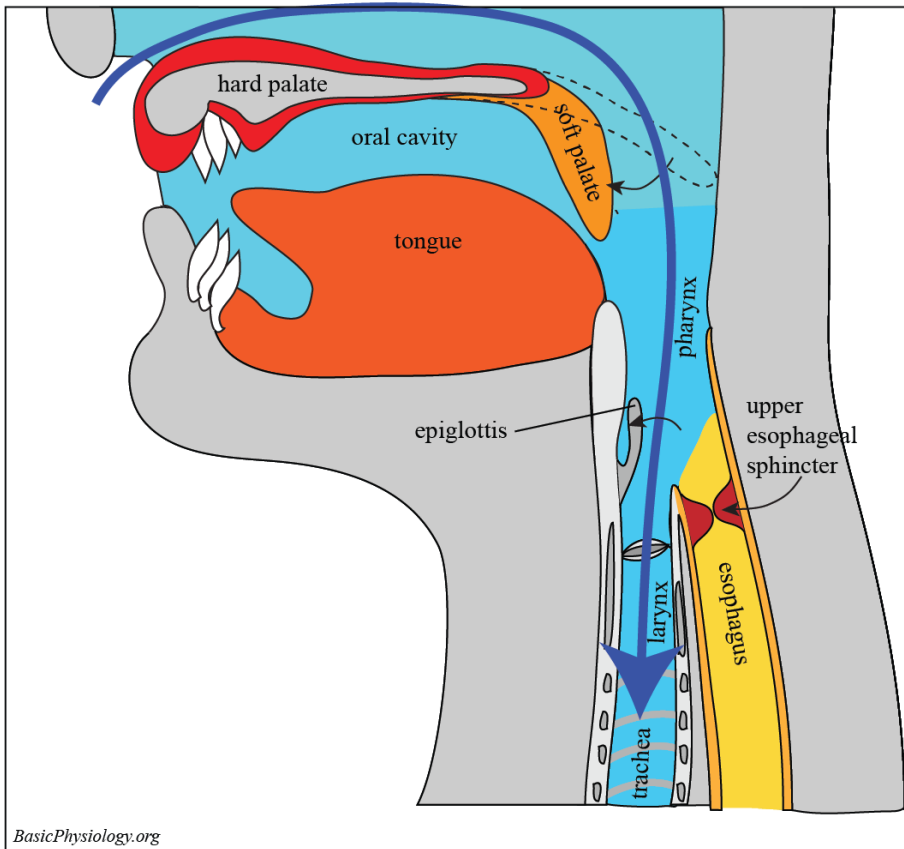
Parts of the pharynx



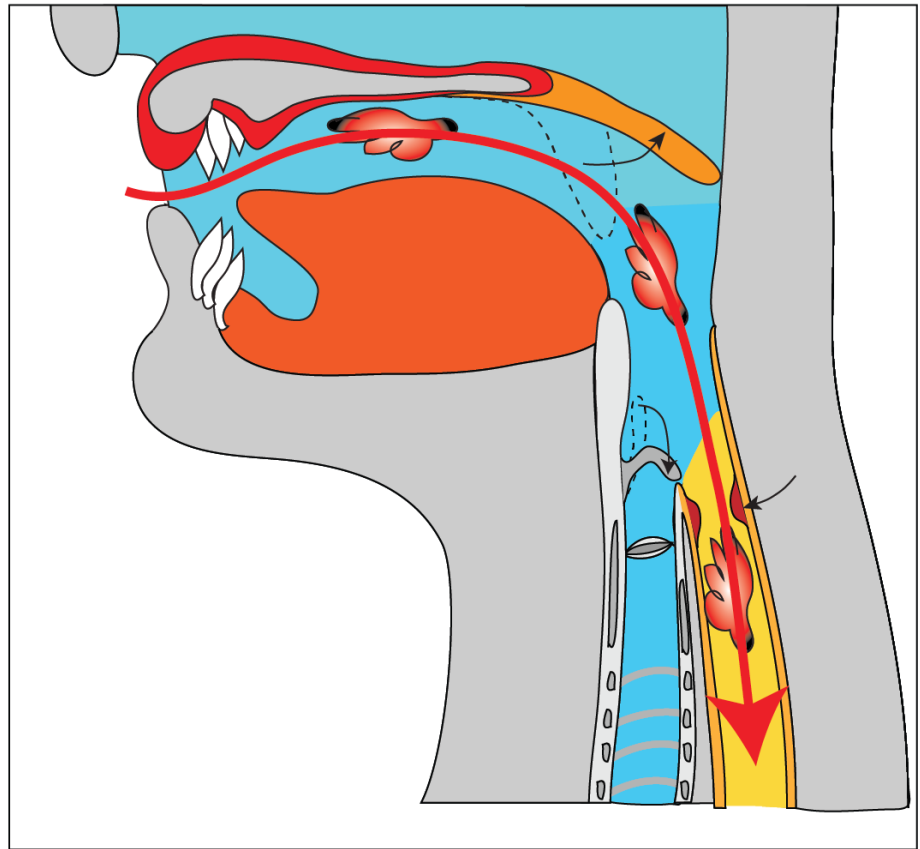
- - **Larynx**: Also known as the voice box, it houses the vocal cords and is responsible for sound production.
- The epiglottis, a flap of cartilage, prevents food from entering the trachea during swallowing.

epiglottis

Inspiration



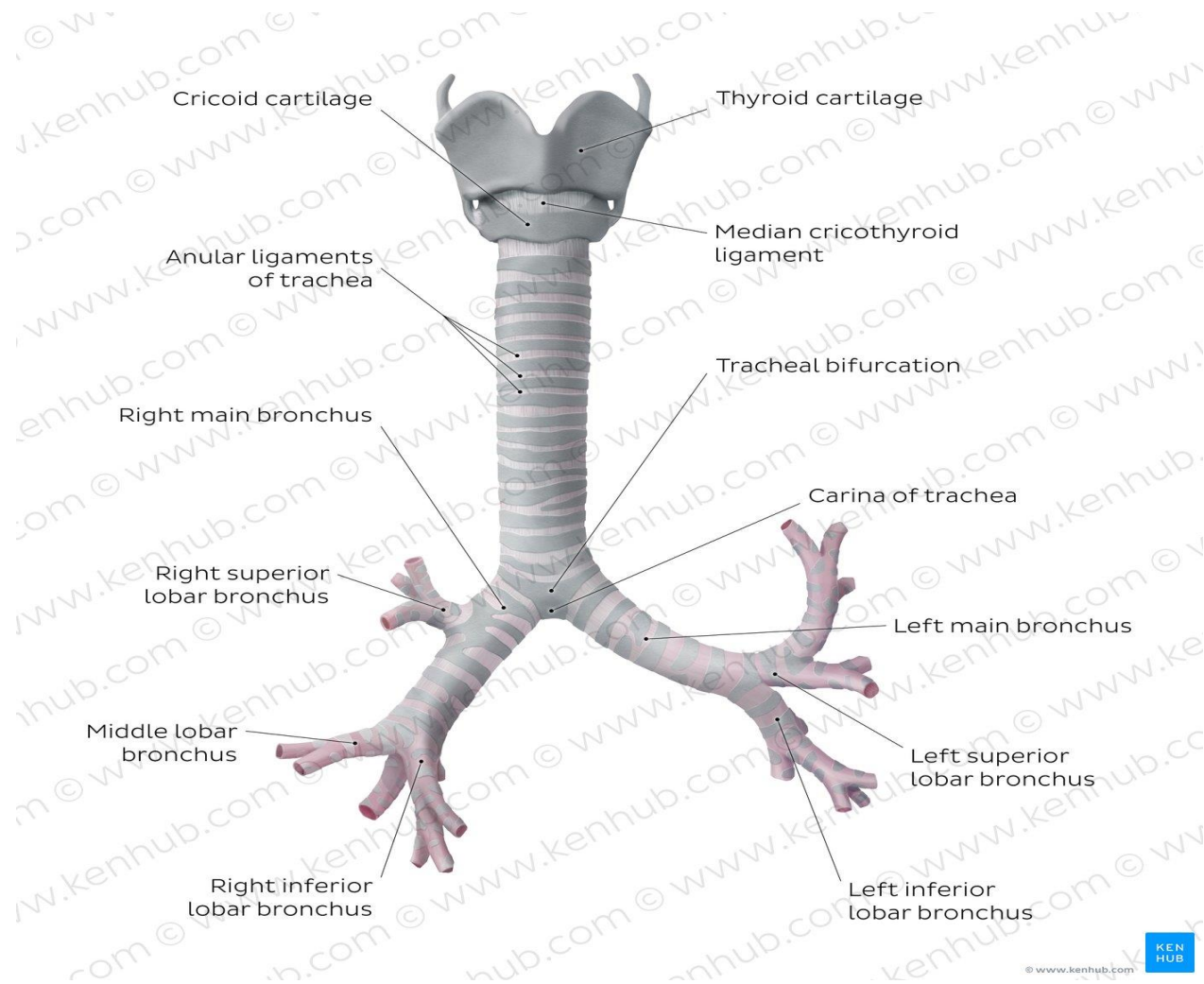
Swallowing



Lower Respiratory Tract:

- - **Trachea:** A cylindrical tube that extends from the larynx and branches into the bronchi. It is reinforced with cartilage rings to keep it open.
- - Bifurcates into the right and left bronchi at the carina.
- - **Bronchi:** The trachea divides into two main bronchi (left and right) that lead to each lung.
- These further branch into smaller bronchi and bronchioles.
- **The right bronchus is wider and more vertical, making it more susceptible to aspiration**

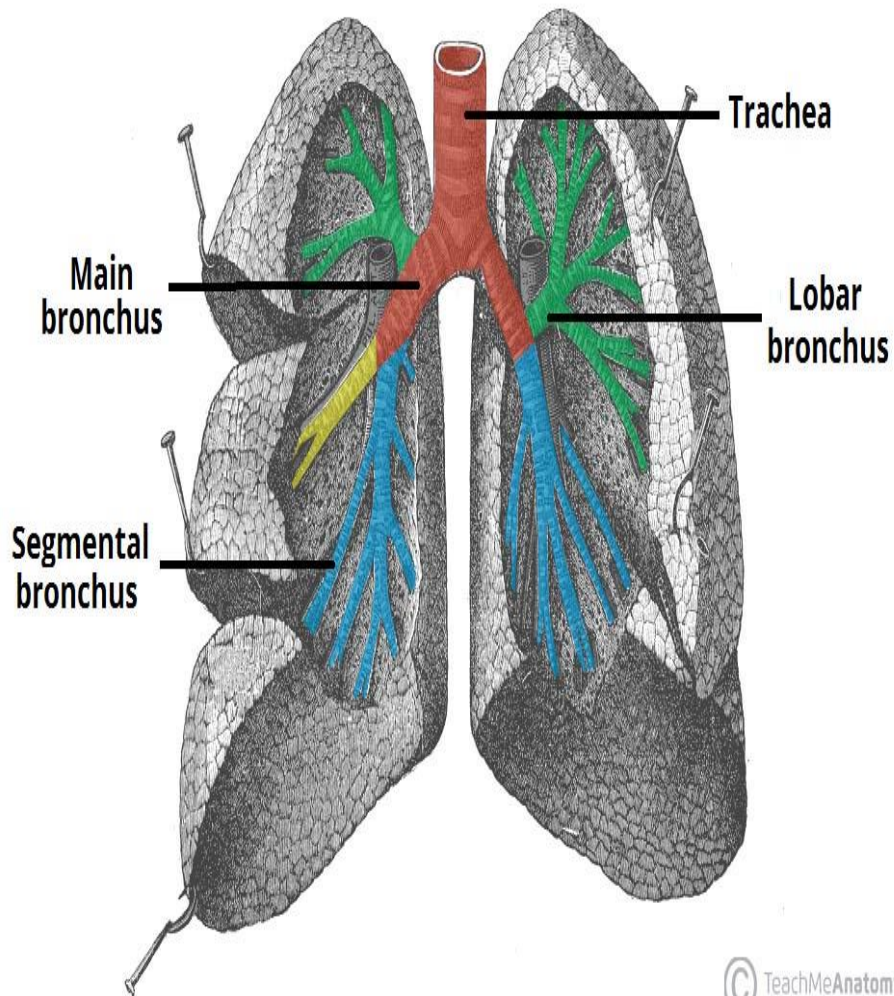
Trachea & bronchi



Lower respiratory tract

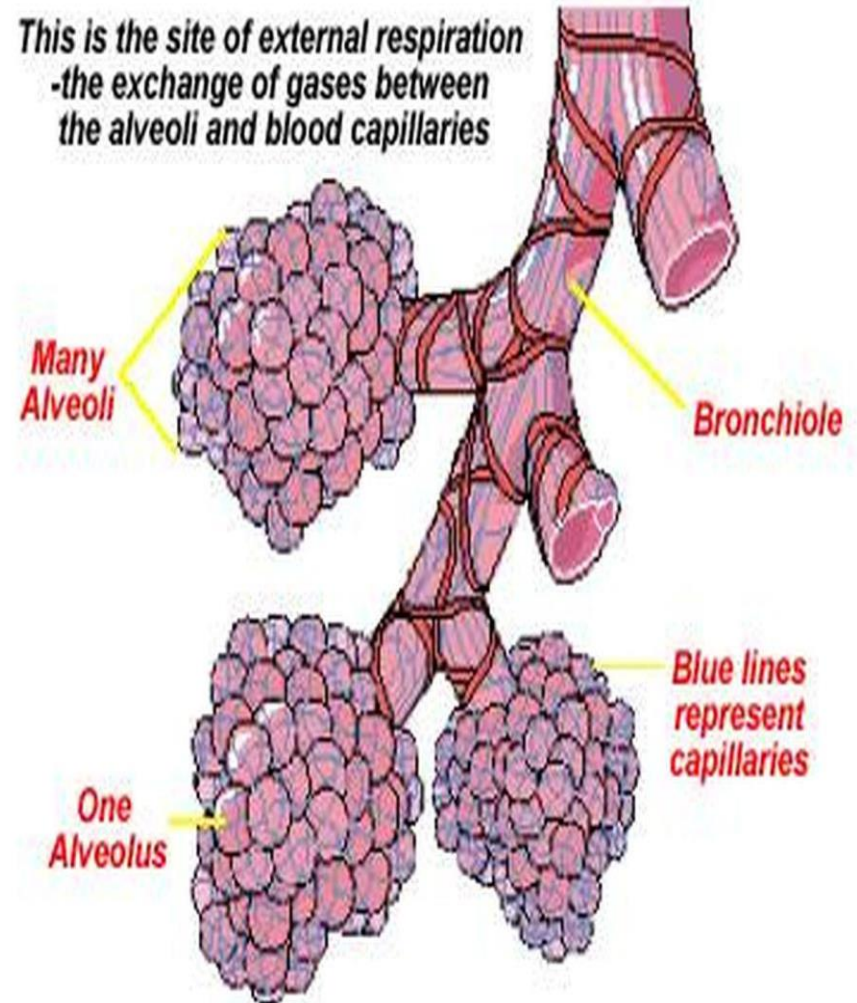
- - **Lungs:** Paired organs located in the thoracic cavity, responsible for gas exchange.
- Each lung is divided into lobes (three in the right lung and two in the left).
- - **Alveoli:** Tiny air sacs at the end of bronchioles where gas exchange occurs. They are surrounded by a network of capillaries.
- Approximately there are 300 million alveoli in the lungs, increasing surface area for gas exchange.

Lung



Bronchiole with Alveoli (each sphere is an individual alveolus)

*This is the site of external respiration
-the exchange of gases between
the alveoli and blood capillaries*



Function of the Respiratory System

a. Gas Exchange:

- **Oxygen Uptake:** Oxygen from inhaled air diffuses across the alveolar walls into the bloodstream.
- **Carbon Dioxide Removal:** Carbon dioxide produced by cellular metabolism diffuses from the blood into the alveoli to be exhaled.

b. Regulation of Blood pH:

- The respiratory system helps regulate the blood's pH by controlling the **levels of carbon dioxide**.
- An increase in carbon dioxide leads to a decrease in pH (more acidic), while a decrease leads to an increase in pH (more alkaline).

c. Vocalization:

- The larynx facilitates sound production, allowing for speech and communication.

d. Protection:

- The respiratory system includes mechanisms like mucous production and ciliary action to trap and expel foreign particles and pathogens.

Mechanism of Breathing

inspiration (Inhalation):

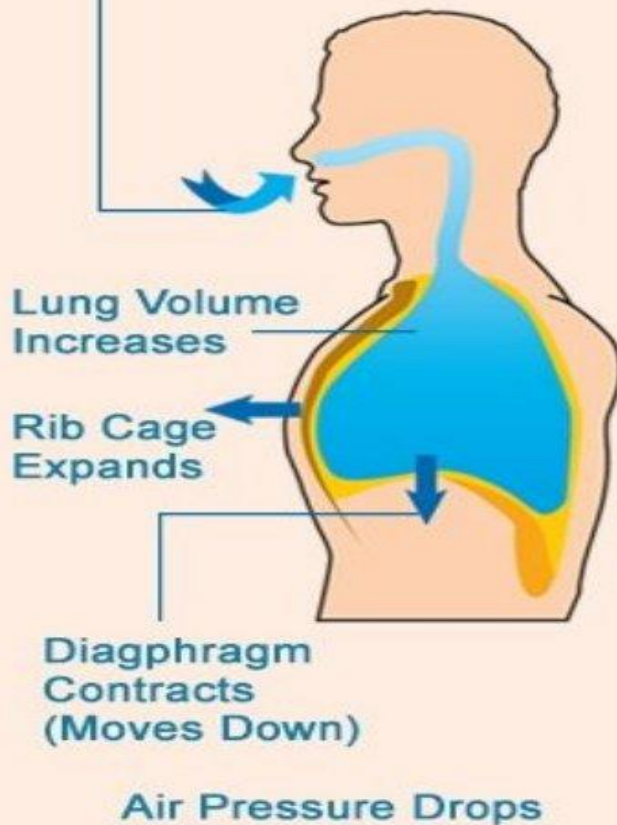
- **Active Process:** Diaphragm and intercostal muscles contract, increasing the thoracic cavity's volume.
- **Airflow:** The pressure inside the thoracic cavity decreases, causing air to flow into the lungs.

b. Expiration (Exhalation):

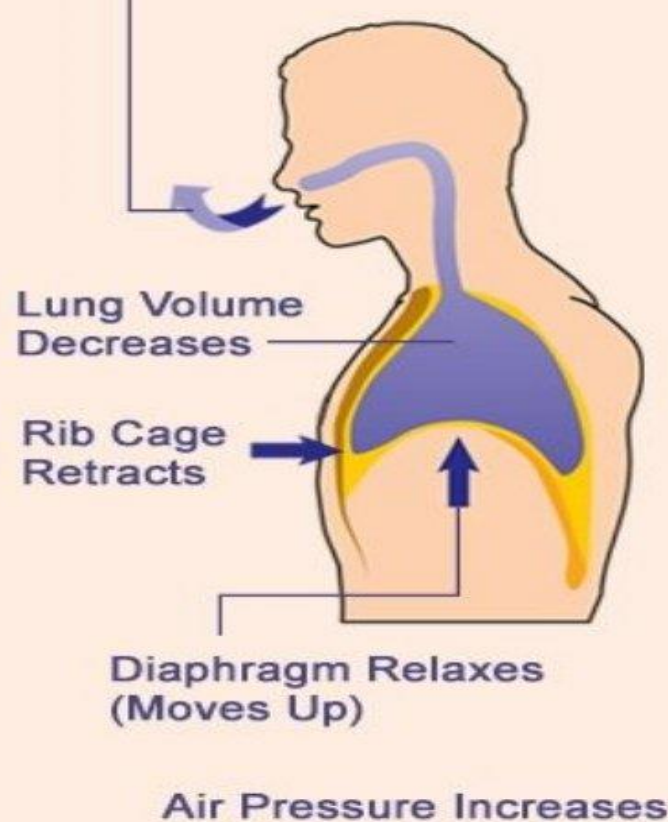
- **Passive Process:** The diaphragm and intercostal muscles relax, decreasing the thoracic cavity's volume.
- **Airflow:** The pressure inside the thoracic cavity increases, pushing air out of the lungs.

Breathing Mechanism Diagram

Inspiration (Inhaling)



Expiration (Exhaling)



Control of Breathing process

1. **Medulla Oblongata and Pons:** These brainstem centers regulate the rate and depth of breathing based on the body's needs.
2. - **Chemoreceptors:** There are 2 types of **Chemoreceptors** **central** and **peripheral chemoreceptors**

❖ **peripheral chemoreceptors :-**

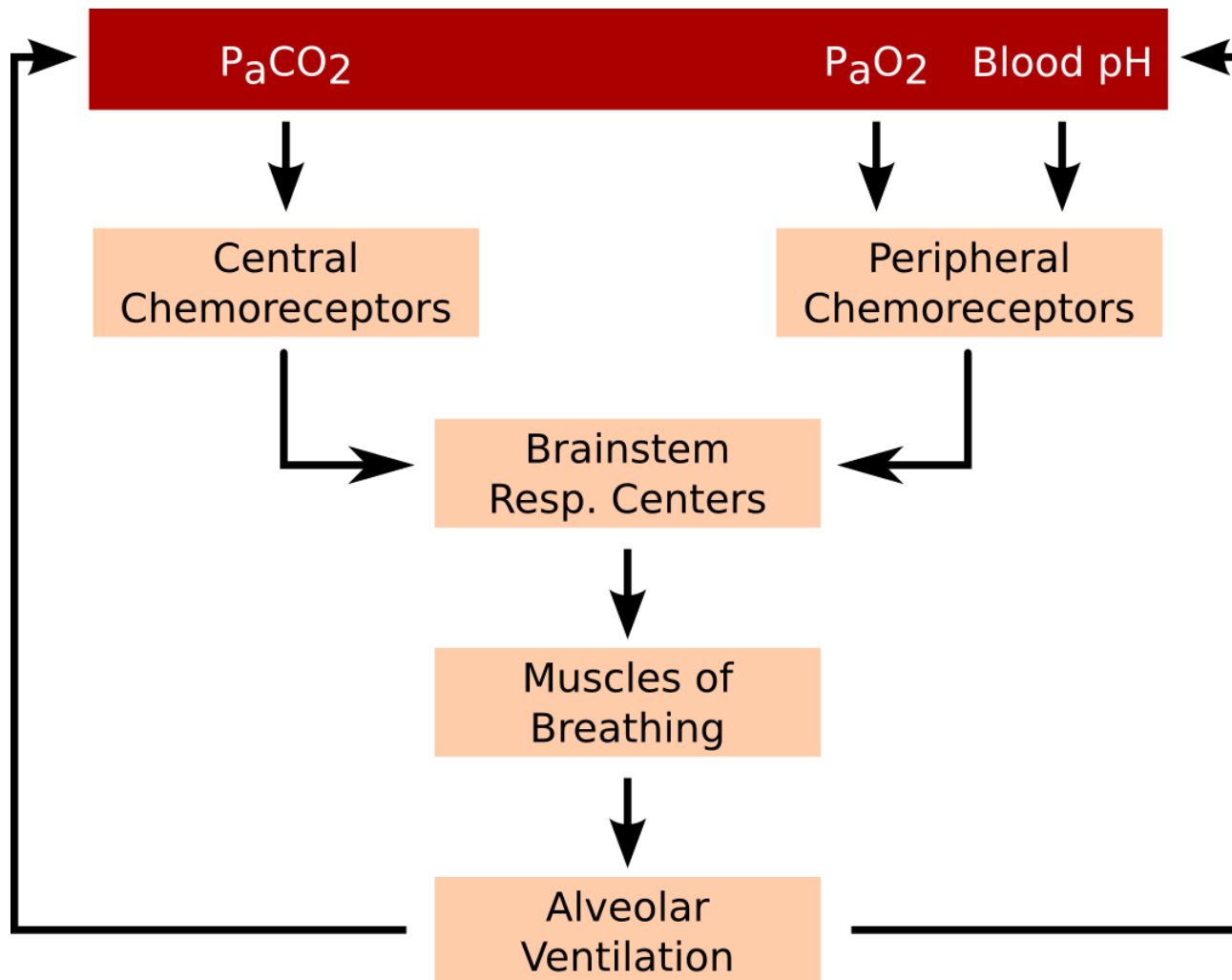
Location in the carotid bodies

Sensitive to changes in carbon dioxide, oxygen, and pH levels in the blood. They send signals to modify breathing patterns.

❖ **central chemoreceptors : located in the Medulla Oblongata of the brain stem**

**They sense changes in pH in cerebrospinal fluid (CSF)
Which reflects the CO₂ level in the blood**

Diagram about Control of Breathing



The skin

- The skin is the body's outermost layer and acts as a barrier between the internal organs and the external environment
- **Functions of the Skin:**
 - **1. Protection:**
 - The skin protects internal organs and tissues from physical damage, pathogens (bacteria, viruses), and harmful substances in the environment..
 - **2. Temperature Regulation:**
 - Through the dilation and constriction of blood vessels and the production of sweat, the skin helps maintain the body's temperature within a narrow range.
 - **3. Sensation:**
 - The skin contains a variety of sensory receptors that detect pain, pressure, temperature, and touch.
 - **5. Vitamin D Synthesis:**
 - The skin synthesizes vitamin D when exposed to sunlight (UVB radiation).
 - This vitamin is essential for the absorption of calcium and phosphate, promoting bone health.
 - **6. Immunity:**
 - The skin acts as the first line of defense in the immune system.
 - The epidermis contains cells like Langerhans cells that help detect pathogens and initiate immune responses.

Structure of the Skin:

The skin consists of three main layers, each with distinct structures and functions:

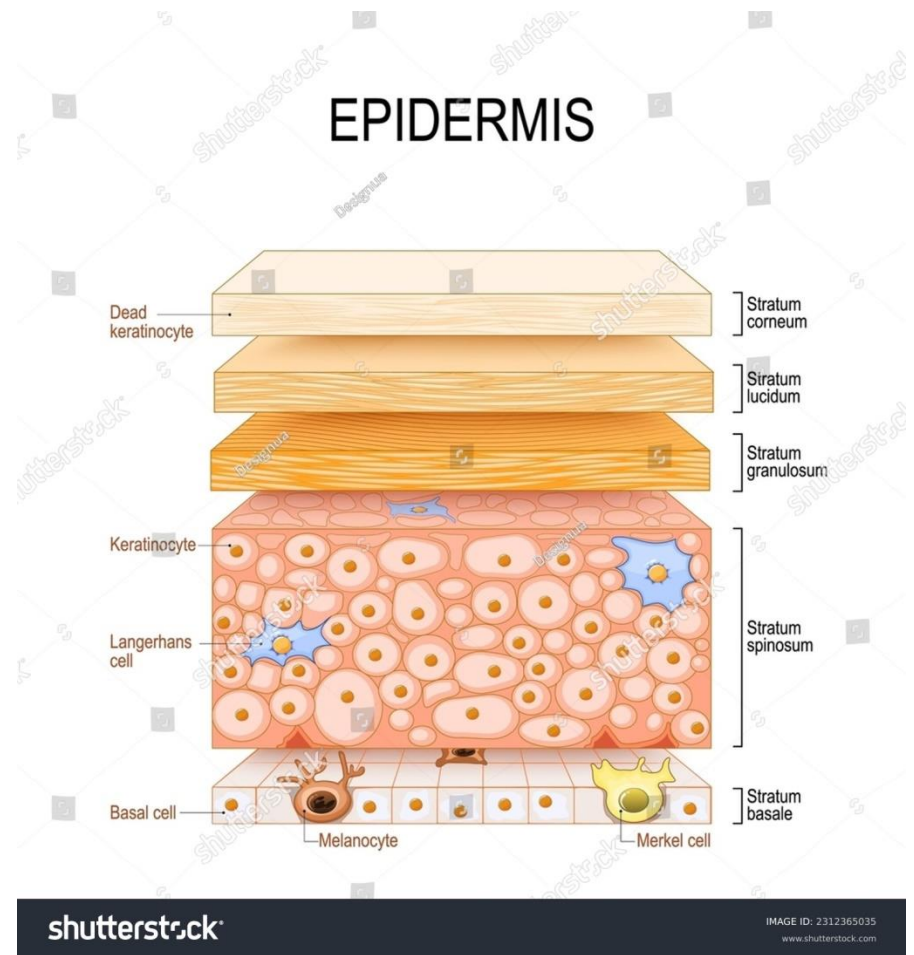
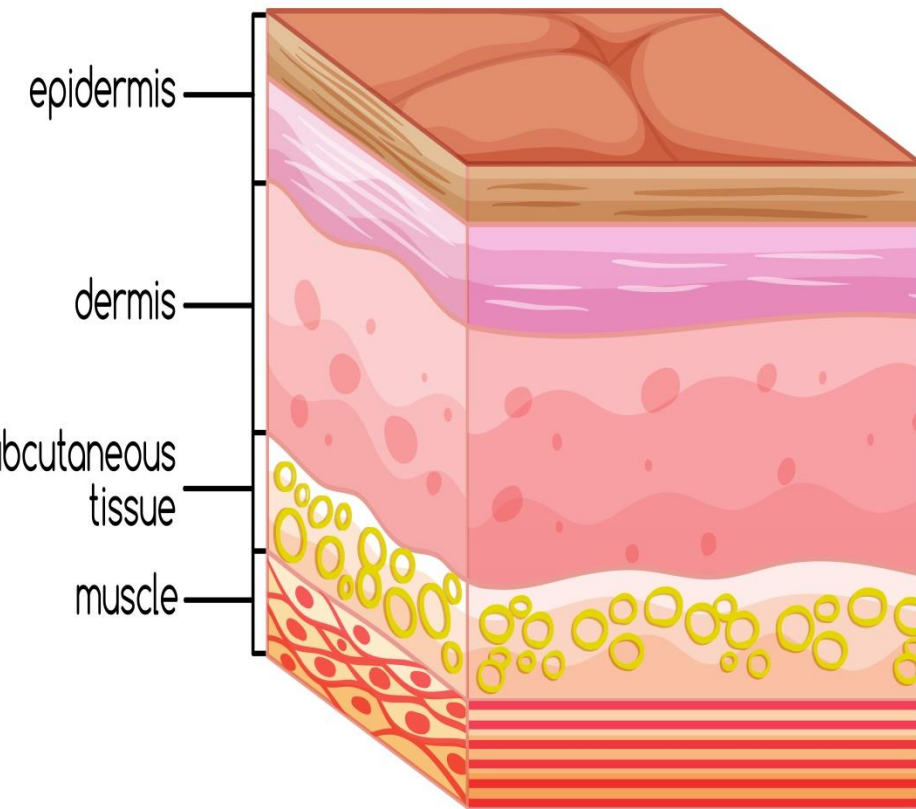
1. **Epidermis (Outer Layer):**

- The epidermis is the outermost layer of the skin, composed of keratinized stratified squamous epithelium. Its main function is protection.
- The epidermis is avascular (lacks blood vessels) and relies on diffusion from the underlying dermis for nutrients.
- **Dermis (Middle Layer):**
 - The dermis lies beneath the epidermis and is much thicker. It contains blood vessels, nerve endings, hair follicles, and glands.
- **Hypodermis (Subcutaneous Layer):**
 - The hypodermis, also called the subcutaneous layer or superficial fascia, lies beneath the dermis. It is made up primarily of adipose tissue (fat) and connective tissue.

layers of the Epidermis (from deep to superficial)

1. • **Stratum basale** The deepest layer, where new skin cells (keratinocytes) are formed through mitosis. This layer also contains melanocytes (cells that produce the pigment melanin)
2. • **Stratum spinosum:** it contains keratinocytes and Langerhans cells (immune cells).
3. • **Stratum granulosum:** In this layer, keratinocytes flatten and start to die, forming granules filled with keratin and lipids that create a waterproof barrier.
4. • **Stratum lucidum:** This thin, clear layer is only found in thick skin (such as the palms and soles). It consists of dead keratinocytes.
5. • **Stratum corneum:** The outermost layer, composed of dead, flattened keratinocytes (corneocytes). These cells form a tough, protective barrier and are constantly shed and replaced.

Layers of Human Skin



Thank you
Any questions ?