Objectives
- To outline the functions of the respiratory system.
- To identify the major structures that contribute to the anatomy of the respiratory system.

Functions
- To move air in and out of the lungs.
- To exchange gases between air and the blood.
- Exchange gases between blood and the body cells.
- To use oxygen and remove CO2 from the cells.

Pathway of Air Travel
- Nose >
- Pharynx >
- Larynx >
- Trachea >
- Bronchi >
- Lungs >
- Alveoli

Nose & Nasal Membranes
- Functions:
  - Humidifies Air
  - Sensory
  - Protection
  - Sinuses
Pharynx

In the throat, connects the nasal and the oral cavities to the larynx. Food and air passages join in the pharynx, which conducts air to the larynx and food to the esophagus.

Three parts:
- Nasopharynx
- Oropharynx
- Laryngopharynx.

Trachea

Tube for respiration and movement of air during inhalation and exhalation.

Also known as the “windpipe” extends from the larynx into the thoracic cavity.

Contains C-shaped hyaline cartilage rings that support the opening for air passage.

Bronchi & Bronchioles

Branches off of the trachea that allow for passage of air to the alveoli – the many air sacs of the lungs.

The right primary bronchus is shorter than the left, both are supported with wedge-shaped cartilage.

Adaptations for Survival

Ciliated epithelium lining bronchus (also in trachea).

- Easily damaged by smoke (1st or 2nd hand) & particulates/pollutants in the air.

Bronchiole and alveoli in a human lung.
Lungs & Alveoli

Composed of the alveoli, where the site of gas exchange occurs.

- Left lung – two lobes
- Right lung - three lobes.

Alveolar wall and the capillary wall are composed of simple, squamous epithelium, together these two walls make up the respiratory membrane.

Site of Gas Exchange

Transport of oxygen

- Oxygen is carried primarily by the hemoglobin, the respiratory pigment found in red blood cells, and some oxygen is also dissolved in the plasma.

- When O2 combines with hemoglobin it is said to be oxyhemoglobin, which forms in the lungs and turns the blood, bright red.

- Myoglobin – heme containing respiratory protein in the muscles (stabilizes oxygen level in muscle cells).

Air movement assisted by the muscular diaphragm
Respiratory control centers in the brainstem control the basic rate and depth of breathing.

Regulation of Respiration (in higher animals)

I. Medulla oblongata: Regulates rhythm
II. Pons: Fine tuning breathing rhythm
Prevents lung over-inflation
III. Cortical (cerebral cortex) Controls: Conscious/voluntary control
IV. Hypothalamus: Emotions & rapid temp changes

Respiration in other animals

Insect tracheal system

Hemocyanin – oxygen carrying pigment that carries copper rather than iron. When oxidized is turquoise color rather than red.

Fish

Gills of albacore tuna
Buccal Breathing

Adaptations for Extreme Environments
Sperm whale can dive up to 2,200 meters (~1.36 mi.) & be under water for 2 hrs.

How?
→ Bradycardia
→ Store O2 in muscle tissues - myoglobin

Flying high – O2 efficient animals

A. Inhalation 1
- ballotropes chest cavity, drawing air in through nostrils. Some of the air flows in through the trachea goes to lungs and some goes to posterior air sacs.

B. Exhalation 1
- Anterior air sacs empty. Air from posterior air sacs moves into lungs.

C. Inhalation 2
- Air in lungs moves to anterior air sacs and is replaced by newly inhaled air.

D. Exhalation 2
- Air in anterior air sacs moves out of the body and air from posterior sacs flows into the lungs.