

# Breathing System

## Functions

- Effective absorption of oxygen from the air
- Excretion of carbon dioxide to the air

## Structure

*Textbook Diagram: macrostructure of the breathing system.*

### Nasal Cavity

- hairs and mucus filter out much of the dust and small particles like bacteria
- the wet surface moistens the air
- the rich blood supply warms the air to body temperature

### Mouth Cavity

- air may enter via the mouth but it does not get the same high level of cleaning, moistening or heating

### Epiglottis

- protects the trachea against the entry of food and drink
- by a reflex action the glottis (opening of trachea) is closed by the epiglottis during swallowing

### Larynx

- uses the flow of air along the trachea to produce specific sounds

### Trachea

- a channel for air to flow to and from the bronchi
- its mucus lining traps dust and bacteria
- the beating of cilia on its surface move the mucus to the pharynx for swallowing
- the C-shaped rings of cartilage support the wall of the trachea keeping it permanently open

### Bronchus

- an open tube for air to flow in and out of a lung
- it is similar in structure to the trachea but narrower

### Bronchioles

- a narrow open tube for air to flow in and out of the alveoli

### Alveoli

- the sites of gas exchange in close extensive contact with blood capillaries

### Lungs

- two large spongy respiratory organs in the thoracic cavity
- possess a large surface area for gas exchange of relatively small volume

## Pleural Membranes

- surround and protect the lungs
- line the thoracic cavity
- 'glues' the lungs to the chest wall and diaphragm
- permits smooth moving of lungs across chest wall and diaphragm during breathing movements

## Ribs

- protective bony cage around the lungs and heart; play a role in breathing

## Diaphragm

- a broad sheet of muscle
- its contraction is responsible for breathing

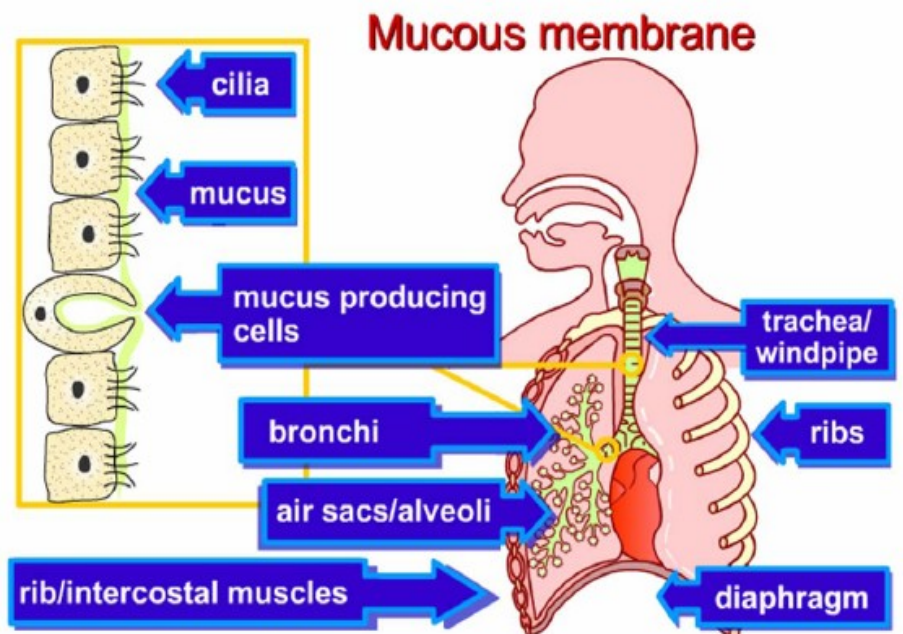
## Intercostal Muscles

- changes the shape of the thoracic cavity
- responsible for 25% of breathing

## Inspired and Expired

Inspired and Expired Air		
Gas + %	Inspired Air	Expired Air
Nitrogen	78%	76%
Oxygen	20.8%	15%
Carbon Dioxide	0.04%	4.2%
Water Vapour	1.2%	6.2%

**Note:** a lot of water is lost from the respiratory tract during expiration.



## Gas Exchange Adaptations

*Textbook Diagram: alveolus and its capillaries.*

Gas exchange is by diffusion so the adaptations are such to make diffusion efficient.

Oxygen diffuses from the air in the alveolus into the blood of the capillary.

Carbon dioxide diffuses from the blood into the air of the alveolus.

- Large Surface Area: 90m<sup>2</sup> — 700 million alveoli and 40 billion capillaries.
- Permeable Surfaces: the cell membranes are freely permeable to O<sub>2</sub> and CO<sub>2</sub>.
- Thin Barrier: the distance between the air and the blood is two cells wide.
- Moist Surface of Alveolus: enhances the uptake of O<sub>2</sub>.
- Elastic Alveoli Walls: efficient filling with air and recoil enhances emptying.
- Slow Capillary Blood Flow: time for complete oxygenation and excretion of CO<sub>2</sub>.

