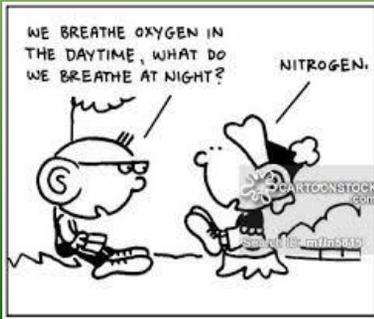


THE RESPIRATORY SYSTEM



• Purpose of the Respiratory System

➤ responsible for exchange of O_2 for CO_2 in the human body

• The Difference Between Breathing & Respiration

➤ Breathing

- = external
- exchange of gases between **the atmosphere & the blood**

➤ Respiration

- = internal
- the exchange of gases between **the blood or tissue fluid & the body's cells**

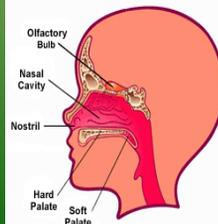
➤ Cellular Respiration

- = metabolism
- using O_2 to break down **glucose** for energy
- waste products of this process are CO_2 and H_2O

• PARTS OF THE RESPIRATORY SYSTEM

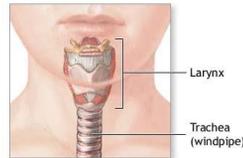
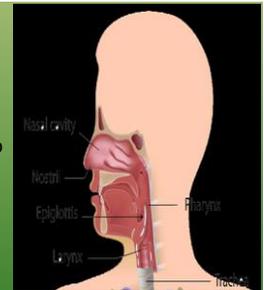
a) Nose and Nasal Passages

- nose is divided by a septum into 2 nostrils which lead to the nasal passages
- nostrils and nasal passages are lined with **hairs and mucus**
- function: **screen out dirt & foreign particles**
- **moisten & warm the air**



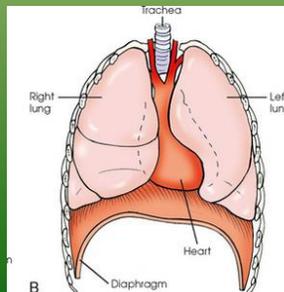
b) Trachea (a.k.a. windpipe)

- joins the nasal passages to the lungs via the **pharynx & larynx (voice box)**
- also lined with cilia & mucus to remove dirt & foreign particles



c) Lungs

- together with the heart occupies the **thoracic cavity**
- covered by a **plural membrane** which secretes a mucous coating to **lubricate** the lungs
- composed of the **bronchi, bronchioles and alveoli**

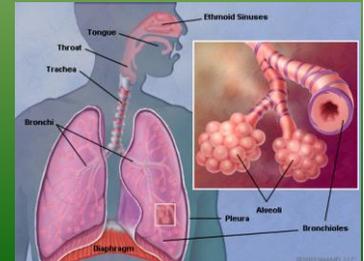


d) Diaphragm

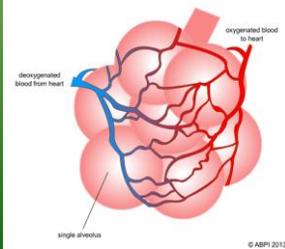
- thin **muscular wall** found beneath the lungs
- responsible for **filling and emptying the lungs**

e) Bronchi, Bronchioles, and Alveoli

- the trachea divides into 2 branches called **bronchi** which extend into each **lung**
- each bronchus subdivides into many smaller tubes called **bronchioles** which end in clusters of air sacs called **alveoli**



- alveoli exchange gases between the air and the blood
(Breathing)
- each alveolus is surrounded by **capillaries** & is only 1 cell thick to promote **diffusion**
- alveoli make up most of the sponge-like lung tissue



• 3 STAGES OF GAS EXCHANGE

a) Breathing

= **movement of air in and out of the lungs**

- Diaphragm & rib muscles fill & empty the lungs

1. **Inhale:**

- diaphragm and muscles contract

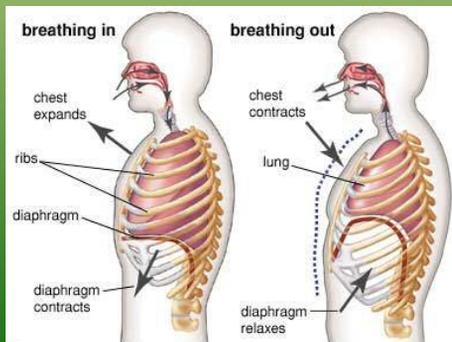
= **ribs expand, diaphragm moves down & the lungs fill with air**

Nose → Nasal passages → Trachea → Bronchi → Bronchioles → Alveoli

2. **Exhale:**

- rib muscles and diaphragm relax

= **diaphragm moves up, ribs compress & air is pushed out of the lungs**



b) Lung / Blood Gas Exchange

= **exchange between alveoli and capillaries through diffusion**

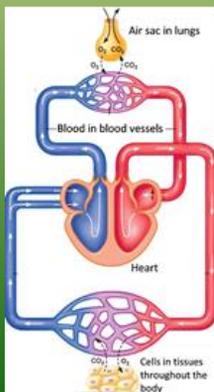
1. Blood from heart containing CO_2 diffuses into the air sacs from the capillaries
2. O_2 Leaves air sacs and enters capillaries

c) Blood / Tissue Gas Exchange

= **exchange of gases between the blood & body cells through diffusion**

1. Hemoglobin in the blood carries O_2 which diffuses into the cells.
2. CO_2 diffuses from cells into the blood
3. It combines with the H_2O in the blood plasma to form carbonic acid
= **keeps level of CO_2 in the blood low**
4. Once in the lungs the carbonic acid breaks down releasing CO_2 which is exhaled with the help of erythrocytes.

Alveoli → Bronchioles → Bronchi → Trachea → Nasal Passages → Nose



• WHAT CONTROLS BREATHING?

- chemoreceptors (**specialized nerve receptors**) in the medulla oblongata monitor CO_2 levels in the blood through a **negative feedback system**
- when CO_2 levels increase, the rate of breathing increases
- usually 'inspiration' occurs 16 - 24 times/min

• EXTERNAL INFLUENCES ON BREATHING

a) Air Quality

- **warm, moist air is necessary**
- dry air is hard on the mucous membranes
- = more susceptible to illness



b) Carbon Monoxide Levels

- CO is 250 times more attracted to hemoglobin than O_2 & is not released from the red blood cells in the alveoli
- increased levels cause **oxygen starvation** as erythrocytes cannot pick up O_2
 - = tissues suffocate and eventually death
- treatment = **hyperbaric chamber**



c) Hypoxia

- oxygen starvation due to **high altitudes**

