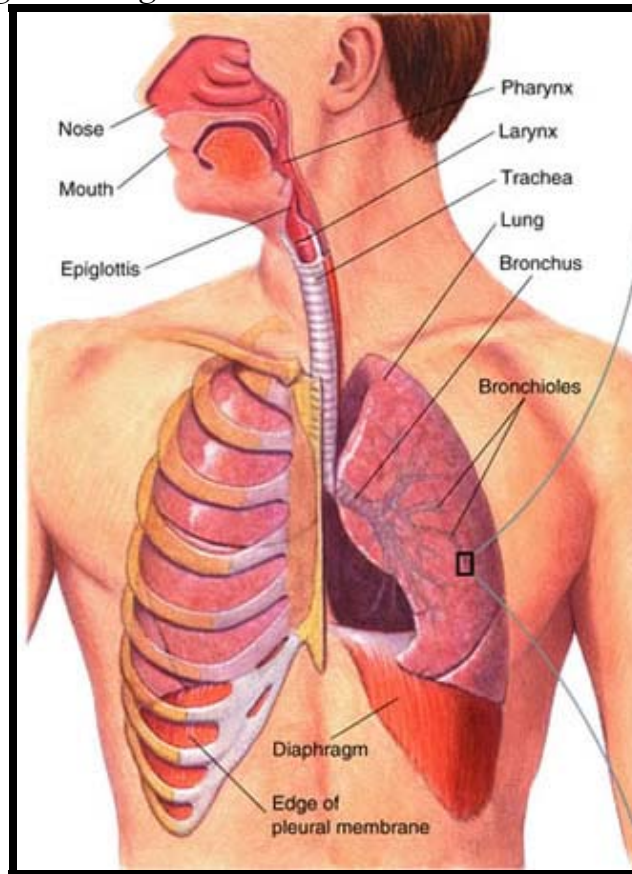
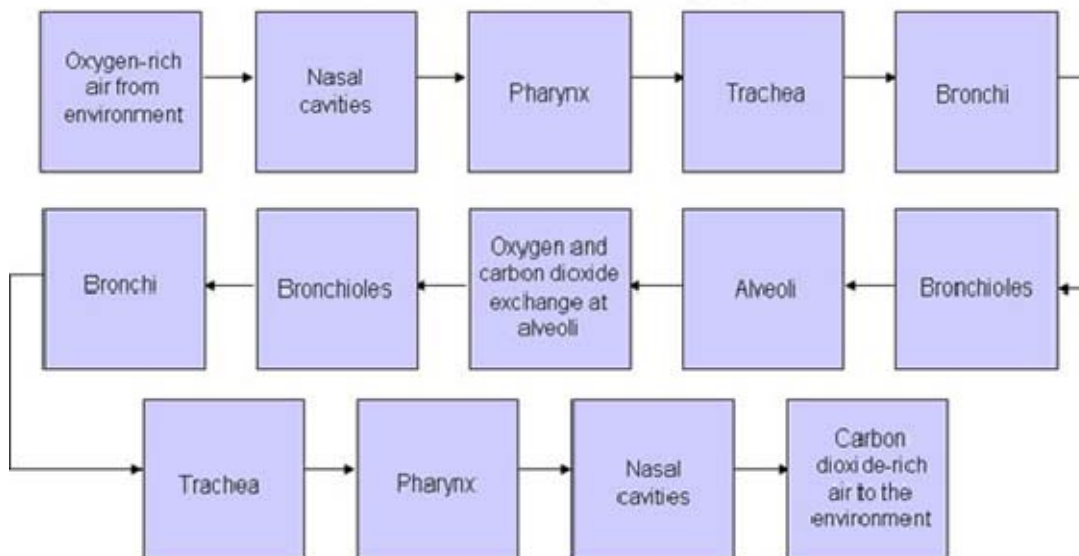


# Human Respiratory System

The human respiratory system moves respiratory gases between the external environment and the internal surfaces of the lungs where gas exchange occurs between the **ALVEOLI** and the **RBC** in the blood.



## Movement of Oxygen and Carbon Dioxide In and Out of the Respiratory System



## **PARTS OF THE RESPIRATORY SYSTEM**

### **NASAL CAVITY (NOSE)**

- ◆ Air enters the nasal cavity which is lined with moist ciliated mucus membranes which warms, moistens, and filters the air

### **PHARYNX**

- ◆ Air then travels past the pharynx, the place where the oral and nasal cavities meet
- ◆ As you know, air can also enter through the oral cavity (mouth) as well

### **EPIGLOTTIS**

- ◆ A flap of tissue at the opening of the WINDPIPE.
- ◆ When swallowing food or drink, the epiglottis covers the WINDPIPE to prevent choking

### **TRACHEA (WINDPIPE)**

- ◆ The air passes from the pharynx to the **TRACHEA**, which leads to the lungs
- ◆ The walls of the trachea contain rings of **CARTILAGE**, which keep the trachea open yet flexible.
- ◆ As the air passes into the trachea, it passes the **LARYNX** or **VOICE BOX**
- ◆ The trachea is lined with **CILIA**, which filters out particles and sweeps them upward toward the pharynx

### **BRONCHI**

- ◆ The lower end of the trachea branches into 2 tubes called the **BRONCHI** (singular - **BRONCHUS**) which lead directly into the lungs
- ◆ The bronchi are also kept open by rings of cartilage and lined with mucus membranes (no cilia)

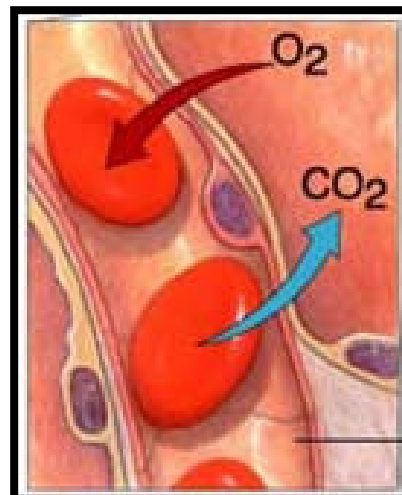
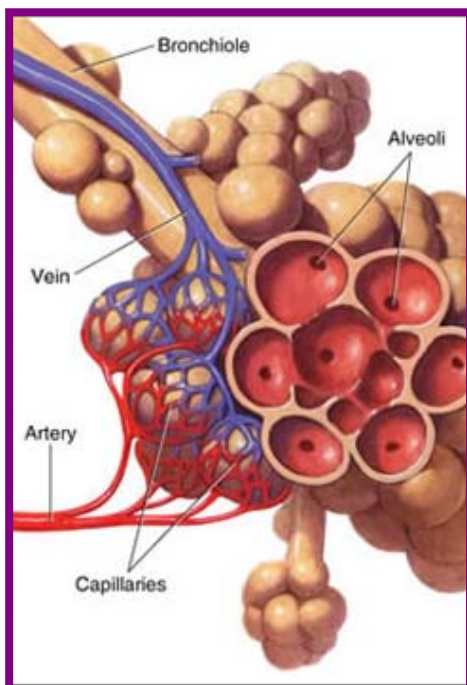
### **BRONCHIOLES**

- ◆ The bronchi extend into the lungs, branching into smaller and smaller tubes called **BRONCHIOLES**
- ◆ The bronchioles are lined with mucus membranes but lack cartilage rings
- ◆ At the end of each bronchiole there is a cluster of tiny, hollow air sacs called **ALVEOLI**

### **ALVEOLI**

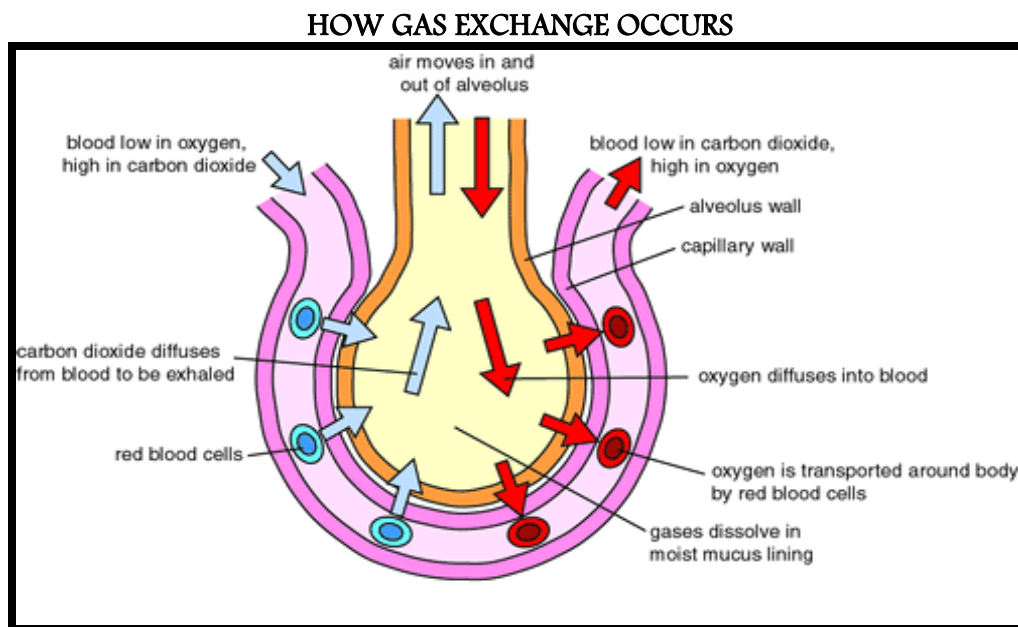
- ◆ The lungs contain millions of **ALVEOLI**, which are the sites for gas exchange
- ◆ The walls of the alveoli are thin and moist and are surrounded by capillaries
- ◆ **Oxygen diffuses out of the alveoli and into the surrounding capillaries; carbon dioxide and water vapor diffuse out of the blood and into the alveoli, to be released to the outside**

### **THE ALVEOLI & CAPILLARIES      GAS EXCHANGE between RBC & ALVEOLI**



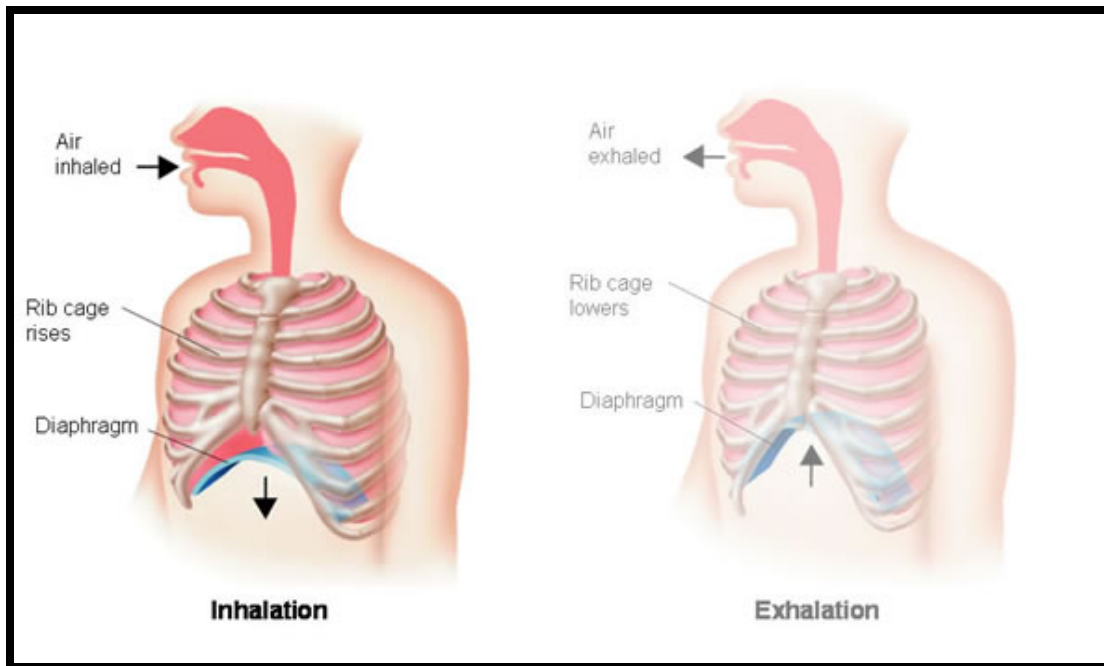
## HOW DOES GAS EXCHANGE OCCUR

- ◆ Oxygen from the alveoli diffuses into the blood and combines with the hemoglobin on the RBC to form a compound called ***OXYHEMOGLOBIN***
- ◆ At the body cells, the oxygen and hemoglobin separate and the oxygen diffuses into the cells. to be used by the mitochondria for aerobic respiration.
- ◆ Carbon dioxide and water (waste products of aerobic respiration) diffuse from the body cells into the blood and carried to
- ◆ A majority of the carbon dioxide combines with the water in the blood and is carried in the form of ***BICARBONATE IONS ( $HCO_3^-$ )***. When the blood gets to the lungs, the bicarbonate ions breaks down into carbon dioxide and water, which diffuses into the alveoli and released to the outside.



## HOW DO WE BREATHE?

- ◆ ***BREATHING***: movement of air in/out of the lungs
- ◆ Lungs are ***ELASTIC*** like balloons, but contain **NO** muscle.
- ◆ The lungs expand and contract in response to pressure changes in the chest cavity which is brought about by the rib cage and the diaphragm
- ◆ ***INHALATION***
  - the ribs push upward and outward and the diaphragm moves downward, **ENLARGING** the chest cavity, **REDUCING** the pressure around the lungs.
  - the lungs expand and air rushes in
- ◆ ***EXHALATION***
  - the ribs move in and down and the diaphragm moves up making the chest cavity smaller, **INCREASING** pressure on the lungs
  - the pressure pushes against the lungs, forcing the air up and out of the body.



### **BREATHING RATE**

- ◆ The breathing rate is controlled by the **MEDULLA OBLONGATA** of the brain
- ◆ The medulla monitors the levels of **CARBON DIOXIDE** in the blood
- ◆ When CO<sub>2</sub> is high, messages are sent to the rib cage muscles and the diaphragm to **INCREASE** the breathing rate
- ◆ When the CO<sub>2</sub> blood levels decrease, the breathing rate slows down.
- ◆ Regulation of breathing rate is an example of a **FEEDBACK MECHANISM** that helps the body maintain homeostasis

### **DISORDERS OF THE RESPIRATORY SYSTEM**

- ◆ **BRONCHITIS**
  - inflammation of the linings of the bronchial tubes, usually due to a bacterial infection
  - due to the swelling, the air passages become narrowed and filled with mucus causing coughing & breathing difficulties
  - usually treated with antibiotics
- ◆ **ASTHMA**
  - an allergic reaction characterized by a narrowing of the bronchial tubes, resulting in difficulty breathing.
  - asthma medications and inhalers are often used to open up the airways
- ◆ **EMPHYSEMA**
  - disease often caused by cigarette smoking
  - walls of the alveoli break down and lose their elasticity, making it more difficult for gas exchange to occur
  - symptoms include difficulty in breathing, decreased lung capacity, and a shortness of breath

