

I. Human Respiratory System

A. The System's Many Functions

- _____ alternately moves air into and out of a pair of lungs inside of which are the tiny air sacs called alveoli where gas exchange takes place
- _____ is necessary for speech, helps blood return to the heart and helps maintain homeostatic condition.
- Limited amounts of _____ and water are eliminated here.
- It also _____ the body's acid-base balance.
- The respiratory system has mechanisms to deal with airborne _____ matter that enters the system.

B. From Airways into the Lungs

- Air enters or leaves the respiratory system though _____ cavities where hair and cilia filter out dust and particles; blood vessels warm; and mucus moistens the air.
- Air moves via this route: pharynx – _____ (route blocked by epiglottis during swallowing)—vocal cords (space between is glottis) – trachea– bronchi– bronchioles--alveoli
- When air is exhaled through the _____, the folds of the cords vibrate to produce sounds which under regulation by nerve commands to the elastic ligaments that regulate the glottal opening.
- Human lungs are a pair of organs in the rib cage _____ the diaphragm.
- Each lung lies in a thin-walled _____ sac, which leaves a very thin intrapleural space between the membranes
- Inside the lungs, respiratory bronchioles bear _____ of their walls called alveoli, which are usually clustered as alveolar sacs.

Alveoli provide a tremendous surface area for _____ exchange with the blood located in the dense capillary network surrounding each alveolar sac.

II. Breathing – Cyclic Reversals in Air Pressure Gradients

- **A. The Respiratory Cycle**

- In _____, the diaphragm contracts and flattens, muscles lift the rib cage upward and outward, the chest cavity volume increases, internal pressure decreases, air rushes in.
- In _____, the actions listed above are reversed; the elastic lung tissue recoils passively.

III. Gas Exchange and Transport

- A. Exchanges at the Respiratory Membrane
 - Each _____ consists of a single layer of epithelial cells through which gases can readily diffuse to and from interstitial fluid and blood capillaries.
 - The _____ are sufficient to move oxygen in and carbon dioxide out of the blood, passively.
- B. Hemoglobin is a protein with four _____ groups that bind oxygen.
 - _____ diffuses down a diffusion gradient into the blood plasma—red blood cells—binds to hemoglobin.
 - Hemoglobin gives up its oxygen in tissues where concentration is low, blood is warmer carbon dioxide is higher, and pH is lower. All four conditions occur in tissues with high metabolism.
- C. Carbon Dioxide Transport
 - 1. Because the concentration of carbon dioxide is _____ in the body tissues, it diffuses into the blood.
- D. How to Match Air Flow with Blood Flow
 - Gas exchange in the alveoli is most efficient when air flow _____ the rate of blood flow.
 - The _____ system controls oxygen and carbon dioxide levels for the entire body by adjusting contraction rates of the diaphragm and chest wall muscles.
 - The brain monitors input of _____ sensors in the blood stream and from receptors sensitive to decreases in oxygen.

IV. When the Lungs Break Down

Bronchitis and Emphysema

Chronic irritation of the lining of the bronchioles leads to _____ in which there is an excess of mucus that may promote bacterial growth leading to scarring and a narrowing of the air passages; breathing becomes difficult.

In _____, the walls of the alveoli become fibrous and inefficient at exchanging gases, as bacterial infections destroy the alveoli walls making it difficult to even draw a breath, chronic bronchitis can pave the way for emphysema.

In the United States, about three million people are affected by emphysema; more than 16,000 are killed yearly.

People missing the gene for antitrypsin are genetically predisposed to develop emphysema, since the enzyme inhibits bacterial attacks on alveoli.

V. Smoking's Impact

Tobacco use kills millions and drains billions of dollars from the economy.

Secondhand smoke is a real danger to innocents who do not participate in the life-threatening habit themselves.

Marijuana is worse than tobacco in every way.