

Unit L Notes #2 : Mechanics Of Breathing

A) Four Processes make up the Respiratory System.

A. Breathing -Ventilation

- Inspiration (inhalation) – Bringing Oxygen into the lungs
- Expiration (exhalation) – Expelling Carbon Dioxide

B. External Respiration

- Exchange of gases between blood and the lungs

C. Internal Respiration

- Exchange of gases between blood and the body tissues fluids

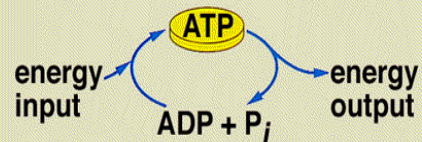
D. Cellular Respiration

- Gas exchange during the production of ATP within the cells.

Cellular Respiration



The ATP/ADP Cycle



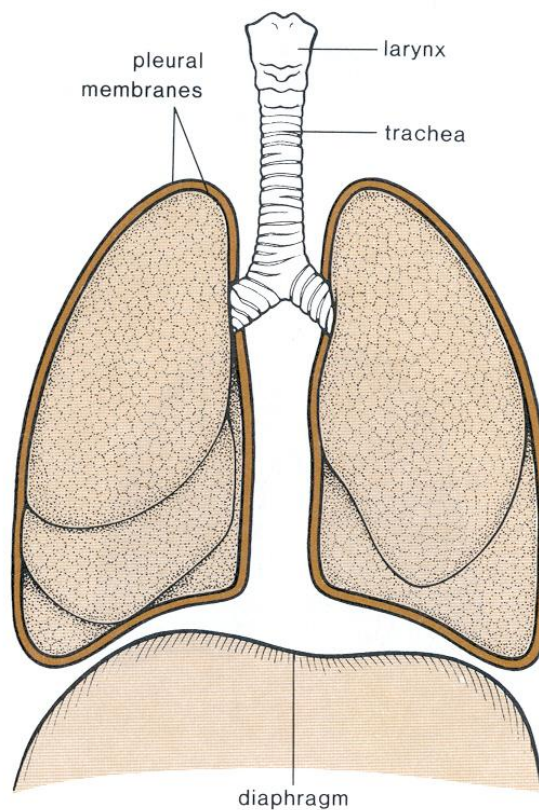
B) Pleural Membranes

- 2 sets of membranes

a. one joined to the lung (visceral pleura)

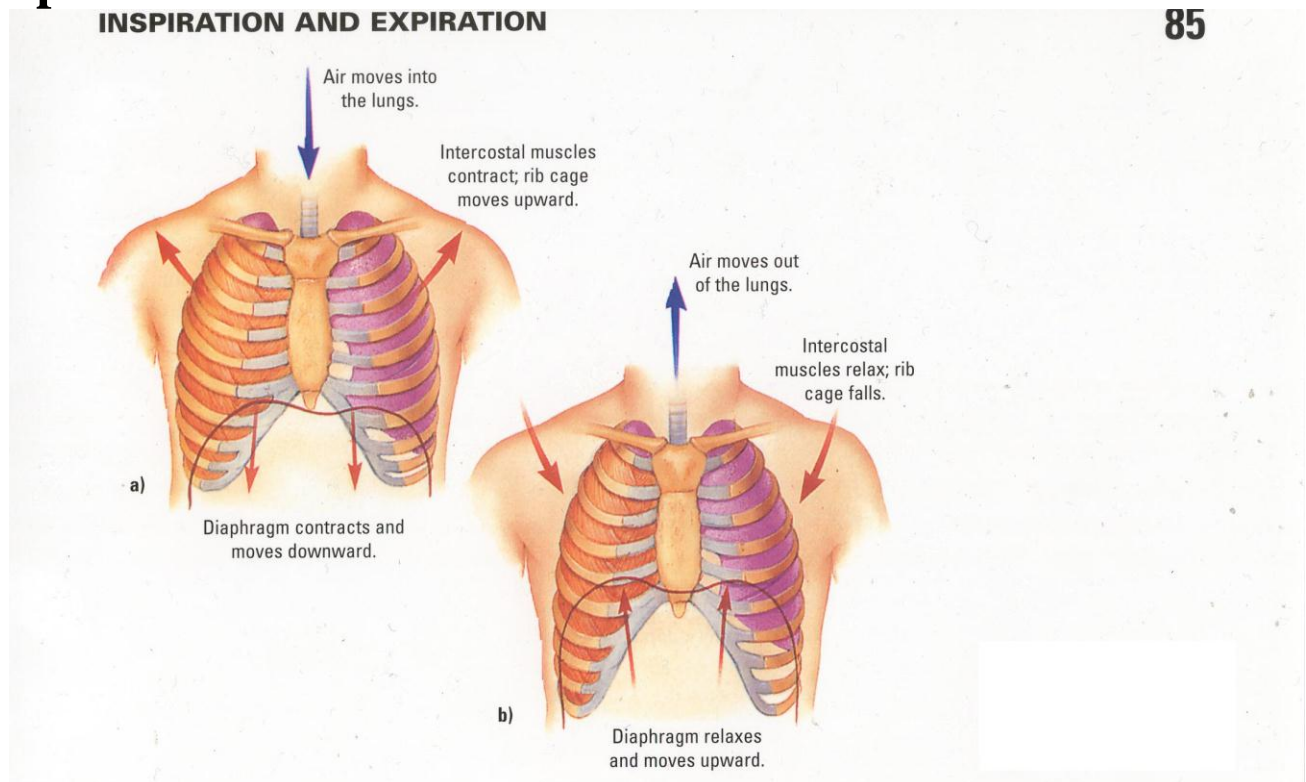
b. one joined to the ribs and diaphragm (parietal pleura)

Pleural membranes. These membranes completely surround the lungs. Humans breathe by negative pressure and this requires that the intrapleural pressure be less than atmospheric pressure. Thus, when the thoracic cavity increases in size, the lungs expand and the air comes rushing in.



- The two sets are close together separated by a slight amount of watery fluid. (vacuum is created)

- If the membranes are punctured, air enters the intrapleural space, destroying the vacuum. The lung collapses.
- They maintain an interpleural pressure that is less than atmospheric pressure; keeping the lungs open.



C) Mechanics of Breathing: Inhalation and Exhalation

- The chest cavity is dome-shaped. The top and sides are surrounded by the ribs. The bottom is made up by the diaphragm. It is a closed system.

Inhalation

1. CO₂ concentration and H⁺ concentration are the **PRIMARY STIMULI** that cause us to breathe.

When Carbon Dioxide and/or Hydrogen ion concentration gets too high, the Breathing center in the Medulla Oblongata is stimulated.

2. A nerve impulse is sent from the Medulla Oblongata to the diaphragm and rib cage down the Phrenic Nerve.

3. The diaphragm contracts and lowers; the rib muscles contract (intercostal muscles) and raise the ribs. These actions increase the size of the chest cavity. This increased volume, decreases pressure on lungs.

4. A partial vacuum is created in the lungs (air pressure in the lungs is reduced).

5. Atmospheric pressure causes air to rush into the lungs from outside in order to rebalance the pressure. This is the process of inspiration.

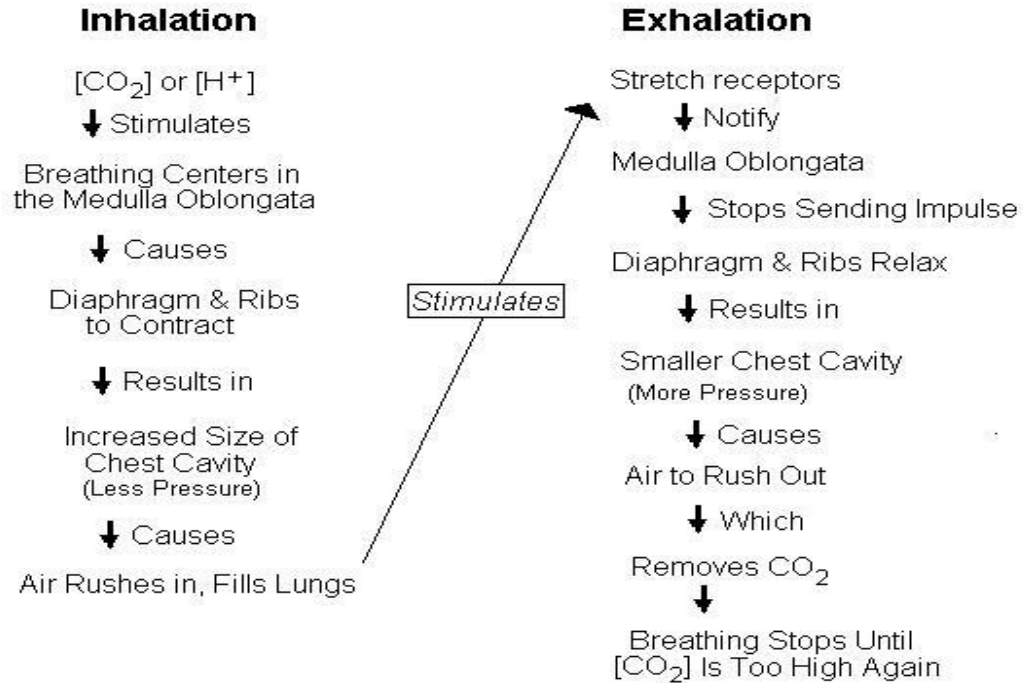
****NOTE:** Air comes in because the lungs have already opened. The air does not force the lungs open. This is why it is said that we breathe by Negative Pressure. (Low pressure sucks the air

into our lungs; the lungs themselves have no muscles)**

Exhalation:

- 1. When the lungs are full, stretch receptors in the alveoli are stimulated and a message is sent back to the Medulla via the Vagus Nerve.**
- 2. The Medulla Oblongata is notified and stops sending messages.**
- 3. The diaphragm and rib muscles relax.**
- 4. The chest cavity gets smaller. Decreasing volume, which increases the pressure in the lungs. Air is forced out.**

Summary



Breathing can also be performed voluntarily using another set of rib muscles

- In addition to the Respiratory Center in the **Medulla Oblongata**, there are other receptors that can respond to stimuli:

- a. **Carotid bodies** – in the carotid artery
- b. **Aortic bodies** – in the aorta

Unlike the chemoreceptors in the Medulla, these chemoreceptors are primarily stimulated by low concentrations of oxygen (O₂), rather than by high CO₂ or H⁺ concentrations.