



Breathing and respiration

The words *breathing* and *respiration* are often thought to mean the same thing. However breathing is only one part of respiration. Respiration is the entire process by which a body obtains and uses oxygen, producing carbon dioxide and water as waste products.

Respiration is divided into two parts:

- breathing which involves inhaling and exhaling, and
- cellular respiration, which involves the chemical reactions that release energy from organic compounds.

Breathing is enabled by the respiratory system, which consists of lungs, throat and passageways that lead to the lungs.

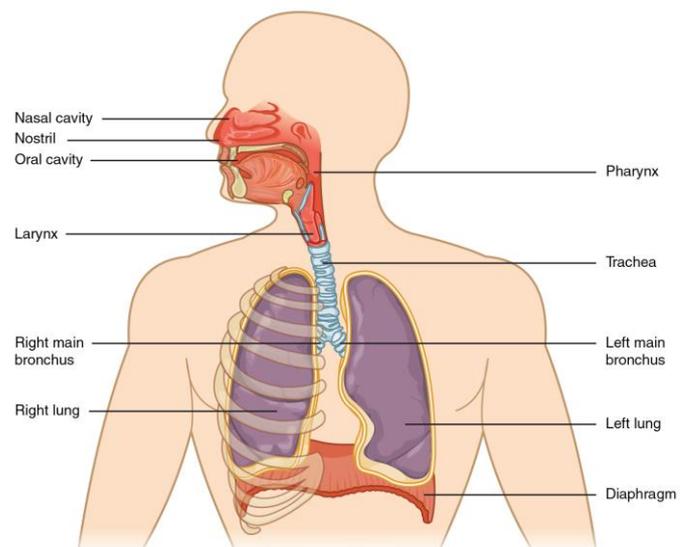
Respiratory cycle

The exchange of gases between an organism and its environment is known as respiration. The respiratory system provides oxygen for the cells and carbon dioxide, generated during cellular respiration, is excreted into the environment.

Breathing is the mechanical process of moving air from the environment into the lungs and of expelling air from the lungs. Inhalation or *inspiration* occurs when air flows into the lungs. Exhalation or *expiration* occurs when air flows out of the lungs. A single breath, called a respiratory cycle, consists of an inhalation followed by an exhalation.

Breathing is done by rib muscles and the diaphragm, a dome shaped muscle underneath the lungs. During inhalation, the volume of the thoracic cavity is increased by the contraction of the diaphragm. When the diaphragm contracts and moves down, the chest cavity volume increases. At the same time, some rib muscles contract and lift the rib cage, also increasing the volume of the thoracic cavity.

This action reduces the pressure inside the lungs relative to the outside atmospheric air pressure. As a consequence, a partial vacuum is created in the lungs and air rushes in from the outside to fill them. The amount



The major respiratory structures span the nasal cavity to the diaphragm (origin: <http://cnx.org>).

of air moved into and out of the lungs with each normal resting breath is called the tidal volume.

The reverse occurs in exhalation. In healthy people, exhalation is mostly a passive process that depends more on the elasticity of the lungs than on muscle contraction. During exhalation, the diaphragm relaxes and its dome curves up into the chest cavity, while the rib muscles relax and the ribs move back down and inward. As the chest cavity decreases in size, so do the lungs. The air in the lungs is forced more closely together and its pressure increases. When that pressure rises to a point higher than atmospheric pressure, the air is expelled or forced out of the lungs until the two pressures are equal again.

Respiratory rate

Respiratory rate *or respiration rate* is the number of breaths you take each minute. The normal respiratory rate of a resting adult ranges from 12 to 18 breaths each minute, roughly one for every four heartbeats. Children breathe more rapidly, at rates of about 18–20 breaths per minute.

These are considered normal rates that, when maintained, should allow a person to speak in full sentences without experiencing shortness of breath. He or she also should have a normal skin color, have a normal mental status and be oriented to person, place and time.

Breathing air

Air from earth's atmosphere is the most common and only natural breathing gas. The air humans breathe out, however, has a different composition.

The following list breaks down the major components of those two types of air and their approximate percentages:

Nitrogen:	78% (inhaled air)	78% (exhaled air)
Oxygen:	21% (inhaled air)	16% (exhaled air)
Carbon dioxide:	0.04% (inhaled air)	4.5% (exhaled air)

Although most of earth's atmosphere is composed of nitrogen, the human body cannot utilize this gas, so it is simply exhaled. Exhaled air has a decreased amount of oxygen and an increased amount of carbon dioxide. These amounts show how much oxygen is retained within the body for use by the cells and how much carbon dioxide is produced as a by-product of cellular metabolism.