Respiratory System

Only life support system under voluntary control

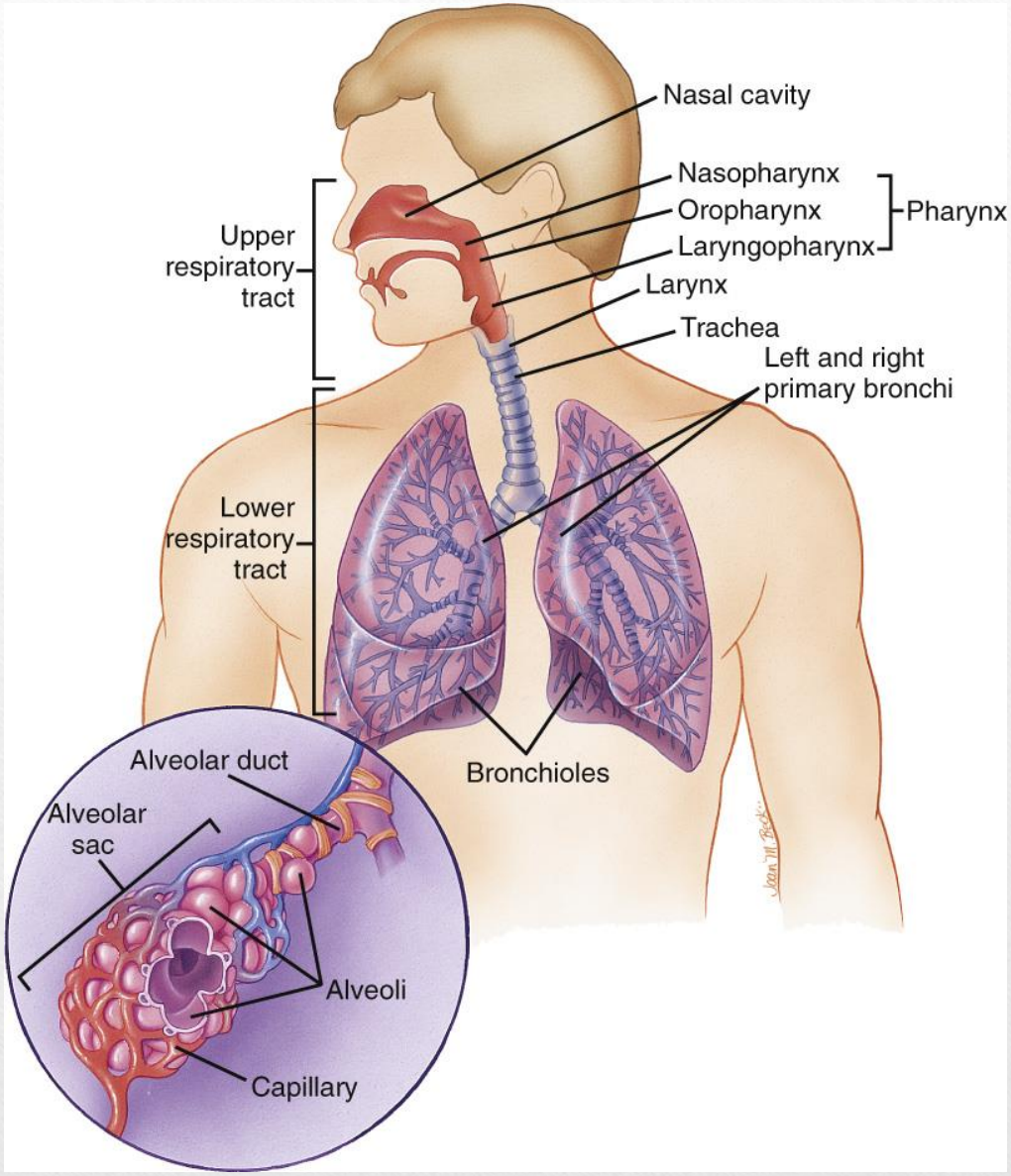
Connected to emotion

Respiration: movement of air in and out of lungs

- External
- Internal

Average: 12 to 16 breaths/minute, 82 gallons of air/hour

Control over breathing allows a person to regulate the autonomic nervous system. This is important for meditation and relaxation techniques.


Nasal cavity
Nasopharynx
Oropharynx
Laryngopharynx
Pharynx
Upper respiratory tract
Larynx
Trachea
Left and right primary bronchi
Lower respiratory tract
Bronchioles
Alveolar duct
Alveolar sac
Alveoli
Capillary

What organs make up the upper respiratory tract?

The nasal cavity, all its structures, and the pharynx.

How about the lower respiratory tract?

The larynx, the trachea, and the bronchi and alveoli in the lungs.

Respiratory System Organs

Nose and nasal cavity

Sinuses

Pharynx

Larynx

Trachea

Lungs

Diaphragm

Thorax

What is laryngitis?

Inflammation of the vocal cords. It can be caused by overuse, infection, or irritation from substances such as cigarette smoke or tumors.

The chest cavity contains the lungs, the heart, and the great vessels.

Nerves and Muscles of the Lungs

Autonomic nervous system in charge

Intercostal muscles served by spinal nerves T1 to T11

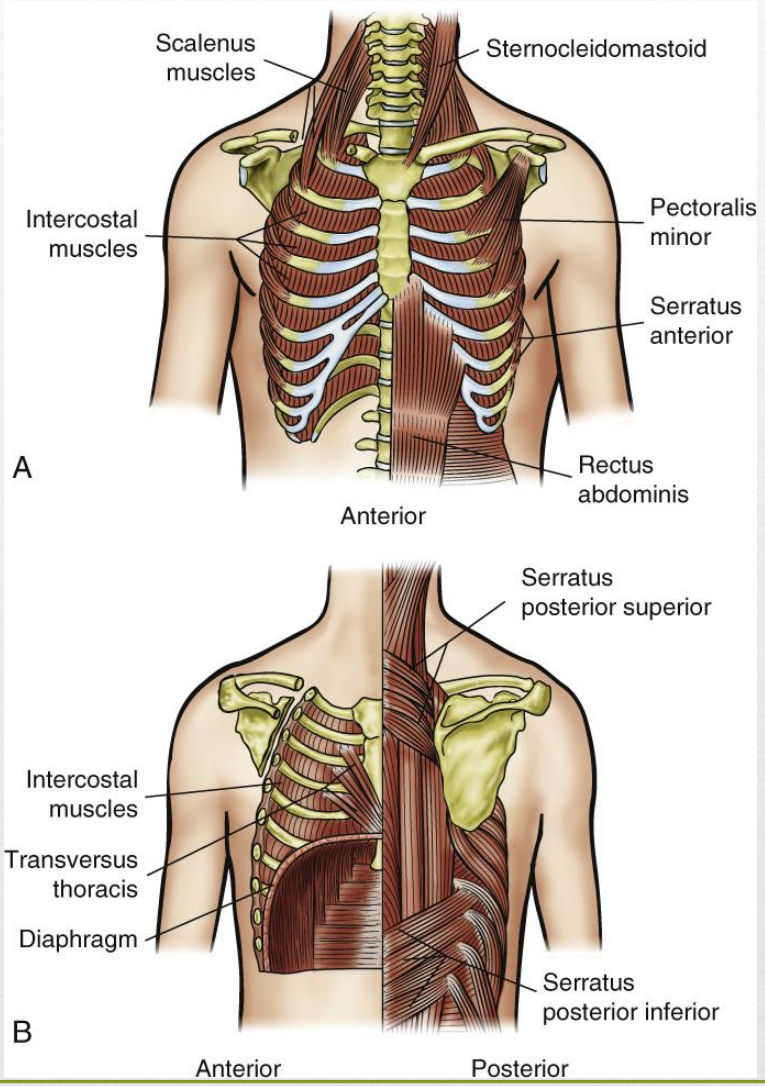
Pulmonary arteries and veins exchange oxygen and carbon dioxide.

How does the diaphragm grow in the womb?

It begins in the neck and then descends from the neck into the abdomen.

Mechanics of Breathing .

Muscles of respiration

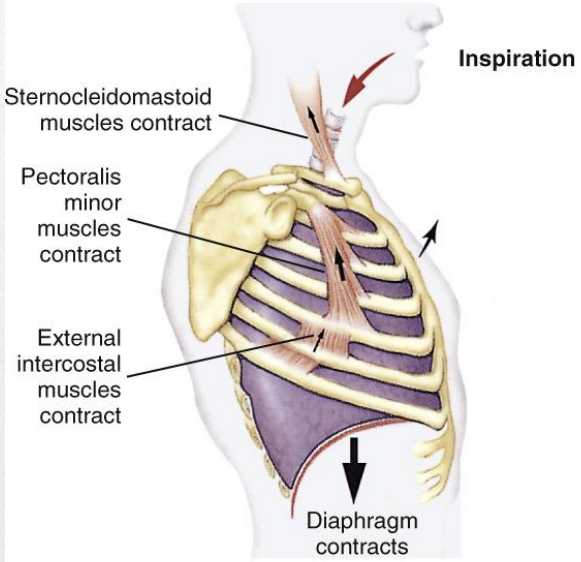


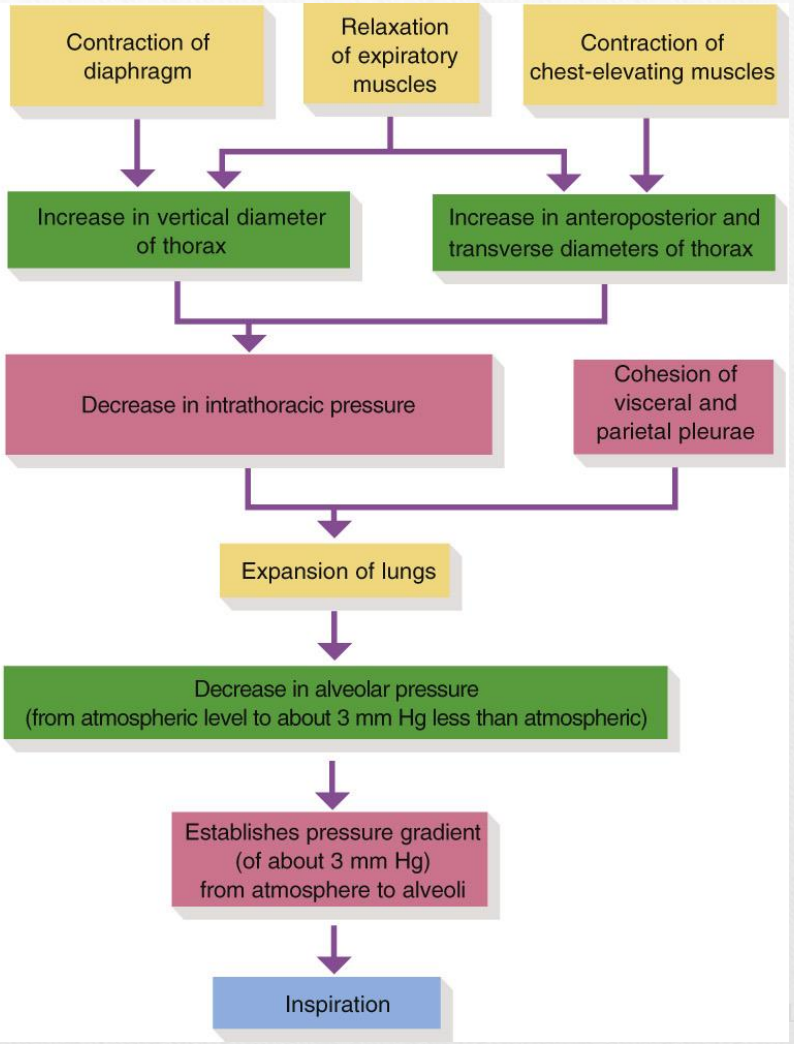
During inspiration, the diaphragm contracts, increasing the volume of the thoracic cavity; in expiration, the diaphragm returns to an upward position.

In cases of asthma, bronchitis, and emphysema, accessory muscles take a larger role in respiration. Can you name some of them? (The sternocleidomastoid muscles in the neck, the internal intercostals, and abdominal muscles.)

Scalenes attach to the first and second ribs, which is why neck injuries can lead to shallow breathing.

Inspiration

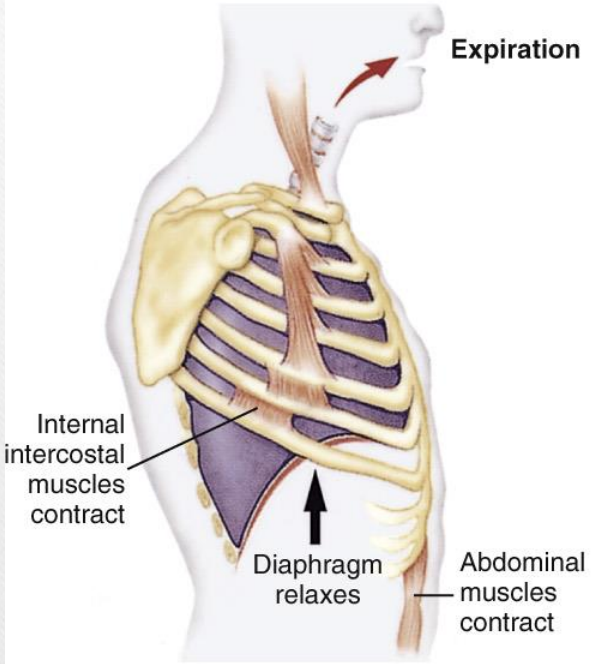




During inspiration, the diaphragm contracts (pulls downward), lowering air pressure and filling the lungs with air.

Inspiration is like pulling air into a bag.

Expiration



Relaxation of inspiratory muscles

Contraction of expiratory muscles

Decrease in size of thorax

Elastic recoil of lung tissue

Increase in intrathoracic pressure from about –6 to –4 mm Hg

Decrease in size of lungs

Increase in alveolar pressure

Pressure gradient from alveoli to atmosphere

Expiration

Oxygen requirements can change as a result of emotional factors, exercise, pain, obesity, and anemia.

Lung Volumes

Tidal volume

Inspiratory reserve volume

Expiratory reserve volume

Vital capacity

In diseased lungs, such as those affected by asthma or emphysema, the vital capacity and expiratory reserve volumes are abnormal.

Transport of Oxygen and Carbon Dioxide

O_2-deficient blood travels from heart to lungs in pulmonary arteries.

CO_2 diffuses from bloodstream through capillary and alveolar membranes into alveoli.

O_2 diffuses in opposite direction, back into bloodstream.

CO_2 is then exhaled from lungs while pulmonary veins return O_2-rich blood to left atrium of the heart.

Red blood cells transport oxygen in the blood as oxyhemoglobin.

The amount of oxygen in the blood depends on the amount of oxygen available in the atmosphere.

Control of Breathing

Respiratory center: group of nerve cells in medulla and pons of brain

Affected by voluntary and involuntary impulses

Chemoreceptors stimulated by concentration of oxygen in body

Increase or decrease respiratory rate

Chemoreceptors, nerve cells found near the baroreceptors, are sensitive to the oxygen level and to a lesser extent to carbon dioxide and pH levels in the bloodstream.

Respiratory Rate

Adult: 12-16 breaths/min

Newborn: 35 breaths/min

Chronic hyperventilation/overbreathing can lead to breathing pattern disorders.

Fear, grief, and shock slow the rate, whereas excitement, anger, and sexual arousal increase the respiratory rate.

Reflexes that Affect Breathing

- Cough reflex: response to foreign matter, irritants in trachea or bronchi
- Sneeze: response to foreign matter, irritants in nasal cavity
- Hiccup: involuntary diaphragm contraction
- Yawn: slow, deep inspiration

What is the biomechanical process behind a cough?

The epiglottis and glottis close, then open suddenly, forcing air up out of the lungs and removing contaminants.

Pathologic Conditions

Common cold

Influenza

Sinusitis

Sore throat

Croup

Pneumonia

Asthma

Chronic obstructive pulmonary disease

Pleurisy

Lung cancer

Pulmonary edema

What is asthma?

The narrowing of small airways, sometimes to the point of severely inhibiting a person's ability to breathe.

What is behind 90 percent of lung cancer cases?

Use of tobacco.

Pathologic Conditions

Tuberculosis

- Contagious

Cystic fibrosis

Choking

Sleep apnea

Carbon monoxide poisoning

Drowning

The Heimlich maneuver is the first aid treatment for choking.

Box 12-1 Heimlich Maneuver/Abdominal Thrust

The Heimlich maneuver, also called *abdominal thrust,* is an effective and often lifesaving technique used to open a suddenly obstructed windpipe. The maneuver uses air already present in the lungs to expel the object obstructing the trachea. Individuals trained in emergency procedures must be able to tell the difference between airway obstruction and other conditions such as heart attacks that produce similar symptoms. The key question to ask the person who appears to be choking is, "Can you talk?" A person with an obstructed airway will not be able to speak, even while conscious. The rescuer makes a fist with one hand, grasps it with the other, and then delivers an upward thrust against the victim's diaphragm just below the xiphoid process of the sternum. The thrust compresses air trapped in the lungs, forcing the object that is choking the victim out of the airway.

Technique If Victim Can Be Lifted

1. Rescuer stands behind the victim and wraps both arms around the victim's waist.
2. Rescuer makes a fist with one hand, places the thumb side of the fist against the victim's upper abdomen, below the ribcage and above navel.
3. The rescuer grabs his or her first with the other hand and presses into the victim's upper abdomen with a quick, upward thrust. The rescuer should not squeeze the ribcage; the force of the thrust should be confined to the hands.
4. The maneuver should be repeated until the object is expelled.

When Victim is Unconscious or Rescuer Cannot Reach Around Victim

1. Rescuer places victim on back.
2. Facing victim, rescuer straddles the victim's hips.
3. Rescuer places one hand on top of the other, the heel of the bottom hand on the upper abdomen below the ribcage and above the navel.
4. Using body weight, rescuer presses into the victim's upper abdomen with a quick, upward thrust.
5. The maneuver should be repeated until the object is expelled.

In sleep apnea the person stops breathing for a period of 10 seconds or more while sleeping, at least a few times per hour. Each time breathing stops, oxygen levels fall and cause the person to wake, which results in resumption of breathing.

Breathing Pattern Disorder

If we exhale too much too quickly, the following systems are affected:

- Respiratory
- Cardiovascular
- Neurologic
- Psychologic
- Gastrointestinal
- Muscular

Neurologic problems associated with breathing pattern disorder include the following: dizziness, faint feelings, visual disturbance, headache, paresthesia, and intolerance of light or noise.

To Test

Access Code: CAMBKHM

Please write down code. You will be asked for it

Once you have successfully passed the test (70% correct), please email Kim Jackson at kim_hotschool@yahoo.com. We will email you your CE certificate within 7 business days.