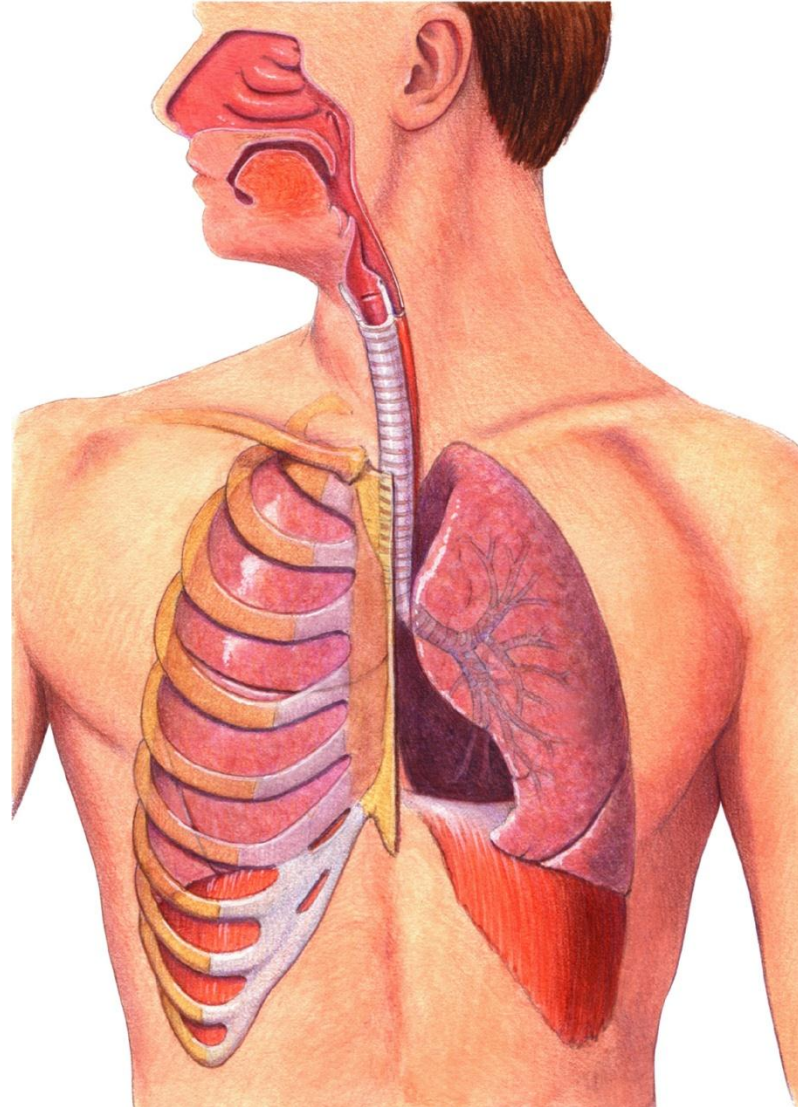


37-3 The Respiratory System



What Is Respiration?

In biology, *respiration* means *two different things*.

Cellular respiration is the *release of energy* from the breakdown of food in the *presence of oxygen*.

At the *organism* level, respiration is the *process of gas exchange*—the release of carbon dioxide and the uptake of oxygen between the lungs and the environment.



The basic function of the human respiratory system is the exchange of oxygen and carbon dioxide between the blood, the air, and tissues.

The respiratory system *consists of* the:

- *nose*
- *pharynx*
- *larynx*
- *trachea*
- *bronchi*
- *lungs*

Air entering the respiratory system *must be warmed, moistened, and filtered.*

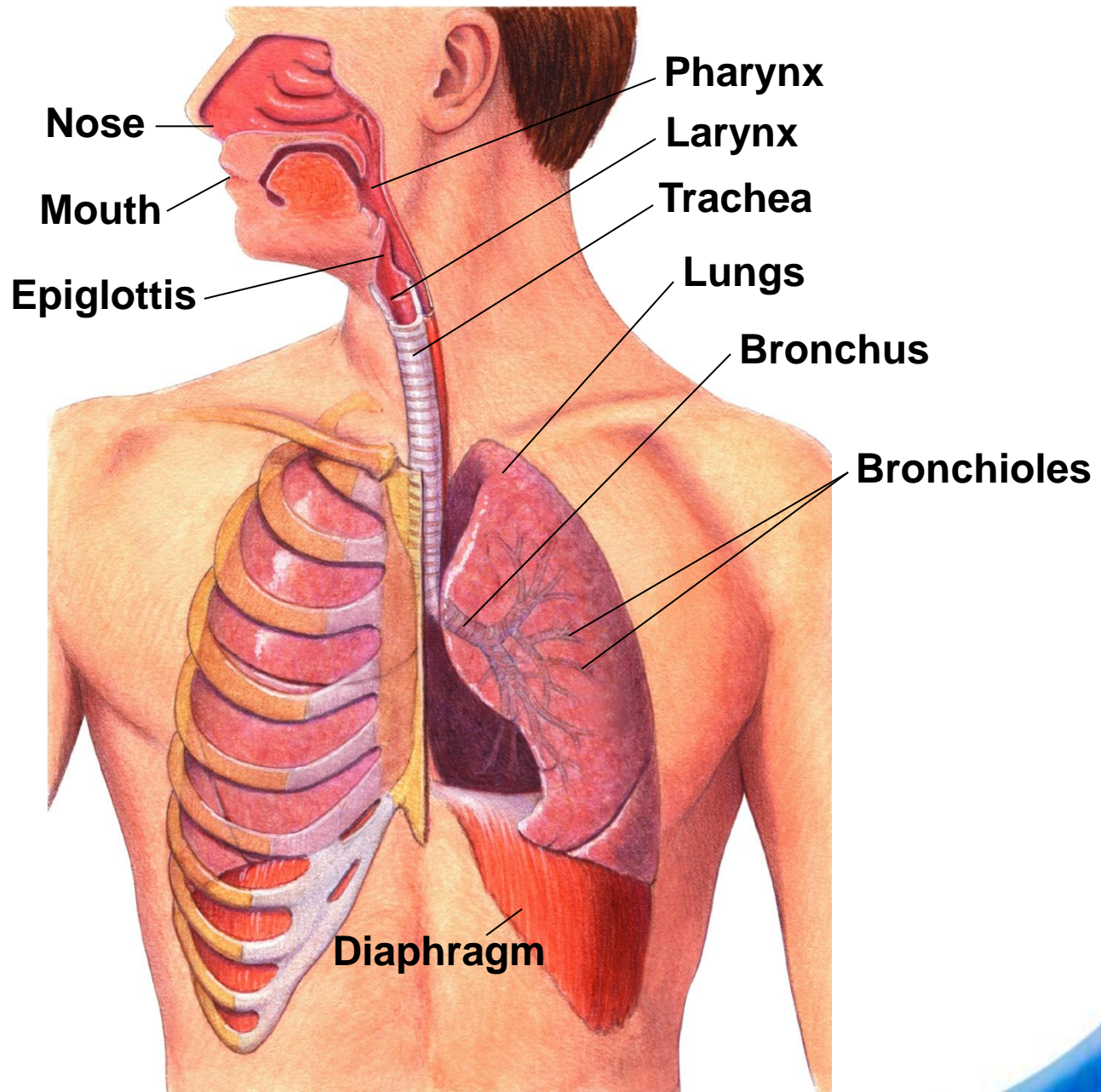
Mucus moistens air and traps particles of dust or smoke.

Cilia sweep particles and mucus to the throat.

Mucus and particles are *either swallowed or spit out.*

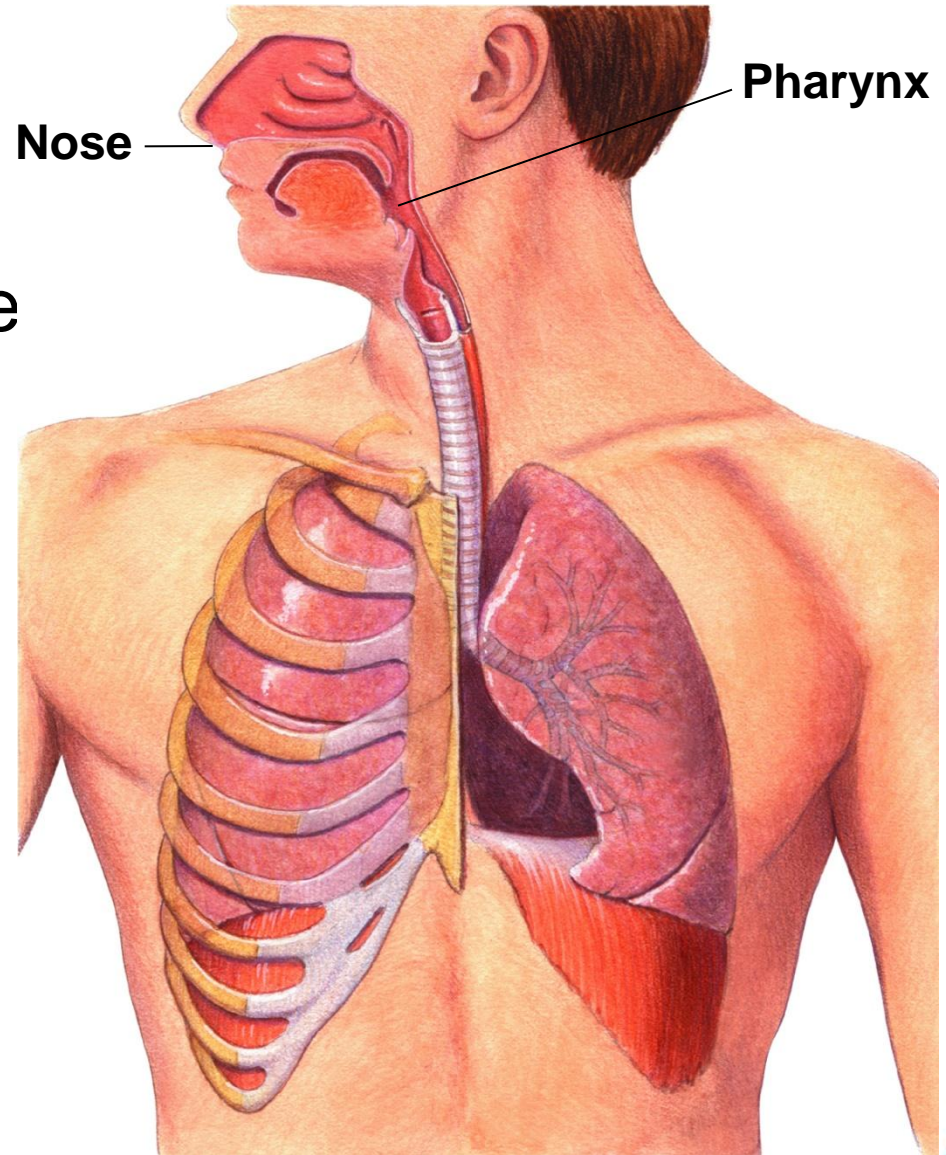
37-3 The Respiratory System → The Human Respiratory System

movie
click to start



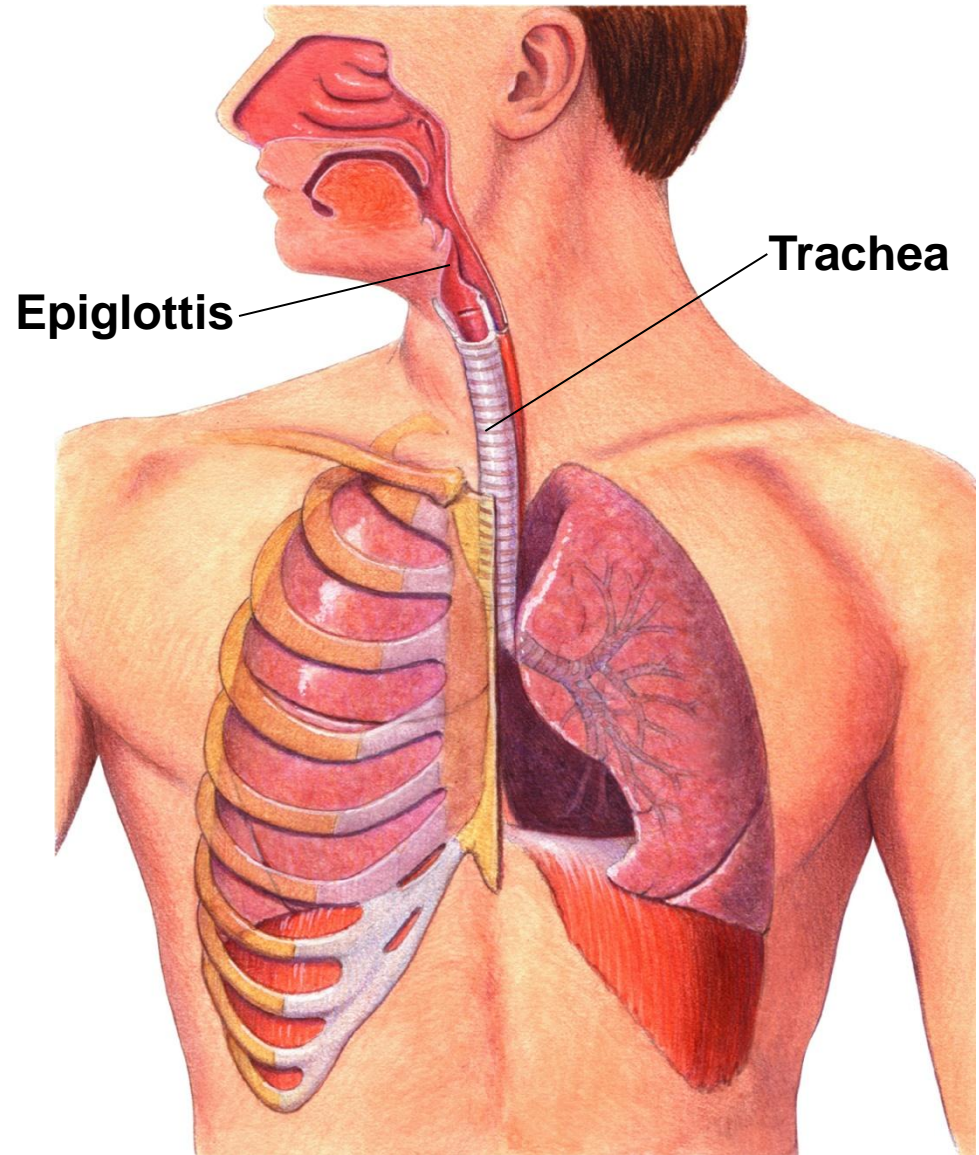
Air *enters the nose or mouth* and moves to the *pharynx*, or throat.

The *pharynx* serves as a *passageway for both air and food*.

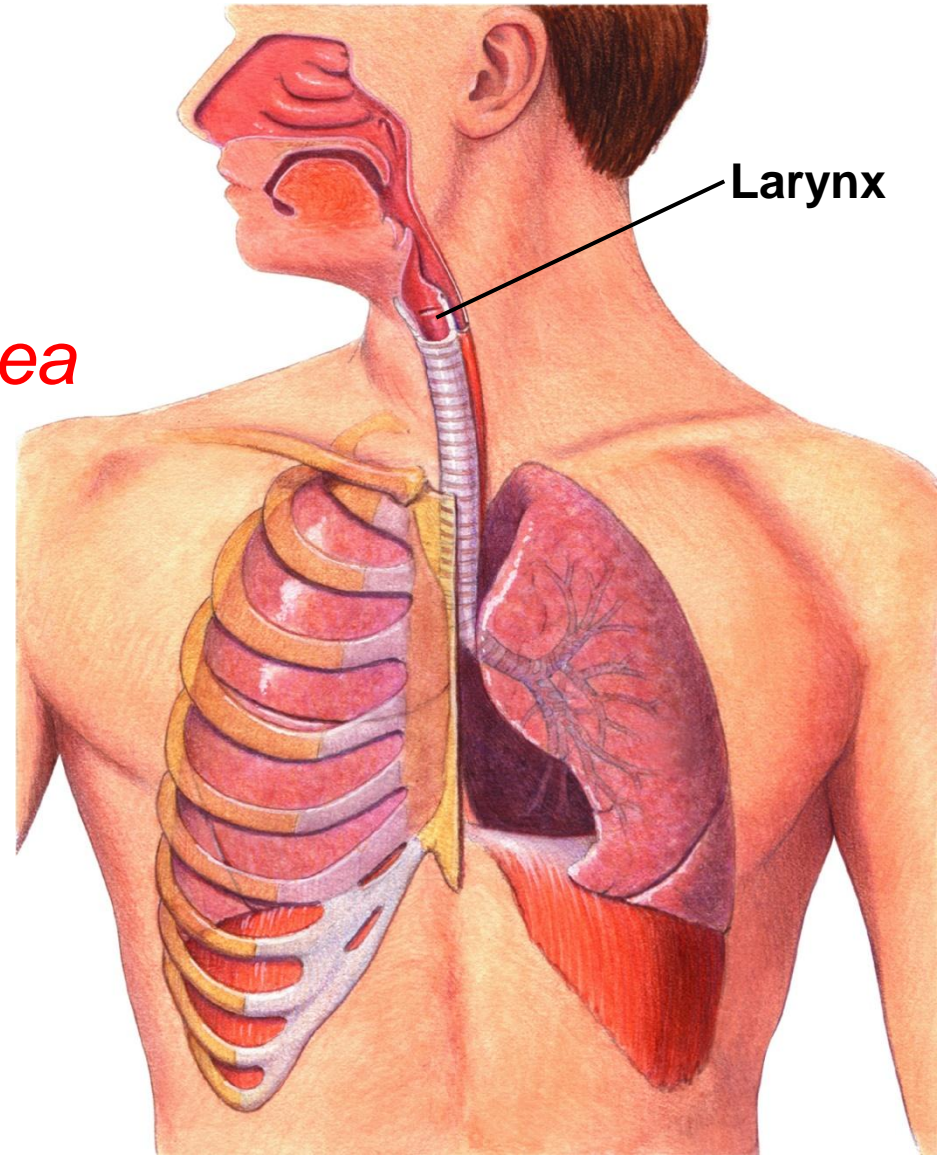


Air moves from the *pharynx* into the *trachea*, or windpipe.

The *epiglottis* covers the entrance to the *trachea* when you swallow.

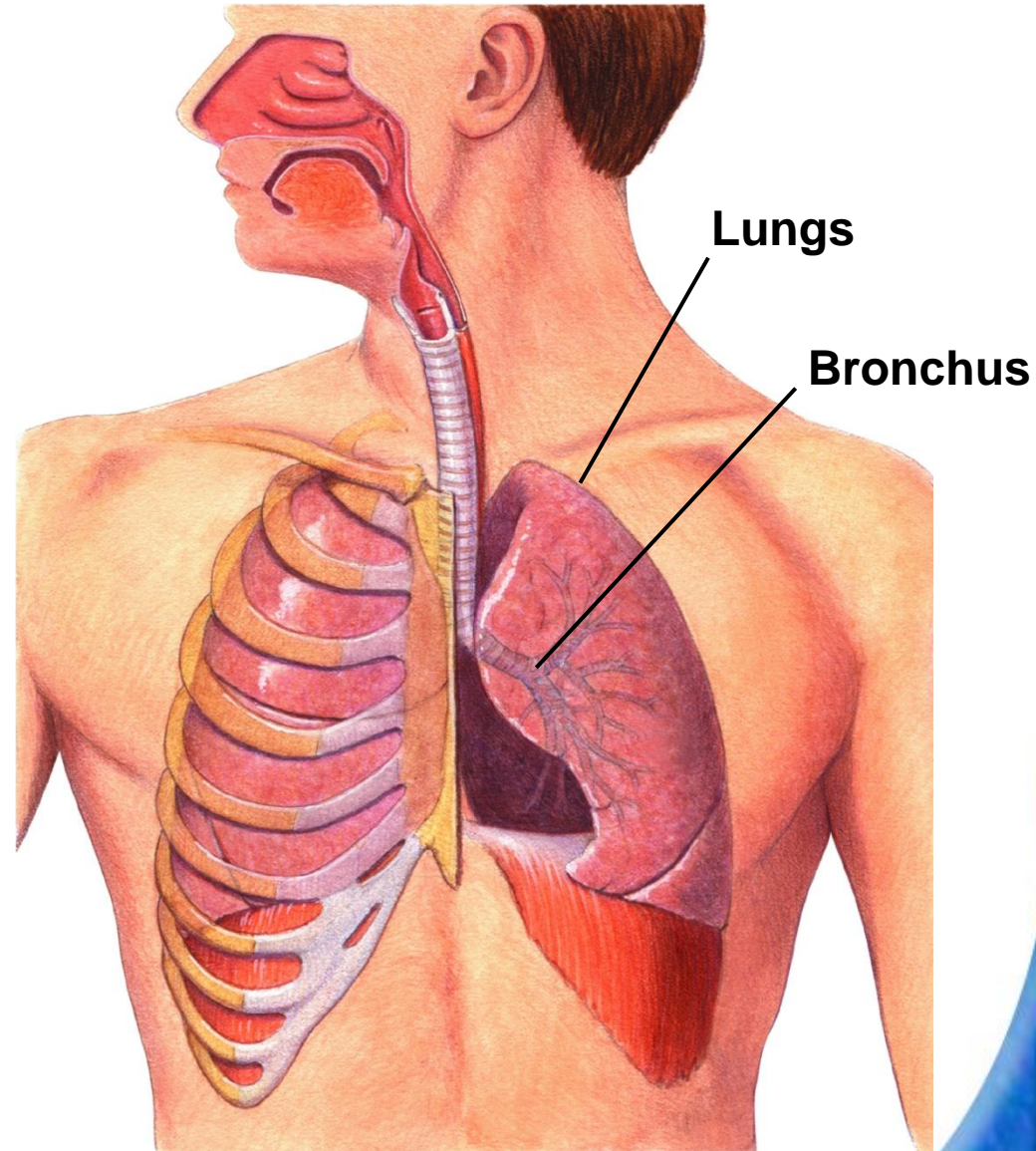


At the *top of the trachea* is the *larynx*, which contains two elastic folds of tissue called *vocal cords*.

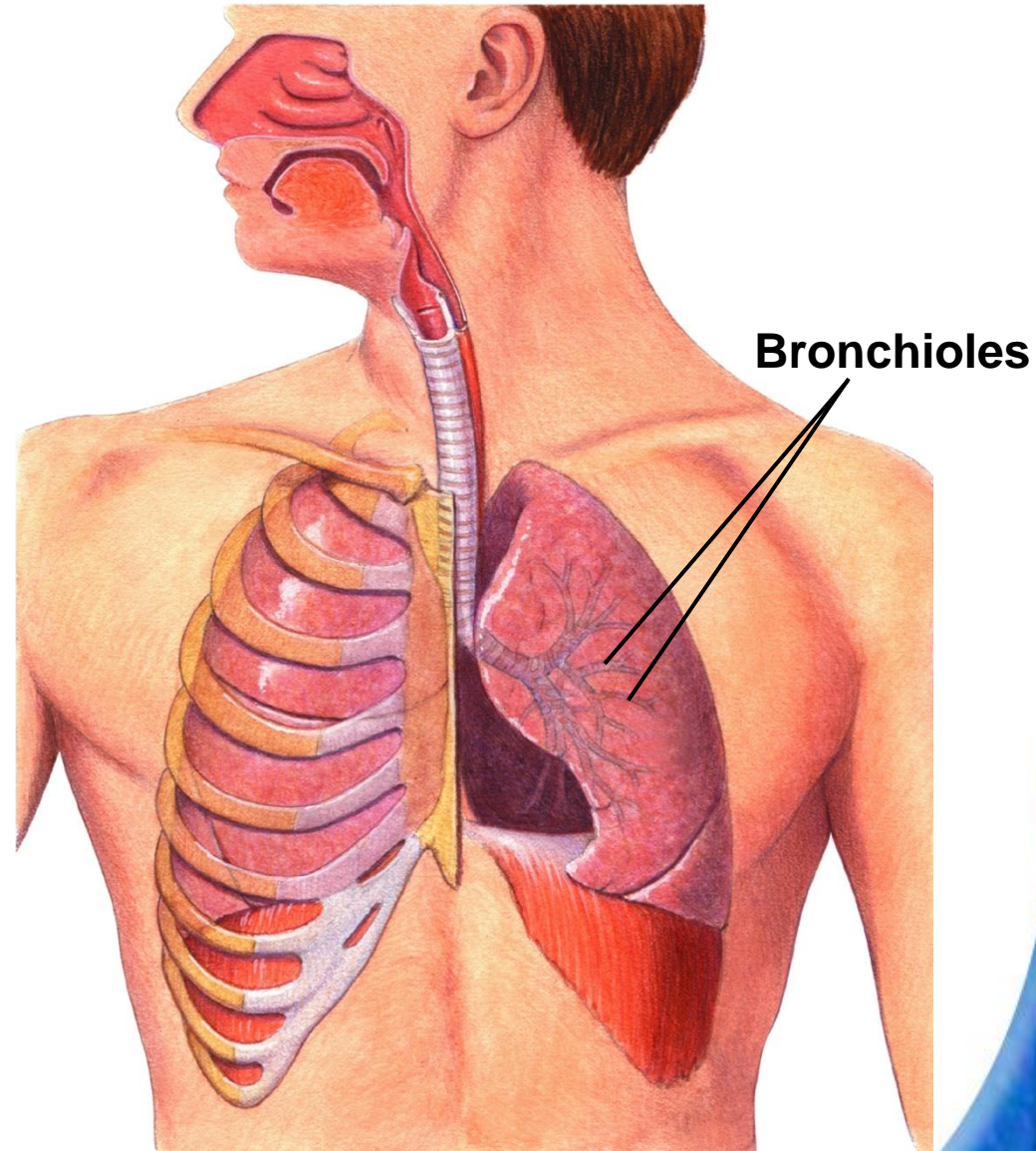


Air then passes through the trachea into *two large passageways in the chest cavity called bronchi*.

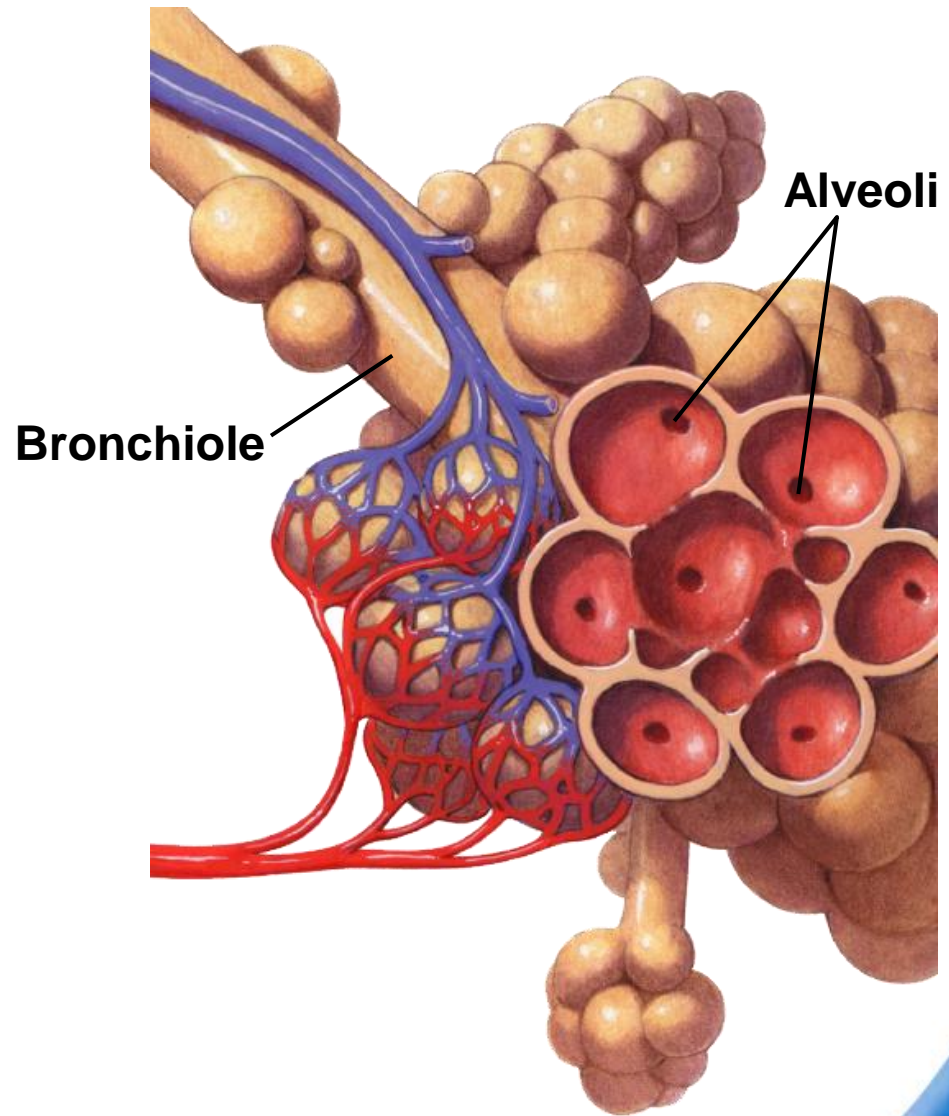
Each bronchus leads into one of the lungs.



In each lung, the *bronchus subdivides into smaller bronchi*, and then into *bronchioles*.

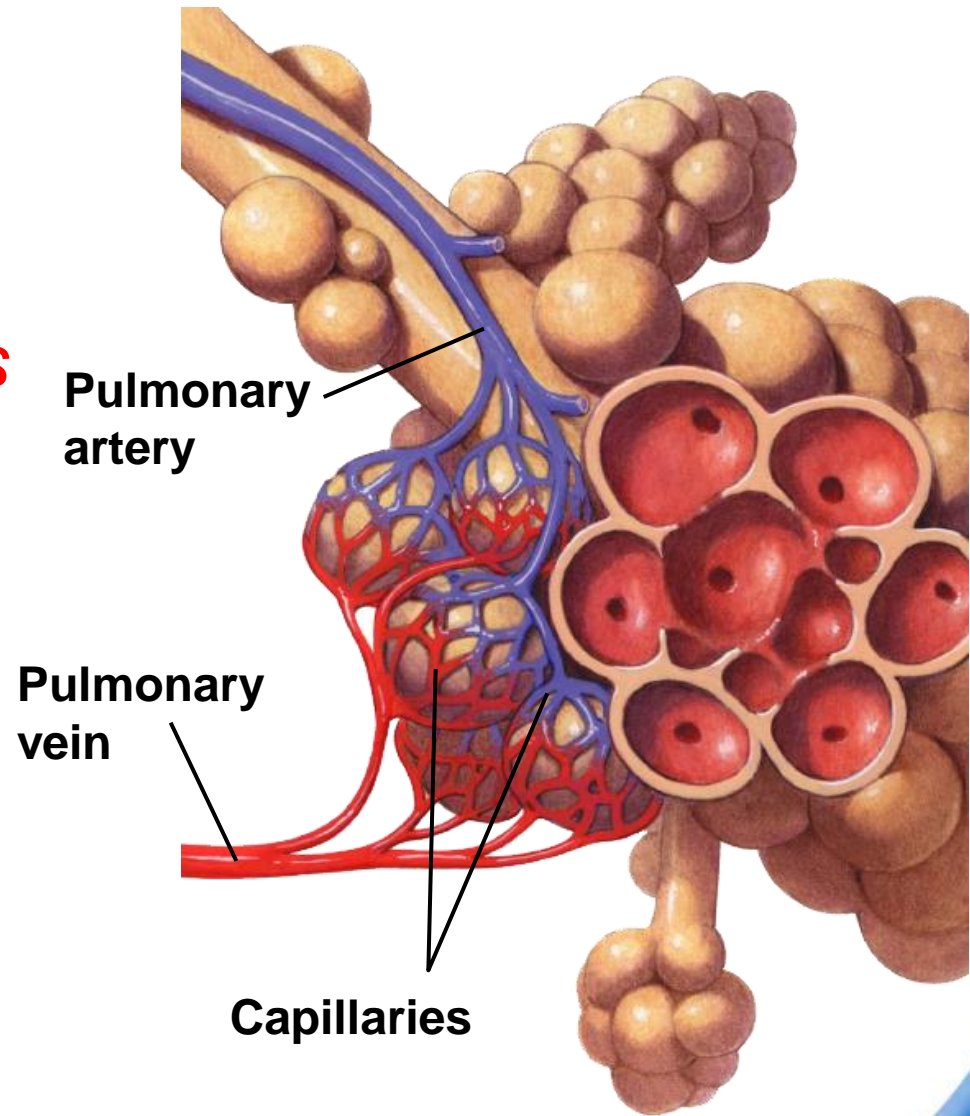


Bronchioles subdivide into millions of tiny air sacs called *alveoli*.



Alveoli are *grouped in clusters*.

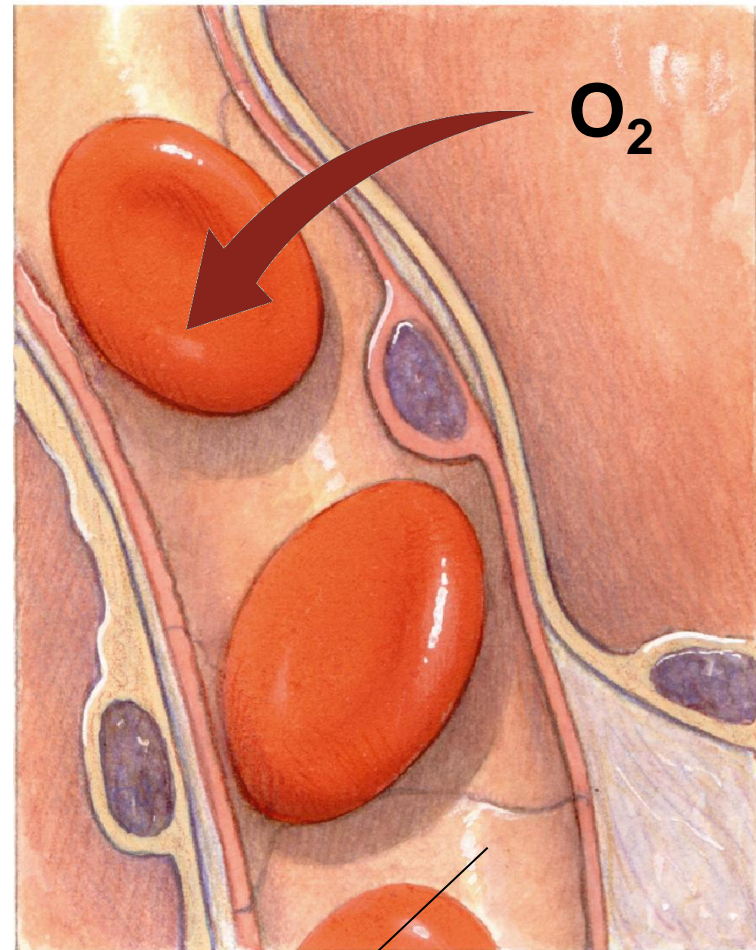
A network of *capillaries surrounds each alveolus*.



Gas Exchange

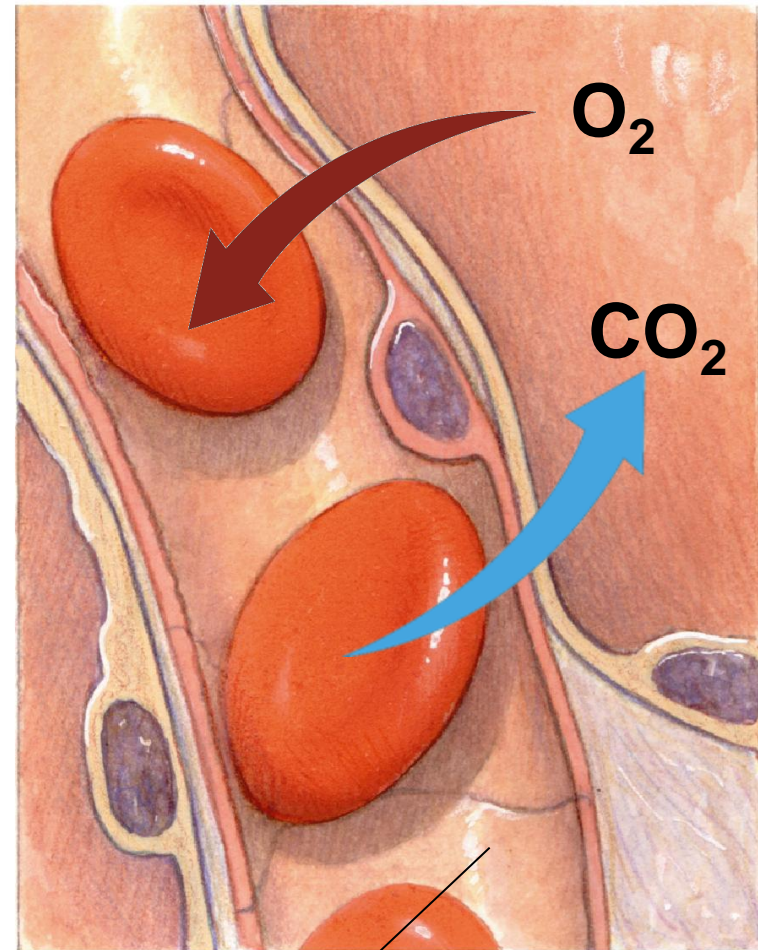
Gas exchange takes place *in the alveoli*.

Oxygen diffuses into the blood.



Capillary

Carbon dioxide in the blood *diffuses into the alveolus*.



Capillary

Breathing

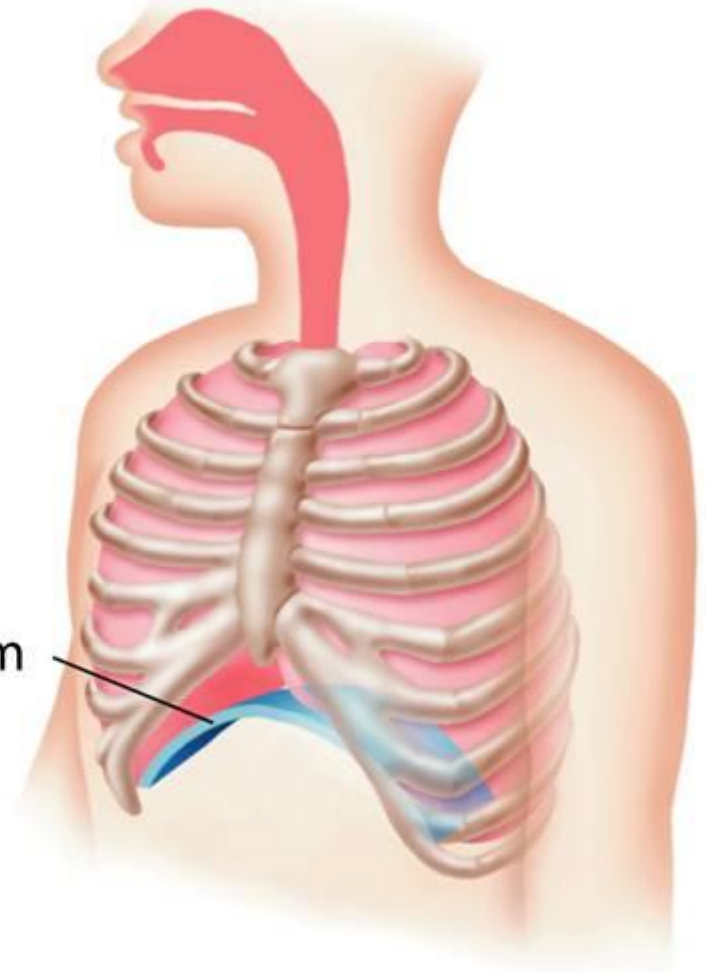
Breathing is the *movement of air into and out of the lungs.*

The *force* that drives air into the lungs *comes from air pressure.*

Lungs are *sealed in pleural membranes* inside the chest cavity.

At the *bottom* of the cavity is a *large, flat muscle* known as the *diaphragm*.

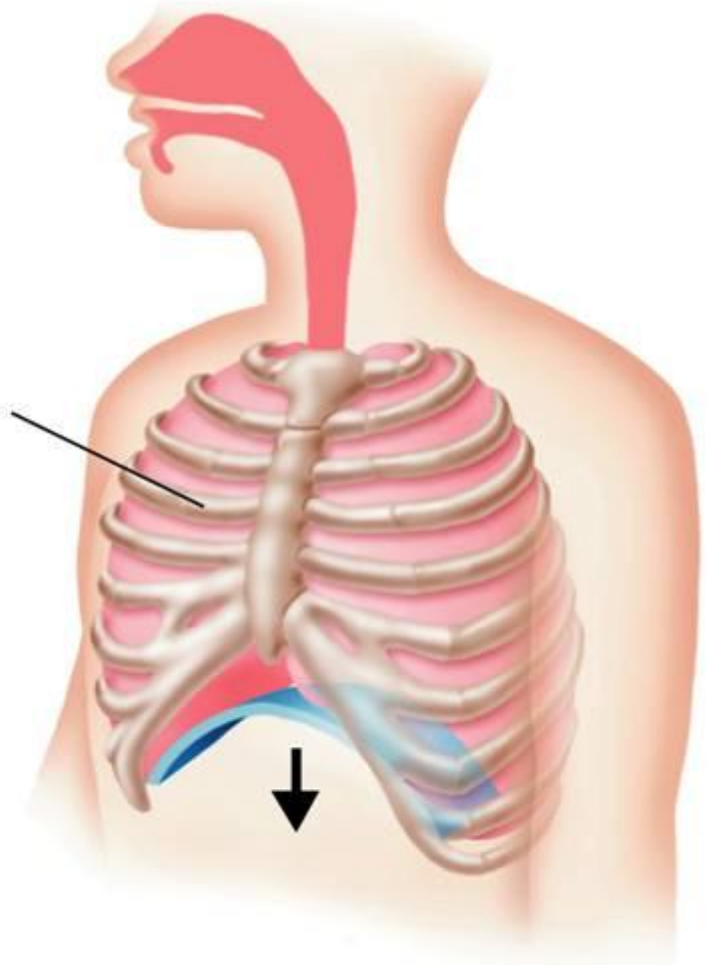
Diaphragm



During *inhalation*, the *diaphragm contracts* and the *rib cage rises up*.

This *expands the volume of the chest cavity*.

Rib cage rises



The chest cavity is sealed, so *this creates a partial vacuum* inside the cavity.

Atmospheric pressure fills the lungs as air rushes into the breathing passages.

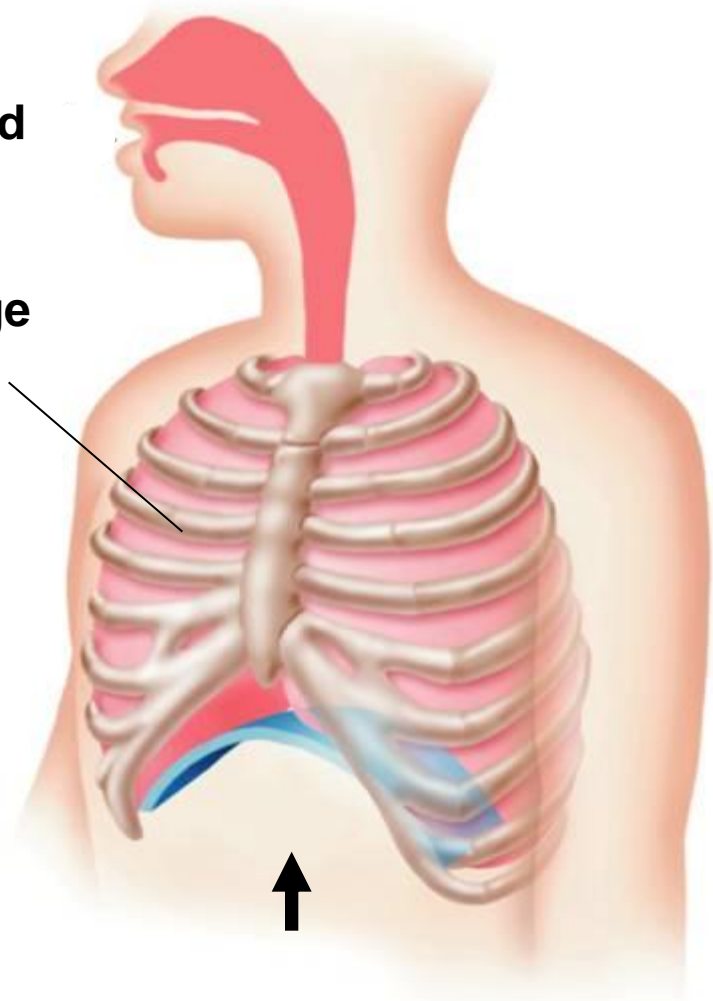
Often exhaling is a passive event.

When the *rib cage lowers and the diaphragm relaxes, pressure in the chest cavity is greater than atmospheric pressure.*

Air is pushed out of the lungs.

Air Exhaled

Rib cage lowers



Exhalation

How Breathing Is Controlled

Breathing is controlled by the *medulla oblongata*.

The medulla oblongata *monitors carbon dioxide* in the blood.

As carbon dioxide *increases*, nerve impulses make the *diaphragm contract*, bringing *air into the lungs*.

The *higher the* carbon dioxide *level, the stronger the impulses*.

Tobacco and the Respiratory System

Tobacco smoke contains ***three dangerous substances*** that affect the body:

- ***nicotine***
- ***carbon monoxide***
- ***tar***

Effects on Respiratory System

Nicotine is a stimulant that *increases heart rate and blood pressure.*

Carbon monoxide is a poisonous gas that *blocks the transport of oxygen by hemoglobin* in the blood.

Nicotine and carbon monoxide *paralyze the cilia.*

Tar contains *compounds* that are *known to cause cancer.*



Smoking can cause such respiratory diseases as chronic bronchitis, emphysema, and lung cancer.

In *chronic bronchitis*, the bronchi become *swollen and clogged with mucus*.

Emphysema is the *loss of elasticity* in lung tissues.

People with emphysema cannot get enough oxygen to the body tissues or rid the body of excess carbon dioxide.

Smoking is a preventable cause of lung cancer.

Lung cancer is deadly because its cells can spread to other locations.

Smoking is also a major cause of heart disease.

Smoking and the Nonsmoker

Passive smoking is *damaging to young children* because their lungs are still developing.

Studies show that *children of smokers are twice as likely* as children of nonsmokers *to develop respiratory problems.*

Dealing With Tobacco

The *best way* to avoid tobacco-related *illness is not to smoke*.

If a smoker quits, his or her *health can be improved, and some of the damage can be reversed*.

37-3 Section QUIZ

Continue to:

Section QUIZ

- or -

Click to Launch:



37-3 Section QUIZ

1

Air passes through the trachea into two large passageways in the chest cavity known as the

A

a. bronchi.

b. alveoli.

c. epiglottis.

d. bronchioles.

37-3 Section QUIZ

- 2** The function of the cilia lining the respiratory surfaces is to
- a. improve the amount of oxygen and carbon dioxide exchanged in the lungs.
 - b. cover the opening of the trachea when you swallow.
 - c. move air in and out of the lungs.
 - A** d. sweep trapped particles and mucus away from the lungs.

37-3 Section QUIZ

3 Oxygen diffuses from the alveolus into the blood because

A a. blood entering the capillaries of the lungs is oxygen-poor.

b. blood entering the capillaries of the lungs is oxygen-rich.

c. air entering the lungs has more carbon dioxide than oxygen.

d. air entering the lungs has less oxygen than is found in the blood.

37-3 Section QUIZ

4 A stimulant drug found in tobacco that increases the heart rate and blood pressure is

- a. tar.
- b. carbon monoxide.

A c. nicotine.

- d. carbon dioxide.

37-3 Section QUIZ

- 5** A respiratory disease that results in the loss of elasticity in the tissues of the lung is
- a. chronic bronchitis.
 - b. lung cancer.
 - A** c. emphysema.
 - d. pneumonia.

END OF SECTION