

HUMAN RESPIRATORY

SYSTEM

WHAT IS RESPIRATION

- **Respiration is the exchange of gases between the organism and its environment.**
- **In HUMAN BODY the respiratory system and circulatory system cooperate in the transport of gases to the cells.**

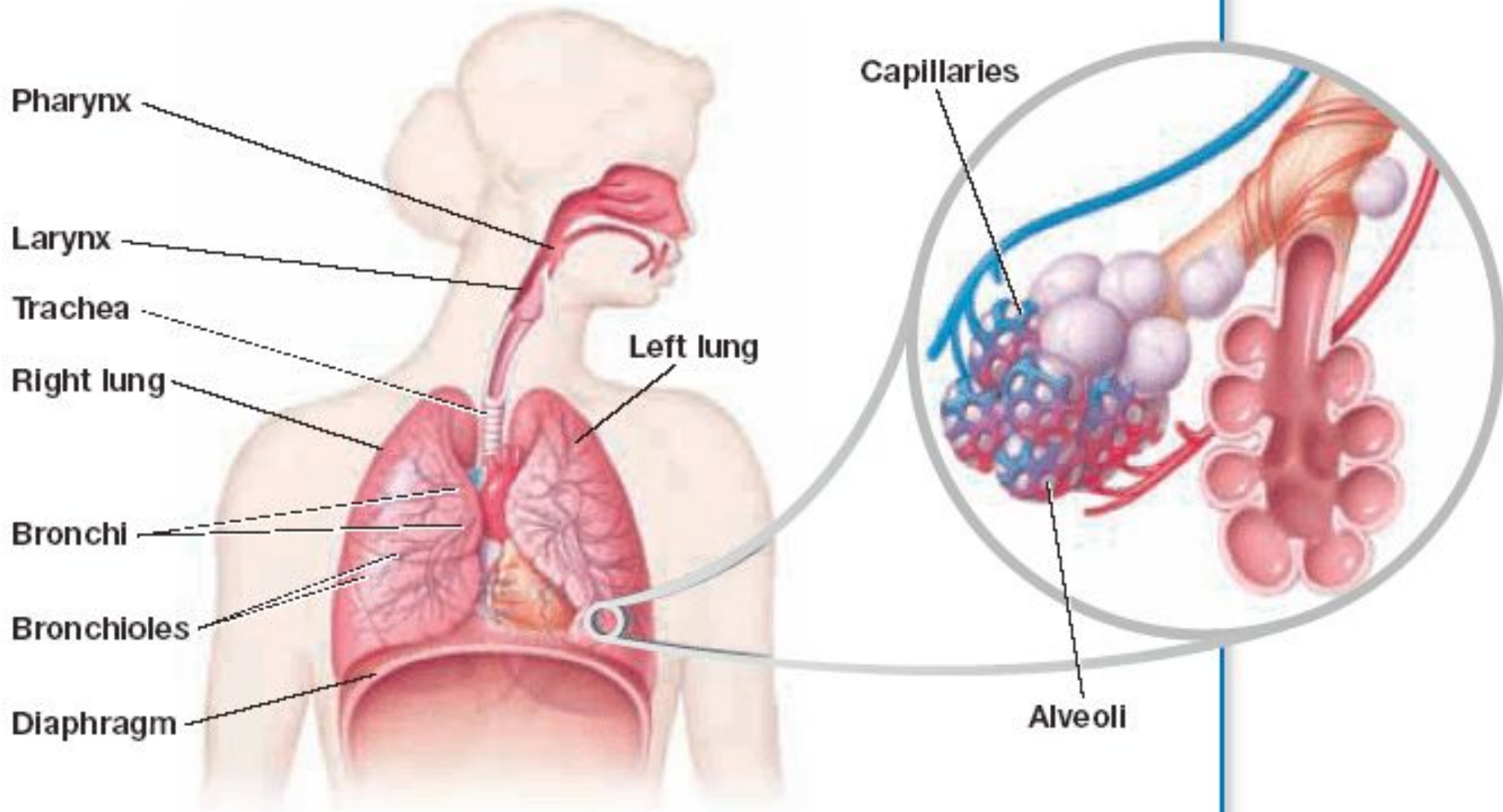
Parts of Human Respiratory System:

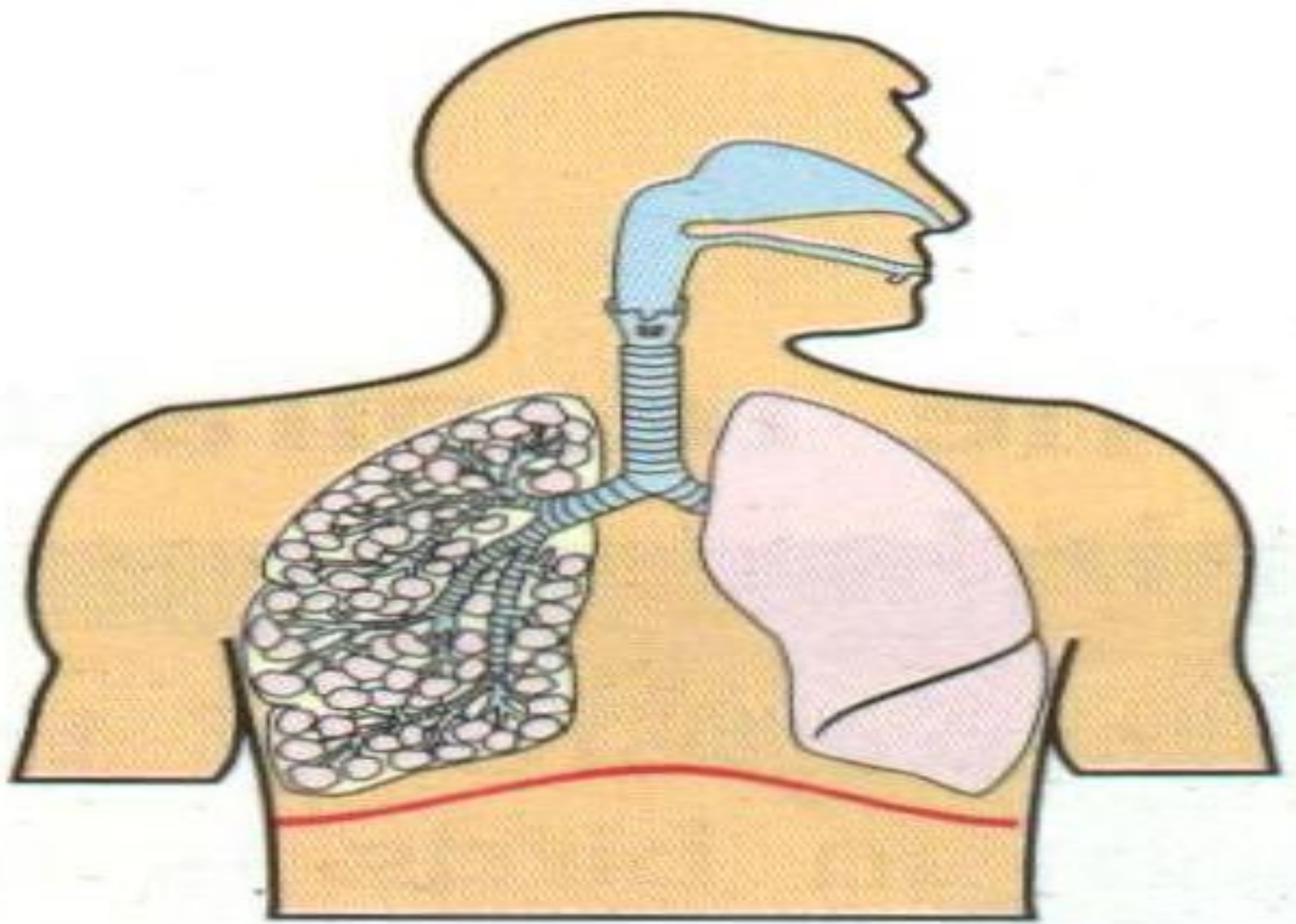
1. **Nose**
2. **Pharynx**
3. **Larynx**
4. **Trachea**
5. **Branchi**
6. **Bronchioles**
7. **Alveoli**

The Path of Air

- From the nose, air passes through a muscular tube in the upper throat called the **pharynx**. The air flows through a passageway for air called the **larynx**.
- Air then passes into the **trachea**. The trachea divides into two smaller tubes, the **bronchi**, which lead to the lungs. Within the lungs, gas exchange occurs in clusters of tiny sacs called **alveoli**.

Respiratory System



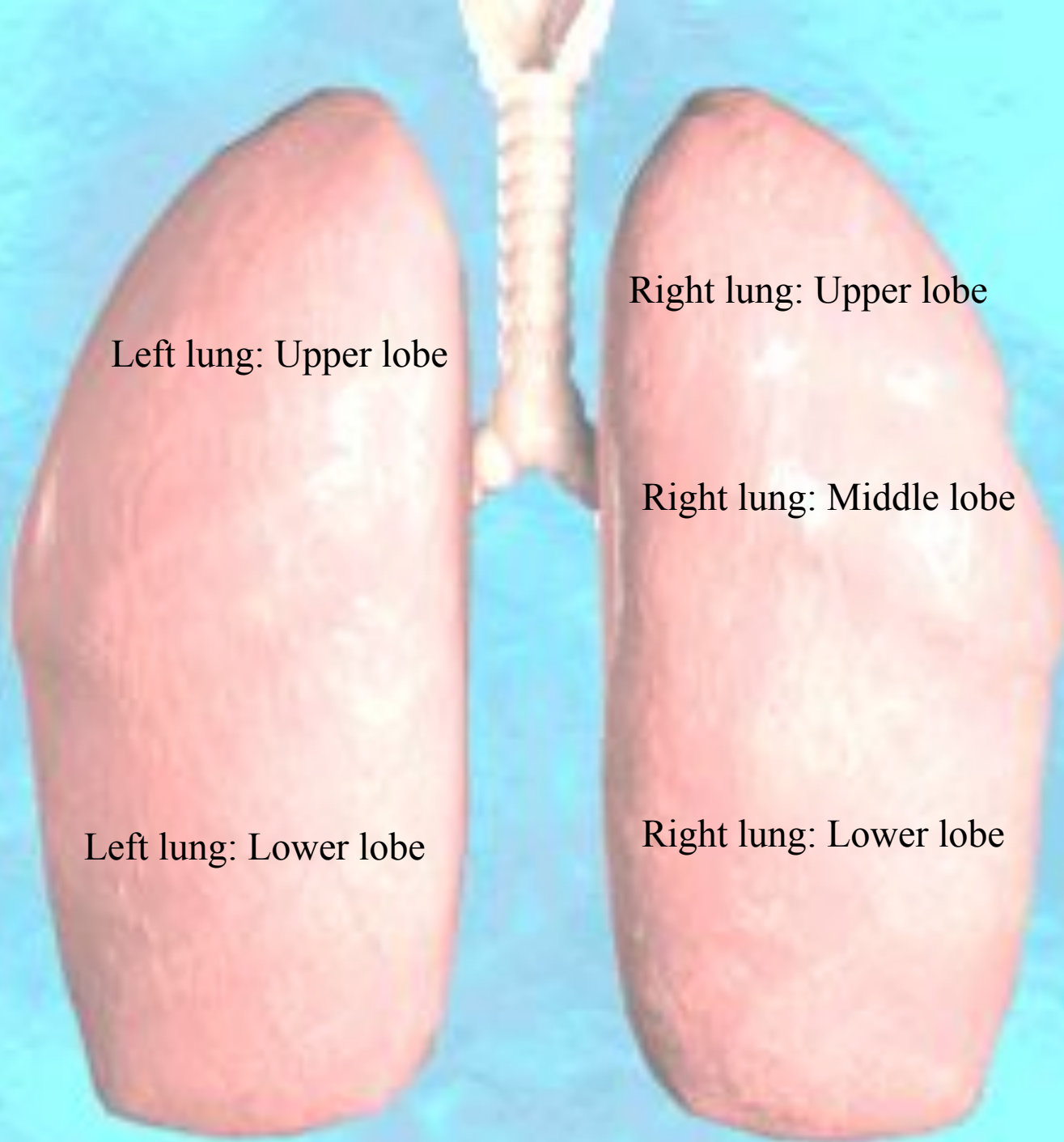


Mammalian lung

- **Pharynx is located behind the mouth cavity.**
(It serves as a passageway for both air and food)
- **Voice box is located in the larynx.**
- **Vocal cords can be controlled to make sounds.**
- **The trachea is divided into two branches that enter into each lung.**
- **Branches is divided into many smaller bronchioles.**

LUNGS

- The lungs are located in the chest cavity or thorax.
- Lungs are separated from the abdominal cavity by the diaphragm.
- Both lungs are surrounded by double layered membrane called **pleura**.



Left lung: Upper lobe

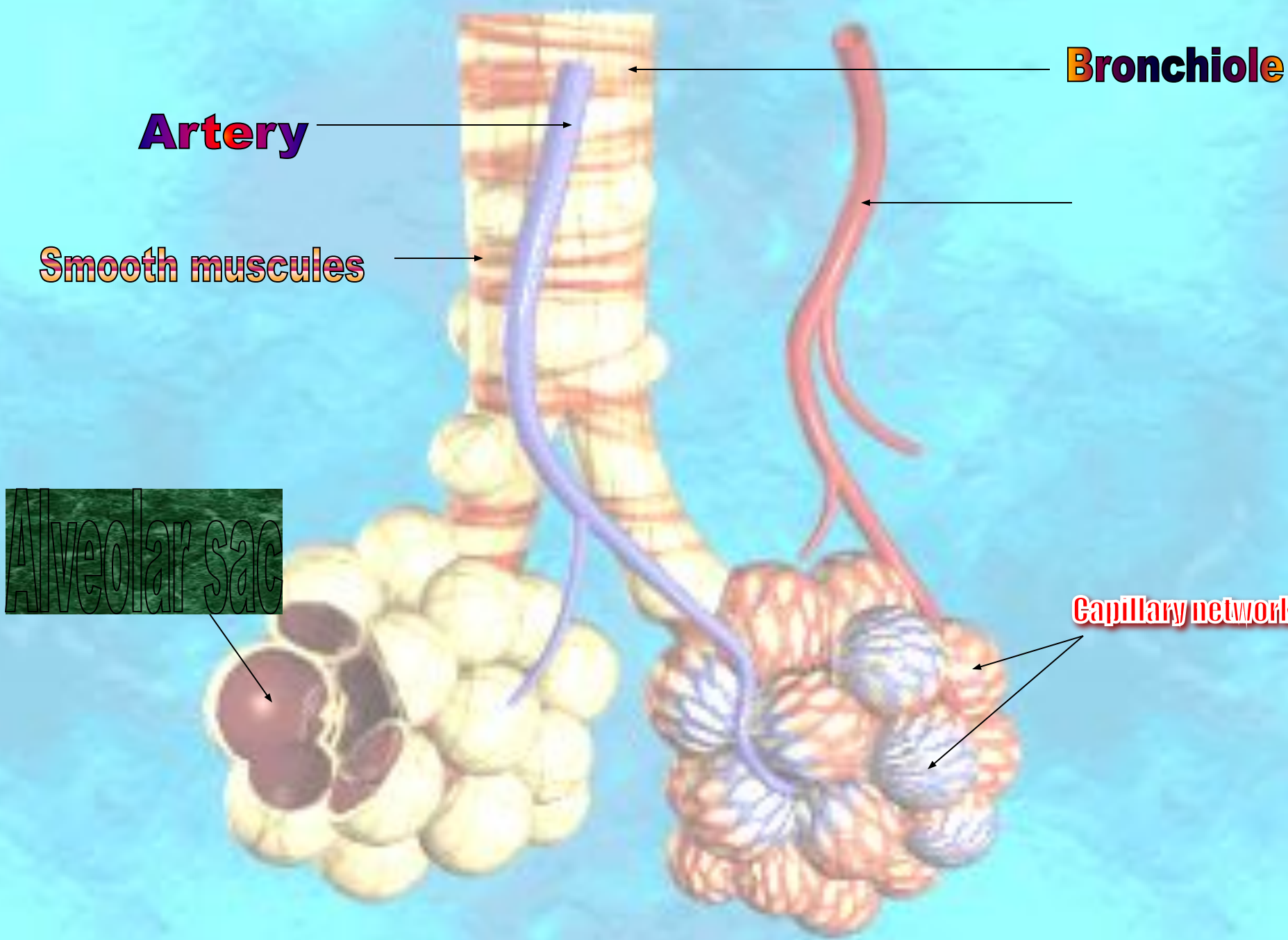
Right lung: Upper lobe

Right lung: Middle lobe

Left lung: Lower lobe

Right lung: Lower lobe

- The lungs consist of many alveoli.
- The alveoli increases the internal surface area of lungs.
- Alveoli are surrounded by a network of capillaries.
- Gases are transported by the blood in all land animals except insects.
- respiration of Insects is Trachae



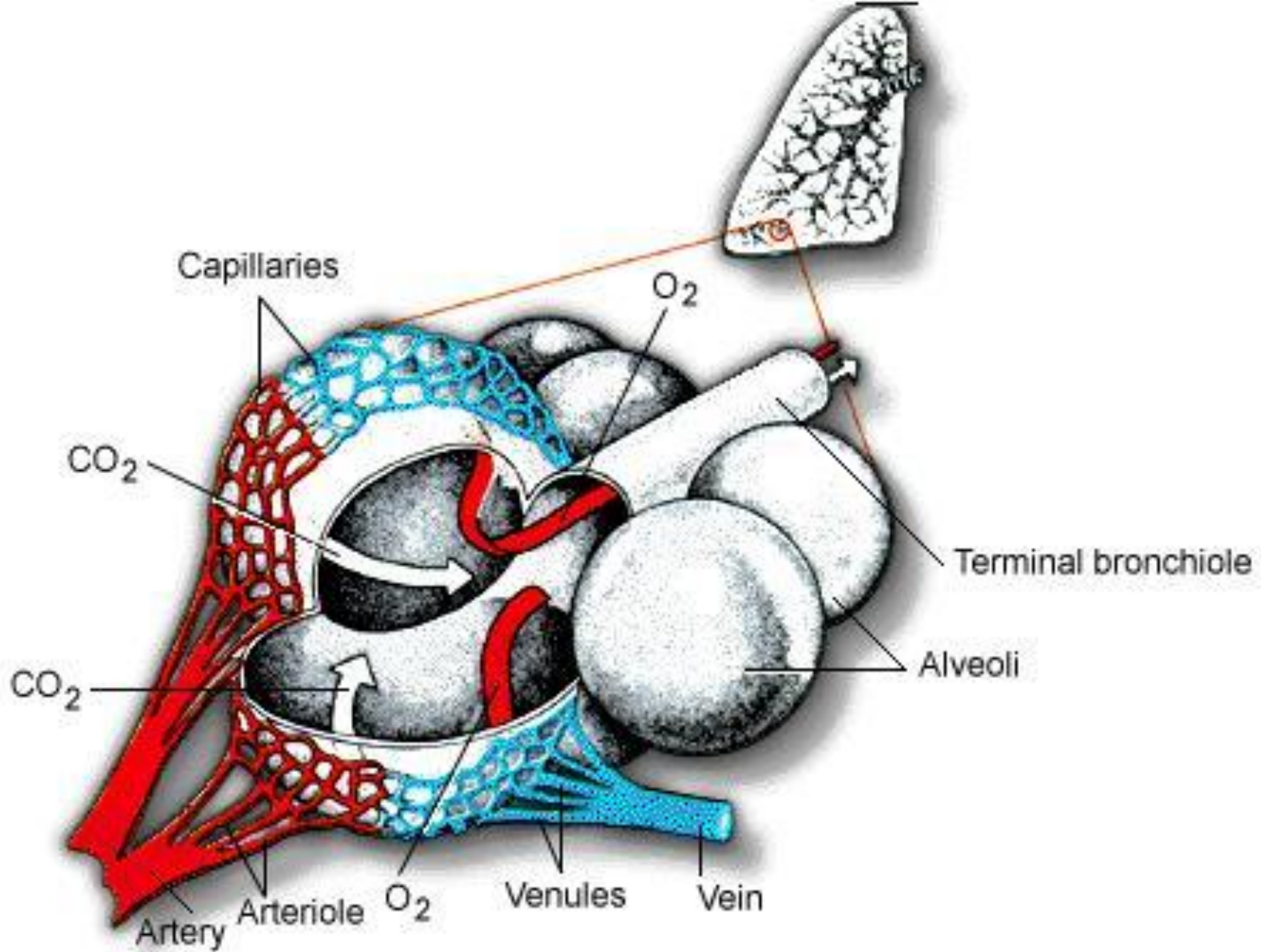
Artery

Bronchiole

Smooth muscles

Alveolar sac

Capillary network



PHASIS OF HUMAN RESPIRATION

- **BREATHING**: Movement of air into & out.
Have 2 phases inhalation & exhalation.
- **EXTERNAL RESPIRATION**: Exchange of O_2 & CO_2 between air & blood in lungs.
- **CIRCULATION**: Carrying dissolved gases.
- **INTERNAL RESPIRATION**: Exchange of O_2 & CO_2 between blood & body cells.

REGULATION OF RESPIRATION

Inhalation and exhalation are under the control of the brain and the spinal cord. The diaphragm and the intercostal muscles are regularly stimulated by the nerves to contract every 4-5 seconds.

HEMOGLOBIN

- Hemoglobin is red color pigment that found in mammals, birds, amphibia, reptiles, fish, worms, molluscs to carry oxygen and CO₂.
- There are iron atoms in structure of hemoglobin.

oxygen transport

- 98% of oxygen is transported by hemoglobin in erythrocytes.
- 2% of oxygen is transported by plasma.
- Oxygen combines with hemoglobine to form oxyhemoglobin (HbO_2). HbO_2 molecules combines with K ions.



- In body tissues HbO_2 is divided into Hb and O_2 .
- Because O_2 concentration is low in body tissues.
- And O_2 diffuses to body tissue.

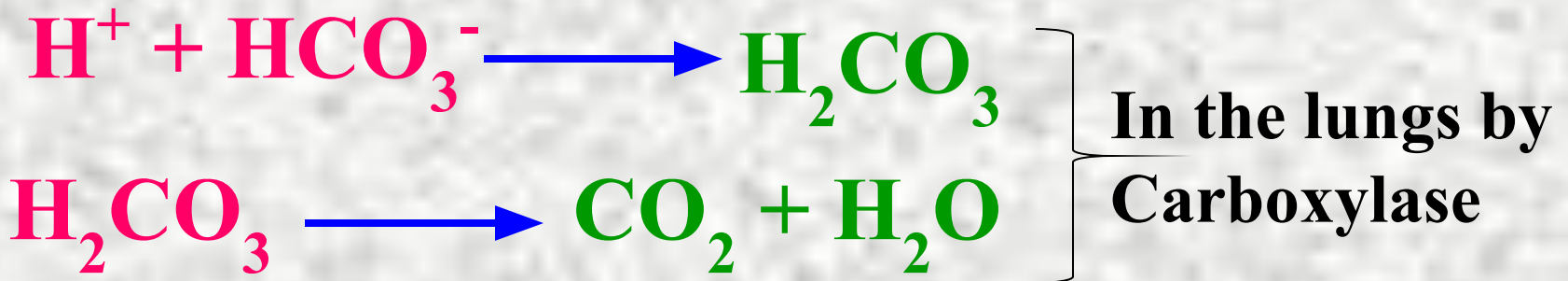


Carbondioxide Transport

70% of CO₂ is transported as bicarbonate ions.



(In the body tissues with action of Carboxylase enzyme)



- **20% of CO₂ is transported by hemoglobin in erythrocytes**



- **10% of CO₂ is transported in the plasma.**

The Effects of Smoking

- * Drop in skin temperature
- * Fast breathing
- * Decrease in appetite
- * Diarrhea
- * Vomiting
- * Tar may cause cancer
- * Tar is deposited in lungs
- * Much tar is coughed up in phlegm

Increased blood pressure

Increased heart rate

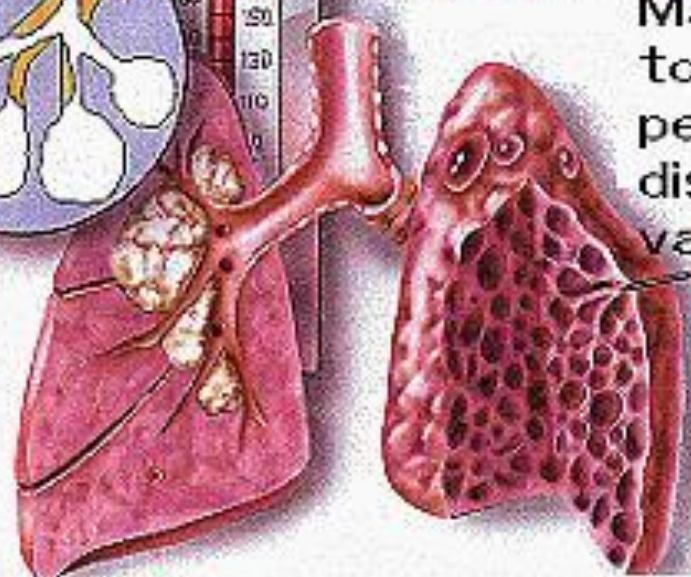
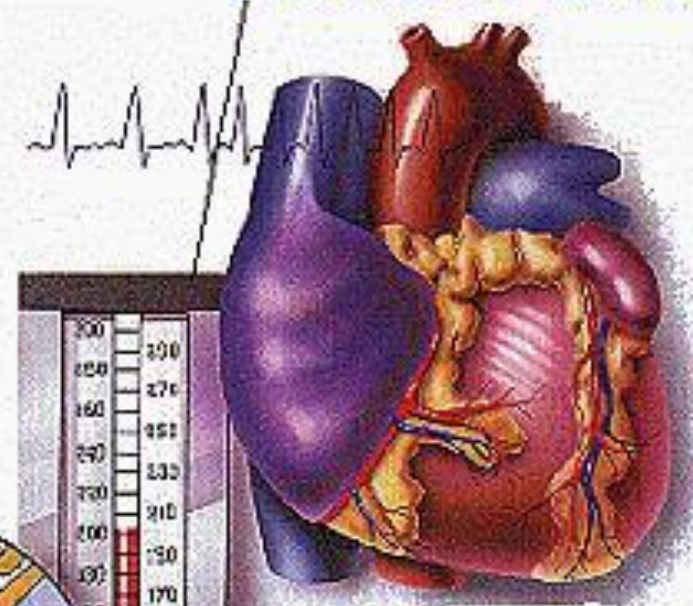
May contribute to coronary and peripheral artery disease via vasoconstriction

Bronchitis

Mucus blocks air passages

Lung Cancer

Emphysema



Indirect Problems Caused by Smoking

Skin wounds
heal less
quickly

Depletes
vitamin C

Reduces
immunity
to disease

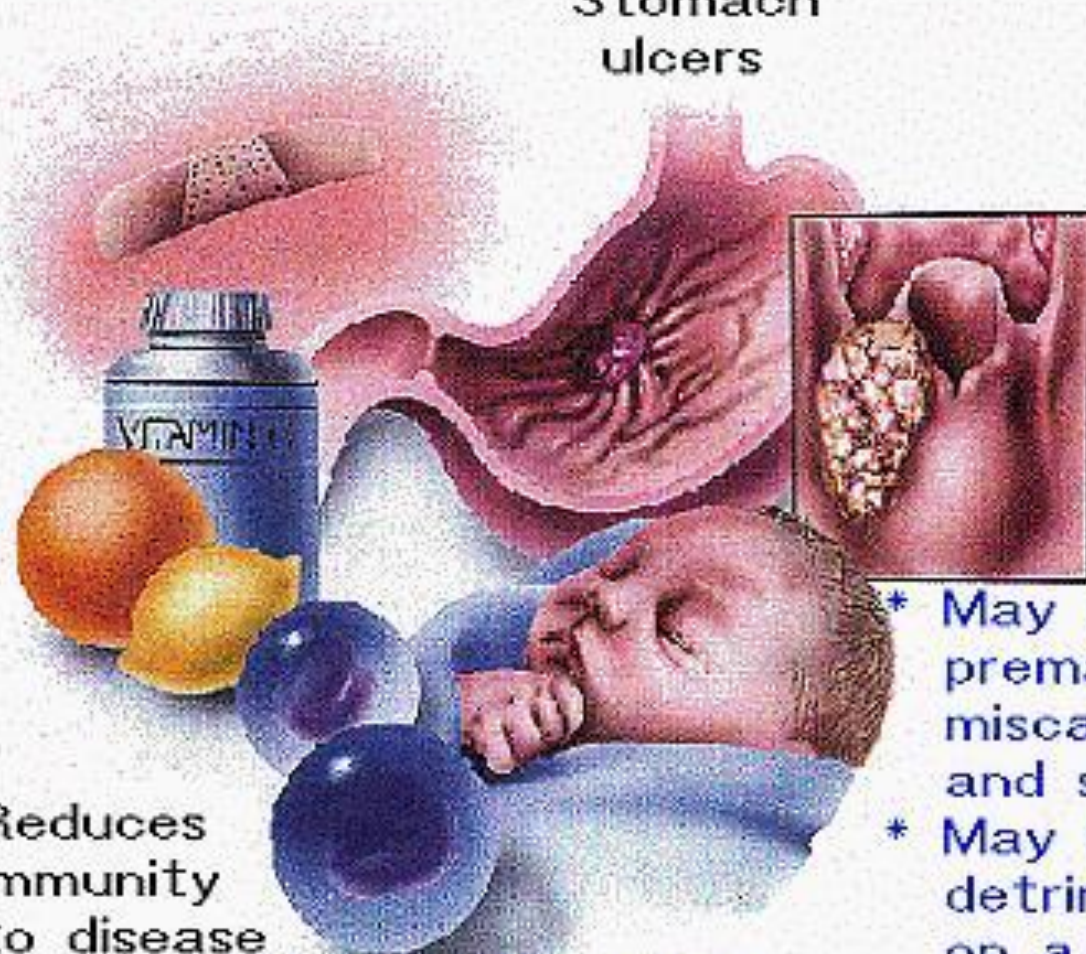
* Babies of women
who smoke may
weigh less
at birth

Stomach
ulcers

Cancer of
mouth and
throat

* May risk
prematurity,
miscarriage,
and stillbirth

* May have a
detrimental effect
on a child's growth,
intellectual
development, and
behavior



Section 4

Breathing—
Air In, Air Out

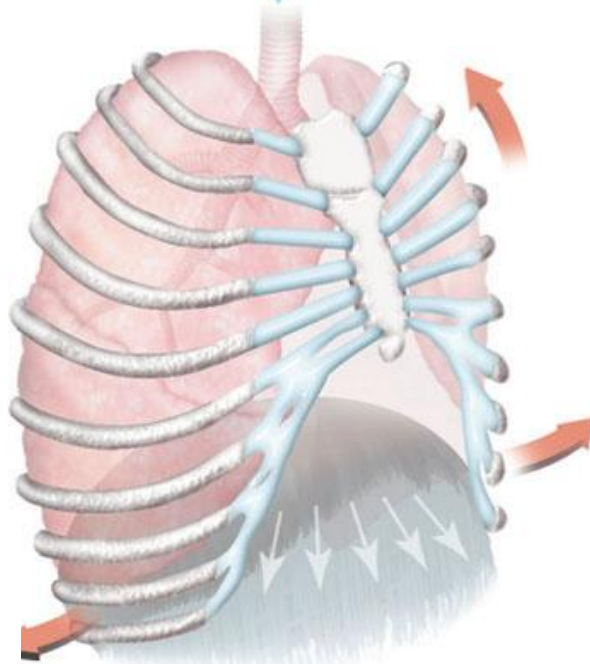
Breathing

- When you breathe, air pressure gradients reverse in a cycle.
 - The *respiratory cycle* is the continuous in/out ventilation of the lungs and has two phases:
 - *Inspiration* (inhalation) draws breath into the airways.
 - *Expiration* (exhalation) moves a breath out of the airways.

Breathing

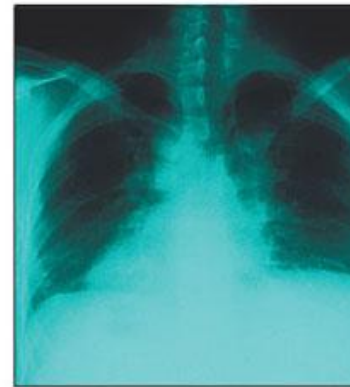
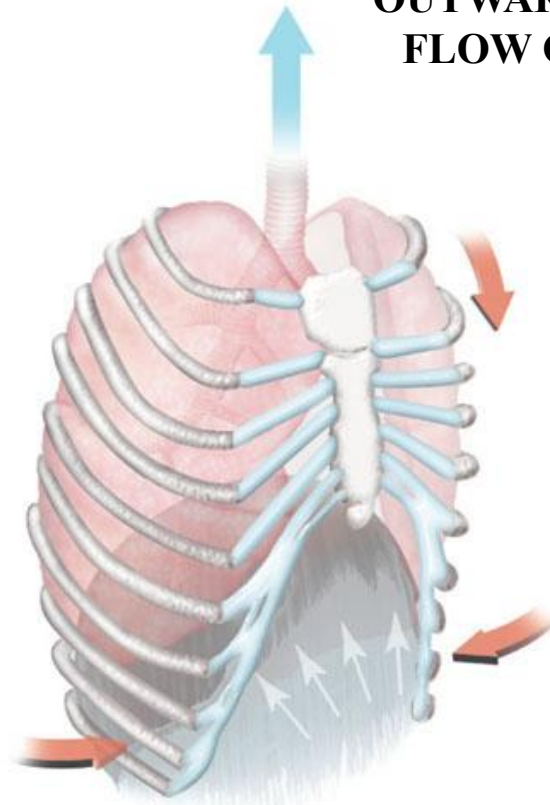
- During the cycle, the volume of the chest cavity increases, then decreases, and the pressure gradients between the lungs and outside air reverse.
 - This works because the air in the airways is the same pressure as the outside atmosphere.
 - Pressure in the alveoli (*intrapulmonary pressure*) is also the same as the outside air.

**INWARD
BULK
FLOW OF AIR**



son Higher Education

**OUTWARD BULK
FLOW OF AIR**



Inhalation
Diaphragm contracts and moves down. The external intercostal muscles contract and lift the rib cage upward and outward. The lung volume expands.

Exhalation
Diaphragm and external

Breathing

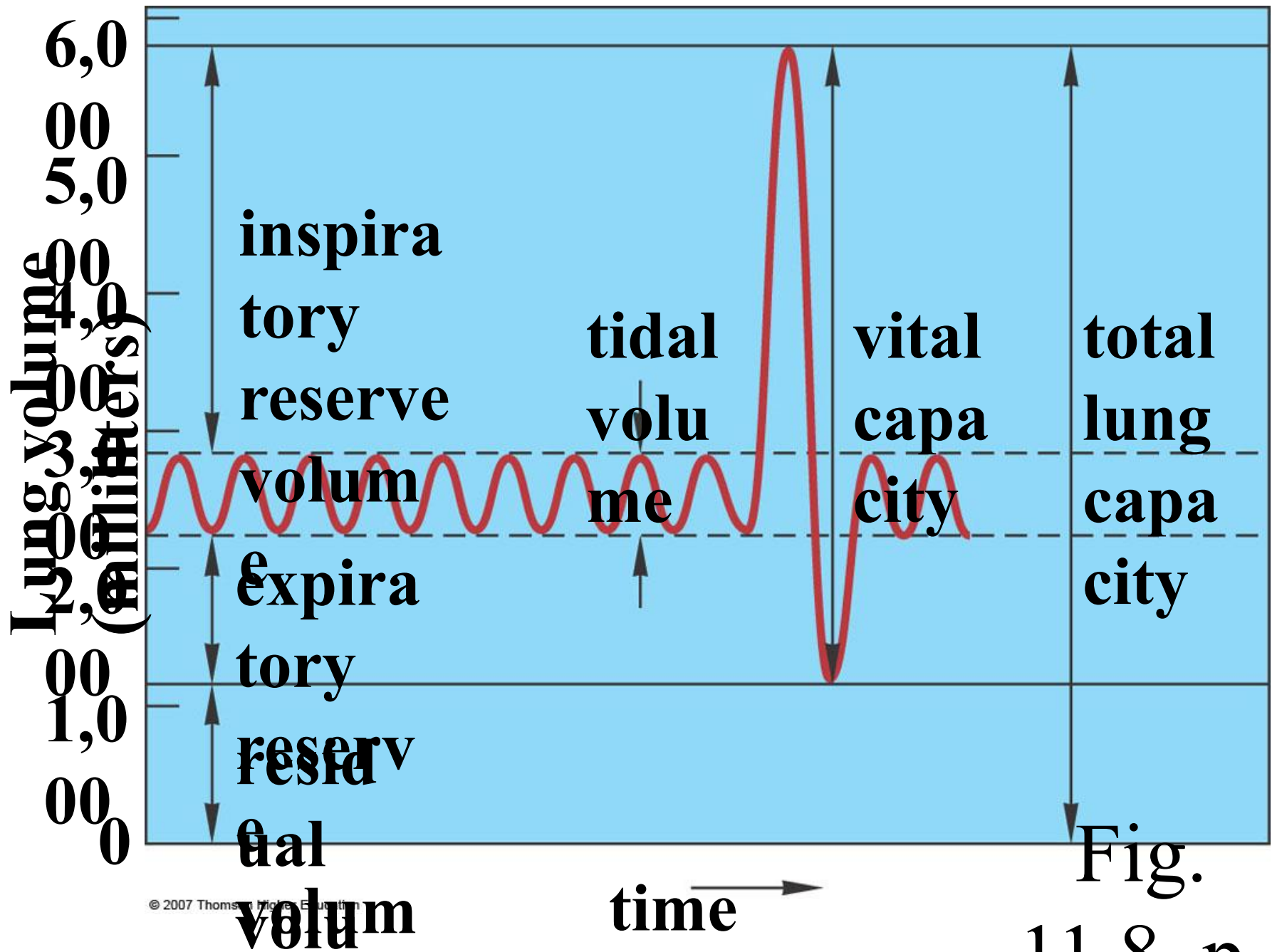
- The basic respiratory cycle.
 - To inhale, the diaphragm contracts and flattens, muscles lift the rib cage upward and outward, the chest cavity volume increases, internal pressure decreases, air rushes in.
 - To exhale, the actions listed above are reversed; the elastic lung tissue recoils passively and air flows out of the lungs.
 - Active exhalation involves contraction of the abdominal muscles to push the diaphragm upward, forcing more air out.

Breathing

- Another pressure gradient aids the process.
 - The lungs are stretched to fill the thoracic cavity by a slight difference between the intrapulmonary pressure (higher) and the intrapleural pressure (lower).
 - In a collapsed lung (*pneumothorax*), air enters the pleural cavity, disrupting the normal expansion and contraction of the lungs.

Breathing

- How much air is in a “breath”?
 - About 500 ml of air (*tidal volume*) enters and leaves the lungs with each breath.
 - A human can forcibly inhale 3,100 ml of air (*inspiratory reserve volume*) and forcibly exhale 1,200 ml (*expiratory reserve volume*).
 - The maximum volume that can be moved in and out is called the *vital capacity* (4,800 ml for males, 3,800 ml for females).



Breathing

- A *residual volume* of about 1,200 ml remains in the lungs and cannot be forced out.
- Sometimes food enters the trachea rather than the esophagus; it can be forced out by the *Heimlich maneuver*, which forces the diaphragm to elevate, pushing air into the trachea to dislodge the obstruction.