# Respiratory system

Level 2 Anatomy and physiology
for exercise and fitness instructors

# Learning outcomes

By the end of this session you will be able to:

- Identify the location and function of the lungs
- Describe the structure of the lungs
- Identify the main muscles involved in breathing
- Describe the passage of air through the respiratory tract
- Describe the process of gaseous exchange of oxygen and carbon dioxide in the lungs

# The function of the lungs

Respiration is the movement of air in and out of the lungs, to:

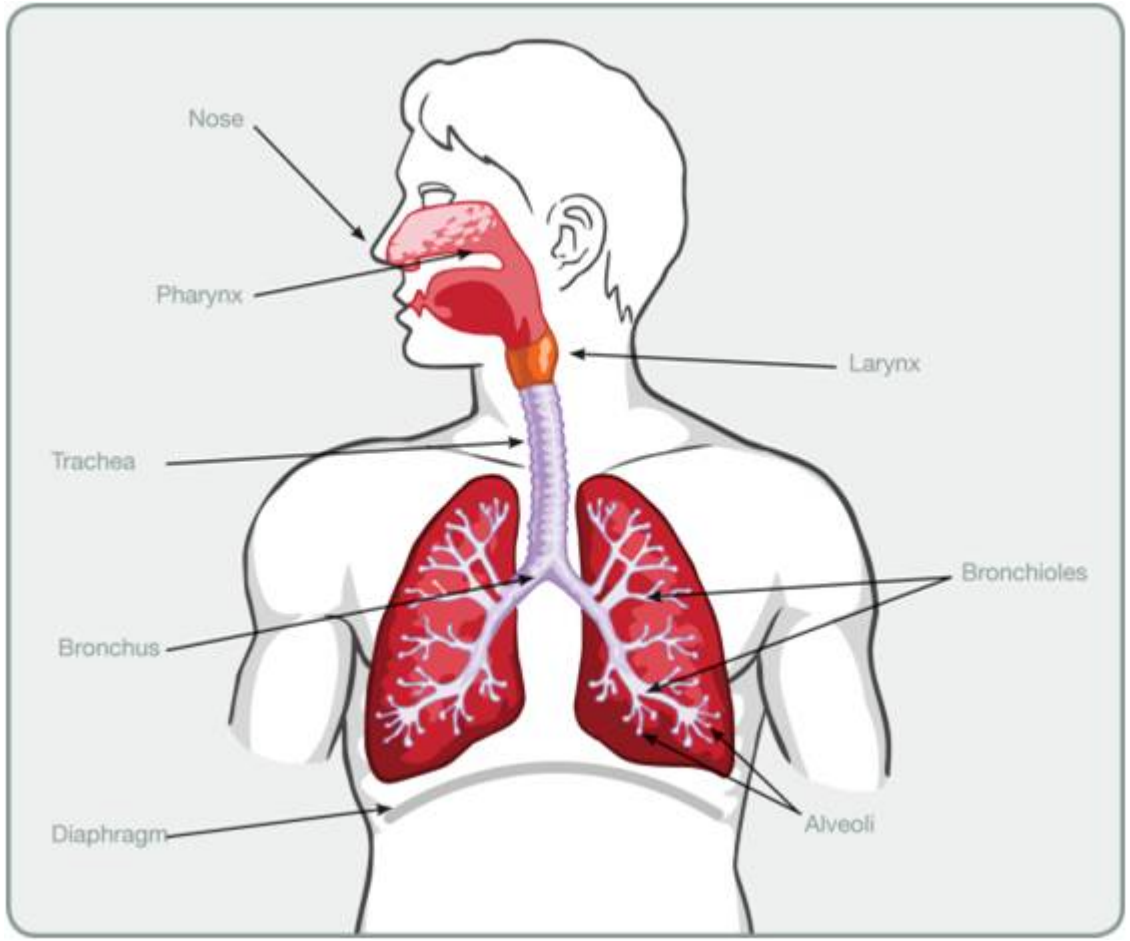
- take in air from the atmosphere
- pass oxygen into the circulatory system
- remove carbon dioxide from the circulatory system

All human cells must obtain oxygen to carry out cell respiration - produce Adenosine Tri Phosphate (ATP) and eliminate carbon dioxide

# The lungs

Located in the thorax

Protected by the ribs



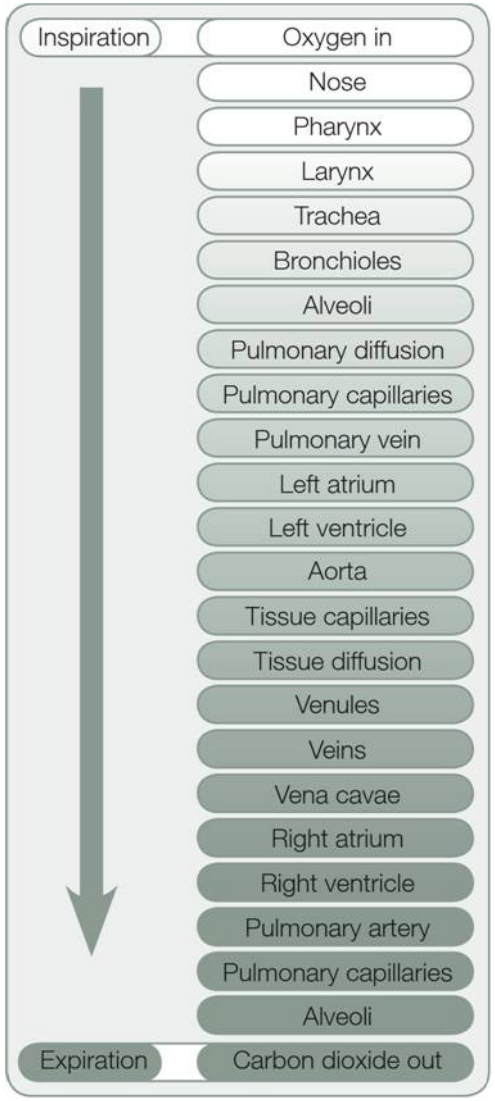
# The structure of the lungs

- Trachea (windpipe)
- Bronchus (bronchi)
- Bronchioles
- Alveoli (singular alveolus)
- Capillaries

# The passage of air through the lungs

- Air enters and leaves via the nose or mouth
- Air is warmed and filtered in the nasal cavities
- The air passes through the pharynx, or throat
- It goes to the larynx
- The epiglottis prevents food from entering the trachea
- The trachea divides into two bronchi
- Each bronchus leads to a lung and lead to the bronchioles
- The bronchioles terminate in clusters of alveoli (often called air sacs) which are surrounded by pulmonary capillaries, the site of gaseous exchange

# The passage of air



# Gaseous exchange

Diffusion

The exchange of gases (oxygen and carbon dioxide) within the lungs

This occurs within the capillaries that surround the alveoli in the lungs

# Gaseous exchange

## Diffusion

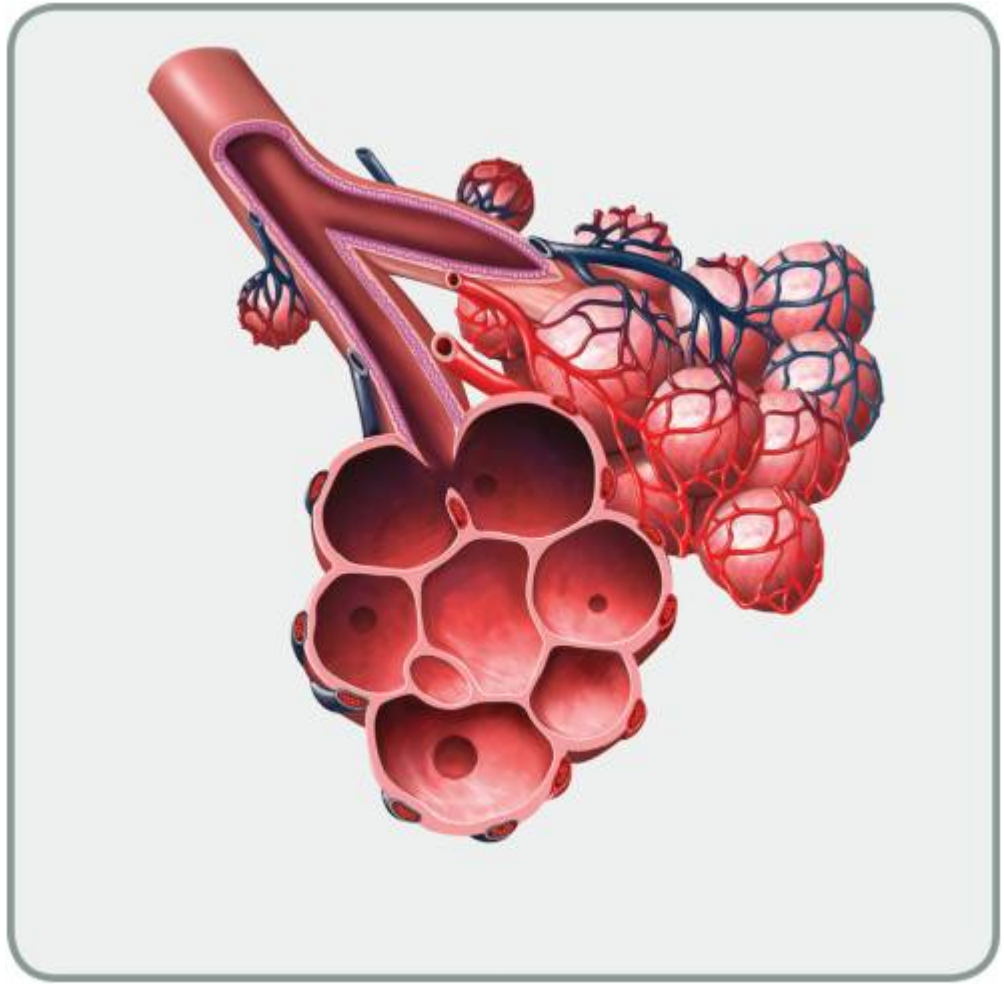
Diffusion is the movement of particles from an area of high concentration to an area of low concentration

In the lungs, the blood will continue to take in oxygen from the alveolar air spaces, provided there is more oxygen in the air spaces than in the blood.

The oxygen diffuses across the alveolar walls into the blood

The circulation takes the oxygen-rich blood away and replaces it with blood that is low in oxygen

# Gaseous exchange



# Cardiovascular and respiratory system links

The cardiovascular and the respiratory system both work toward the same goal - getting oxygen to tissues and getting carbon dioxide out.

The respiratory system is involved in supplying oxygen to the blood and removing carbon dioxide.

When the heart receives blood that is low in oxygen and high in carbon dioxide, it pumps it to the lungs via the pulmonary arteries.

# Cardiovascular and respiratory system links

When the lungs expand and get fresh air from the environment, oxygen is transferred (via the alveoli) into the low-oxygen blood, which also then sends some of its carbon dioxide back into the lungs.

Now that this blood has fresh oxygen in it, it returns to the heart and the heart then pumps it throughout the body.

# The air we breathe

| Normal air | Exhaled air |
|---|---|
| 78% nitrogen | 78% nitrogen |
| 21% oxygen | 16% oxygen |
| 0.04% carbon dioxide | 4% carbon dioxide |

# Respiratory muscles

**Diaphragm**

A dome-shaped muscle

When it contracts, it flattens increasing the abdominal cavity

# Respiratory muscles

**Internal and external obliques**

External – pull the ribs upwards and outward

Internal – pull the ribs downward and inward