

# The structure and functions of the cardio-respiratory system



**UNTAMED**  
EDUCATION

3.1.1 Applied anatomy and physiology

**Respiratory System**

**Gaseous Exchange**

**Heart**

**Oxyhemoglobin**

**Inspiration**

The structure and functions of the cardio-respiratory system

**Spirometer**

**Expiration**

**Stroke Volume**

**Blood Vessels**

**Cardiac Output**



## The structure and functions of cardio-respiratory system

## 1. Respiratory system

**Nose** - has three functions.

- **Warms** the air to internal temperatures.
- **Cilia** hairs filter the air and remove small particles.
- **Moistens** the air so it can be absorbed more easily.

**Trachea**

- **Cartilage rings** keeps the windpipe open.

**Diaphragm**

- **Flattens** to move air into the lungs.
- **Relaxes** into a dome shape to expire air.

**Alveoli**

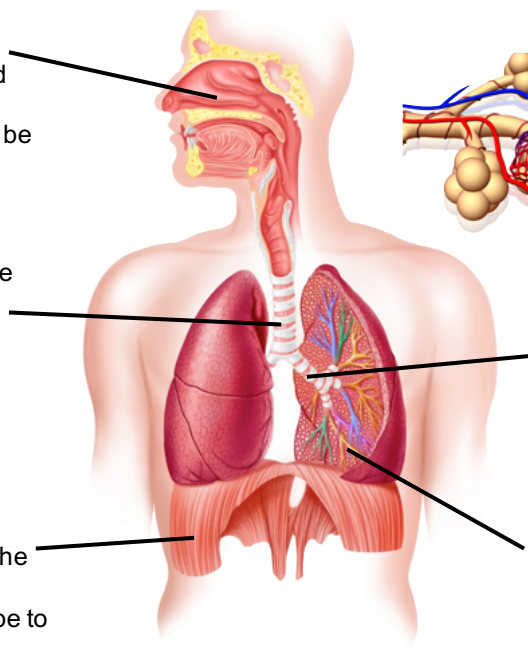
- **Gaseous exchange** happens between the capillaries that surround them.

**Bronchi**

- Two tubes branch from the trachea into the left and right lung.

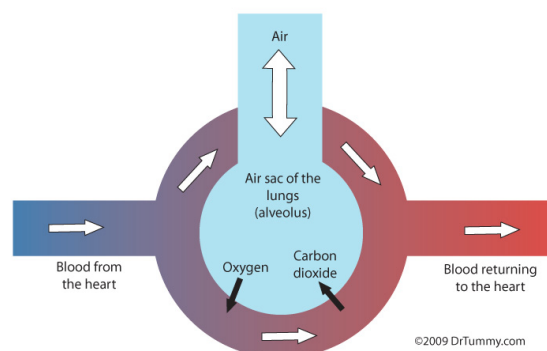
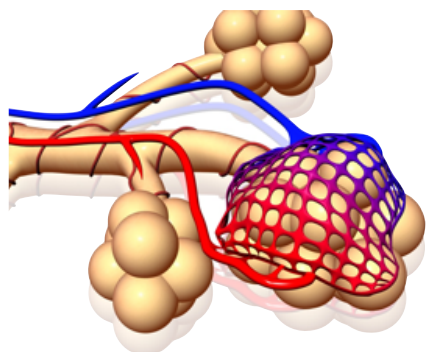
**Bronchioles**

- Sub-divisions of the bronchi.



## 2. Gaseous exchange

- ▶ **Oxygen** breathed in travels **to the** \_\_\_\_\_ which are surrounded by \_\_\_\_\_.
- ▶ Oxygen combines with haemoglobin to form \_\_\_\_\_ and is carried around the body.
- ▶ At the same time \_\_\_\_\_ is **released** by haemoglobin into the alveoli to be breathed out.





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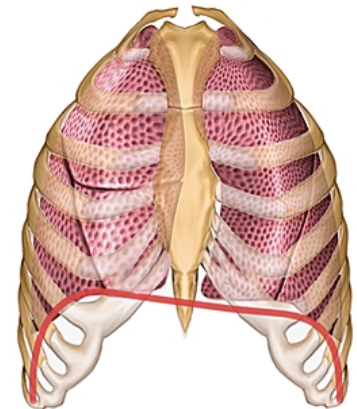
\_\_\_\_\_ (diffusion) occurs efficiently for the following reasons:

- ▶ **Large surface** \_\_\_\_\_ of alveoli and lots of capillaries allows for large amounts of oxygen and carbon dioxide to diffuse between the lungs and the blood vessels.
- ▶ The alveoli have **thin** \_\_\_\_\_ that are one cell thick. This reduces the distance of diffusion.
- ▶ The alveoli provide \_\_\_\_\_ as gases must first dissolve in liquid before they can diffuse.
- ▶ The circulatory system provides a **large blood supply**. This maintains a **concentration** \_\_\_\_\_ as gases need to move from a high concentration to a low concentration.

### 3. Inspiration and expiration

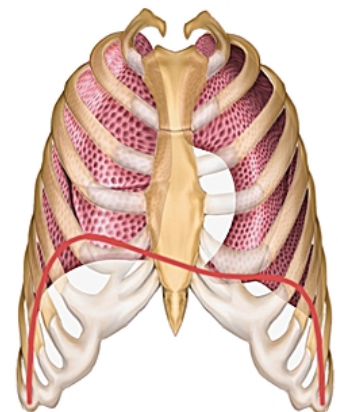
#### Inspiration

- ▶ The **diaphragm** \_\_\_\_\_ and **flattens**.
- ▶ The **intercostal muscles** \_\_\_\_\_.
- ▶ The **ribs** move \_\_\_\_\_ and \_\_\_\_\_.
- ▶ Air **pressure inside** the lung cavity \_\_\_\_\_.
- ▶ **Air** from the atmosphere **moves into** the **lungs**.



#### Expiration

- ▶ The **diaphragm** \_\_\_\_\_ into a dome shape.
- ▶ The **intercostal muscles** \_\_\_\_\_.
- ▶ The **ribs** move \_\_\_\_\_ and \_\_\_\_\_.
- ▶ Air **pressure inside** the lung cavity \_\_\_\_\_.
- ▶ Air **moves** from inside the lungs **to** the **atmosphere**.

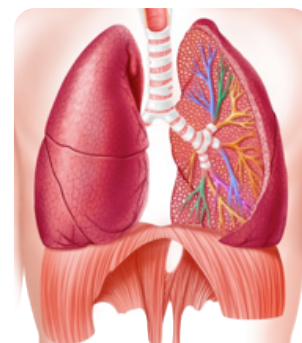




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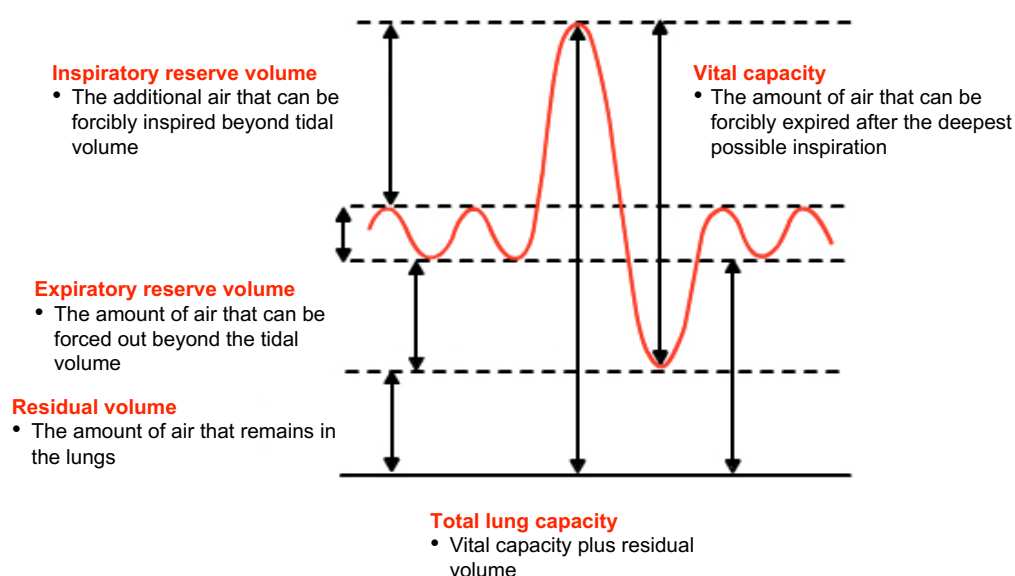
### 4. Respiratory changes

- ▶ Breathing rate \_\_\_\_\_.
- ▶ Depth of breathing increases due to the use of pectorals and sternocleidomastoid.
- ▶ When expiring the abdominals are used to force the air out more quickly.
- ▶ Increased \_\_\_\_\_ of oxygen and carbon dioxide at the lungs.



### 5. Spirometer

A spirometer measures air capacity of the lungs

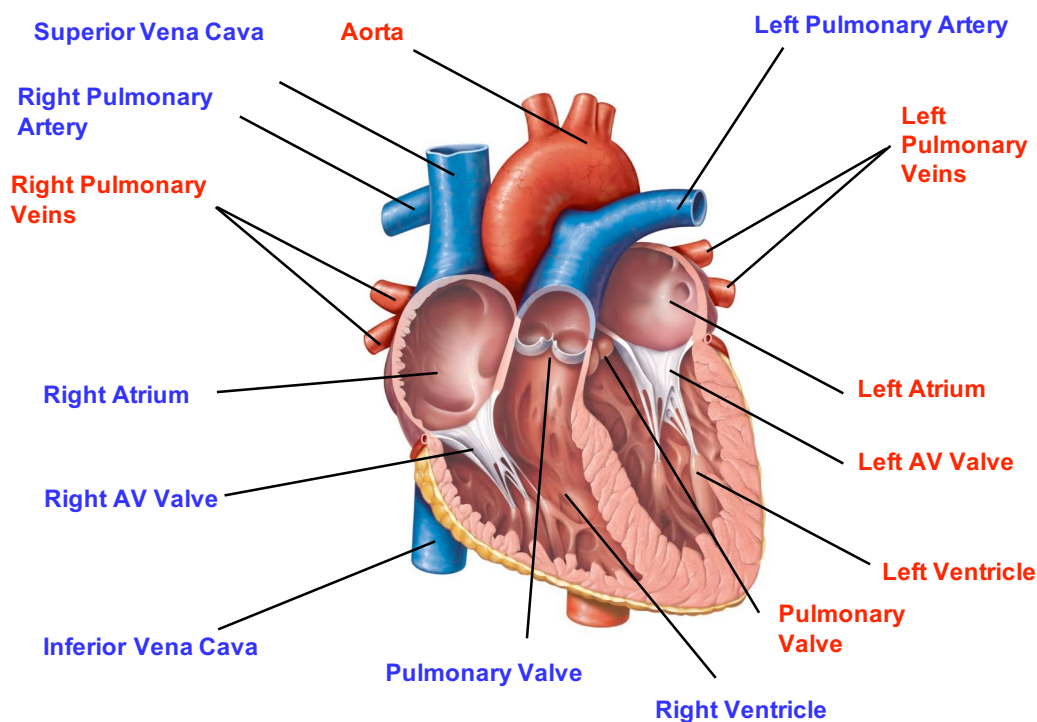


- ▶ Tidal volume \_\_\_\_\_ with exercise.
- ▶ Expiratory reserve volume \_\_\_\_\_ during exercise.
- ▶ Inspiratory reserve volume \_\_\_\_\_ during exercise.
- ▶ Residual volume does not \_\_\_\_\_ during exercise.
- ▶ Vital capacity does not \_\_\_\_\_ during exercise.
- ▶ Total lung volume does not \_\_\_\_\_ during exercise.

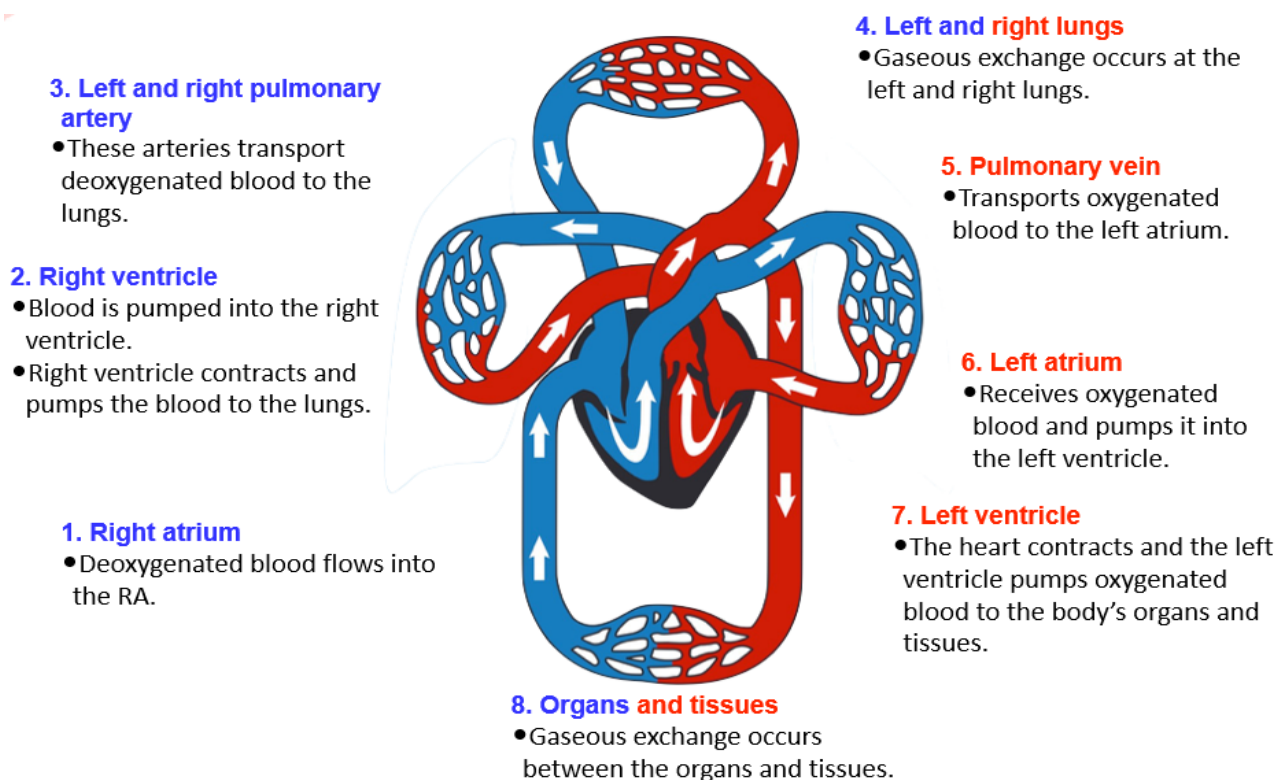


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### 6. The heart



### 7. Blood transportation





## The structure and functions of cardio-respiratory system

### 8. Blood vessels

#### Arteries

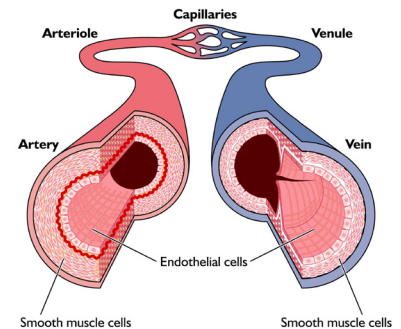
- ▶ Carry oxygenated blood \_\_\_\_\_ from the **heart**.
- ▶ Thick walls withstand **high blood** \_\_\_\_\_.

#### Capillaries

- ▶ These are the \_\_\_\_\_ **blood vessels** with walls that are only one cell thick.
- ▶ They are very \_\_\_\_\_ **at gaseous exchange** at the lungs and muscles.

#### Veins

- ▶ Carry deoxygenated blood \_\_\_\_\_ the **heart**.
- ▶ They have a \_\_\_\_\_ **diameter**.
- ▶ They work under \_\_\_\_\_ **pressure** so have \_\_\_\_\_ to prevent the back flow of blood.



### 9. Cardio-vascular measurements

#### Heart Rate

- ▶ This is the amount of times your heart **beats per** \_\_\_\_\_.
- ▶ A **low resting heart rate** indicates an \_\_\_\_\_ **heart** and circulatory system. Delivering more oxygen per minute.

#### Stroke Volume

- ▶ This is the \_\_\_\_\_ **of blood** the \_\_\_\_\_ **ventricle of your heart pumps** in **one beat**.
- ▶ An **improved stroke volume** increases gaseous exchange, delivering **more oxygen** and **removing more waste products**.

$$\text{Heart Rate} \times \text{Stroke Volume} = \text{Cardiac Output}$$



#### Cardiac Output (Q)

- ▶ This is the \_\_\_\_\_ **of blood pumped** from the left ventricle **in** \_\_\_\_\_.



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### 10. Heart rate graph

