

# الفلسفة مرحلة ثانية

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# CARDIOVASCULAR SYSTEM

# Cardiovascular System

## Function of CVS:

1. Transport of O<sub>2</sub>, glucose, aminoacids, fatty acids, Vitamins, drugs, & H<sub>2</sub>O to tissues.
2. Wash out of waste products e.g.: CO<sub>2</sub>, urea, creatinine.
3. Helps fight diseases caused by various pathogens
4. Maintain homeostasis by preventing blood loss

5. Distributes hormones to the tissues & secrete some hormones e.g. ANP.
6. Temperature control: by delivering heat from body core to skin.

# The Circulatory System

## 1. Cardiovascular system

a) The heart

b) Blood vessels.

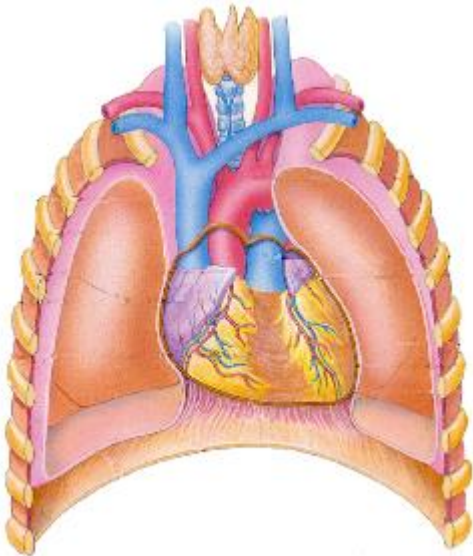
## 2. Lymphatic system

Lymphatic vessels

Lymphoid tissues (spleen, thymus, tonsils, and lymph nodes).

# The Heart

**Location** The heart is situated in the mediastinum oriented more towards the left of the chest cavity



## The Heart is Enclosed by *Pericardium*

The wall of the heart is composed of 3 layers:

### **Outer-*Epicardium***

(thin cover)

### **Middle-*Myocardium***

(thick, ring-like, contractile)

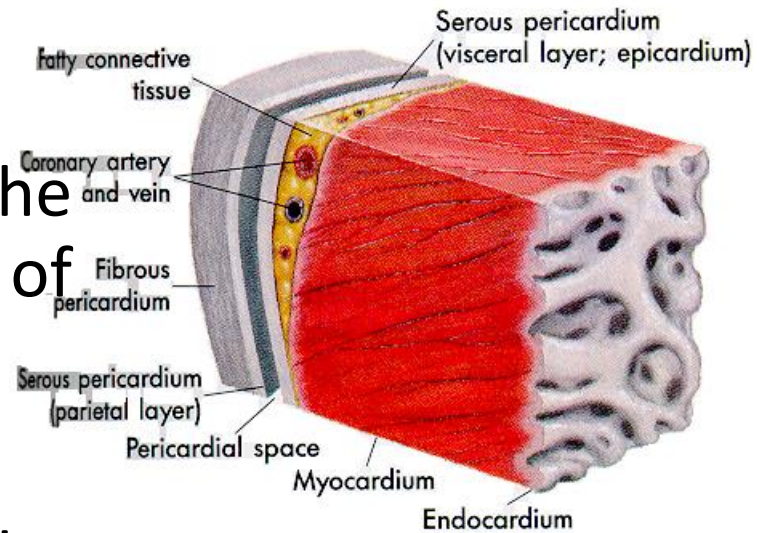
### **Inner-*Endocardium***

(thin sheet between chambers)

The **Epicardium** covers the outer surface of the heart

The **Myocardium** is the middle muscular layer of the heart

The **Endocardium** lines the chambers and the valves

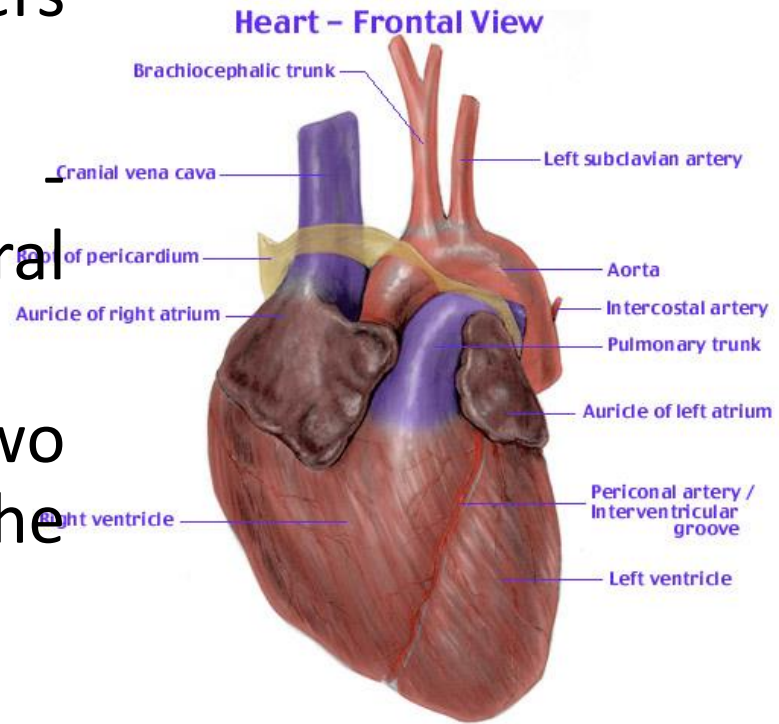




The PERICARDIUM covers the heart

There are two parts – parietal and visceral pericardium

The space between the two pericardial layers is the pericardial space



The heart contains four chambers:

Two atria, which receive venous blood.

Two ventricles, which eject blood into arteries.

The right ventricle pumps blood to the lungs, where the blood becomes oxygenated; the left ventricle pumps oxygenated blood to the entire body..

The size of a fist, the hollow, cone-shaped heart is divided into four chambers.

The right and left atria (singular, atrium ) receive blood from the venous system; the right and left ventricles pump blood into the arterial system.

**The right atrium and ventricle (sometimes called the right pump ) are separated from the left atrium and ventricle (the left pump ) by a muscular wall, or septum. This septum normally prevents mixture of the blood from the two sides of the heart**

Between the atria and ventricles, there is a layer of dense connective tissue known as the **fibrous skeleton** of the heart.

Bundles of myocardial cells in the atria attach to the upper margin of this fibrous skeleton and form a single functioning unit, or *myocardium*. The myocardial cell bundles of the ventricles attach to the lower margin and form a different myocardium. As a result, the myocardia of the atria and ventricles are structurally and functionally separated from each other, and special conducting tissue is needed to carry action potentials from the atria to the ventricles. The connective tissue of the fibrous skeleton also forms rings, called annuli fibrosi, around the four heart valves, providing a foundation for the support of the valve flaps.

# Pulmonary and Systemic Circulations

Blood whose oxygen content has become partially depleted and whose carbon dioxide content has increased as a result of tissue metabolism returns to the right atrium. This blood then enters the right ventricle, which pumps it into the *pulmonary trunk and pulmonary arteries*.

The pulmonary arteries branch to transport blood to the lungs, where gas exchange occurs between the lung capillaries and the air sacs (alveoli) of the lungs. Oxygen diffuses from the air to the capillary blood, while carbon dioxide diffuses in the opposite direction.

The blood that returns to the left atrium by way of the *pulmonary veins* is therefore enriched in oxygen and partially depleted of carbon dioxide. The path of blood from the heart (right ventricle), through the lungs, and back to the heart (left atrium) completes one circuit: the **pulmonary circulation**.

Oxygen-rich blood in the left atrium enters the left ventricle and is pumped into a very large, elastic artery—the aorta. The aorta ascends for a short distance, makes a U-turn, and then descends through the thoracic (chest) and abdominal cavities. Arterial branches from the aorta supply oxygen-rich blood to all of the organ systems and are thus part of the systemic circulation.

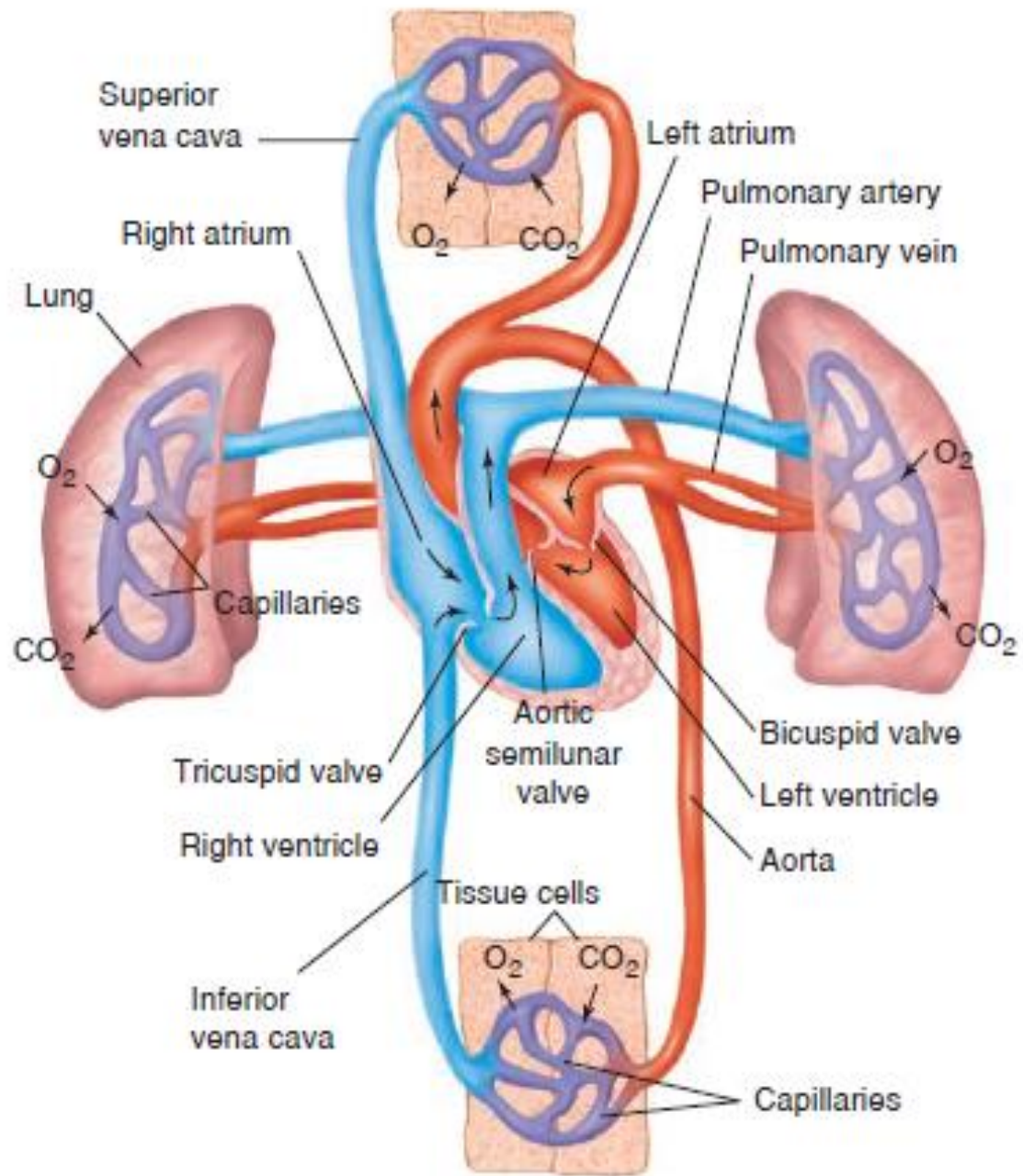
As a result of cellular respiration, the oxygen concentration is lower and the carbon dioxide concentration is higher in the tissues than in the capillary blood.



Blood that drains from the tissues into the systemic veins is thus partially depleted of oxygen and increased in carbon dioxide content. These veins ultimately empty into two large veins—the superior and inferior venae cavae—that return the oxygen-poor blood to the right atrium. This completes the

***systemic circulation:***

from the heart (left ventricle), through the organ systems, and back to the heart (right atrium).



The numerous small muscular arteries and arterioles of the systemic circulation present greater resistance to blood flow than that in the pulmonary circulation. Despite the differences in resistance, the rate of blood flow through the systemic circulation must be matched to the flow rate of the pulmonary circulation.

Because the amount of work performed by the left ventricle is greater (by a factor of 5 to 7) than that performed by the right ventricle, it is not surprising that the muscular wall of the left ventricle is thicker (8 to 10 mm) than that of the right ventricle (2 to 3 mm).

## Summary of the Pulmonary and Systemic Circulations

	Source	Arteries	O <sub>2</sub> Content of Arteries	Veins	O <sub>2</sub> Content of Veins	Termination
<i>Pulmonary Circulation</i>	Right ventricle	Pulmonary arteries	Low	Pulmonary veins	High	Left atrium
<i>Systemic Circulation</i>	Left ventricle	Aorta and its branches	High	Superior and inferior venae cavae and their branches*	Low	Right atrium