UNIT 4. THE CIRCULATORY SYSTEM

FUNCTION: Transports substances through the blood, which moves inside the blood vessels propelled by the heart.

4.1 The blood

Transports the substances through the body. It is made up of various **blood cells** which float in a liquid called **blood plasma**. The main component of the plasma is water.

- **THE BLOOD CELLS**

1.- Red blood corpuscles (erythrocytes): Small cells without nucleus. They are the most abundant cells in the blood (4-5 millions per mm3). They contain hemoglobine, a protein that **transports oxygen and carbon dioxide**.

2.- White blood corpuscles (leukocytes): They are bigger and much less abundant in the blood (about 8000 per mm3). They **protect** the organism against pathogens and tumoral cells.

3.- Platelets: They are small bits of cytoplasm from other cells (about 300000 per mm3). They are involved in the **coagulation of the blood**.

FUNCTIONS OF THE BLOOD

- **Transports substances** (nutrients and waste).
- **Regulates the body temperature**, distributing the heat throughout our body.
- **Protects our body** (white cells and platelets).

4.2 The blood vessels

There are three types: **arteries**, **veins** and **capillaries.**

(1) ARTERIES: They are the thickest and most elastic blood vessels. They **carry the blood from the heart to the organs**. They divide into smaller arteries called **arterioles**.

(2) VEINS: They are thinner and less elastic than arteries. They **carry the blood from the organs to the heart**. They divide into small vessels called **venules**.

(3) CAPILLARIES: Microscopic blood vessels involved in exchanging substances with cells. Arterioles and venules join through capillaries.

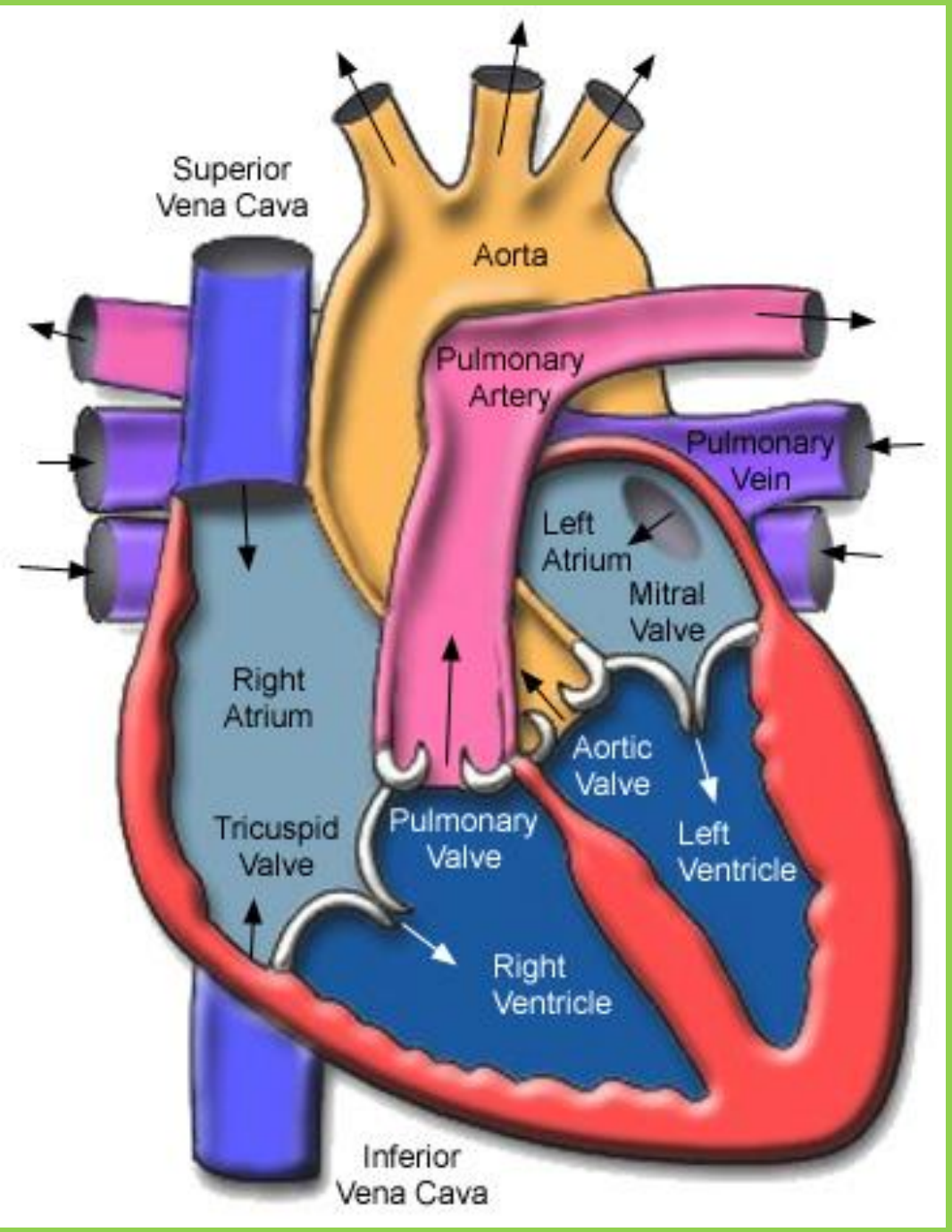
4.3 The heart

It is a muscular organ that **helps supply blood and oxygen to all parts of the body through the blood vessels**.

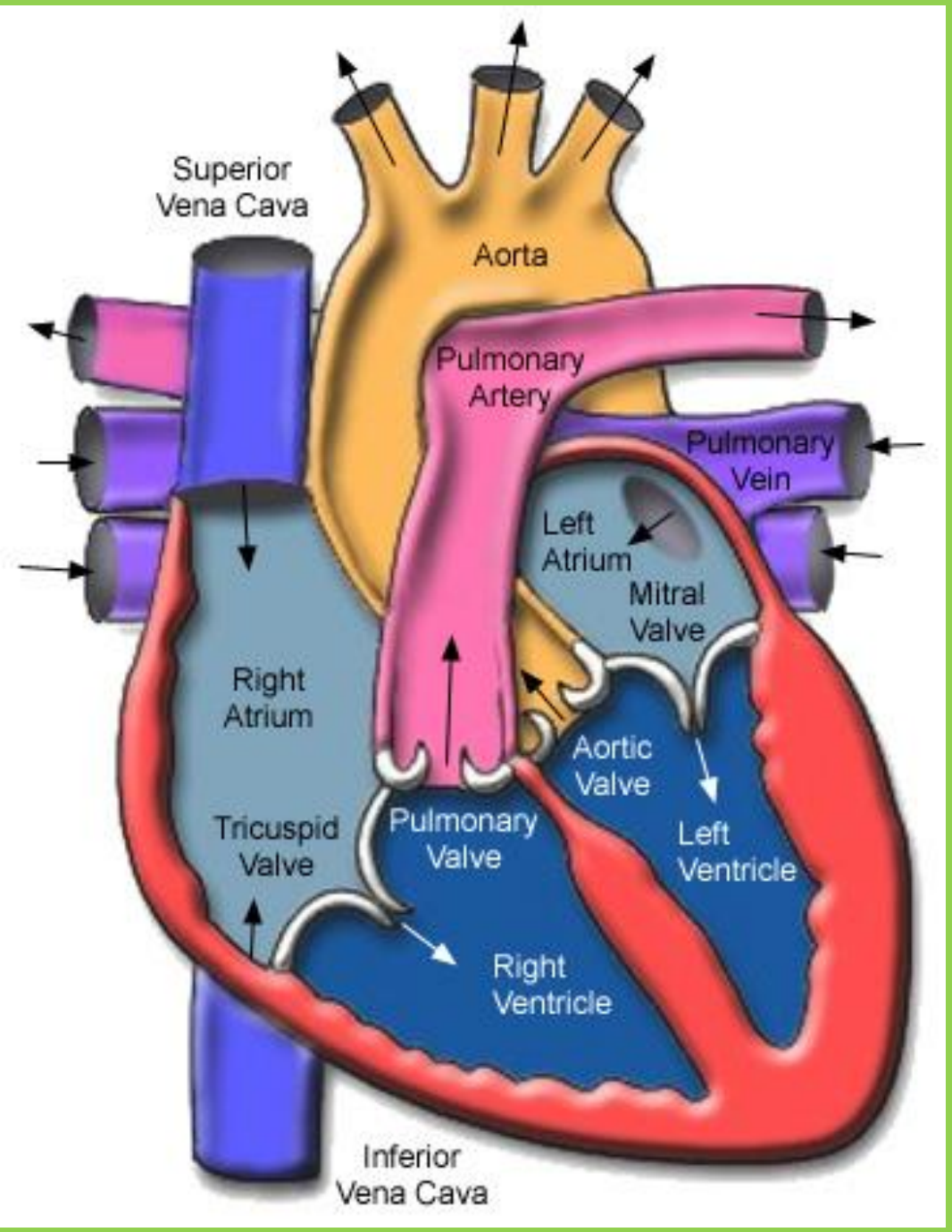
It is located inside the rib cage, between the lungs. It has a special muscular tissue called the **myocardium**, which let the heart contract and dilate in order to pump the blood.

ANATOMY

The heart is divided by a partition or septum into two halves, **left and right**, and the halves are in turn divided into two hollow spaces: **ATRIA** and **VENTRICLES**.



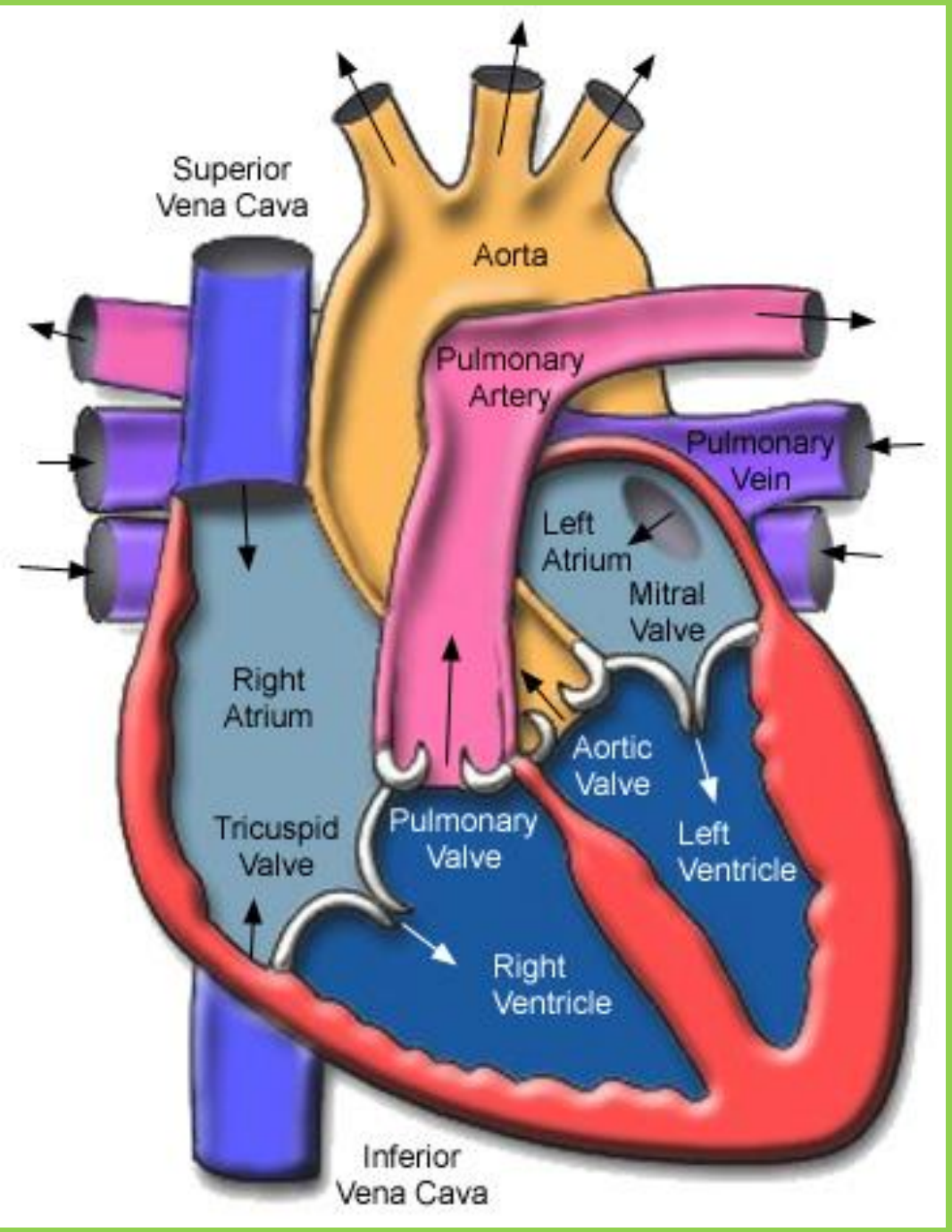
ATRIA: **The blood coming from the lungs enters the LEFT ATRIUM though the *pulmonary veins* and the blood coming from the rest of the organs enters the RIGHT ATRIUM through the *superior and the inferior cava veins*.**



VENTRICLES: **They connect with the atria through two valves that prevent the blood from flowing back into the atria :**

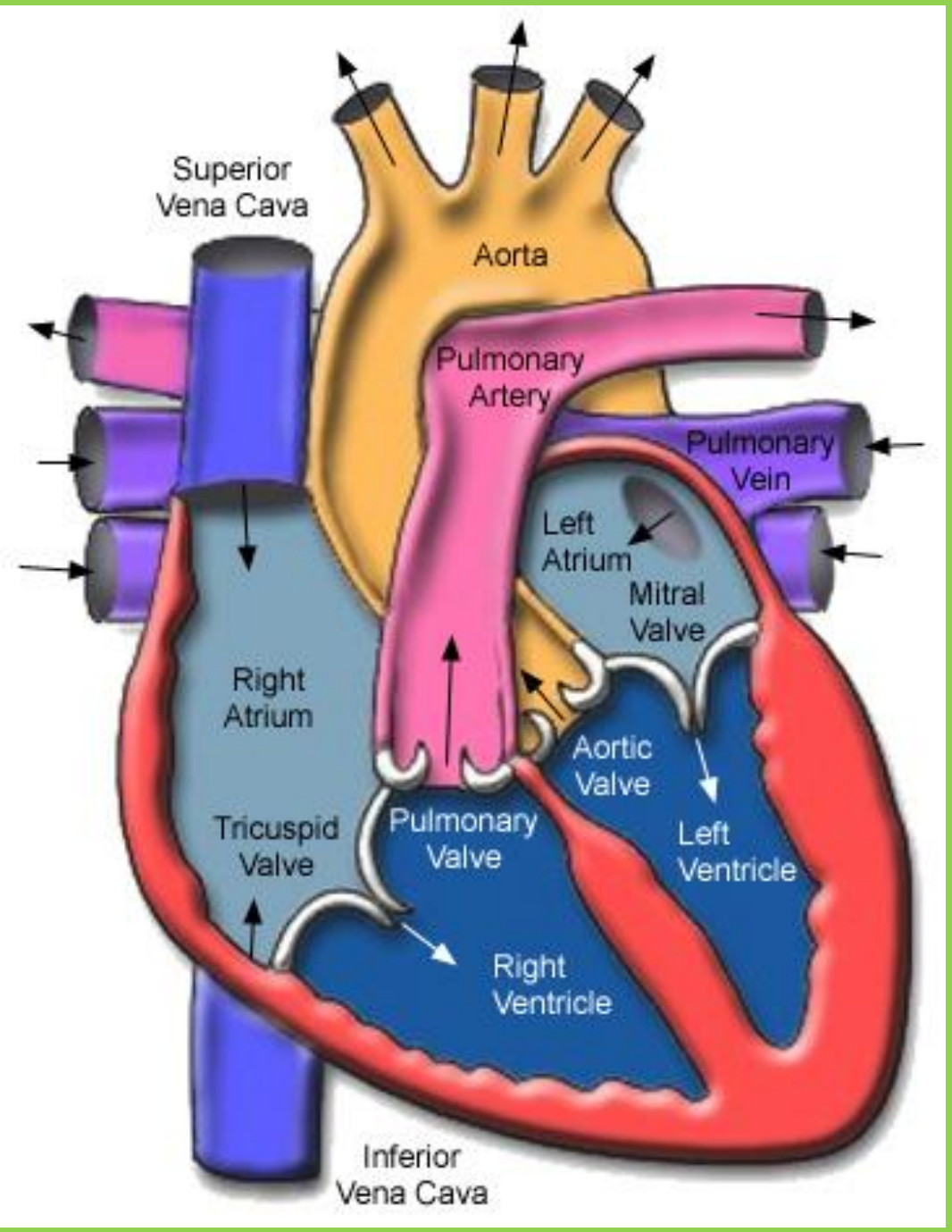
THE TRICUSPID VALVE regulates blood flow between the right atrium and right ventricle.

THE MITRAL VALVE regulates blood flow from the left atrium and left ventricle.



VENTRICLES:

The blood is carried from the right ventricle to the lungs through the **PULMONARY ARTERY** and from the left ventricle to the rest of the body through the **AORTA ARTERY.**



VENTRICLES:

Both the PULMONARY ARTERY and the AORTA ARTERY have the **SEMILUNAR VALVES**, that prevent the blood from flowing back to the heart.

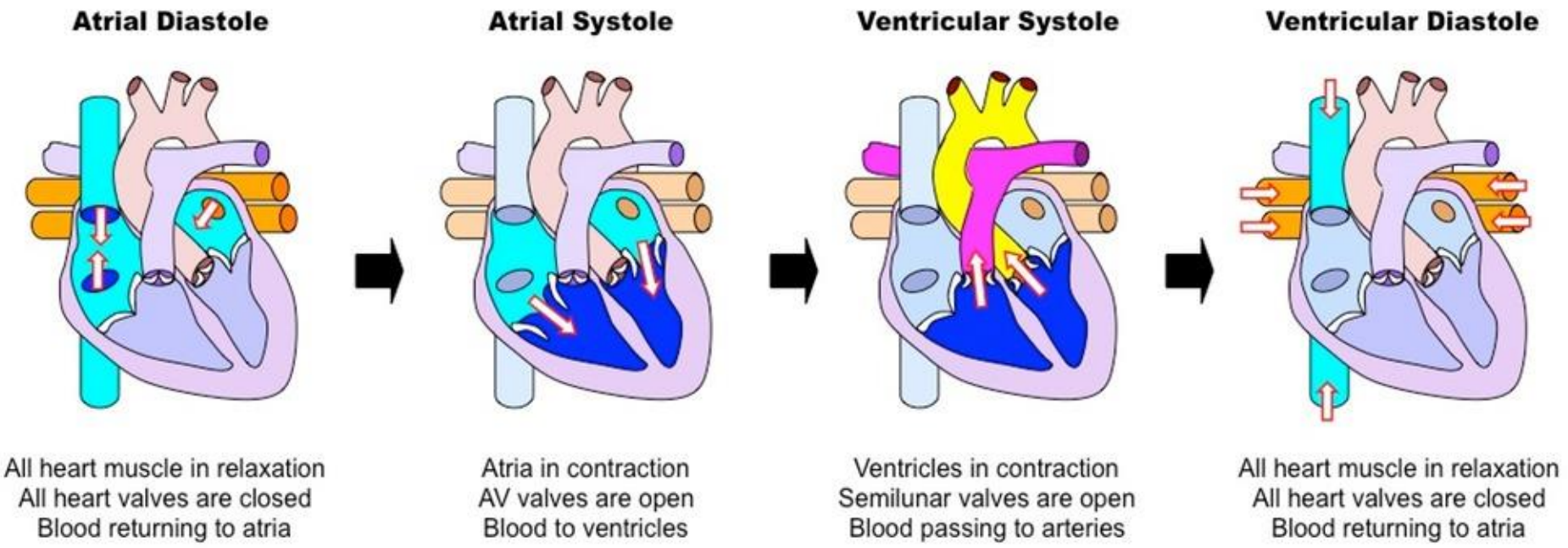
4.4 The cardiac cycle

Is the sequence of contraction movements, **SYSTOLE**, and relaxation movements, **DIASTOLE**.

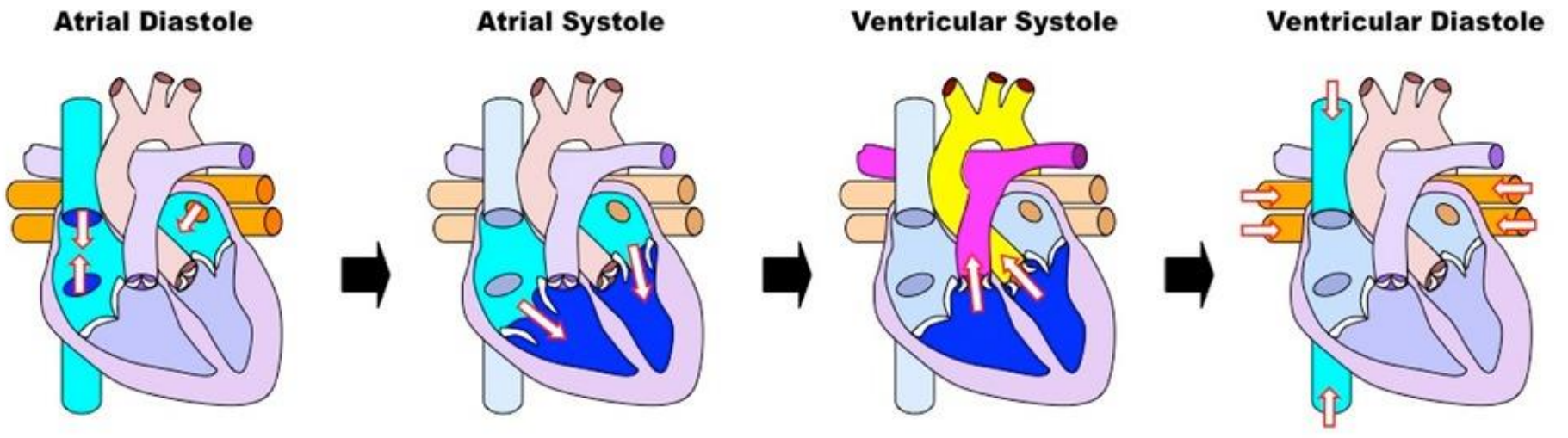
During a **cardiac cycle** the blood **enters** the heart through the **veins** (cavas and pulmonary) and **leaves** the heart through the **arteries** (aorta and pulmonary).

STAGES OF THE CARDIAC CYCLE

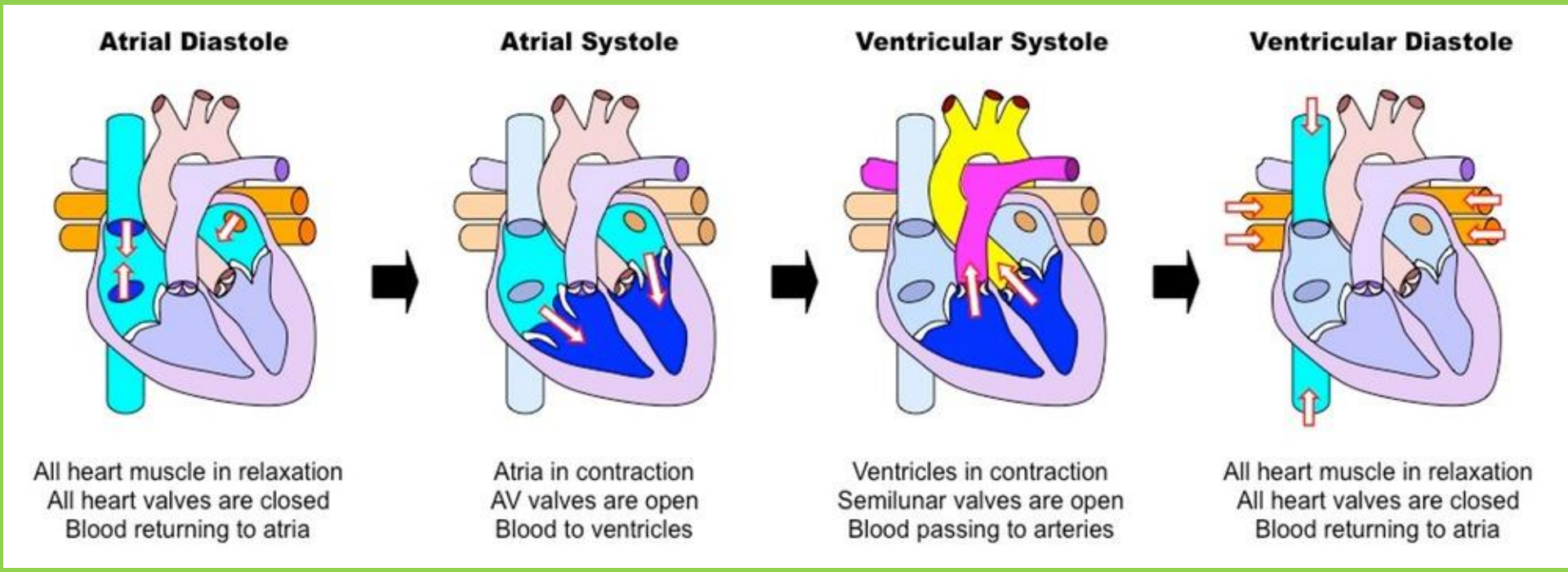
1. The cardiac cycle begins with the relaxation (**ATRIAL DIASTOLE**) of the atria. The blood enters the atria through the pulmonary veins (left atrium) and cava veins (right atrium). Mitral and tricuspid valves are closed.



2. When sufficient blood has entered the atria, these contract (**ATRIAL SYSTOLE**). The valves located between the atria and ventricles open, allowing blood to flow through to the ventricles.



3. When sufficient blood has entered the ventricles, these contract (**VENTRICULAR SYSTOLE**). To avoid the blood flowing back to the atria, both the mitral and tricuspid valves are closed.



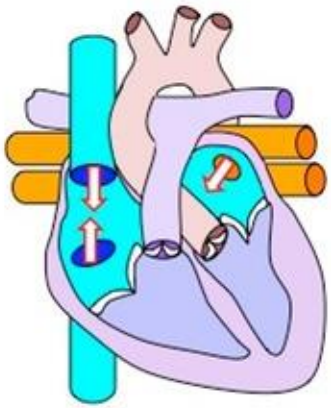
4. When ventricular systole occurs, the blood pushes the semilunar valves and they open, letting the blood out the heart through both arteries:

AORTA ARTERY → REST OF THE BODY

PULMONARY ARTERY → LUNGS

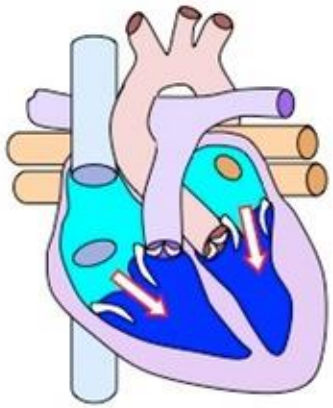
Atria relax (**ATRIAL DIASTOLE**) and the cycle begins again.

Atrial Diastole



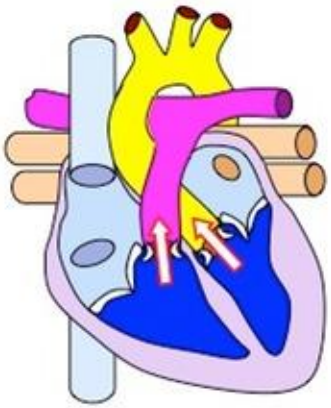
All heart muscle in relaxation
All heart valves are closed
Blood returning to atria

Atrial Systole



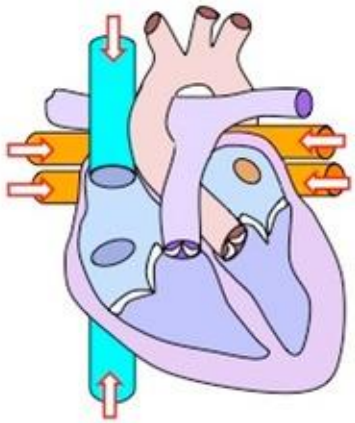
Atria in contraction
AV valves are open
Blood to ventricles

Ventricular Systole



Ventricles in contraction
Semilunar valves are open
Blood passing to arteries

Ventricular Diastole



All heart muscle in relaxation
All heart valves are closed
Blood returning to atria