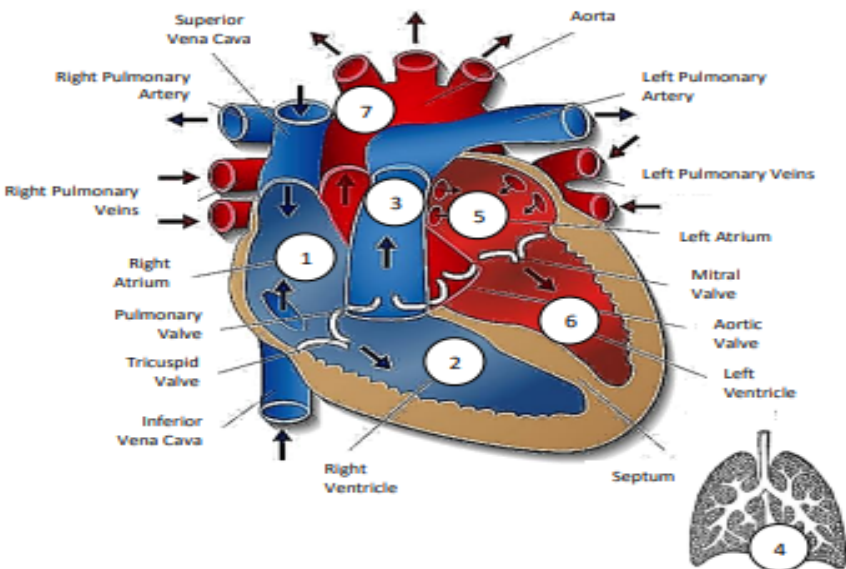


The Cardiac Cycle and Pathway of the Blood



The blood fills the heart during **diastole** and is pumped out of the heart during **systole**. The flow of blood between different structures is controlled by valves which allow blood under high pressure to flow through them, but prevent it from flowing in the opposite direction.

Blood is pumped around the heart and to the lungs in the order outlined below and on the diagram:

- 1 Deoxygenated blood flows into the **right atrium**.
- 2 The blood passes into the **right ventricle** (as atrioventricular valves are open).
- 3 The right ventricle contracts to force blood out of the heart to the **lungs** via the **left pulmonary artery**.
- 4 At the lungs, gaseous exchange occurs and **oxygen** is taken up by the blood. The blood becomes **oxygenated**.
- 5 The **oxygenated blood** is transported back to the **left atrium** via the **pulmonary vein**.
- 6 The blood then flows into the **left ventricle** (as atrioventricular valves are open).
- 7 The blood is pumped out of the heart and transported to the **body** via the **aorta**.

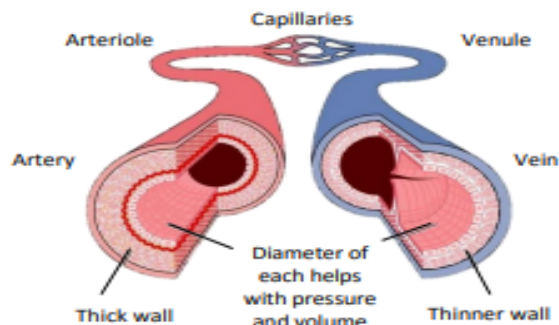
The valves of the heart open due to the pressure of the blood filling the atria. They close to prevent backflow of blood.

Cardiac System

Structure of Blood Vessels

Blood vessels carry blood around the body and back to the heart. Each has a different structure and their structure is directly linked to their function.

Vessel	Arteries	Capillaries	Veins
Size/ Diameter	Small, to elevate pressure	Large surface area for gaseous exchange	Large diameters to carry large volumes of blood
Wall Thickness	Thick, so that blood can be pumped around the body. The walls also allow vasodilation* and vasoconstriction* to occur.	Very thin so that oxygen and carbon dioxide can easily diffuse	Thin, as blood does not need to be under high pressure
Valves	No	No	Yes



Blood Redistribution during Exercise

Blood is redistributed around the body during exercise so more blood is taken to the working muscles and less to the internal organs.

This occurs by the arteries' smooth muscle layer either:

- contracting (**vasoconstriction**), or
- widening (**vasodilation**)

Function of the Heart

The heart needs to supply the muscles with enough oxygen to work. In order to increase the amount of oxygen supplied, they can increase the stroke volume or the heart rate.



The relationship facts:

- A long-term effect of exercise is cardiac hypertrophy, which involves an increase in heart size and strength. A stronger heart can pump out more blood per contraction, resulting in a higher stroke volume.
- With more blood being pumped per contraction, the heart does not have to work as hard and is more efficient, meaning long-term exercise results in a lower resting heart rate.
- Exercise increases heart rate, due to the demand for more oxygen by working muscles. This will result in an increased cardiac output during exercise.

Heart Rate during Exercise

