

# Human Heart Chapter

## Experiments

### Basic Level Difficulty Rating

*HH-1: The Electrocardiogram and Circulation*

*HH-2: The Electrocardiogram and Heart Sounds*

*HH-3: Exercise, the Electrocardiogram, and Circulation*

*HH-8: Heart Sounds/Auscultation*

*HH-9: ECG and the Electronic Stethoscope*

### Advanced Level Difficulty Rating

*HH-4: The Six-Lead Electrocardiogram*

*HH-5: The Diving Reflex*

*HH-6: Heart Rate Variability*

*HH-7: ECG using Six Chest leads*

*HH-10: 12 Lead ECG 5*

## Overview

The heart is a pump that pushes blood around the body. Blood enters the heart at a low pressure and leaves at a higher pressure, and this high pressure provides the force to propel the blood through the circulatory system. The organization of the human heart and the circulatory system is shown in [Figure HH-0-1](#). Blood returning from the body is sent to the right side of the heart and then to the lungs to pick up oxygen and release carbon dioxide. This oxygenated blood is sent to the left side of the heart and back to the body, where oxygen is released and carbon dioxide is collected. The complete division of the heart insures that there is no mixing of deoxygenated blood (in the right side) with oxygenated blood (in the left side).

The mammalian heart is autorhythmic, since it will continue to beat if removed from the body (and kept in an appropriate solution). Heart contractions are, therefore, not dependent upon the brain, rather the rhythm comes from within the heart itself. The heart is composed almost entirely of large, strong muscle fibers (myocardium), which are responsible for the pumping action of the heart. Other cardiac muscle cells are weakly contractile and produce or conduct the rhythm for the rest of the heart. A group of these weak muscle cells is located in the sinoatrial (SA) node and acts as the pacemaker for the heart ([Figure HH-0-2](#)). These cells rhythmically produce action potentials, which spread via gap junctions to fibers of both atria. The resulting contraction pushes blood into the ventricles. While adjacent atrial fibers are connected by gap junctions, the only electrical connection between the atria and the ventricles is via the atrioventricular (AV) node. The action potential spreads slowly through the AV node and then rapidly through the Bundle of His and Purkinje fibers to excite both ventricles.

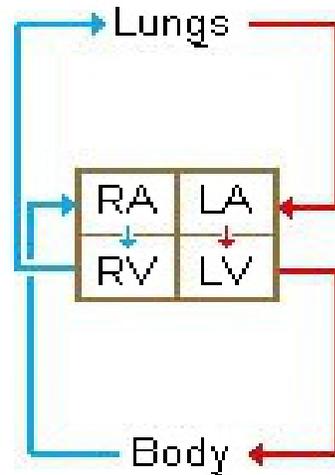


Figure HH-0-1: A diagram to show the circulation of blood around the human body and its association with the heart, composed of a right atrium (RA), a left atrium (LA), a right ventricle (RV), and a left ventricle (LV).

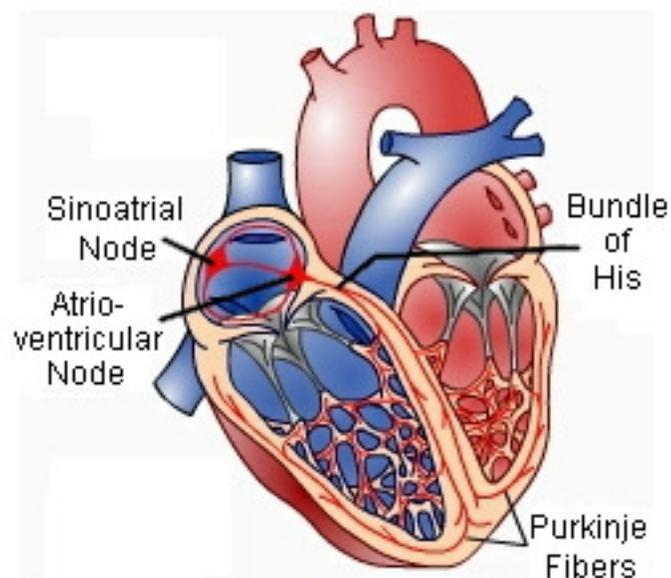


Figure HH-0-2: A diagram of the human heart to show the location of the sinoatrial (SA) and atrioventricular (AV) nodes.

The semilunar valves are located between the ventricle and the main artery on each side of the heart. In the relaxed heart, the high arterial pressure shuts the semilunar valves and prevents blood flow from the artery back into the ventricle. Ventricular contraction increases the pressure of the blood in the ventricle. When the ventricular pressure is greater than the arterial pressure, the semilunar valves open and blood flows into the artery. Then, the myocardium relaxes, the ventricular pressure declines, and the semilunar valves close.