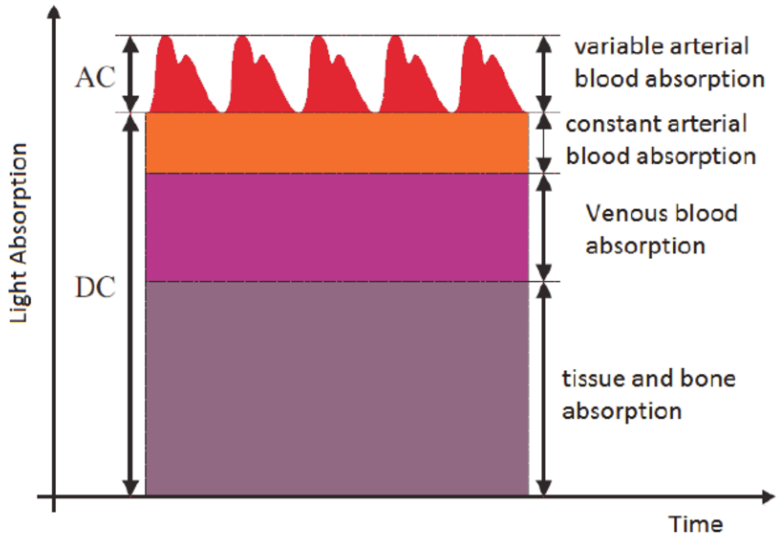
Heart Rate Sensor

How a Heart Rate Sensor Works

Cars have to stop at a stoplight a set time, when the light turns red, and continue moving when the light turns green again. The change in color of the lights is an indicator of a new period.

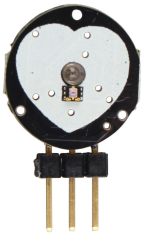
A heart rate sensor measures periods of time between each heartbeat. It also uses the indicator of color change to do this. Blood travels through the body in one direction away from the heart full of oxygen and then travels back without oxygen to collect more, cycling through the body in this way. The oxygenated (arterial) and deoxygenated (venous) blood cells have slightly different optical (react differently to light) properties which heart rate sensors can detect. With every heartbeat, there is a spike in oxygenated blood being pushed through the body. This makes a change in how much red/infrared light the sensor can detect, and how much is scattered through its blood.



Note: blood is always red, just different shades (bright red when oxygenated, dark red when deoxygenated).

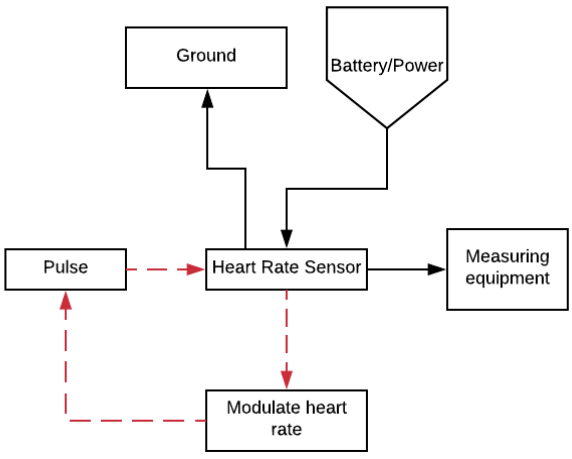
At a doctor's appointment you may have seen them use a device like this on your finger, called a pulse oximeter.

Fancy Word: Photoplethysmography (PPG) - measures change in volume of blood through an organ which changes the light intensity (AKA a fancy word that describes how a heart rate sensor works)



This is a heart rate sensor

We can apply our **systems perspective** to this circuit to help us understand and design it. The system below represents the circuit described. The main sensing circuit consists of power, the heart rate sensor, to ground. The measuring equipment (Arduino) collects input information from the heart rate sensor in the form of voltage changes and the code will convert it into a form that will display onto your screen.



The three prongs have different colored wires connected to them. Wire colors are important to help people follow circuits. **Red** connects to power, **black** to ground, and other colors (in this case **purple**) to other parts in a circuit. Look at your arduino. Find the 5V power, ground pin, and inputs. In this case we are using the analog pins, or A0-A5. Look at the code to figure out which pin you should connect the purple wire to.

Below is what your heart rate sensor should look like