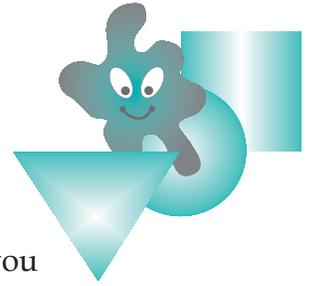


# Cardio Kickers & Heart Bodies

## Student Information Page, Activity 2B



### Activity Introduction:

Now that you are officially a teenager, your mom has decided that you will have a check-up with your family doctor. You don't feel sick, but she wants you to go anyway. When your name is called, a nurse whisks you in the back and has you jump on the scales to get your weight. After the nurse whisks you into the examining room she quickly takes your pulse and makes a note in your chart. Next, she puts on the blood pressure cuff. It doesn't look like much, but once the nurse starts pumping the cuff up you think she has forgotten that your arm is in the middle. She pumps the cuff up until you think your arm will explode. Eventually she hears what she needs and writes your blood pressure down on your chart. In this activity, you will use a model of a heart to explore these things and more.



### Activity Background:

*The heart, blood and blood vessels* make up the *circulatory system*, also called the *cardiovascular system*. The primary job of the circulatory system is to deliver blood to body cells. This job is essential, because blood carries oxygen and nutrients required for our cells to stay alive. The blood is also involved in carrying carbon dioxide and other waste products away from the cells. The heart is a hardworking pump that sends blood through blood vessels to every organ, tissue and cell in our bodies.

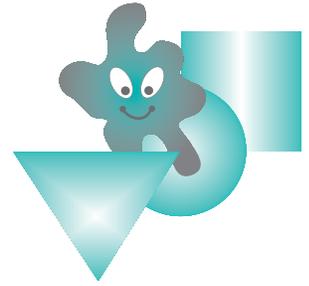
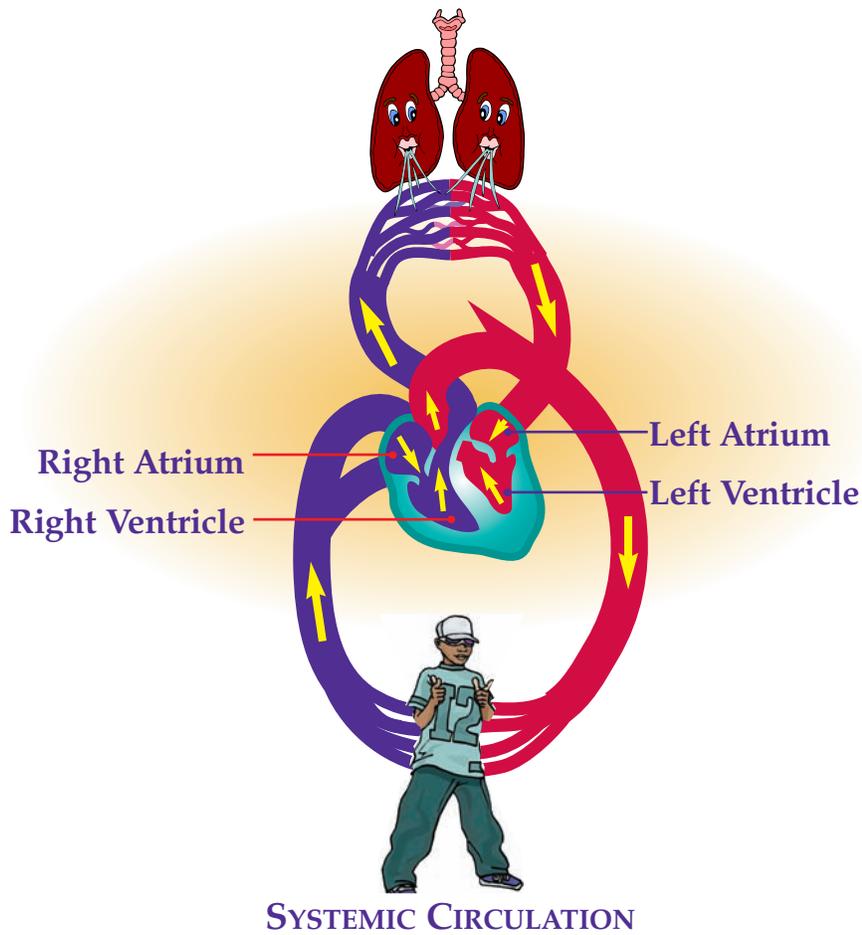
The human body actually has two circulation pathways; they are *pulmonary circulation* and *systemic circulation*. *Pulmonary circulation* is the short pathway from the heart to the lungs and back to the heart again. Pulmonary circulation is handled by the right side of the heart. *Systemic circulation* sends blood from the heart to all parts of the body and then back to the heart again; a much longer pathway. The left side of the heart pumps blood out into the *systemic circulation*. See *Figure 1* on the following page.

The heart is a hollow, muscular organ made of cardiac muscle. It's job is to pump blood throughout the body, usually beating 60 to 100 times every minute. The heart constantly receives messages from the body so the amount of oxygen can be regulated depending upon oxygen needs. We require much less oxygen during rest than during exercise or high-stress events. The heart has *four chambers*; the two upper chambers are called the right and left *atria* (atrium; singular) and the two lower chambers are called the right and left *ventricles*. The atria receive blood coming into the heart and the ventricles pump blood out of the heart. See *Figure 2* on the following page. If you have ever listened to your heart with a stethoscope, you have heard distinct sounds that occur when the ventricles contract. These sounds are often described as "lub-dub".

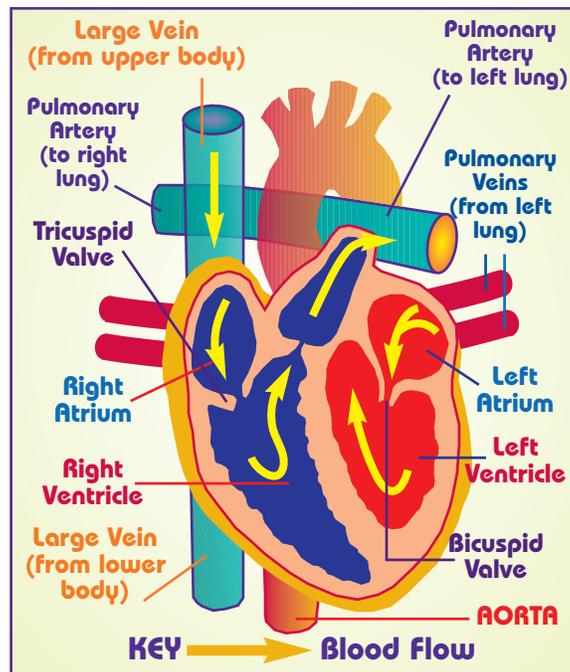


LESSON 2  
ACTIVITY 2B

## PULMONARY CIRCULATION



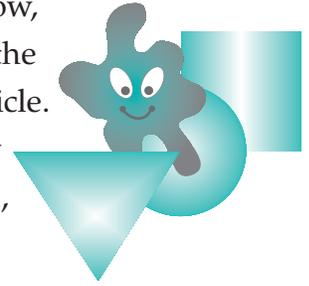
**Figure 1 Pulmonary and Systemic Circulation**



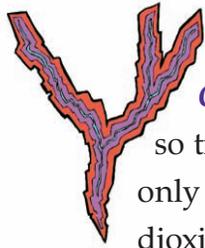
**Figure 2 General Anatomy of the Heart**



In order to keep blood moving in the correct direction and to prevent backflow, the heart contains *valves*. The *tricuspid valve* separates the right atrium and the right ventricle. The *bicuspid valve* separates the left atrium and the left ventricle. The *pulmonary valve* separates the right ventricle from the pulmonary artery going to the lungs. The *aortic valve* separates the left ventricle from the aorta, going to the body. See *Figure 2*.



Blood vessels that *carry blood to the heart are called veins*; blood vessels that *carry blood away from the heart are called arteries*. In general, veins carry oxygen-poor blood and arteries carry oxygen-rich blood. *Exceptions are the pulmonary vein, which carries oxygen-rich blood and the pulmonary artery, which carries oxygen-poor blood.*

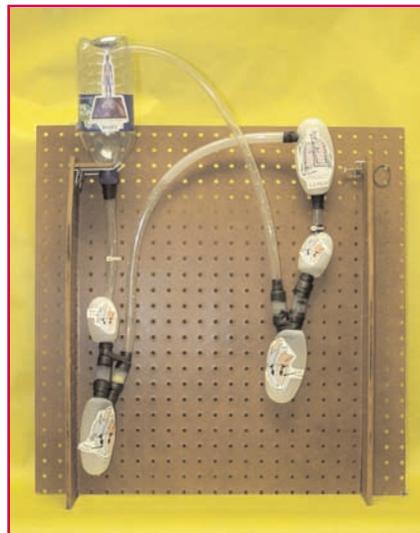


*Capillaries* are tiny blood vessels that join arteries to veins. The capillaries are so tiny that only one red blood cell at a time can pass and the capillary walls are only one cell thick. It is in the capillaries where the exchange of oxygen and carbon dioxide takes place, so they are very important to the job of circulation.

When the ventricles contract, blood is squeezed much like water in an eyedropper bulb. Blood pushes against the heart walls and valves with increased pressure. Eventually, blood moves through the path of least resistance, out the arteries. In the case of *pulmonary circulation*, oxygen-poor blood moves out of the right ventricle through the pulmonary artery to the lungs. In the lungs, blood picks up oxygen and releases carbon dioxide. The oxygen-rich blood returns to the left atrium through the pulmonary vein. In *systemic circulation*, oxygen-rich blood moves from the left ventricle out the aorta to all parts of the body. In the body, blood delivers oxygen to body cells and picks up carbon dioxide waste. The blood is now oxygen-poor and returns to the heart through the superior vena cava into the right atrium. See *Figure 2*. In this way, the heart acts as two separate pumps combined into one!

### Activity Materials: (per group of 4)

- Mounted heart model and clamp
- 1 Packet *Student Information Pages*
- 1 *Student Data Page* (per student)



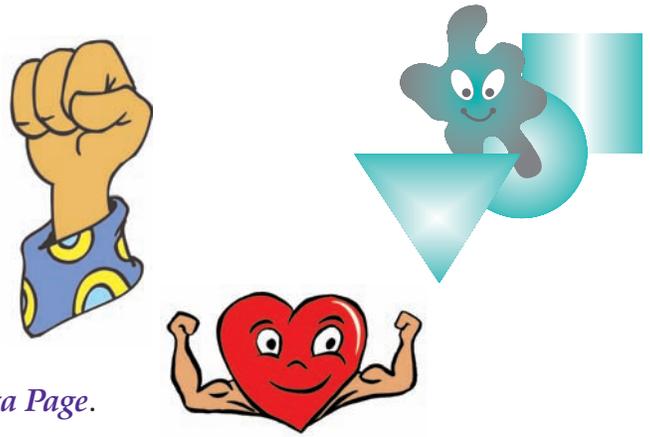
LESSON 2  
ACTIVITY 2B

INFLAMM-O-WARS

## Activity Instructions:

1. Make a fist with one hand. This is approximately the size of your heart.
2. Follow the directions for operating the heart model and make observations on how “blood” flows through the model.

Record your observations on the *Student Data Page*.



- a. Take turns “pumping” the heart model.
- b. When you are the “pump” squeeze the right ventricle (it will be in your left hand) first, followed immediately with a squeeze to the left ventricle (in your right hand). Keep your arms on the counter and squeeze with your thumbs pushing against your four fingers. Watch that you don’t pull down on the “ventricles” while you squeeze.
- c. Listen to a recording of a typical heartbeat and pump the model along with the recording. (Heart sounds are available on many Internet websites - three such sites are referenced in the teacher section of this activity). You will try to “pump” the heart at a rate of 72 beats (left hand then right hand squeeze is one beat) in 60 seconds. If the heart sounds are not available, use a clock or stopwatch to keep track of the number of seconds. (You must squeeze the bottles at a rate of once in less than one second to keep the rate).

### 3. *Simulating heart disease*

- a. Find one of the clamps on the model. Gently, tighten it until you see the vessel begin to indent toward the middle. **DO NOT** tighten the clamp completely. Again, try to keep a normal rhythm by “pumping” 72 times in 60 seconds.

