

The Circulatory System

One of the most important systems of your body is the circulatory system. To circulate means to move around and around something, which is what our blood does in our bodies. The blood moves around and around our bodies in vessels. The two jobs of this system are to carry food (nutrients) and oxygen to the cells of our bodies and to carry wastes (given off when our cells use the nutrients and oxygen) away from our cells. From the heart's left side blood passes into the Aorta (main artery), then into the other arteries. Each artery branches 15 or 20 times, becoming smaller and smaller. The smallest arteries lead into a network of tiny capillaries. The thin walls of these capillaries allow oxygen and nutrients to move (diffuse) through them from the blood into the body tissues. Eventually these capillaries join other capillaries until they form into veins. These veins take the stale blood back to the heart's right side. This side pumps it to the lungs to collect more oxygen, and from there it returns to the heart's left side. Blood thus makes a double circuit: around the body (known as systemic circulation), then to the lungs and back (called pulmonary circulation).

The Heart and Heart Beat

Driven by the pumping of the heart, the blood circulates the body. It delivers food and oxygen to all the cells and collects their waste products. The heart is really a pump about the size of your fist. It is a "bag" of muscle with four chambers and two separate pumping systems, one on each side. The left side has the harder task. It pumps "fresh" blood out into the arteries and round the body from head to toes. The right side pumps "stale" blood to the lungs.

The top two chambers are called atrias (or auricles), and the lower ones are called ventricles. Blood from the head and body enters the right atrium through the large veins (called Vena Cava). A valve opens to allow blood into the right ventricle, then the valve closes. The right ventricle contracts (squeezes), forcing blood out through the large pulmonary artery. This has a right and left branch, which then takes the "stale" blood to the lungs. There it gets a new supply of oxygen and returns to the left side of the heart through the pulmonary veins. These go to the left atrium. A valve opens to allow the blood into the left ventricle, then the valve closes. The left ventricle contracts and forces blood, now rich in oxygen, into the large artery (Aorta) and then circulates the blood round the body.

Blood

Blood carries things to and from your cells. More than half of your blood is a pale yellow fluid called **plasma**. Plasma is mostly water, but it also contains sugars, nutrients, acids, salts, minerals, and proteins. Plasma carries the food your body needs and carries wastes away to be disposed of. The other half of your blood consists of three types of blood cells: **Red Blood Cells, White Blood Cells, and Platelets**.

Red Blood Cells (erythrocytes) - are shaped like tiny doughnuts and carry oxygen to all parts of the body and collect carbon dioxide to be removed by the lungs.

White Blood Cells (leucocytes) - fight germs that invade your body.

Platelets (thrombocytes) - deal with wounds in our bodies.

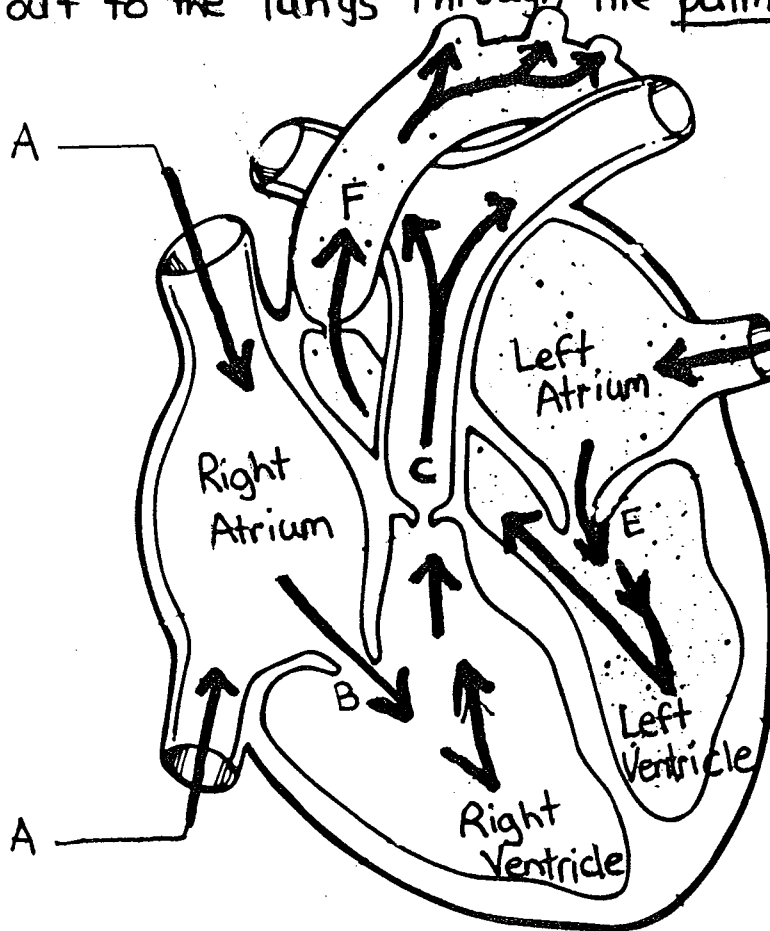
When exposed to air, the platelets clump into groups. They stick to each other and to the ragged edges of the wound to form a plug.

Clotting in detail

A sticky lump known as a blood clot forms at the site of tissue damage, such as a cut in the skin. Unless the wound is large and gaping, the clot prevents more blood and other fluids from leaking out. When the skin is cut, **platelets** become sticky and clump together at the site. Also, sticky strings of the clotting protein **fibrin** make a tangled net that traps blood cells. Within a few minutes the clot starts to take shape. Gradually it shrinks and hardens, forming a tough scab. This protects the tissues while the cells in them multiply to heal the damage.

Two special features make the heart incredibly hardworking and versatile (able to adjust to the bodies changing needs). The first is the muscle in the heart's walls. It is called cardiac muscle , and unlike normal muscle, it never tires. The second is the heart's ability to change its pumping speed and force to match the body's needs. Refer to diagram below.

- Ⓐ "Stale" blood from the body enters the right side of the heart from the Vena Cava (Large Veins)
- Ⓑ The "Stale" blood moves from the right Atrium, through a valve, into the right ventricle.
- Ⓒ The right ventricle squeezes the "stale" blood through a valve and out to the lungs through the pulmonary arteries.



Ⓓ The "refreshed" (oxygenated) blood returns from the lungs through the pulmonary veins.

Ⓔ The oxygenated blood moves from the left atrium, through a valve and into the left ventricle

Ⓕ The left ventricle squeezes the fresh blood through a valve and out to the body through the Aorta (Large Artery)

Bill Nye the Science Guy

Blood and Circulation

Name: _____

Your heart beats and pumps blood all through your body.

Your heart is as big as your fist .

The heart in an average guy pumps enough blood in a day to fill over
 30 oil drums.

Blood vessels near your heart are big like highways . As blood moves
away from your heart it ends up in smaller vessels like streets .

Every cell in your body sits next to a very small blood vessel called a
capillary, which is like a driveway .

Blood brings nutrients and oxygen to every cell and
every cell puts waste products like carbon dioxide
back into the blood stream.

Our blood stream is like a river 100 000 km long. It would
stretch 2 1/2 times around the Earth.

Interesting Information

Your feet fall asleep when your blood vessels and nerves get squeezed.
This can happen when you sit cross-legged for a very long time or your foot
is in a weird position. It can also happen to arms when you sleep funny.

Your heart has a left side and a right side. When the right side squeezes it sends blood to your lungs where it gets oxygen and turns red. From there it goes to the left side. When the left side squeezes it sends blood to all the other parts of your body. When it comes back from those it's on the right side again. When one side squeezes one valve has to open and the other valve has to stay closed - otherwise the pump won't work.

Blood Cells

In your blood vessels you have two kinds of blood cells, red and white. We have about 25 trillion red blood cells and about 25 billion white blood cells. There is only about one white blood cell for every 1000 red blood cells. Together these cells keep us strong and healthy.

White blood cells are like cops in the blood stream. They stop infection and prevent germs from spreading disease.

All the white blood cells in our body would only be about 5 ml but are enough to fight off almost every disease you can think of.

Each day your body makes 200 billion new red blood cells.

White blood cells live for 2 weeks and red blood cells live for 4 months.

We have five litres of blood in our body, which is pumped through our bodies over 100 000 times a day.

Capillaries

Capillaries are very small passageways that allow liquids to move through them. They are vessels that connect arteries to veins.

Capillaries are so small that blood ^{cells} ~~vessels~~ have to travel single file through them.

Blood Pressure

When watching TV it takes blood 35 to 40 seconds to make one complete trip through your body.

When exercising it takes blood only 10 seconds to make the same trip.

Arteries take blood away from the heart, veins bring blood back to the heart and capillaries connect arteries and veins.

When resting, your heart beats about 70 times per minute.

When exercising it beats up to twice that to keep up with your muscles' oxygen demands. Blood brings oxygen to your muscles.

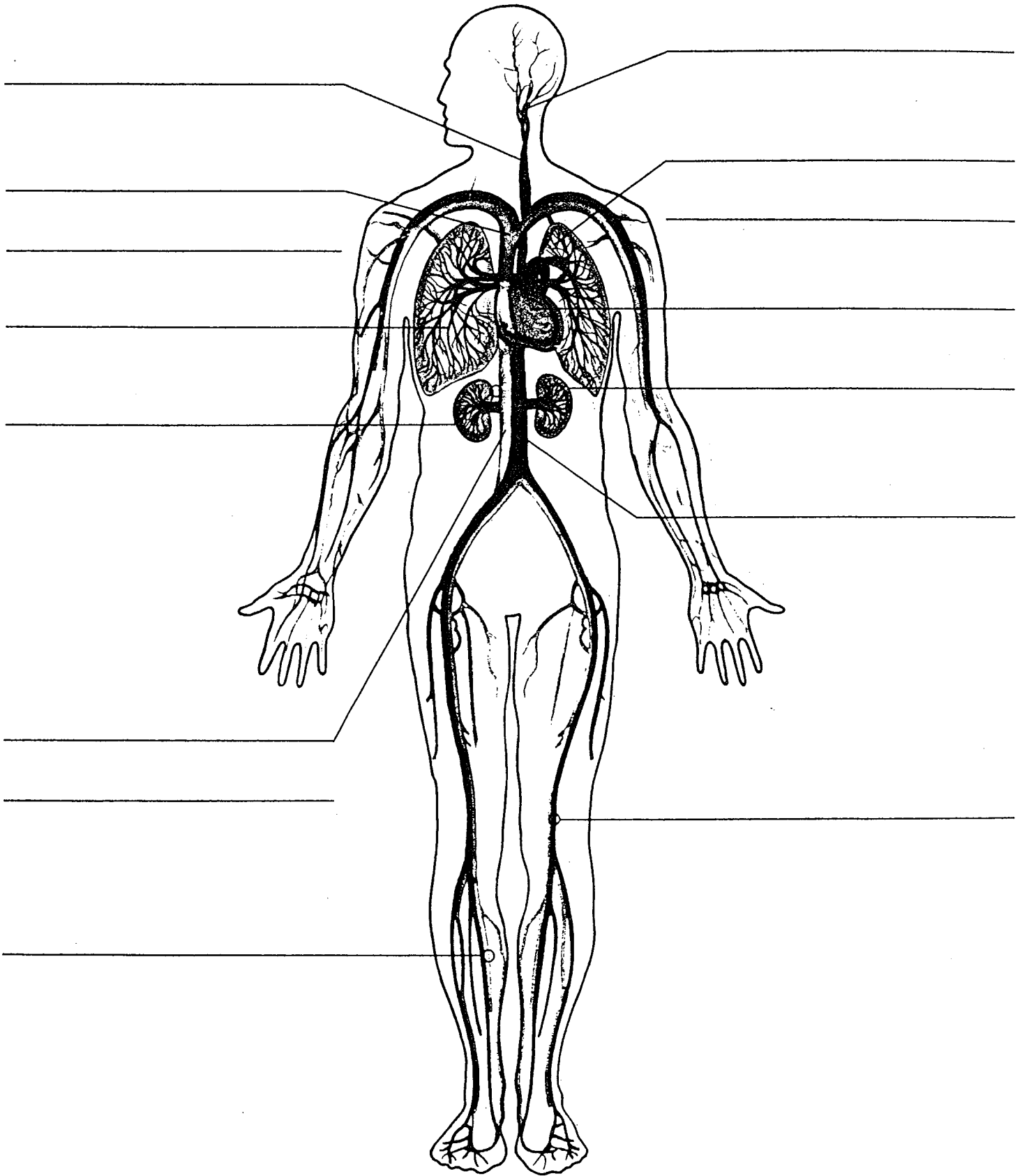
Your heart weighs about 300 grams, which is about as much as an apple, and pumps 7000 litres per day.

Your heart is a special muscle that can be made stronger by exercise. Exercising, a low fat diet and not getting hooked on cigarettes can help keep your heart strong and keep your arteries from getting clogged with fat.

Blood cells are made in your bones.

During a lifetime your heart will beat about 2 billion times.

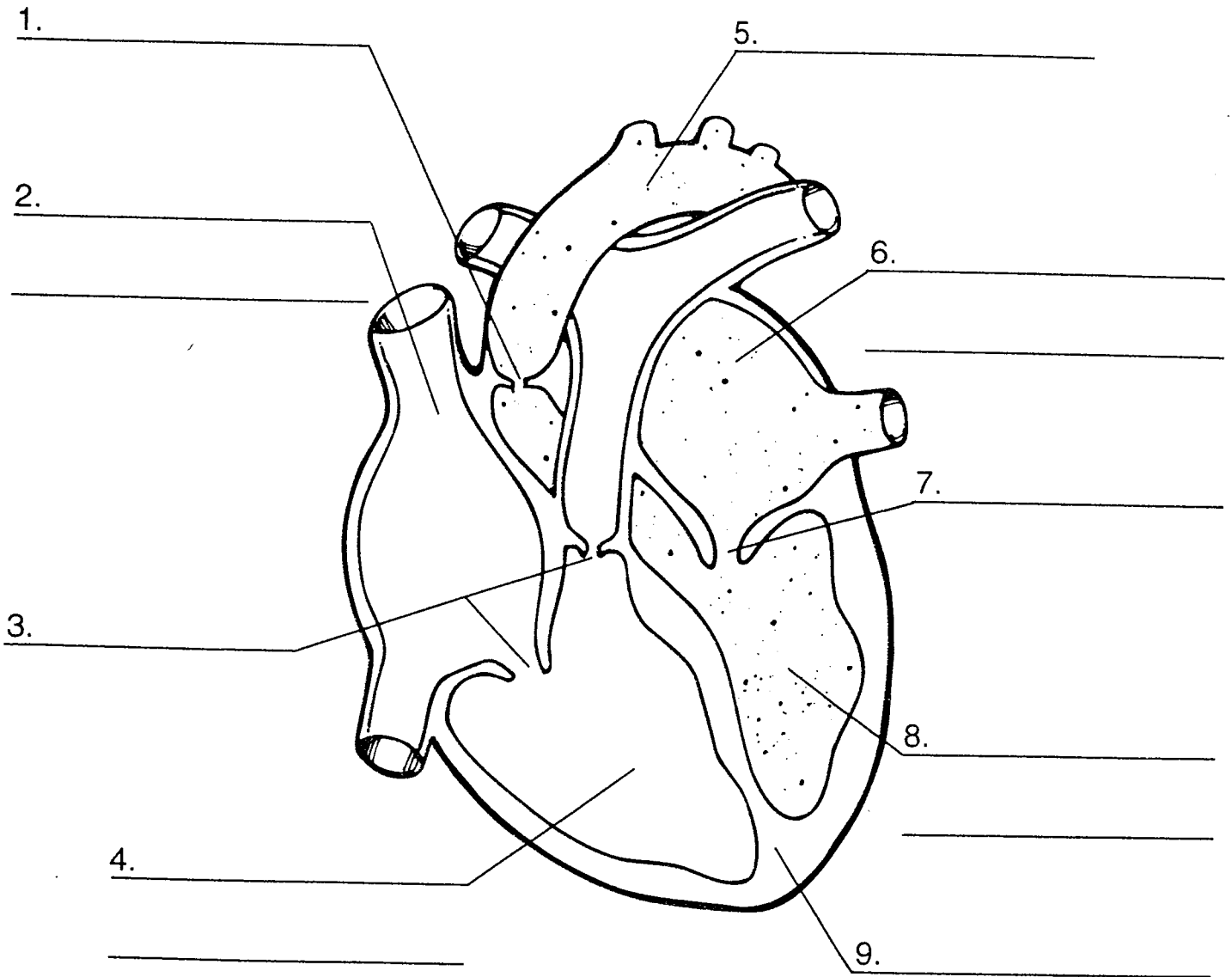
The Circulatory System



The Heart

Use the words in the Word Box to label this diagram of the human heart. One word will be used twice.

left ventricle	septum	valve	aorta
right atrium	left atrium	right ventricle	valves



Brainwork! Getting regular exercise and eating healthful foods help your heart work better. Draw yourself doing something that is good for your heart.