

## SCOP Circulation

### Structure of the Heart

The obvious starting point of this system is the **heart**. The heart is a muscular pump about the size of a human fist. The heart is made of a unique muscle tissue called **cardiac muscle**, which is found within the **myocardium**, which makes up the wall of the heart. Like skeletal muscle, it is striated with strands of **actin** and **myosin** proteins. However, unlike skeletal muscle, and like the smooth muscle found in the digestive system, it is **involuntary** (requiring no conscious control). It has a much higher amount of **mitochondria** to allow for nearly continuous aerobic respiration, which permits the muscle to avoid fatigue under normal circumstances. Like all muscles, this muscle requires a blood supply, which comes from the **coronary arteries**. It was widely believed that cardiac muscle tissue was incapable of reproduction during a person's lifetime, but testing with radioactive isotopes has shown that this occurs very slowly over a lifetime.

The heart consists of four chambers. The bottom two chambers are called **ventricles**, which are the larger and more powerful of the chambers, and are responsible for pumping blood out of the heart and into the arteries. The top chambers are called **atria** (singular: atrium), which collect blood from the veins, and hold it before letting it into the ventricles.

### The Path of Blood

Blood enters the right atrium from one of two large veins, collectively known as the **venae cavae**. The **superior** (top) **vena cava** brings deoxygenated blood from parts of the body above the heart, and the **inferior** (bottom) **vena cava** brings deoxygenated blood from the lower body. The blood passes through the **tricuspid valve** into the right ventricle, where it is pumped through the **semilunar valve** into the **pulmonary arteries**, where it is taken to the **lungs** to exchange carbon dioxide for oxygen. After that, the oxygenated blood returns to the heart through the **pulmonary veins** and enters the left atrium. The blood passes through the **bicuspid valve** (also known as the **mitral valve**) into the left ventricle. The blood is then pumped through another **semilunar valve** (or the **aortic valve**) before entering the thick-walled, high pressure **aorta**, the largest artery in the body.

**Arteries** take blood away from the heart (*mnemonic: arteries away*), and **veins** carry it to the heart. People often think “arteries carry oxygenated (red) blood and veins carry deoxygenated (blue) blood”, but that is reversed in the pulmonary blood vessels.

The blood passes through the arteries, which constantly branch into smaller and smaller vessels until the blood reaches the **arterioles**. Arterioles lead directly to **capillaries**, which are small and thin enough to allow diffusion of materials into and out of the blood stream. The blood then enters **venules**, followed by a series of veins that repeatedly join into larger and larger veins before reaching the vena cava.

### Notable Blood Vessels

superior & inferior <b>venae cavae</b>	
<b>pulmonary</b> arteries & veins	see above
<b>aorta</b>	
<b>carotid</b> arteries	carry blood up the neck to the brain
<b>jugular</b> vein	converse of the carotid arteries—take blood from the brain down the neck
<b>subclavian</b> veins	one on each side; joined to all veins in each arm
<b>coronary</b> arteries	feed heart tissue
superior & inferior <b>mesenteric</b> arteries	feed intestines
<b>celiac</b> artery	feed liver, stomach, spleen
<b>renal</b> arteries & veins	supply kidneys
<b>iliac</b> arteries & veins	supply reproductive organs, buttocks, inner thighs

### Composition of Blood

<b>erythrocytes</b> (red blood cells)	transport oxygen, which is bound to iron-containing <b>hemoglobin</b>
<b>leukocytes</b> (white blood cells)	part of the immune system—attack and destroy invading bacteria
<b>thrombocytes</b> (platelets)	help blood clot
<b>plasma</b>	the liquid component of blood—mostly salty water
<b>antigens</b>	bound to blood cells to identify them as non-foreign cause blood types in the ABO system and the Rh factor system, according to what type of antigens a person carries
<b>antibodies</b>	attack cells not marked with antigens, destroying them

## **Cardiovascular Disorders and Their Treatment**

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### **-HEART-**

<b>arteriosclerosis</b>	hardening of the arteries by plaque, a fatty deposit
<b>atherosclerosis</b>	arteriosclerosis in the coronary arteries
<b>myocardial infarction</b> (heart attack)	caused by a blockage of arteries when arteriosclerosis becomes very severe consists of the destruction of heart tissue, disrupting the electrical signals from the <b>sinoatrial node</b> (pacemaker), which regulates heartbeat
<b>ventricular fibrillation</b> (V-fib)	the stopping of blood circulation when the heart twitches erratically instead of beating often the result of very severe myocardial infarctions
<b>defibrillation</b>	the application of electrode paddles to the chest, disrupting the irregular signals of V-fib and restoring normal electrical rhythm
<b>statins</b>	a fairly new drug, specific examples of which include Lipitor, Crestor, and Zocor, which lower cholesterol and may even reverse atherosclerosis

### **-BRAIN-**

<b>stroke</b>	the event of the brain being cut off from its blood supply, often because of carotid artery blockage, causing brain tissue to die
<b>cerebral hemorrhage</b>	the most severe type of stroke, the actual rupture of a brain blood vessel

### **-BLOOD-**

<b>anemia</b>	the condition of a reduced capacity to carry oxygen in blood often caused by injury-induced blood loss, too little iron intake (causing low hemoglobin production), too little Vitamin B12 intake (also causing low hemoglobin production), radiation poisoning (damages blood marrow, which produces red blood erythrocytes)
<b>sickle-cell disease</b>	a recessive genetic disease, most common in people of African descent, causing misshapen (sickle-shaped) erythrocytes that lead to anemia homozygous persons generally die young; carriers have an immunity to malaria
<b>leukemia</b>	a form of cancer in which leukocytes reproduce out of control
<b>hemophilia</b>	a condition in which blood clotting is inhibited, causing the sufferer to be unable to stop bleeding often caused by low Vitamin K intake, or an error in an X-linked factor that codes for clotting factor VIII (this type is very rare in females, but more common in males) carried by and suffered from by many European royal families due to intermarriage and inbreeding, originating with Queen Victoria
<b>phlebitis</b>	the converse of hemophilia: clots form in unwanted places, causing capillaries to burst, blocking coronary arteries and leading to heart attacks, blocking cerebral arteries and leading to strokes, etc.
<b>anticoagulants</b>	drugs administered to treat phlebitis
<b>hemotoxins</b>	poisons, often administered by rattlesnakes, vipers, and some spiders, that destroy blood cells to prevent the movement of oxygen and carbon dioxide

### **-MISC-**

<b>embolus</b>	a blood clot that has become free in the circulatory system
<b>embolism</b>	the event of an embolus becoming lodged in capillaries, causing a blockage and buildup of pressure followed by a vessel bursting
<b>aneurysm</b>	the weakening of an artery's wall, causing it to bulge out and often leading to a rupture