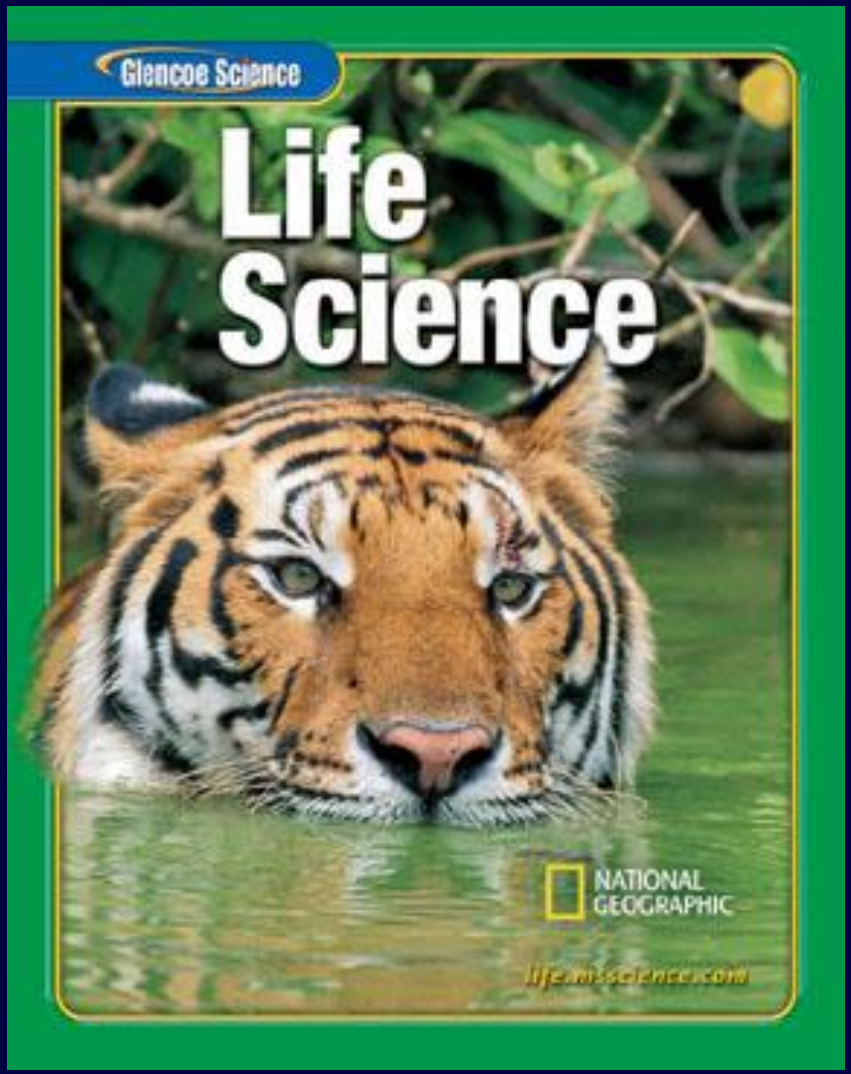
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Chapter: Circulation

1

How Materials Move Through the Body

- Materials are moved throughout your body by your cardiovascular (kar dee oh VAS kyuh lur) system.

- It includes your heart, kilometers of blood vessels, and blood.

1

How Materials Move Through the Body

- Blood vessels carry blood to every part of your body.
- Blood moves oxygen and nutrients to cells and carries carbon dioxide and other wastes away from the cells.

1

How Materials Move Through the Body

- Movement of materials into and out of your cells occurs by diffusions (dih FYEW zuhn) and active transport.
- Diffusion occurs when a material moves from an area where there is more of it to an area where there is less of it.
- Active transport is the opposite of diffusion.

1

The Heart

- Your heart is an organ made of cardiac muscle tissue.
- Your heart has four compartments called chambers.
- The two upper chambers are called the right and left **atriums** (AY tree umz).
- The two lower chambers are called the right and left **ventricles** (VEN trih kulz).

1

The Heart

- The blood flows only in one direction from an atrium to a ventricle, then from a ventricle into a blood vessel.
- A wall prevents blood from flowing between the two atriums or the two ventricles.

Click box to view movie.

1

The Heart

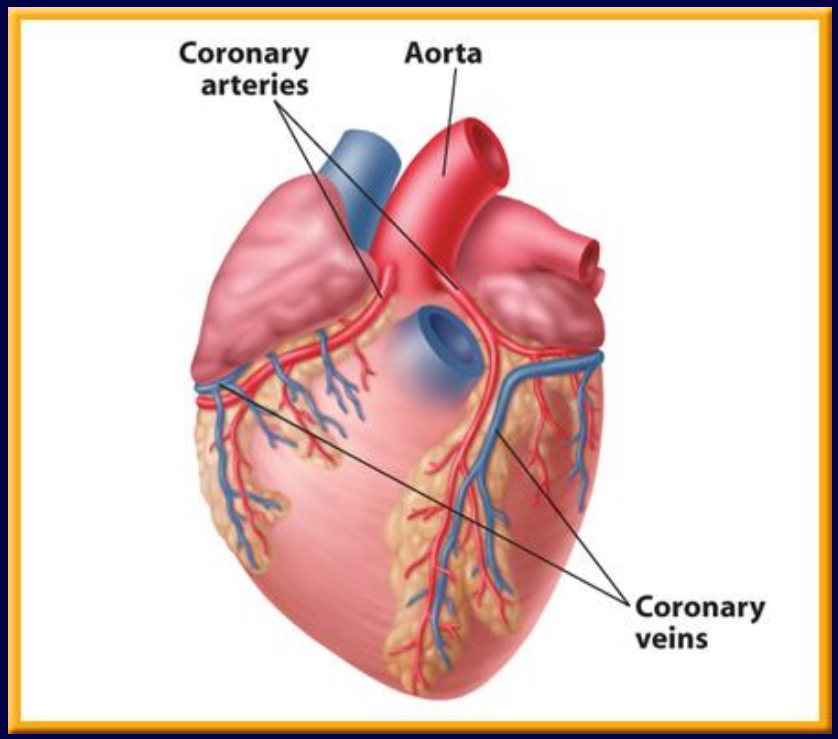
- Scientist have divided the circulatory system into three sections – coronary circulation, pulmonary (PUL muh ner ee) circulation, and systemic circulation.

- The beating of your heart controls blood flow through each section.

1

Coronary Circulation

- **Coronary** (KOR uh ner ee) **circulation**, is the flow of blood to and from the tissue of the heart.
- When the coronary circulation is blocked, oxygen and nutrients cannot reach all the cells of the heart. This can result in a heart attack.



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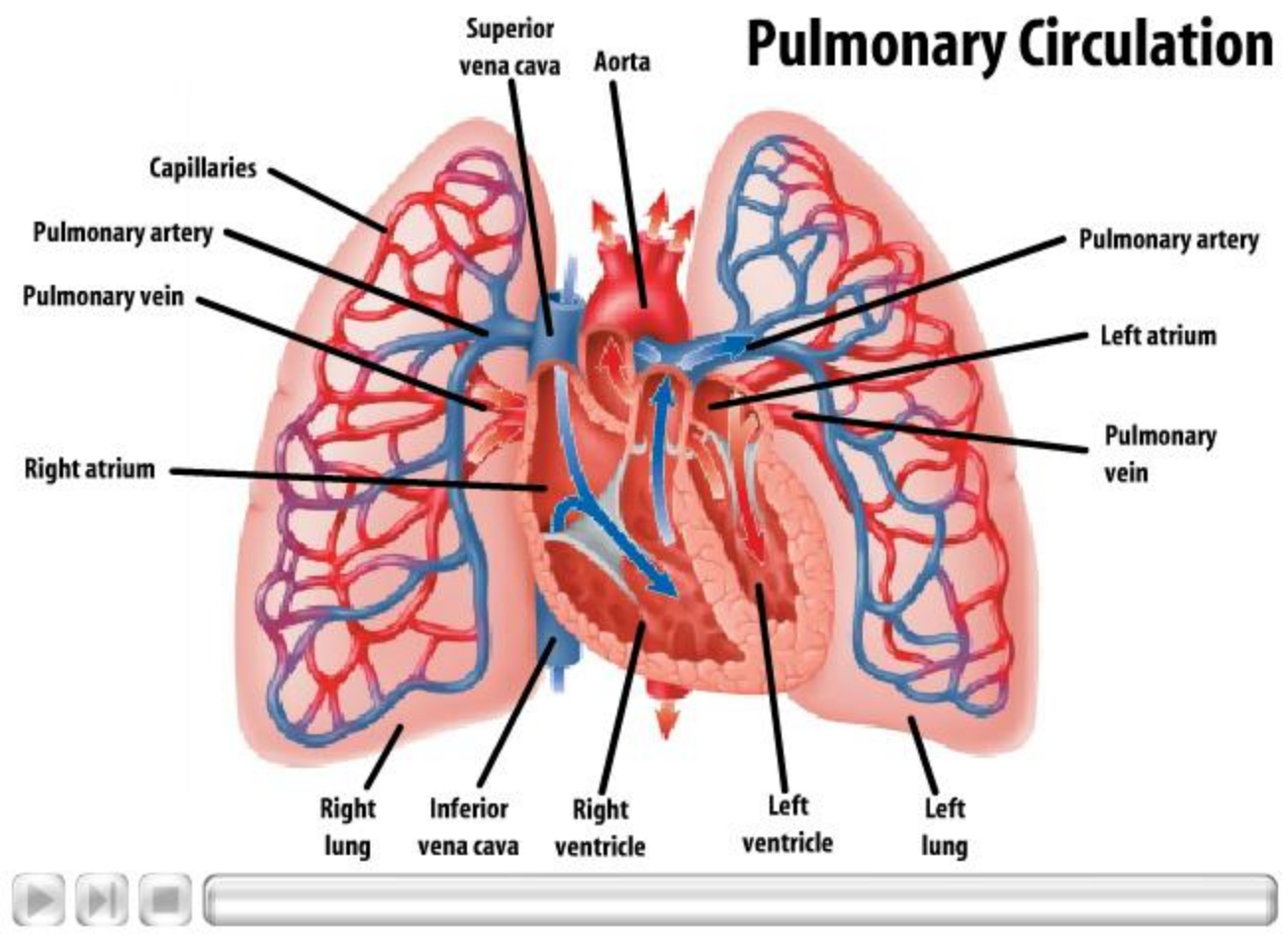
Pulmonary Circulation

- The flow of blood through the heart to lungs and back to the heart is **pulmonary circulation**.

1

Pulmonary Circulation



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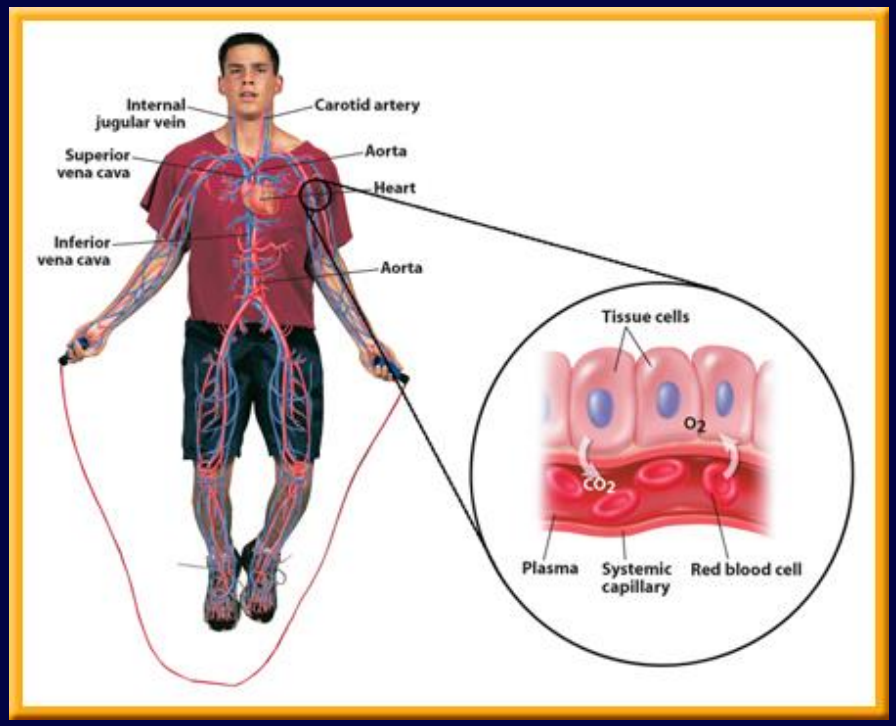
Systemic Circulation

- Oxygen- rich blood moves to all of your organs and body tissues, except the heart and lungs, by **systemic circulation**, and oxygen-poor blood returns to the heart.



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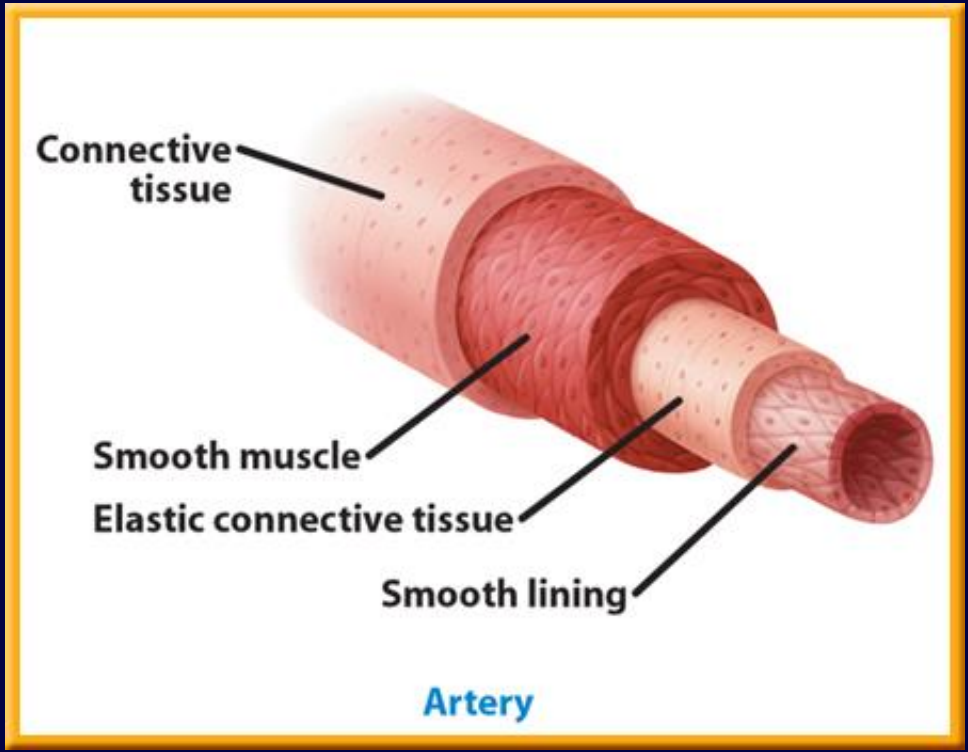
Systemic Circulation

- Oxygen-rich blood flows from your heart in the arteries of this system.
- Then nutrients and oxygen are delivered by blood to your body cells and exchanged for carbon dioxide and wastes.
- Finally, the blood returns to your heart in the veins of the systemic circulation system.

1

Blood Vessels – Arteries

- **Arteries** are blood vessels that carry blood away from the heart.
- Arteries have thick, elastic walls made of connective tissue and smooth muscle tissue.



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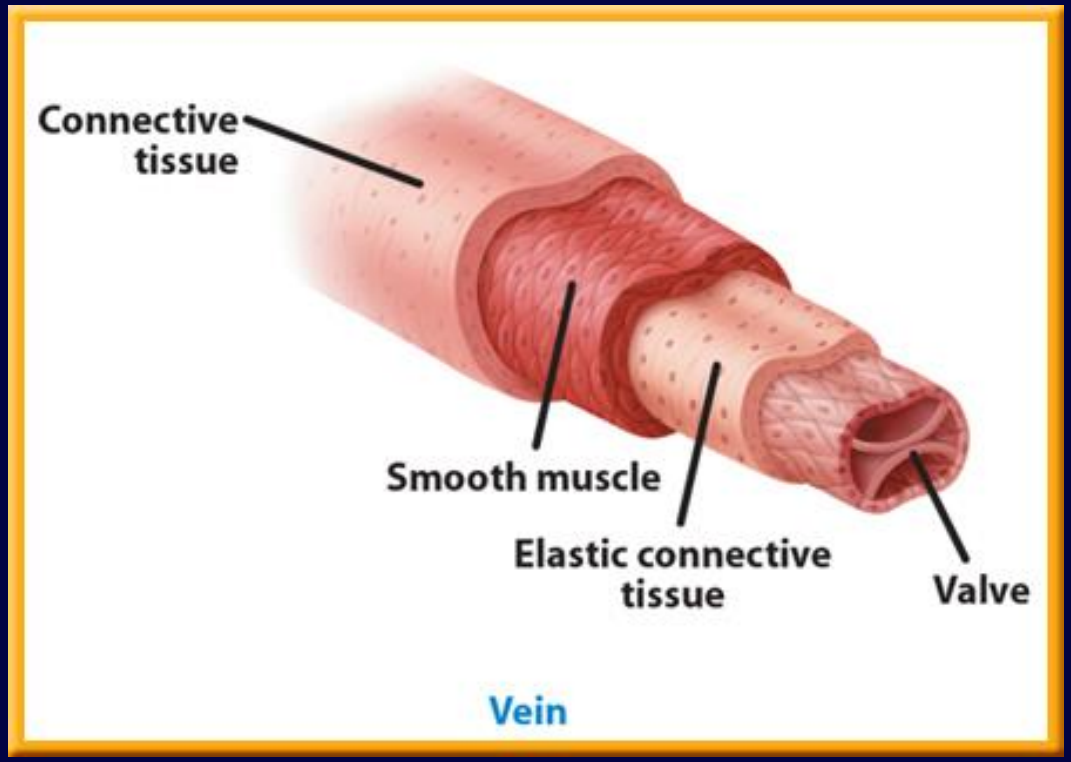
Arteries

- Each ventricle of the heart is connected to an artery.
- Every time your heart contracts, blood is moved from your heart into arteries.

1

Veins

- The blood vessels that carry blood back to the heart are called **veins**.
- Veins have one-way valves that keep blood moving toward the heart.



1

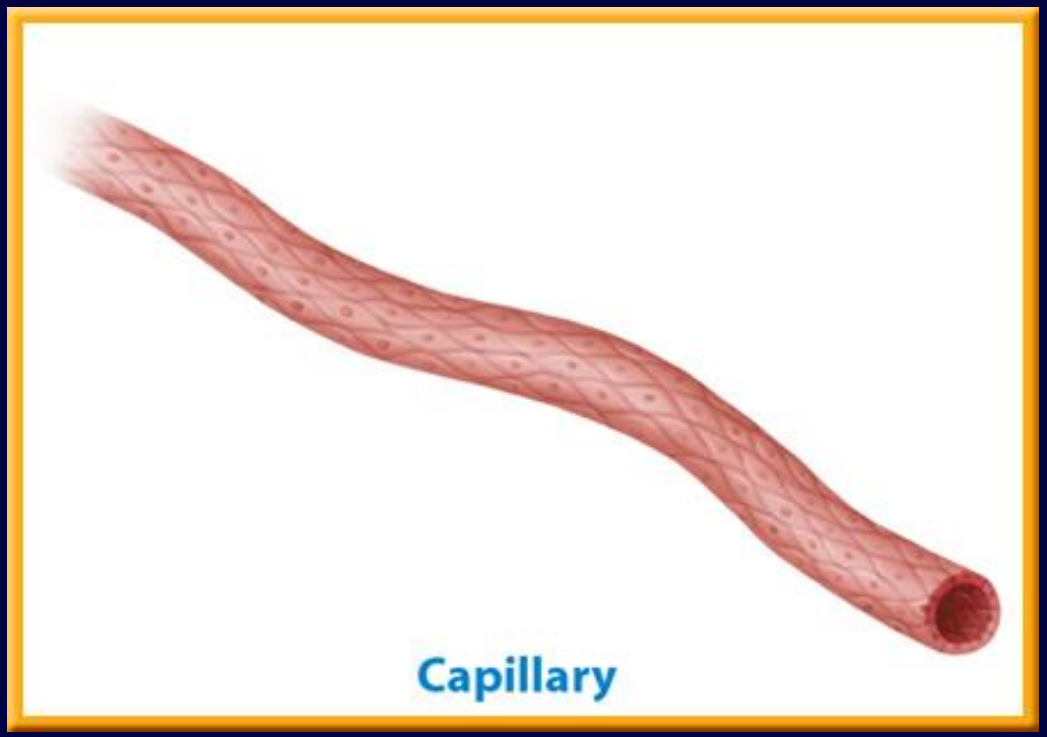
Veins

- Two major veins return blood from your body to your heart.
- The superior vena cava returns blood from your head and neck.
- Blood from your abdomen and lower body returns through the inferior vena cava.

1

Capillaries

- Arteries and veins are connected by microscopic blood vessels called **capillaries**.
- The walls of capillaries are only one cell thick.



1

Capillaries

- Nutrients and oxygen diffuse into body cells through the thin capillary walls.
- Waste materials and carbon dioxide diffuse from body cells into the capillaries.

1

Blood Pressure

- When your heart pumps blood through the circulatory system, the pressure of the push moves through the blood.
- The force of the blood on the walls of the blood vessels is called blood pressure.
- This pressure is highest in arteries and lowest in veins.

1

Measuring Blood Pressure

- Blood pressure is measured in large arteries and is expressed by two numbers, such as 120 over 80.

- The first number is a measure of the pressure caused when the ventricles contract and blood is pushed out of the heart.

1

Measuring Blood Pressure

- This is called the systolic (sihs TAH lihk) pressure.
- The second number is a measure of the diastolic (di uh STAH lihk) pressure that occurs as the ventricles fill with blood just before they contract again.

1

Controlling Blood Pressure

- When pressure is higher or lower than normal, messages are sent to your brain by nerve cells.

- Then messages are sent by your brain to raise or lower blood pressure—by speeding up or slowing the heart rate for example.

1

Cardiovascular Disease

- Any disease that affects the cardiovascular system—the heart, blood vessels, and blood—can seriously affect the health of your entire body.

- Heart disease is the leading cause of death, when you factor in all age groups.

1

Atherosclerosis

- One leading cause of heart disease is called atherosclerosis (ah thuh roh skluh ROH sus).
- In this condition, fatty deposits build up on arterial walls.
- If a coronary artery is blocked, a heart attack can occur.

1

Hypertension

- Another condition of the cardiovascular system is called hypertension (HI pur TEN chun), or high blood pressure.

- When blood pressure is higher than normal most of the time, extra strain is placed on the heart.

1

Heart Failure

- Heart failure results when the heart cannot pump blood efficiently.
- It might be caused when heart muscle tissue is weakened by disease or when heart valves do not work properly.
- People with heart failure usually are short of breath and tired.

1

Preventing Cardiovascular Disease

- The choices you make to maintain good health may reduce your risk of future serious illness.
- Many diseases, including cardiovascular disease, can be prevented by following a good diet.

1

Preventing Cardiovascular Disease

- Being over weight is associated with heart disease and high blood pressure.
- Large amounts of body fat force the heart to pump faster.

1

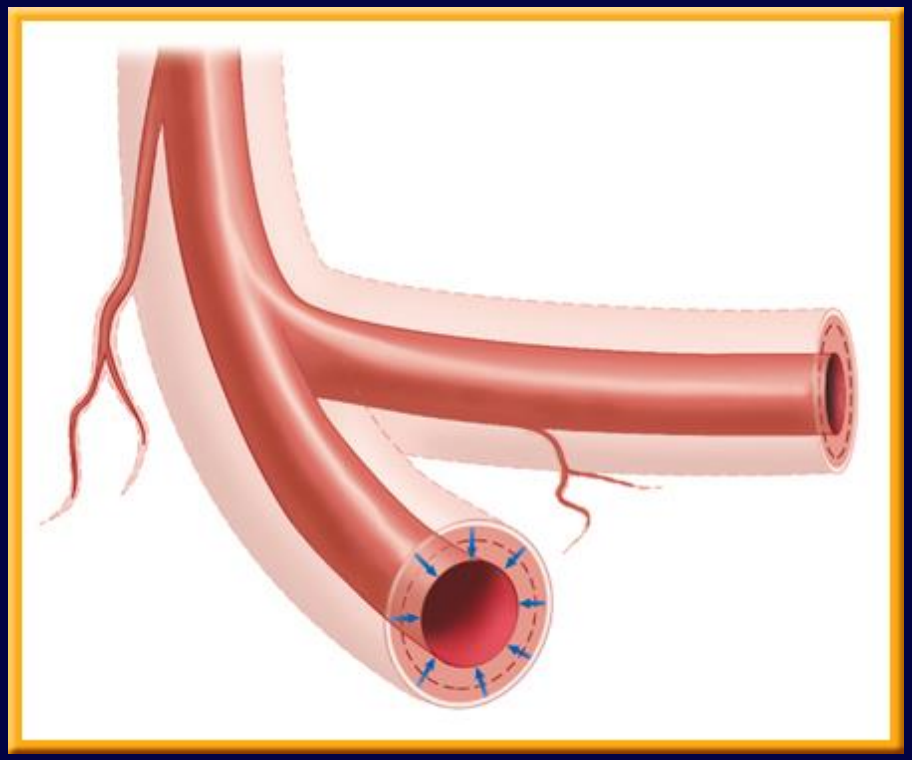
Preventing Cardiovascular Disease

- Learning to relax and having a regular program of exercise can help prevent tension and relieve stress.

1

Preventing Cardiovascular Disease

- Another way to prevent cardiovascular disease is to not smoke.
- Smoking causes blood vessels to contract, and makes the heart beat faster and harder.



1

Question 1

The flow of blood to and from the tissues of the heart is called _____.

A. atrium circulation
B. coronary circulation
C. pulmonary circulation
D. systemic circulation

1

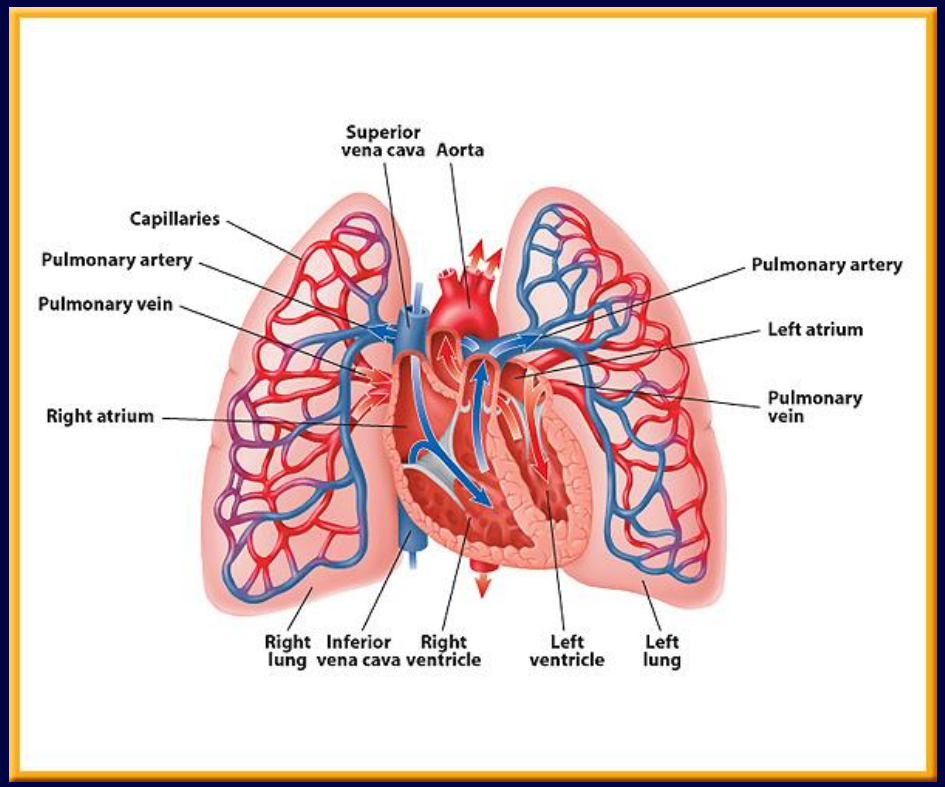
Answer

The correct answer is B. The beating of your heart controls blood flow to and from the tissues.

1

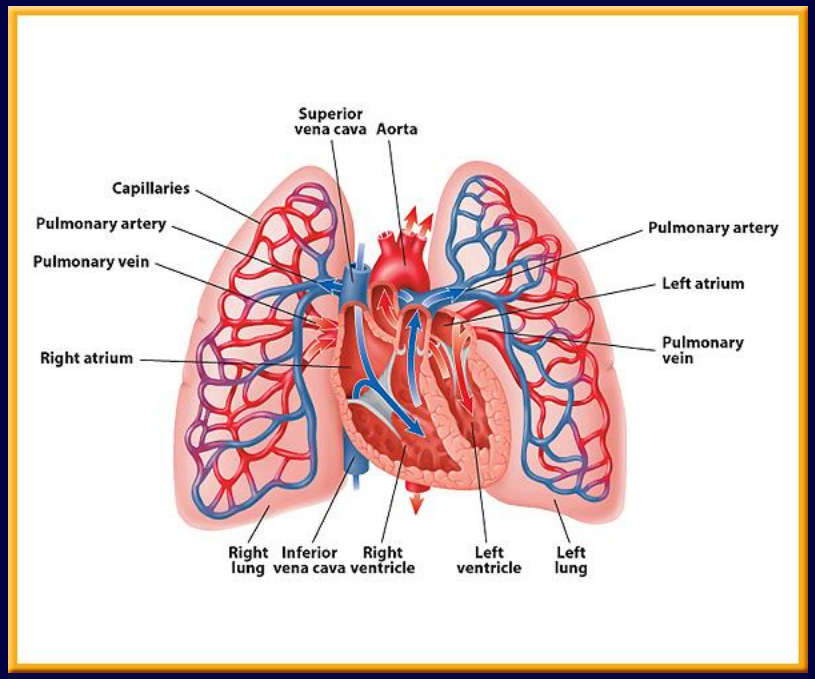
Question 2

Which is the largest artery in your body?



Section Check

1



A. aorta

B. left atrium

C. pulmonary artery

D. superior vena cava

1

Answer

The answer is A. Oxygen-rich blood is pumped from the left ventricle into the aorta.

1

Question 3

What is another name for high blood pressure?

A. atherosclerosis
B. heart failure
C. hemoglobin
D. hypertension

1

Answer

The answer is D. One cause of hypertension is atherosclerosis

2

Functions of Blood

- Blood has four important functions.
- Blood carries oxygen from your lungs to all your body cells. Your blood carries carbon dioxide to your lungs to be exhaled.
- Blood carries waste products from your cells to your kidneys to be removed.

2

Functions of Blood

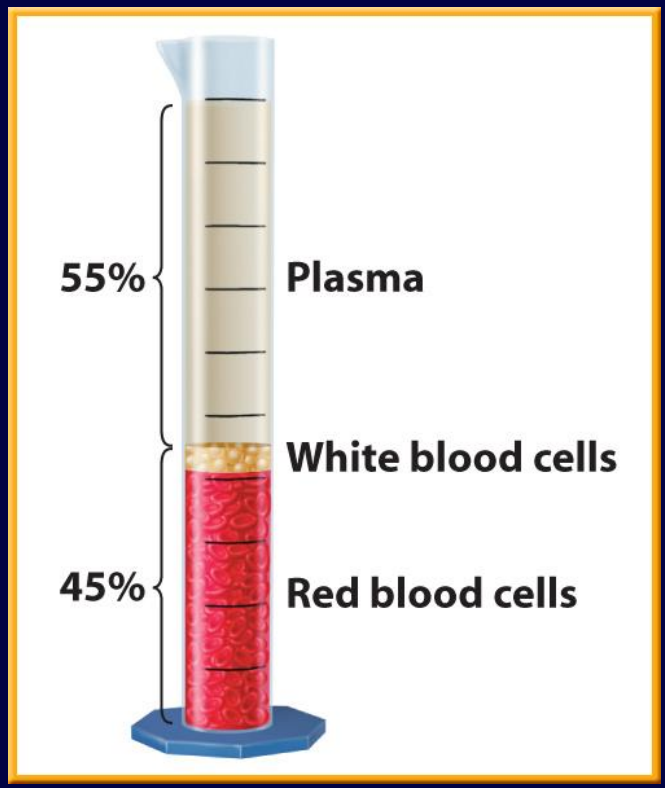
- Blood transports nutrients and other substances to your body cells.

- Cells and molecules in blood fight infections and help heal wounds.

2

Parts of Blood

- Blood is a tissue made of plasma (PLAZ muh), platelets (PLAYT luts), and red and white blood cells.
- Blood makes up about eight percent of your body's total mass.
- The amount of blood in an adult would fill five 1-L bottles.



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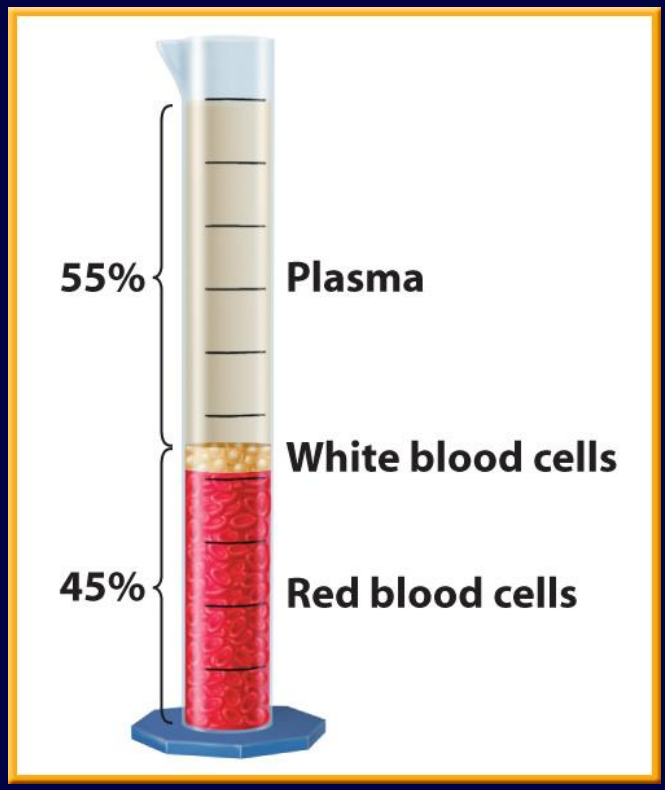
Plasma

- The liquid part of blood is mostly water and is called **plasma**.
- Nutrients, minerals, and oxygen are dissolved in plasma and carried to cells.
- Wastes from cells are also carried in plasma.



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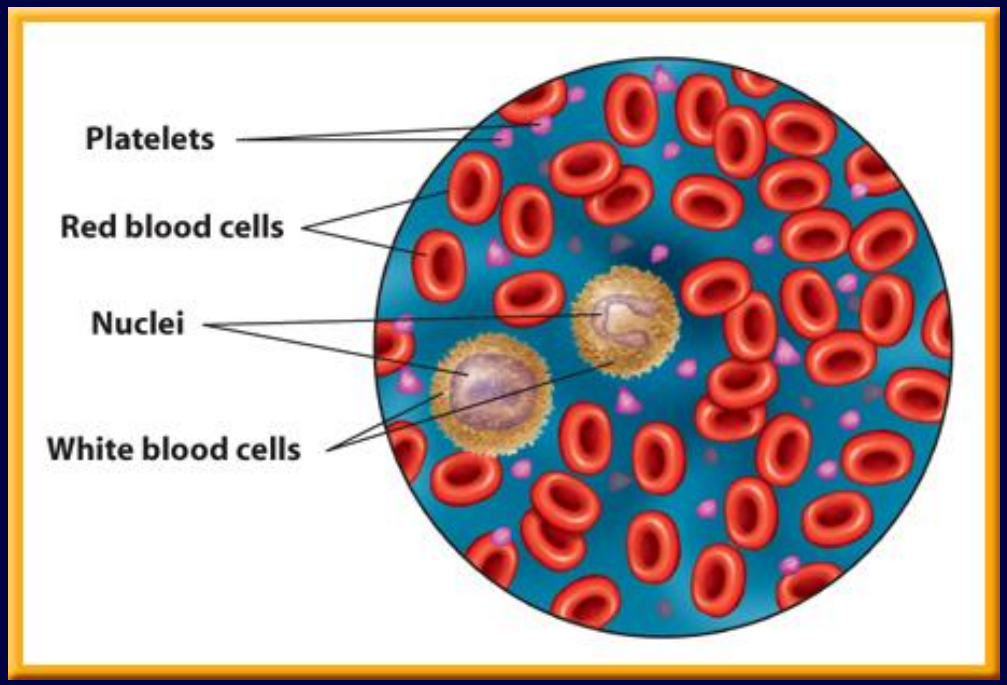
Blood Cells

- Red blood cells contain **hemoglobin** (HEE muh gloh bun), which is a molecule that carries oxygen and carbon dioxide, and made of an iron compound that gives blood its red color.



2

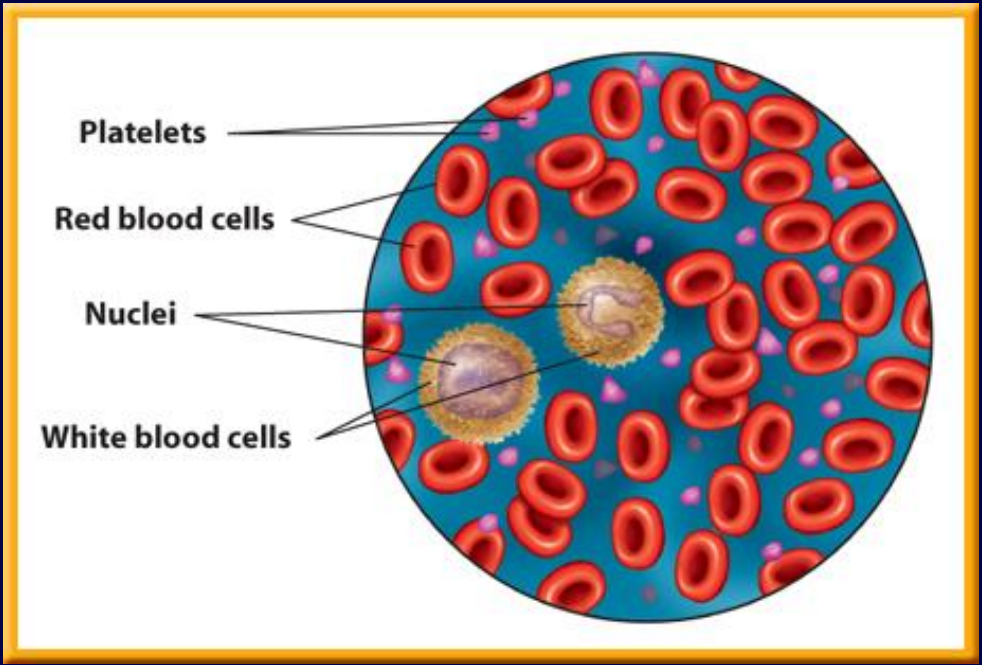
Blood Cells

- Red blood cells have life span of about 120 days.
- They are made at a rate of 2 million to 3 million per second in the center of long bones like the femur in your thigh.
- Red blood cells wear out and are destroyed at about the same rate.

2

Blood Cells

- White bloods cells fight bacteria, viruses, and other invaders of your body.



- These cells leave the blood through capillary walls and go into the tissues that have invaded.

2

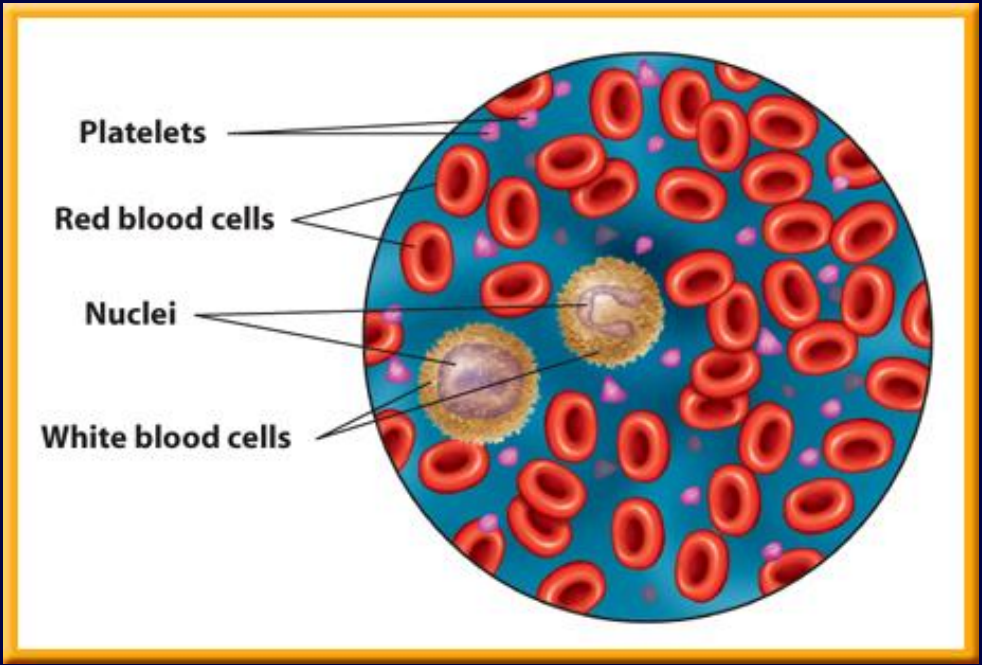
Blood Cells

- Here, they destroy bacteria and viruses and absorb dead cells.
- The life span of white blood cells varies from a few days to many months.

2

Blood Cells

- **Platelets** are irregularly shaped cell fragments that help clot blood.

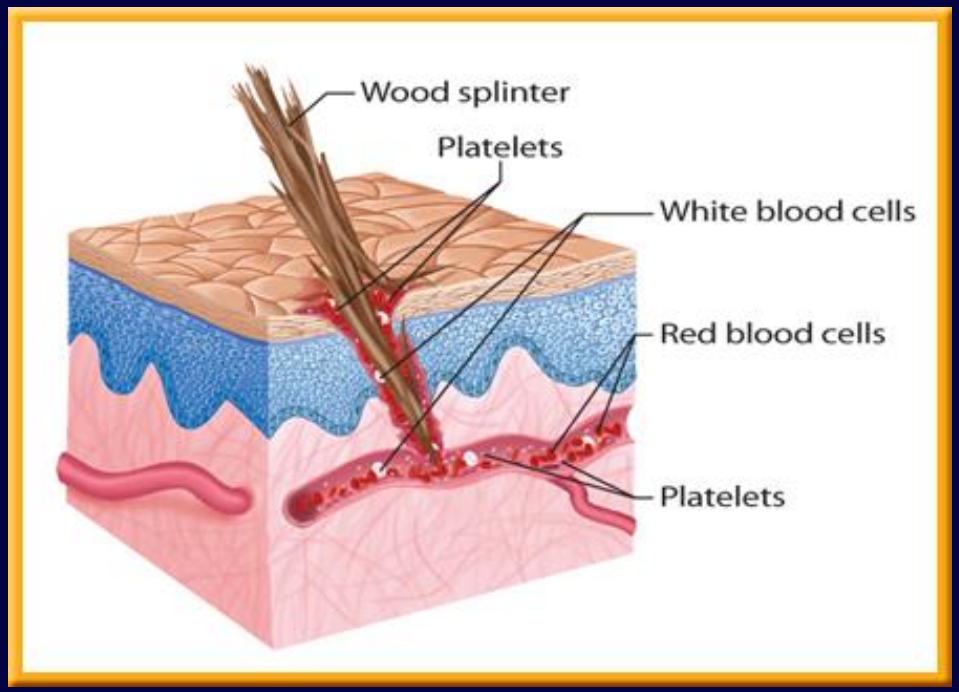


- A cubic millimeter of blood can contain as many as 400,000 platelets.
- Platelets have a life span of five to nine days.

2

Blood Clotting

- When you cut yourself, platelets stick to the wound and release chemicals.

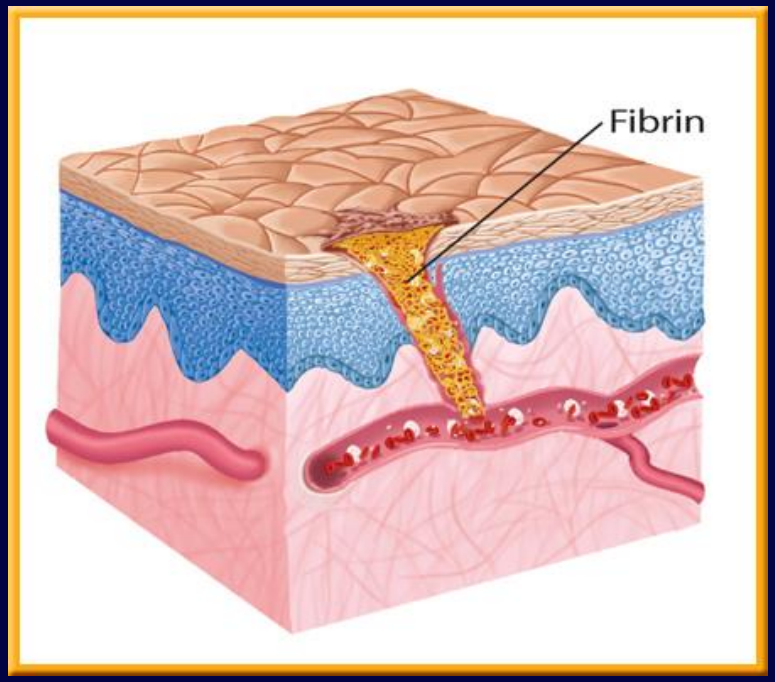


- Then substances called clotting factors carry out a series of chemical reactions.

2

Blood Clotting

- These reactions cause threadlike fibers called fibrin (FI brun) to form a sticky net.
- This net traps escaping blood cells and plasma and forms a clot.



- After the clot is in place and becomes hard, skin cells begin the repair process under the scab.

2

Blood Clotting

- Some people have a genetic condition called hemophilia (hee muh FIH lee uh).
- Their plasma lacks one of the clotting factors that begins the clotting process.
- A minor injury can be a life threatening problem.

2

Blood Types

- During a blood transfusion, a person receives donated blood or parts of blood.

- If the wrong type is given, the red blood cells will clump together. Then, clots form in the blood vessels and the person could die.

2

The ABO Identification System

- People can inherit one of four types of blood: A, B, AB, or O.

Blood Types

Blood Type	Antigen	Antibody
A	A	Anti-B
B	B	Anti-A
AB	A,B	None
O	None	Anti-A, Anti-B

2

The ABO Identification System

- Types A, B, and AB have chemical identification tags called antigens (AN tih junz) on their red blood cells.

Blood Types

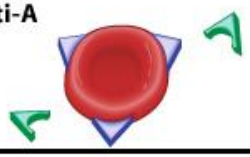
Blood Type	Antigen	Antibody
A	A	Anti-B
B	B	Anti-A
AB	A,B	None
O	None	Anti-A, Anti-B

2

The ABO Identification System

- Type O red blood cells have no antigens.

Blood Types

Blood Type	Antigen	Antibody
A 	A 	Anti-B 
B 	B 	Anti-A 
AB 	A,B 	None 
O 	None 	Anti-A Anti-B 

2

The ABO Identification System

Blood Transfusion Options		
Type	Can Receive	Can Donate To
A	O, A	A, AB
B	O, B	B, AB
AB	all	AB
O	O	all

- Each blood type also has specific antibodies in its plasma.
- Antibodies are proteins that destroy or neutralize substances that do not belong in or are not part of your body.

2

The ABO Identification System

Blood Transfusion Options		
Type	Can Receive	Can Donate To
A	O, A	A, AB
B	O, B	B, AB
AB	all	AB
O	O	all

- Because of these antibodies, certain blood types cannot be mixed.

2

The RH Factor

- Rh factor also is inherited.
- If the Rh factor is on red blood cells, the person has Rh-positive (Rh+) blood.
- If it is not present, the person's blood is called Rh- negative (Rh-).

2

The RH Factor

- If an Rh- person receives a blood transfusion from an Rh+ person, he or she will produce antibodies against the Rh factor.
- These antibodies can cause Rh+ cells to clump.
- Clots then form in the blood vessels and the person could die.

2

The RH Factor

- When an Rh- mother is pregnant with an Rh+ baby, the mother might make antibodies to the child's Rh factor.
- At 28 weeks of pregnancy and immediately after the birth, an Rh- mother can receive an injection that blocks the production of antibodies to the Rh+ factor.
- These injections prevent this life-threatening situation.

2

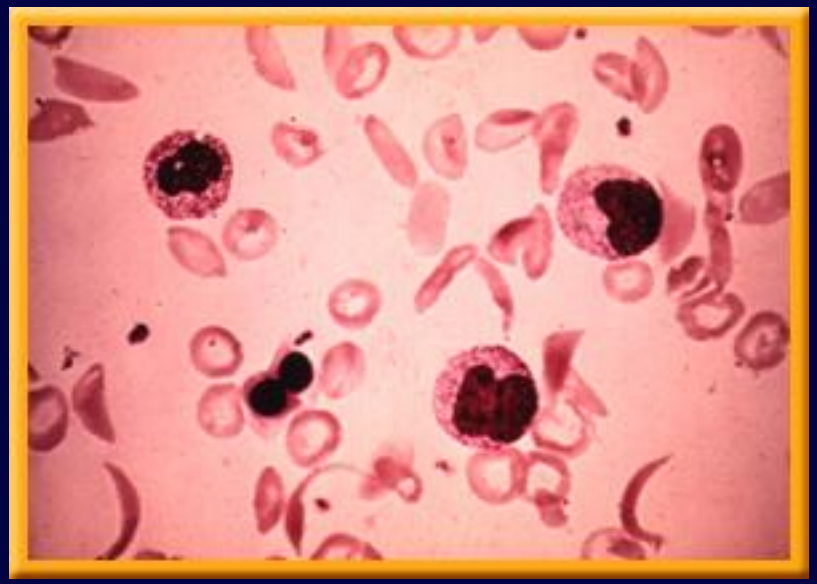
Diseases of Blood

- One common disease of the blood is anemia (uh NEE mee uh).
- In this disease of red blood cells, body tissues can't get enough oxygen and are unable to carry on their usual activities.

2

Diseases of Blood

- Persons with sickle-cell anemia have misshapened red blood cells.
- The sickle-shaped cells clog the capillaries of a person with this disease.
- Oxygen cannot reach tissues served by the capillaries, and wastes cannot be removed.



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Diseases of Blood

- Leukemia (lew KEE mee uh) is a disease in which one or more types of white blood cells are made in excessive numbers.
- These cells are immature and do not fight infections well.
- They fill bone marrow and crowd out the normal cells.

2

Diseases of Blood

- Medicines, blood transfusions, and bone marrow transplants are used to treat this disease.

- If the treatments are not successful, the person eventually will die from related complications.

2

Question 1

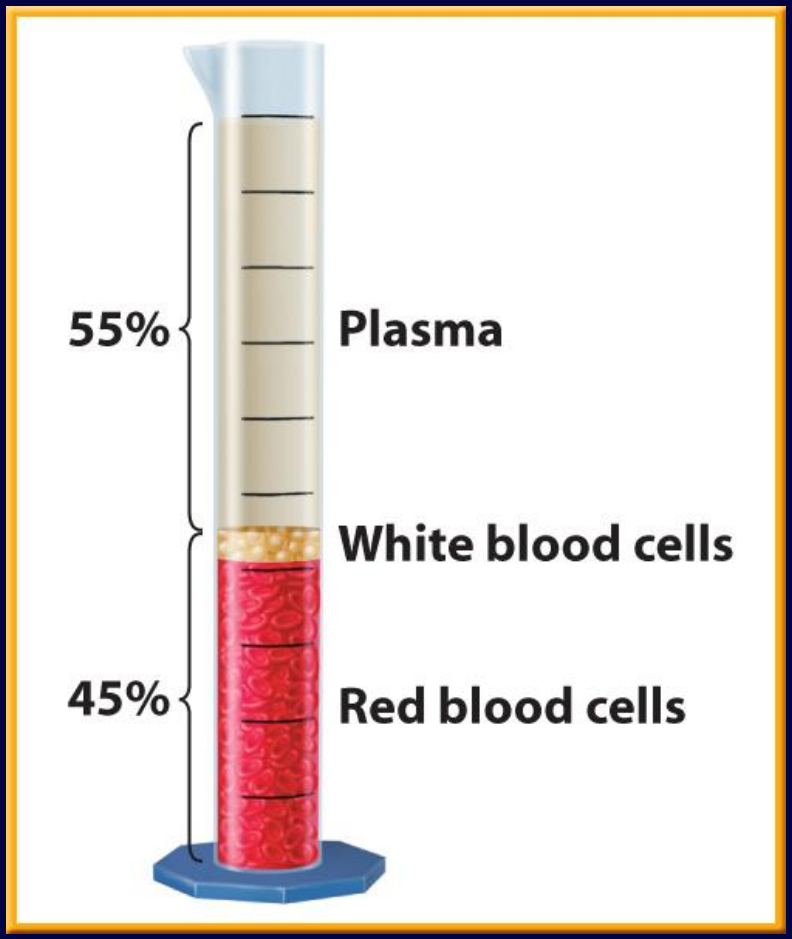
Which is made mostly of water?

A. hemoglobin
B. plasma
C. red blood cells
D. white blood cells

2

Answer

The answer is B.
Plasma makes up about 55 percent of blood.



2

Question 2

Explain what happens when skin is damaged.

Answer

When skin is damaged, a sticky blood clot seals the leaking blood vessel. Eventually, a scab forms to protect the wound from further damage and allow it to heal.

2

Question 3

Which can a person with blood type A receive in a transfusion?

A. all
B. B
C. O
D. AB

2

Answer

The answer is C. Type O blood has both A and B antibodies, therefore a person with type A blood can receive blood from a person with type O blood.

3

Functions of the Lymphatic System

- Your body's excess tissue fluid is removed by the lymphatic (lihm FA tihk) system.
- After tissue fluid diffuses into the lymphatic capillaries it is called **lymph** (LIHMF).
- Your **lymphatic system**, carries lymph through a network of lymph capillaries and larger lymph vessels.
- Then, the lymph drains into large veins near the heart.

3

Functions of the Lymphatic System

- The movement of lymph depends on the contraction of smooth muscles in lymph vessels and skeletal muscles.

- If the lymphatic system is not working properly, severe swelling occurs because the tissue fluid cannot get back to the blood.

3

Functions of the Lymphatic System

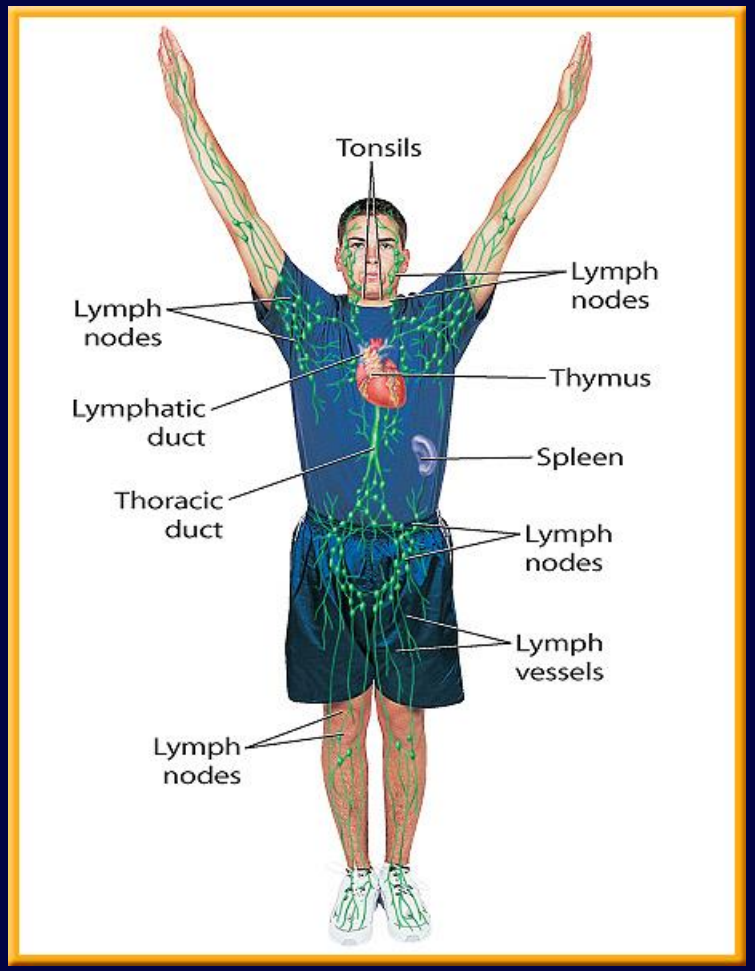
- In addition to water and dissolved substances, lymph also contains **lymphocytes** (LIHM fuh sites), a type of white blood cell.

- Lymphocytes help your body defend itself against disease causing organisms.

3

Lymphatic Organs

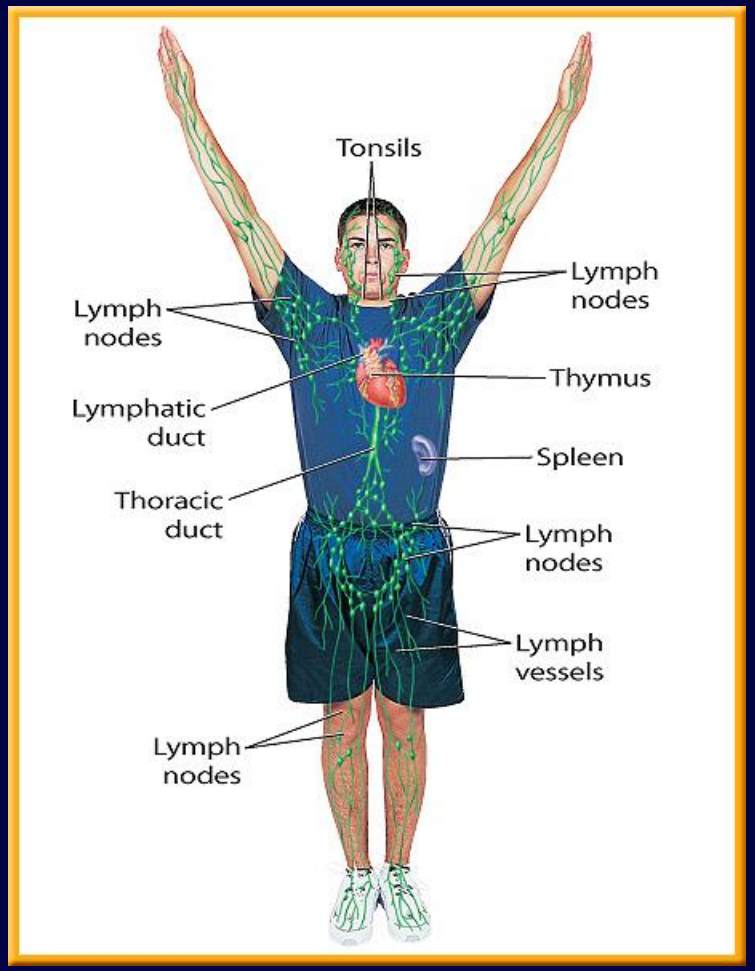
- Lymph nodes are bean-shaped organs of varying sizes found throughout the body.
- **Lymph nodes** filter out microorganisms and foreign materials that have been taken up by lymphocytes.



3

Lymphatic Organs

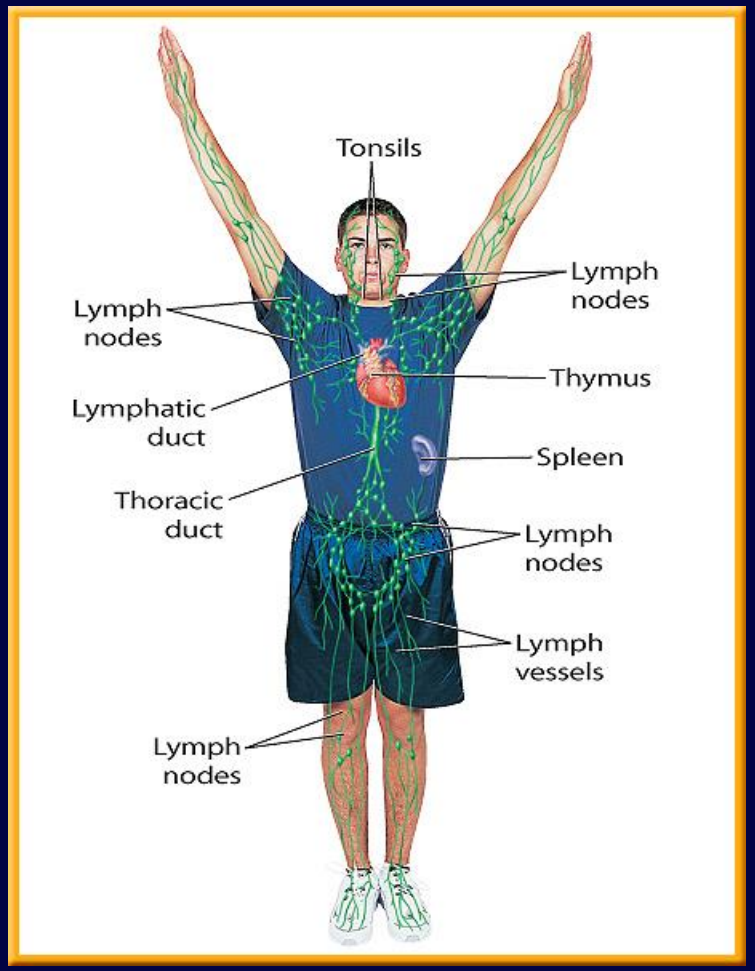
- When your body fights an infection, lymphocytes fill the lymph nodes.
- The lymph nodes become warm, reddened, and tender to the touch.



3

Lymphatic Organs

- Besides lymph nodes, the tonsils, the thymus, and the spleen are important lymphatic organs.
- Tonsils protect you from harmful microorganisms.



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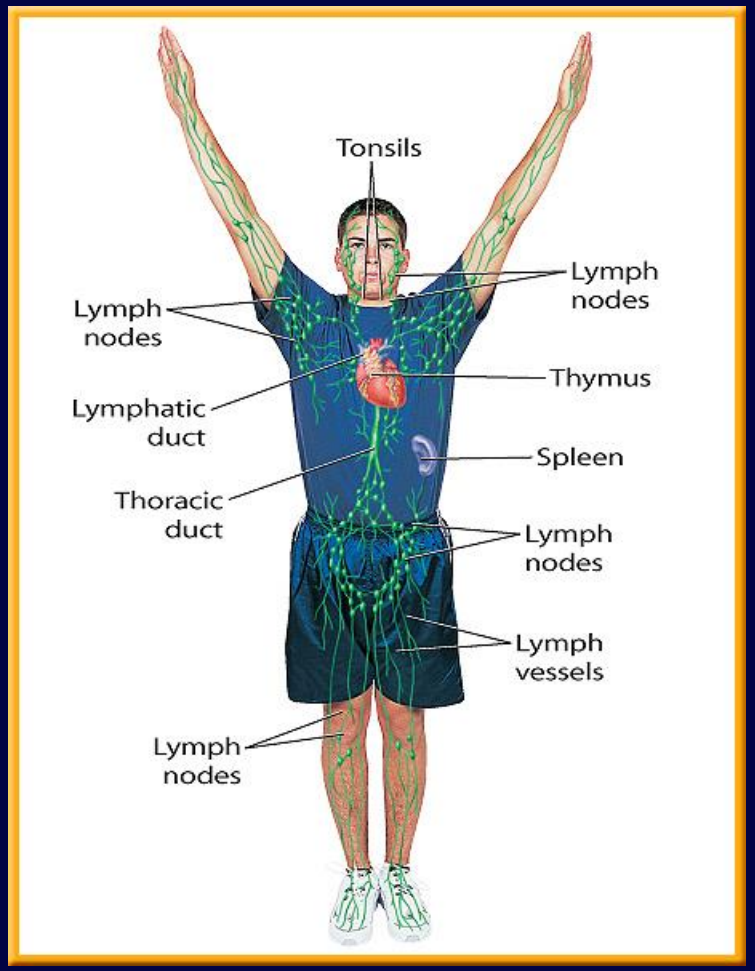
Lymphatic Organs

- Your thymus makes lymphocytes that travel to other lymph organs.
- The spleen filters the blood by removing worn out and damaged red blood cells.



3

A Disease of the Lymphatic System

- HIV is a deadly virus.
- When HIV enters a person's body, it attacks and destroys lymphocytes called helper T cells that help make antibodies to fight infections.
- This affects a person's immunity to some diseases.
- Usually, the person dies from these diseases, not from the HIV infection.

3

Question 1

Which is a function of the lymphatic system?

A. filtering blood
B. pumping blood throughout the body
C. removing excess tissue fluid from the body
D. removing nutrients from food

3

Answer

The answer is C. Your body's excess tissue fluid is removed by the lymphatic system

3

Question 2

Before lymph enters the blood, it passes through _____.

A. arteries
B. capillaries
C. lymph nodes
D. veins

3

Answer

The answer is C. Lymph nodes filter out microorganisms and foreign materials that have been taken up by lymphocytes.

3

Question 3

Which is a disease of the lymphatic system?

A. atherosclerosis
B. blood clots
C. hypertension
D. HIV

3

Answer

The answer is D. When HIV enters a person's body, it attacks and destroys lymphocytes called helper T cells.

Help

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Click on this icon to open the resources file.

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End of Chapter Summary File