The Body's Transport System

Guided Reading and Study

Use Target Reading Skills
Bottom oval: Left side of heart; Left oval: Body
1. circulatory
2. blood vessels; blood
3. Needed substances, waste products, disease fighting cells
4. Each time the heart beats, it pushes blood through the blood vessels of the cardiovascular system.
5. Upper: atria; two; to receive blood that comes into the heart. Lower: ventricles; two, to pump blood out of the heart
6. valve
7. pacemaker; oxygen
8. It makes the heart contract at a normal rate.
9. arteries, capillaries, veins
10. Blood is pumped from the right atrium to the right ventricle and then to the lungs. In the lungs, blood picks up oxygen and releases carbon dioxide. Blood then flows to the left atrium.
11.

The Body's Transport System

Review and Reinforce

1.

2. The right atrium receives oxygen-poor blood from the body. The left atrium receives oxygen-rich blood from the lungs. The right ventricle pumps the oxygen-poor blood to the lungs. The left ventricle pumps the oxygen-rich blood to all parts of the body.
3. b and d are arteries because they carry blood away from the heart; a and c are veins because they carry blood to the heart
4. pacemaker
5. heart
6. cardiovascular system
7. valve
8. aorta
9. capillaries

The Body's Transport System

Enrich

1. In the heart in the figure, blood flows from the left ventricle into the aorta and into the right ventricle.
2. In a normal heart, blood only flows from the left ventricle into the aorta.
3. The blood in the right ventricle of a normal heart is oxygen-poor. The blood in the right ventricle of the abnormal heart in the figure contains a mixture of oxygen-poor and oxygen-rich blood.
4. Since oxygen-rich and oxygen-poor blood would mix, the cardiovascular system might not be able to deliver enough oxygen to body cells.
ANSWER KEY

A Closer Look at Blood Vessels

Guided Reading and Study

Use Target Reading Skills

Sample answers:

**Artery:** Carries blood away from heart; Thick walls consisting of three cell layers with thick muscle in the middle layer

**Capillary:** Exchange of materials between the blood and body cells; Thin walls consisting of one cell layer

**Vein:** Carries blood back to the heart; Thick walls consisting of three cell layers with thin muscle in the middle layer

1. heart
2. false
3. b, c
4. true
5. In the capillaries, materials are exchanged between the blood and the body’s cells.
6. diffusion
7. Veins carry blood back to the heart.
8. a. Contraction of nearby skeletal muscles; b. Valves that prevent blood from flowing backward; c. Breathing movements that squeeze veins in the chest
9. Blood pressure is the pressure that blood exerts against the walls of blood vessels.
10. c

A Closer Look at Blood Vessels

Review and Reinforce

1. a. vein; b. artery; c. capillary
2. arteries, capillaries, veins
3. artery
4. capillary
5. Contraction of the ventricles
6. The action of skeletal muscles near veins pushes against veins and makes blood move, valves in veins keep blood from moving backward, and breathing movements exert a squeezing pressure against veins in the chest.
7. c
8. b
9. a
10. d

A Closer Look at Blood Vessels

Enrich

1. Blood pressure when the ventricles contract is 120 mm of mercury.
2. Blood pressure when the ventricles relax is 80 mm of mercury.
3. The average pressure is about 90 mm of mercury.
4. The pressure is about 35 mm of mercury.
5. Answers may vary. Sample: Blood pressure in a large artery varies as the ventricle contracts and relaxes, but pressure in a vein doesn’t. Therefore, the doctor can sense the pulse in an artery. Also, pressure in a vein might be hard to measure because it is so low.

Skills Lab

Heart Beat, Health Beat

For answers, see the Teacher’s Edition.

Blood and Lymph

Guided Reading and Study

Use Target Reading Skills

Sample details: Plasma is the liquid part of blood; red blood cells take up oxygen and deliver it to cells in the body; white blood cells fight disease; platelets help form blood clots.

1. plasma
2. White blood cells; Platelets
3. water
4. a. nutrients; b. chemical messengers; c. wastes
5. Red blood cells pick up oxygen in the lungs and carry it to cells in the body.
6. Hemoglobin is an iron-containing protein that binds chemically to oxygen molecules. It is found in red blood cells.
7. They fight disease.
8. a. There are fewer of them. b. They are bigger. c. They have nuclei. d. Most live for months or even years.
9. true
10. Fibrin weaves a net of tiny fibers across a cut, which traps blood cells and platelets that form a clot.
11. A blood transfusion is the transfer of blood from one person to another.
12. Type A blood has clumping proteins that act against the marker molecules on type B blood cells.
13. The Rh factor is a marker on red blood cells that determines whether a person’s blood type is Rh positive or Rh negative.
14. b
15. d
16. a
17. c
18. The lymphatic system is a network of veinlike vessels that returns fluid to the bloodstream.
19. lymph
20. Lymph nodes filter the lymph, trapping bacteria and other microorganisms that cause disease.
Blood and Lymph
Review and Reinforce
Plasma: liquid made of water and dissolved materials; transports materials from one part of the body to another
Red blood cell: red, disk-shaped, with pinched-in center, made mostly of hemoglobin with no nucleus; carries oxygen from the lungs
White blood cell: have nuclei and are larger than red blood cells; helps fight infections, may alert the body to invasion, produce chemicals to fight invaders, or kill foreign organisms
Platelet: cell fragment; sticks to the site of a wound and eventually causes the production of fibrin to form a clot
1. A person with type B blood can receive either type B blood or type O blood. The person should not receive either type A blood or type AB. These two blood types both contain the A marker and would cause clumping in the blood.
2. Fluid leaks out of the blood through the capillary walls where it is called lymph. The fluid then moves into the lymphatic system, which is a series of vessels that connect to large veins in the chest. Once in the lymphatic system, the fluid is called lymph.
3. lymph node
4. Plasma
5. hemoglobin
6. lymphatic system

Blood and Lymph
Enrich
1. type B blood
2. type AB
3. type O
4. type A
5. type AB
6. type A
7. type B
8. type AB
9. type O

Blood Type Can Receive Blood From (Type and Percent of Population)

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<th>Can Receive Blood From</th>
<th>Type and Percent of Population</th>
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</thead>
<tbody>
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</tr>
<tr>
<td>A</td>
<td>A, O</td>
<td>85%</td>
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<tr>
<td>B</td>
<td>B, O</td>
<td>56%</td>
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<tr>
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<td>A, B, AB, O</td>
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Blood Type Can Donate Blood To (Type and Percent of Population)

<table>
<thead>
<tr>
<th>Blood Type</th>
<th>Can Donate Blood To</th>
<th>Type and Percent of Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
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</tr>
<tr>
<td>A</td>
<td>A, AB</td>
<td>44%</td>
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<tr>
<td>B</td>
<td>B, AB</td>
<td>15%</td>
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<tr>
<td>AB</td>
<td>AB</td>
<td>4%</td>
</tr>
</tbody>
</table>

Cardiovascular Health
Guided Reading and Study

Use Target Reading Skills
Possible questions and answers include:
Q. What are some cardiovascular diseases?
A. atherosclerosis, hypertension
Q. How can a person keep healthy?
A. Exercise regularly, eat a healthy diet, and avoid smoking
1. Atherosclerosis is a condition in which an artery wall thickens as a result of the buildup of fatty materials.
2. Cholesterol is a waxy, fatlike substance that can restrict the flow of blood in arteries.
3. blood; oxygen; heart attack
4. Hypertension is a disorder in which a person’s blood pressure is consistently higher than normal.
5. Hypertension makes the heart work harder and also may damage the walls of the blood vessels.
6. Treatment includes regular exercise, careful food choices, limited sodium intake, and medication.
7. a. saturated fat; b. trans fats; c. cholesterol
8. false
9. Exercise strengthens heart muscles. High-fat foods can lead to atherosclerosis; weight gain can strain the cardiovascular system. Smoking increases the risk of heart attack.
Cardiovascular Health

Review and Reinforce

1.–4. running; eating low-sodium foods; playing basketball; eating foods low in cholesterol
5.–8. eating foods high in saturated fat; smoking; eating salty foods; being overweight
9. Atherosclerosis can lead to a heart attack, which can permanently damage the heart or cause death.
10. Hypertension causes the heart to work harder and may damage the walls of the blood vessels. It is called the “silent killer” because people with hypertension often have no obvious symptoms to warn them.
11. When atherosclerosis narrows the arteries, blood pressure increases. This is hypertension.
12. A condition in which the artery wall thickens as a result of the buildup of fatty materials
13. A waxy, fatlike substance that can restrict the flow of blood in the arteries
14. A condition in which blood flow to part of the heart muscle is blocked
15. A disorder in which a person’s blood pressure is consistently higher than normal

Cardiovascular Health

Enrich

1. Blood flows from the aorta through the grafted vessel and into the coronary artery.
2. The heart muscle needs oxygen-rich blood. Blood coming from the left ventricle is oxygen rich and blood coming from the right ventricle is oxygen poor.
3. A blood vessel is used to bypass a block in a coronary artery.
4. Doctors don’t have to match blood types if they use a vessel from the patient’s own body.
5. They must avoid foods high in fat, sodium, and cholesterol.

Skills Lab

Do You Know Your A-B-O’s?

For answers, see the Teacher’s Edition.

Key Terms

Down: 1. capillaries, 2. plasma, 3. coronary, 8. vein
Across: 4. pacemaker, 5. pulse, 6. atrium, 7. valve, 9. lymph
Connecting Concepts
This concept map is only one way to represent the main ideas and relationships in this chapter. Accept other logical answers from students.
Laboratory Investigation

Direction of Blood Flow

Pre-Lab Discussion

1. Artery walls have three layers and are muscular and thick. Walls of veins also have three layers, but they are thinner and less muscular than artery walls. Large veins contain valves, which arteries don’t have. A valve is a flap of tissue that prevents blood from flowing backward.
2. Answers may vary. Sample answer: If blood couldn’t flow uphill, it would go to your feet and stay there and couldn’t flow up to your brain.

Observations

Data Table

<table>
<thead>
<tr>
<th>Step</th>
<th>Subject 1 Effect on Vein</th>
<th>Subject 2 Effect on Vein</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observer moves fingers</td>
<td>The vein seems to disappear.</td>
<td>The vein seems to disappear.</td>
</tr>
<tr>
<td>apart.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observer releases upper</td>
<td>The vein stays flat.</td>
<td>Blood comes a little way back into the vein.</td>
</tr>
<tr>
<td>finger.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observer releases both</td>
<td>The vein fills up.</td>
<td>The vein fills up.</td>
</tr>
<tr>
<td>fingers.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Analyze and Conclude

1. The blood was pushed out of the vein by the top finger, and the bottom finger prevented any more blood from coming into the vein.
2. A valve prevented blood from coming back into the vein.
3. The vein filled up after the pressure was removed. Valves enabled the blood to flow in the proper direction.
4. Valves in the veins allow blood to pass in one direction but not in the other direction. Thus, blood cannot flow backward in the body.

Critical Thinking and Applications

1. Arteries do not contain valves. If an artery had been used, blood would have filled the artery when the observer released the finger between the heart and the lower finger in Step 6.
2. Clothes that are too tight might prevent proper blood flow. If clothing presses on veins, it might have the same effect as the fingers in the investigation did on blood flow.
3. The drain pipe would need to contain a valve that would allow the drain water to go out but not come back in the other direction.

More to Explore

Analyze and Conclude

1. Jumping rope uses arm muscles as well as leg muscles, so the whole body works and the heart has to pump harder to supply blood to more muscle tissue.
2. Answers will vary. Sample answer: The target rate exercises the heart without exhausting or damaging heart muscle.

Performance Assessment

Sample data table:

The blood type of my model is A.

<table>
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<tr>
<th>Name</th>
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<th>Safe Donor?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sasha</td>
<td>AB</td>
<td>no</td>
</tr>
<tr>
<td>Thomas</td>
<td>O</td>
<td>yes</td>
</tr>
<tr>
<td>Zach</td>
<td>B</td>
<td>no</td>
</tr>
<tr>
<td>Julia</td>
<td>A</td>
<td>yes</td>
</tr>
<tr>
<td>Lupita</td>
<td>B</td>
<td>no</td>
</tr>
</tbody>
</table>

Analyze and Conclude

1. Answers may vary. Sample: I mixed water and yellow food coloring to model plasma. I made red blood cells out of red clay. I rolled them into balls and then I pinched them between my fingers to make disk shapes. I made white blood cells out of white clay. I shaped them into balls and then I rolled them over carpet to give them a bumpy texture. I made platelets by pinching off small pieces of blue clay. I made the white blood cells larger than the red blood cells and the red blood cells larger than the platelets.
2. Answers will vary depending on the blood type that the student models. Sample: I indicated type A blood by pushing A marker molecules (toothpicks) into the red blood cells of my
model. Types A and O can safely donate blood to my model.

3. Answers may vary. Sample: In real blood, there are about 500 to 1,000 red blood cells for every white blood cell, but in my model, there are about 3 red blood cells for every white blood cell. The cells in my model are much larger than real blood cells.

4. Answers may vary. Sample: The “foreign” red blood cells would clump together. I could show this by squeezing several model red blood cells together into a clump.

Chapter Test

1. a
2. d
3. b
4. b
5. a
6. c
7. d
8. a
9. b
10. c
11. Cholesterol
12. ventricles
13. blood pressure
14. heart attack
15. capillaries
16. true
17. blood clots
18. true
19. ventricles
20. artery
21. Maria Nevarez
22. Give James Patel 0.45 L of type O blood as well as all the B blood; give Sonya Jackson 0.9 L of both A and AB; give Maria Nevarez the remaining 0.9 L of type O blood.
23. The pumping force of the ventricles moves blood through the arteries. In the veins, the blood pressure is much lower than in the arteries. Contracting skeletal muscles next to the veins help to squeeze the blood. Larger veins have valves that prevent the blood from flowing backward as it moves toward the heart. Also, breathing movements exert pressure against veins in the chest, forcing blood toward the heart.
24. Blood is made up of a liquid called plasma that transports needed materials and waste throughout the body. Red blood cells transport both oxygen and carbon dioxide. White blood cells fight disease. Platelets help to cause the production of fibrin, which is used in the formation of blood clots.

25. To decrease the risk of cardiovascular problems, you should eat a balanced diet that is low in sodium, cholesterol, and saturated and trans fat. Also, you should exercise regularly and avoid smoking.

26. The capillaries are located in the lungs because the oxygen level of the blood increases when oxygen moves from the lungs into the blood.

27. The oxygen level of the blood will remain high in the arteries and will decrease in the capillaries where the oxygen diffuses into the body cells.

28. Arteries have thick three-layered walls. The innermost layer is made up of smooth epithelial tissue. The middle layer is made up of mostly muscle tissue. The outer wall is made up of connective tissue. Capillary walls are only one cell thick. The walls of veins have three layers, similar to arteries, but they are generally not as thick as arteries. Larger veins have valves in them.

The thick artery walls give them the strength and flexibility to withstand the high blood pressure caused by the heart. The smooth inner layer lets blood flow freely. The muscle layer regulates blood flow by constricting and relaxing. Because capillaries have thin walls, materials can move easily between the body and the blood. The middle layer of muscle in the veins is used to help move the blood to the heart. The valves in the larger veins prevent the blood from flowing backward.

29. Fluid from the blood seeps out of the bloodstream and moves into the lymphatic system. Once in the lymphatic system, the fluid is called lymph. The lymph collects in the lymph vessels and is carried back to the bloodstream.

30. Diffusion is the process by which molecules move from an area of high concentration to an area of low concentration. For example, glucose is more highly concentrated in blood than it is in the body cells. Therefore, glucose diffuses from the blood, through the capillary wall, and into the body cells.