

# CHAPTER 16

## Circulation



## Chapter 16 Objectives

### Section 1: The Body's Transport System

1. List the major functions of the circulatory system.
2. Identify on a diagram all of the parts of the heart and all of the blood vessels leading into and out of the heart.
3. Trace the pathway of blood through the chambers of the heart.
4. Identify the function of the pacemaker.
5. Differentiate between pulmonary, coronary and systemic circulation.
6. Describe the difference between arteries, veins, and capillaries.
7. Compare the structure and function of arteries, veins, and capillaries.
8. Describe the cause of blood pressure.
9. Name and explain what the two numbers in a blood pressure reading mean.
10. Identify what would be considered normal and abnormal blood pressure.
11. Describe how your pulse is caused and the best places to find your pulse.
12. Describe the process of diffusion and give an example.

### Section 2: Blood and Lymph

13. Describe the characteristics and functions of the parts of the blood.
14. Identify where red blood cells and white blood cells are produced.
15. Describe the function of hemoglobin.
16. Name and describe the function of two different types of white blood cells.
17. List the steps in the blood clotting process.
18. Name and describe the differences between the four major blood types.
19. Explain the importance of checking blood types before a transfusion.
20. Describe the functions of the lymphatic system.
21. Explain where lymph comes from.
22. Explain the role of lymph nodes in fighting infections.

### Section 3: Cardiovascular Health

23. Identify the benefits of cardio exercise.
24. Explain the relationship between poor eating habits and various heart conditions.
25. Describe the disorder atherosclerosis.
26. Identify the scientific name for high blood pressure and list five causes of it.
27. Differentiate between a heart attack and a stroke.
28. Describe several blood diseases including anemia, sickle-cell anemia, leukemia and AIDS.

## ITOUCH ACTIVITY: CARDIOVASULAR SYSTEM



**Directions:** Use the I-Touch to answer the following questions. Click on the “Anatomy 3D” application, then click on “Encyclopedia” and “Cardiovascular system”

1. What is the function of the cardiovascular system?
2. What is a closed circulatory system?
3. What are the three main components of the circulatory system?
4. What are the names of the 2 “loops” that make up the Cardiovascular system?
5. How much blood is in an adult human?
6. What are the main components of blood?
7. What are the 2 types of fluid that move through the Cardiovascular System?
8. What is the difference between systemic, coronary, and pulmonary circulation?
9. What is the status of blood that enters the right atrium?
10. What is the status of blood that enters the left atrium?

**Directions:** Use the I-Touch to answer the following questions. Click on the “Anatomy 3D” application, then click on “Encyclopedia” and “Lymphatic system”

1. What are the 3 interrelated functions of the lymphatic system?
2. Why is studying lymphatic drainage so important?
3. What is a lymph node?

# Label the Heart

1. Label the following parts of the heart:

left atrium	right atrium
left ventricle	right ventricle
left AV valve	right AV valve
bicuspid valve	tricuspid valve
pulmonary valve	aortic valve
right semilunar valve	left semilunar valve
superior vena cava	pulmonary artery
inferior vena cava	pulmonary vein
aorta	

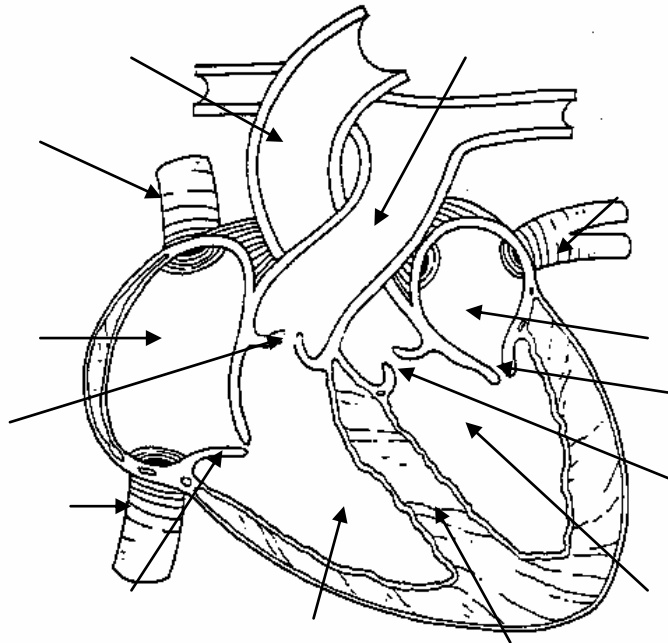
2. Use arrows to show the flow of blood through the heart:

Use **red** arrows to show blood that is rich in oxygen

Use **blue** arrows to show blood that is low in oxygen

3. Color the cardiac muscle a light brown.

4. Label the septum.





Put the following events into the proper sequence.

- \_\_\_\_\_ Blood passes through the bicuspid valve.
- \_\_\_\_\_ Blood enters the pulmonary veins.
- \_\_1\_\_ Blood comes from the various body parts and goes into the vena cavae.
- \_\_\_\_\_ Blood enters the right ventricle.
- \_\_\_\_\_ Blood enters the left atrium.
- \_\_\_\_\_ Blood is pumped into the aorta.
- \_\_\_\_\_ Blood enters the lungs.
- \_\_\_\_\_ Blood enters the left ventricle.
- \_\_\_\_\_ Carbon dioxide in the blood is exchanged for oxygen.
- \_\_\_\_\_ Blood enters the pulmonary arteries.
- \_\_\_\_\_ Aorta carries the blood to all parts of the body.
- \_\_\_\_\_ Blood enters the right atrium.
- \_\_\_\_\_ Blood passes through the tricuspid valve.



# HOW MUCH BLOOD DOES YOUR HEART PUMP IN ONE MINUTE?

Instructions: Read the text then use it to help you do the calculations and answer the questions.

Your “heart rate” is the number of times your heart beats (or contracts) in one minute. Since the job of your heart is to send oxygen to your cells, one major factor that determines how fast your heart beats is the amount of oxygen your cells need. While resting, the average person has a heart rate of about 72 beats (contractions) a minute. When you exercise, however, the cells of your body are working harder and use more oxygen; obviously, this means that your heart must beat faster to deliver more oxygen to the working cells.

Your “stroke volume” is the amount of blood pumped out of your heart each time it contracts. Each time the left ventricle contracts, about 80 milliliters of blood is sent out of your heart through the aorta (the artery that directs oxygenated blood to the body’s cells), and a shock wave of blood pressure passes through the arteries of your body. When you count your pulse by putting a finger on one of the “pulse spots” (on your wrist, or perhaps, on your throat), you are really feeling this shock wave at a spot where the major arteries pass close to your skin.

While during this project, you will determine how much blood is pumped out of your left ventricle each minute. You will first determine your heart rate by taking your pulse and then use this figure to determine the amount of blood your heart pumps. To do this, you simply multiply your pulse rate – which is the same as your heart rate – by 80 ml of blood. You may use a calculator.

Procedure:

1. Watch carefully as your teacher shows how to locate your pulse in your wrist or throat. To insure accuracy, you will do this three times and then figure the average.
2. Count your pulse for one minute and record it on line A.
3. Count your pulse rate two more times. Record these pulse rates on lines B and C.
4. Add lines A, B and C then write the sum on line D.

A = \_\_\_\_\_

B = \_\_\_\_\_

C = \_\_\_\_\_

D = \_\_\_\_\_

5. Divide the sum on Line D by 3. This will give you your average heart rate. Record it below.

Average Heart Rate = \_\_\_\_\_

6. Multiply your average heart rate by 80 and write the answer on Line E.

E = \_\_\_\_\_

7. Use your answer on Line E to complete the following:

Since I know that my heart pumps about \_\_\_\_\_ ml (milliliters) of blood with each contraction, and my heart contracts \_\_\_\_\_ times each minute, I know that my heart pumps about \_\_\_\_\_ ml in one minute.

8. How many times your heart beats (contracts) in one minute is your

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9. What major factor determines how fast your heart beats?

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10. While resting, the average person has a heart rate of about \_\_\_\_\_ beats per minute.

11. The amount of blood pumped out of the aorta each time the left ventricle contracts is the

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\_\_\_\_\_ volume.

12. Why does your heart beat faster when you exercise?

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13. What causes your pulse?

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14. Most trained athletes have lower-than-average heart rates. What might be an explanation?

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15. If your heart rate is about 80 beats per minute, does this mean your heart rate is abnormal? Explain your answer.

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16. Your body contains about 5 liters of blood. Is the entire volume of your blood pumped through your heart in less than a minute or more than a minute?

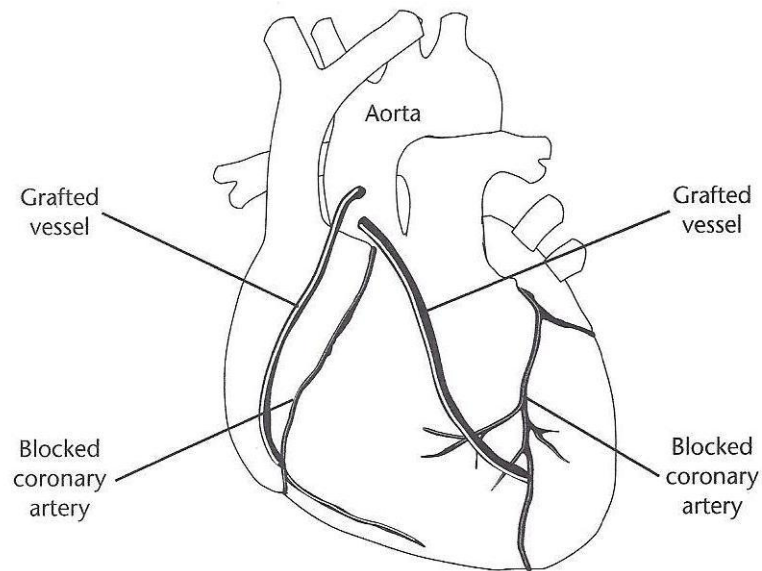
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## BYPASS SURGERY

As you learned, people with severe atherosclerosis may need to undergo surgery. A patient whose heart muscle is not receiving enough blood because of blocked coronary arteries sometimes has a surgery called a *coronary artery bypass graft*. Heart surgeons often refer to this operation as a CABG or a “cabbage”.

In a CABG, doctors remove a blood vessel from another part of the patient’s body. For example, they may cut out a piece of a vein in the patient’s leg. Then they attach or graft this vessel to the patient’s heart. Blood then flows through the grafted blood vessel and around the block in the coronary artery. The figure below shows a heart that has had two blood vessels grafted to it.



Directions: Answer the following questions

1. From what blood vessel does the blood that flows through the grafted blood vessel come?
2. Why do you think the blood vessels are grafted to the artery leading from the left ventricle and not to the artery leading from the right ventricle?
3. Why do you think this type of surgery is called a bypass?
4. Using what you have learned about transplants, can you think of one reason that a doctor would want to use a patient’s own blood vessel in a CABG?
5. After having bypass surgery, patients are advised to follow a special diet. What types of foods should these patients avoid?

## Laboratory Exercise: Cow Heart Observations



### Part A: Outside the Heart

Put the two halves of the heart together. Check off the steps as you complete them.

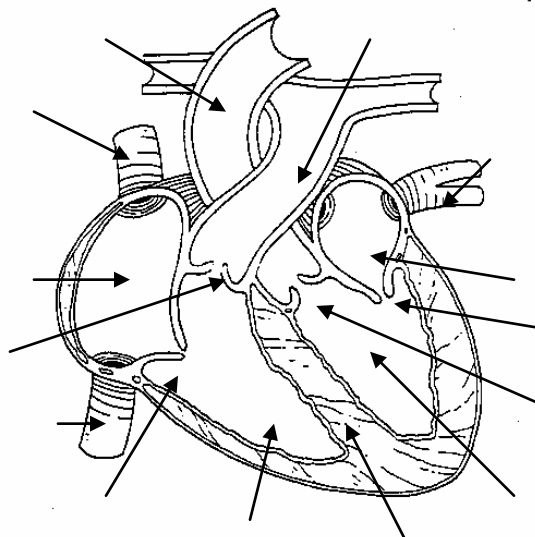
1. \_\_\_\_ Hold up the heart. Decide how you think it would be positioned in your body.
2. \_\_\_\_ Find the fat. It is cream-colored. It does not look like muscle tissue.
3. \_\_\_\_ The large blood vessels at the top of the heart were cut when this heart was removed. How many can you find? \_\_\_\_\_ Gently put your finger in one. How does it feel? (Write rough or smooth.) \_\_\_\_\_
4. \_\_\_\_ Find the ventricles. They make up the most of the heart muscle. There are two ventricles – a right one and a left one. From the outside, they look like one structure.
5. \_\_\_\_ Find each atrium. The atria look like two flaps and are located on top of the heart. They are much smaller than the ventricles.
6. \_\_\_\_ A netlike system of blood vessels serves the heart muscle. You can see some of these vessels on the outside of the ventricles. They are called coronary vessels. (They may look like lines.) Identify them now.
7. \_\_\_\_ Have your teacher check off and initial this step.

### Part B: Inside the Heart

Separate the two halves and lay them open on your pan.

8. \_\_\_\_ Find the ventricles. Each ventricle is a chamber with a muscular wall. The left ventricle has thicker walls than the right. In fact, the left ventricle is the largest structure of the heart. Identify the left ventricle now.
9. \_\_\_\_ The right ventricle is smaller than the left one. Identify the right ventricle now.

10. \_\_\_\_ The left atrium is above the left ventricle. Identify it now.
11. \_\_\_\_ The right atrium is above the right ventricle. Identify it now.
12. \_\_\_\_ Blood flows from the right atrium into the right ventricle. The right AV valve prevents the blood from going back into the atrium. Valves are flaps of connective tissue. These flaps are connected by the ventricles by threadlike tendons. Identify the right AV valve now on both halves of the heart as it may have been cut when separating the heart.
13. \_\_\_\_ Find the left AV valve on both halves of the heart as it may have been cut when separating the heart.
14. \_\_\_\_ Carefully hold up both halves of the heart. The large vessels are at the top of the heart. Identify the aorta and the pulmonary artery.
15. \_\_\_\_ Imagine that this heart is in your chest. Notice where the left and right sides are. Identify the front of your heart.
16. \_\_\_\_ Identify the back of your heart.
17. \_\_\_\_ Have your teacher check off and initial this step.
18. \_\_\_\_ Place your heart back on the tray. **THOROUGHLY CLEAN** your work space. **AFTER** cleaning your work space **NOTIFY YOUR TEACHER FOR APPROVAL.**
19. \_\_\_\_ Once your teacher has approved your work space, **ONLY NOW MAY YOU REMOVE YOUR GLOVES.** Wash and dry your hands thoroughly and return quietly to your assigned seat.
20. \_\_\_\_ Based on what you observed today, label the diagram below.



**Movie Focus Questions**  
**Circulatory System: The Plasma Pipeline**

1. What are the 2 main parts of the Circulatory System?
2. How many miles of blood vessels are in the body?
3. How many times does the heart beat each day?
4. How much does the heart weigh?
5. What are the upper chambers of the heart called? The bottom chambers?
6. What type of circulation is the right side of the heart responsible for? The left side?
7. What is the function of the heart valves?
8. What is blood pressure?
9. What is the name of the muscular wall that separates the left and right chambers?
10. What part of the nervous system controls the heartbeat?
11. How much blood is in the body and how many times a day does the blood pump through the heart?
12. What are the four main parts of blood?
13. What is the largest artery in the body?
14. What happens in the capillaries?
15. How are veins different than arteries?

16. What is the name of the largest vein?
17. What percent of the body's weight is blood?
18. What is the average temperature of blood?
19. Where are the 4 main areas of blood cell production in the adult skeleton?
20. How long do red blood cells live?
21. How long do white blood cells live?
22. What do platelets do for the body?
23. How long do platelets live?
24. What is plasma? What is in plasma?
25. What do lymph nodes do?
26. What is the function of the spleen?
27. What is another name for high blood pressure?
28. What is normal blood pressure? What blood pressure is considered high?
29. What are three things someone can do to treat high blood pressure?
30. What are three causes of heart disease?
31. Give 2 reasons exercise is so vital to your health.

# Circulation

## Part A. Understanding Ideas

On the line to the left, write the letter of your choice that best completes each statement.

1. \_\_\_\_\_ The purpose of a circulatory system is
  - a. to digest food.
  - b. for pickup and delivery.
  - c. to make blood.
2. \_\_\_\_\_ Your heart sounds are caused by
  - a. heart muscle.
  - b. heart valves opening.
  - c. heart valves closing.
3. \_\_\_\_\_ When blood gets to the lungs
  - a. oxygen is picked up and carbon dioxide is given off.
  - b. carbon dioxide is picked up and oxygen is given off.
  - c. carbon dioxide is picked up.
4. \_\_\_\_\_ Preventing heart problems can be helped by
  - a. proper diet.
  - b. not smoking.
  - c. exercise.
  - d. a, b, and c
5. \_\_\_\_\_ Which of the following does not help prevent heart problems?
  - a. smoking
  - b. exercise
  - c. a balanced diet
6. \_\_\_\_\_ A heart attack occurs when heart muscle does not receive enough
  - a. water.
  - b. carbon dioxide.
  - c. oxygen and nutrients.
7. \_\_\_\_\_ Cholesterol that coats the inside of arteries may cause
  - a. a heart murmur.
  - b. low blood pressure.
  - c. high blood pressure.

## Part B. Interpreting Ideas

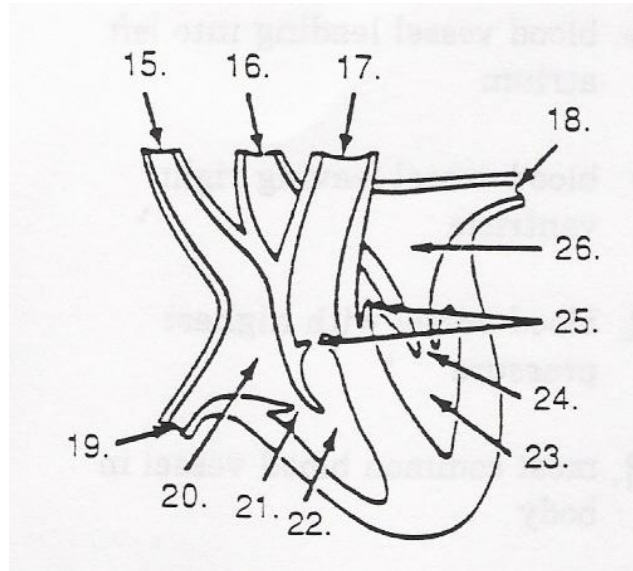
Show whether the phrases refer to arteries, veins, or capillaries by placing an A, V, or C in the blank.

8. \_\_\_\_\_ carries blood to the heart
9. \_\_\_\_\_ carries blood from the heart
10. \_\_\_\_\_ blood vessel with the thickest walls
11. \_\_\_\_\_ smallest kind of blood vessel
12. \_\_\_\_\_ carries blood away from capillaries
13. \_\_\_\_\_ has much smooth muscle in the wall
14. \_\_\_\_\_ brings oxygen and nutrients close to the cells

**Part C. Using Ideas**

Examine the heart diagram below. Label numbers 15 through 19 as either an artery or a vein. Then the write names of parts 20 through 26 in the spaces provided.

- 15. \_\_\_\_\_
- 16. \_\_\_\_\_
- 17. \_\_\_\_\_
- 18. \_\_\_\_\_
- 19. \_\_\_\_\_
- 20. \_\_\_\_\_
- 21. \_\_\_\_\_
- 22. \_\_\_\_\_
- 23. \_\_\_\_\_
- 24. \_\_\_\_\_
- 25. \_\_\_\_\_
- 26. \_\_\_\_\_



**Part D. Vocabulary Check**

Match the phrases in the right column with the terms in the left column. Write the correct letter on the line to the left of each term.

- |                              |   |
|------------------------------|---|
| 27. _____ aorta              | A. death of a section of heart muscle       |
| 28. _____ circulatory system | B. small top heart chambers                 |
| 29. _____ ventricles         | C. largest artery in the body               |
| 30. _____ valves             | D. keep blood flowing in one direction      |
| 31. _____ blood pressure     | E. carries blood from heart to lungs        |
| 32. _____ pulmonary artery   | F. blood, blood vessels and heart           |
| 33. _____ coronary vessels   | G. fatlike chemical found in certain foods  |
| 34. _____ heart attack       | H. force of blood pushing against vessels   |
| 35. _____ cholesterol        | I. carry blood to and from the heart itself |
| 36. _____ hypertension       | J. largest vein in body                     |
| 37. _____ atria              | K. force blood out of the heart             |
| 38. _____ vena cava          | L. disease caused by high blood pressure    |

### Part E. Using Ideas

Use the following choices for questions 39 – 51.

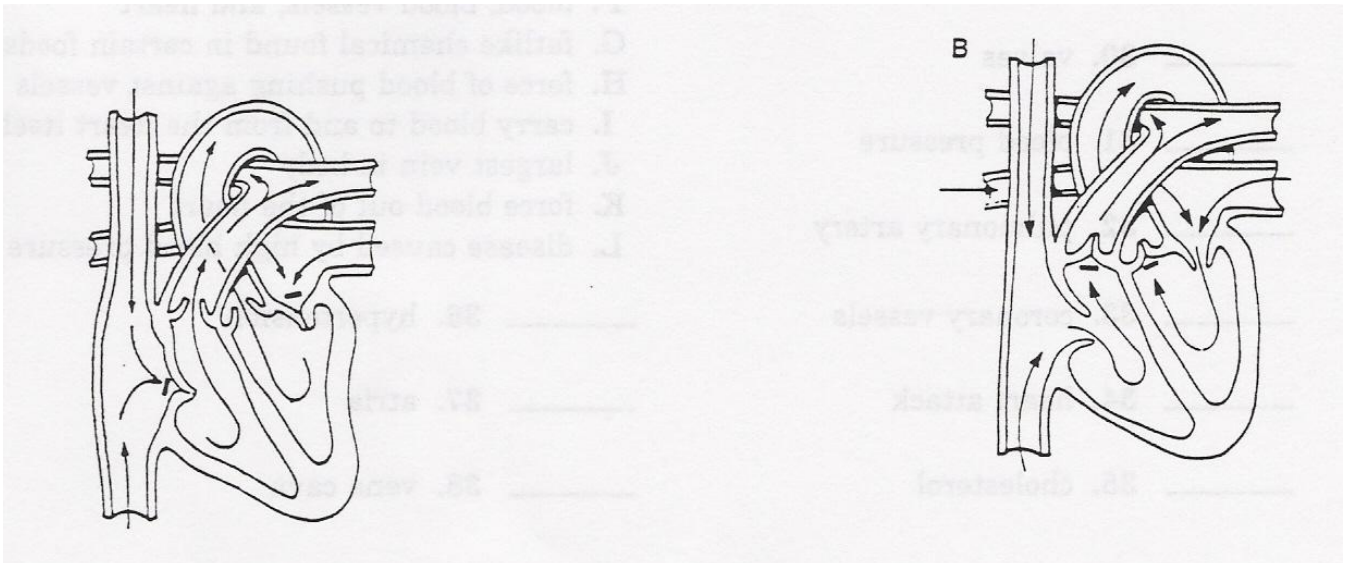
- a. artery      b. vein      c. capillary      d. artery, vein and capillary

39. \_\_\_\_\_ blood vessel leading into the right atrium  
40. \_\_\_\_\_ blood vessel carrying blood away from the heart  
41. \_\_\_\_\_ makes up part of the circulatory system  
42. \_\_\_\_\_ carries blood  
43. \_\_\_\_\_ carries blood to the heart  
44. \_\_\_\_\_ only one cell thick  
45. \_\_\_\_\_ place where blood delivers oxygen and food to cells  
46. \_\_\_\_\_ blood vessel leading into left atrium  
47. \_\_\_\_\_ blood vessel leaving right ventricle  
48. \_\_\_\_\_ blood vessel with highest pressure  
49. \_\_\_\_\_ most common blood vessel in body  
50. \_\_\_\_\_ thickest of all vessels  
51. \_\_\_\_\_ contains many one-way valves

### Part F. Making Observations

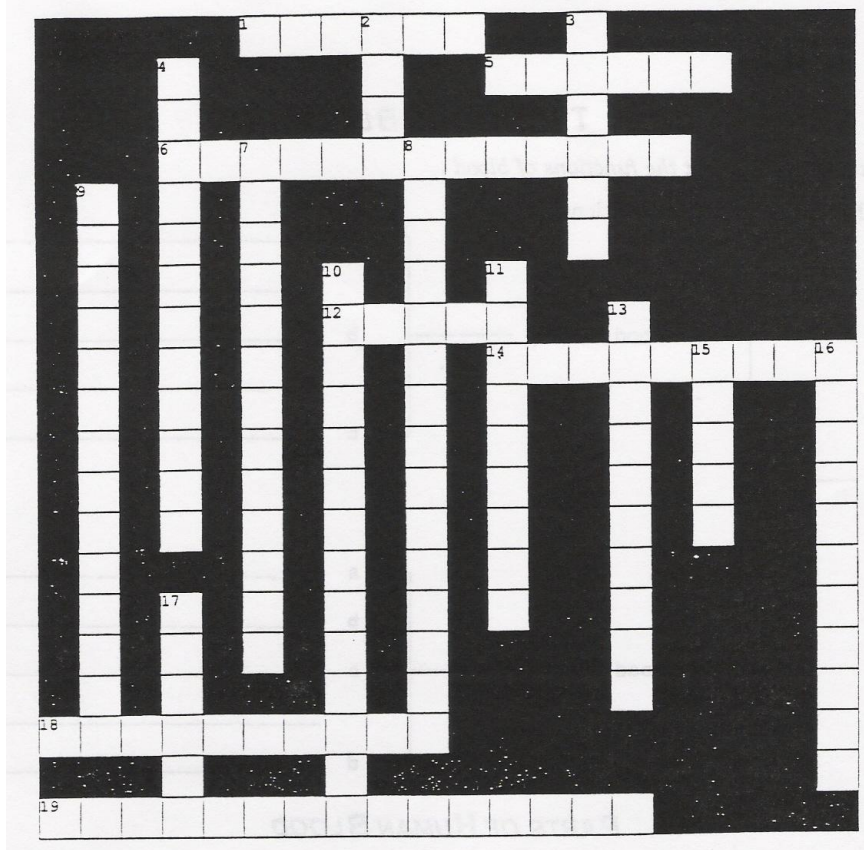
Select the letter of the diagram that correctly matches the following statements.

52. \_\_\_\_\_ the atria are pumping  
53. \_\_\_\_\_ semilunar valves are closed.  
54. \_\_\_\_\_ bicuspid and tricuspid valves are closed.  
55. \_\_\_\_\_ atria are relaxed  
56. \_\_\_\_\_ ventricles are pumping  
57. \_\_\_\_\_ ventricles are relaxed





## Crossword Review



### ACROSS

1. structures that keep blood from flowing backwards
5. when blood vessels in brain are blocked and brain matter dies
6. blood vessel that carries blood from the lungs to the heart
12. chambers of the heart that receive blood and send it to the ventricles
14. portion of the heart responsible for making the heart beat
18. chambers of the heart that pump out of the heart
19. blood vessel that carries blood from the heart to the lungs

### DOWN

2. type of blood vessel that carries blood to the heart
3. type of blood vessel that carries blood away from the heart
4. another term for high blood pressure
7. chamber that pumps blood to all parts of the body
8. when arteries become clogged with plaque
9. chamber that pumps blood to the lungs
10. name for disease that affects heart and blood vessels
11. type of blood vessel responsible for food and gas exchange with cells
13. chamber that receives blood from the lungs
15. main artery leading out of the left ventricle
16. chamber that receives blood from the body
17. wall separating the left and right sides of the heart

## More about Blood Types

The four major blood types do not occur equally in humans. Some blood types are rarer than others. The number of people with a certain blood type is one factor that determines how much of the blood supply can be safely transfused to people in need. Some people can safely receive blood from a larger percentage of the population than others. In the same way, some people can safely donate blood to a larger percentage of the population than others. The table below shows the percent of the U.S. population having each blood type.

Blood Type	Percent of Population	Can receive blood from Types	Percent of Population	Can Donate Blood to Types	Percent of Population
O	45%	O			
A	40%	A, O			
B	11%	B, O	56%	B, AB	15%
AB	4%	A, B, AB, O			

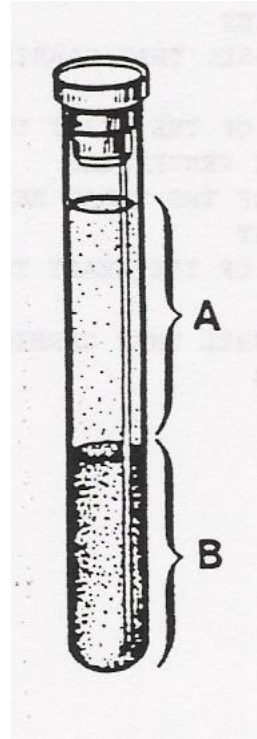
**Directions:** Answer the following questions

1. Since blood type B can receive blood from O (45%) and B (11%), blood type B can receive blood from 56% of the population ( $45\% + 11\% = 56\%$ ). Complete the rest of the table using the information given.
2. Which blood type is most rare? Which is most common?
3. People with type O blood are sometimes referred to as universal donors and people with type AB blood are sometimes referred to as universal recipients. Why do you think this is so?
4. What is the total percentage of the population that has A markers on red blood cells? What total percentage has B markers?
5. What is the total percentage of the population that has anti-A clumping proteins? What percentage has anti-B clumping proteins?
6. A patient with type AB blood needs a transfusion, but the hospital has run out of AB blood. Is this a problem? Explain.

## The parts of human blood

**Directions:** Examine the diagram of blood that has been sitting for an hour. Write the letter of the blood part being described in each of the words or phrases below.

1. \_\_\_\_\_ plasma
2. \_\_\_\_\_ liquid part
3. \_\_\_\_\_ blood cell part
4. \_\_\_\_\_ nonliving part
5. \_\_\_\_\_ living part
6. \_\_\_\_\_ mostly water
7. \_\_\_\_\_ includes cells that carry oxygen
8. \_\_\_\_\_ includes parts that aid in blood clotting
9. \_\_\_\_\_ includes proteins, nutrients, salts and wastes
10. \_\_\_\_\_ red
11. \_\_\_\_\_ yellow
12. \_\_\_\_\_ includes cells that destroy harmful microbes



**Directions:** Use the abbreviated versions given below to label each phrase or description. Use your textbook to help you find the correct information for each.

RBC = red blood cells

WBC = white blood cells PLT = platelets

- |   |   |
|---|---|
| <ol style="list-style-type: none"> <li>1. _____ 8,000 in a small drop of blood</li> <li>2. _____ 250,000 in a small drop of blood</li> <li>3. _____ 5 million in a small drop of blood</li> <li>4. _____ not whole cells</li> <li>5. _____ destroy microbes</li> <li>6. _____ aid in blood clotting</li> <li>7. _____ can move between capillaries and among body cells</li> <li>8. _____ increase during an infection</li> <li>9. _____ contain hemoglobin</li> <li>10. _____ remove dead cells</li> <li>11. _____ transport oxygen</li> </ol> | <ol style="list-style-type: none"> <li>12. _____ destroyed in spleen</li> <li>13. _____ if number is low, person feels tired</li> <li>14. _____ life span of 5 years</li> <li>15. _____ life span of 10 days</li> <li>16. _____ life span of 120 days</li> <li>17. _____ increase abnormally during leukemia</li> <li>18. _____ cell with a nucleus</li> <li>19. _____ cell with no nucleus</li> <li>20. _____ results in hemophilia if not working</li> <li>21. _____ look like doughnuts without holes</li> </ol> |
|---|---|

## 12-1 How Can Blood Diseases Be Identified?

Blood is a tissue. It has many different cells with many different jobs. If you look at blood under the microscope, you will find three different cell types—red cells, white cells, and platelets. In a normal person the numbers of types of blood cells are fairly constant. Sometimes, however, the number of cells will change due to a certain disease. Noticing this change in number can help a physician in the diagnosis of a person's disease.

### INTERPRETATION

### OBJECTIVES

In this exercise, you will:

- learn how to recognize three blood cell types.
- examine diagrams of blood samples from six hospital patients.
- match the blood samples with certain diseases.

### KEYWORDS

Define the following keywords:

diagnosis \_\_\_\_\_

platelet \_\_\_\_\_

red blood cell \_\_\_\_\_

white blood cell \_\_\_\_\_

### PROCEDURE

#### Part A. Normal Blood Cells

- Examine Figure 1, which shows human blood cells magnified 1000 times.
- Count each cell type present.  
HINT: To help avoid counting cells twice place a checkmark on each cell as you count.
  - red blood cells—round, very numerous, no nucleus.
  - white blood cells—round, few in number, larger than red blood cells, nucleus present.
  - platelets—dotlike, many but less than red cells, very small.

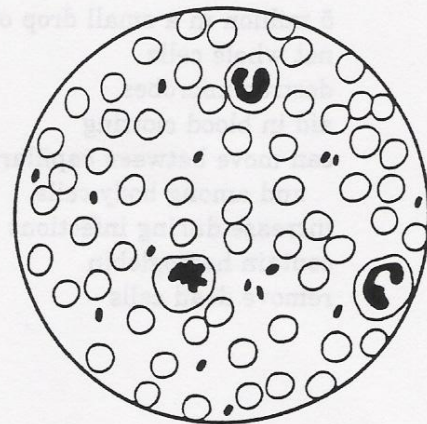


FIGURE 1. Normal blood sample

3. Record the number of each cell type for Figure 1 in Table 1. These numbers are for normal blood.
4. Using the numbers 1, 2, or 3, rank the cells in order from the most common (1) to the least common (3). Enter these rankings in the next column in Table 1 marked *Rank*.

**Part B. Examining Abnormal Blood Cells**

1. Examine Figures 2 to 6. These represent human blood samples from people with certain diseases.
2. Count each cell type and record the number for each sample in Table 1 under the right column.
3. Complete the rank columns using the numbers 1 to 3 as with the normal blood sample.

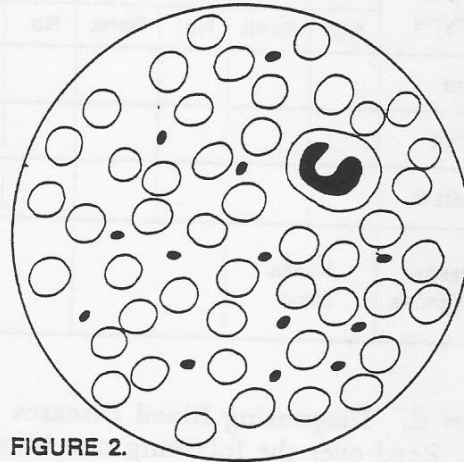


FIGURE 2.

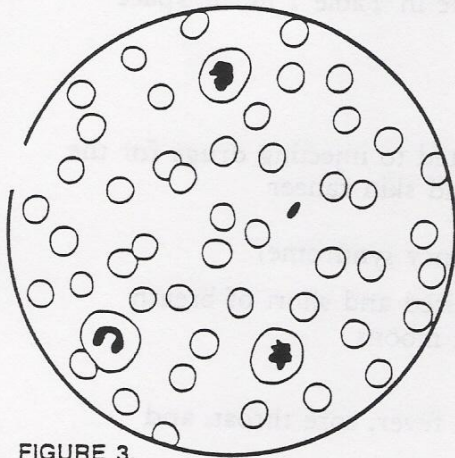


FIGURE 3.

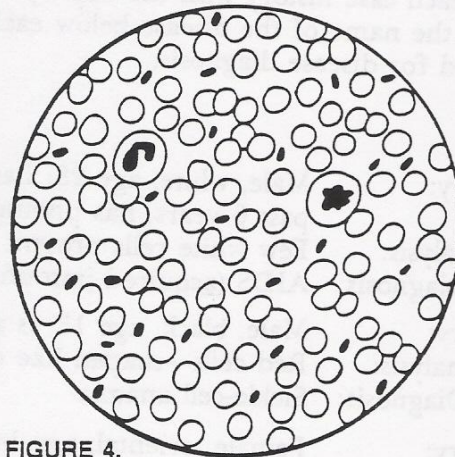


FIGURE 4.

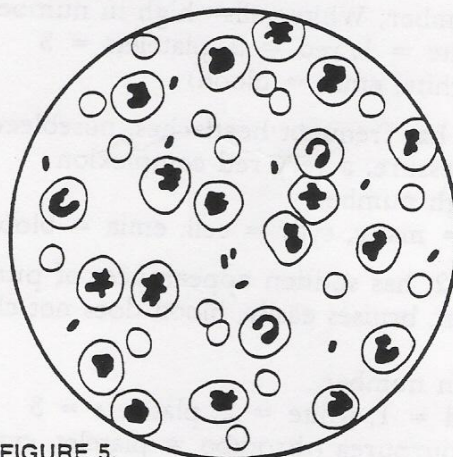


FIGURE 5.

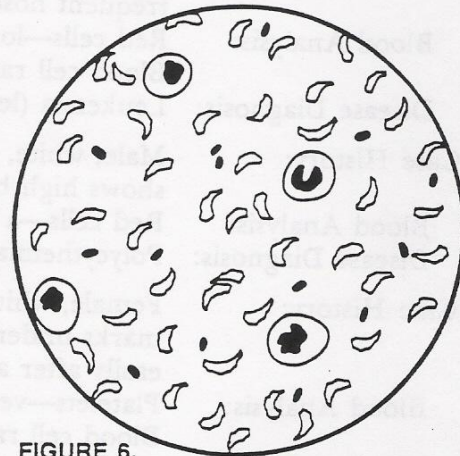


FIGURE 6.

**Table 1. Blood Cell Counts**

Cell type	Fig. 1		Fig. 2		Fig. 3		Fig. 4		Fig. 5		Fig. 6	
	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank
Red												
White												
Platelet												
Disease diagnosis	Normal blood											

**Part C. Diagnosing Blood Diseases**

1. Read over the following case histories for five hospital patients.
2. Match each case history with the appropriate blood sample.
3. Record the name of the disease below each sample in Table 1 in the space provided for disease diagnosis.

Case History: Male, white, age 28; has admitted to injecting drugs for the past 6 years, has pneumonia and skin cancer

Blood analysis: Few white cells present

Disease Diagnosis: AIDS (acquired immunodeficiency syndrome)

Case History: Male, black, age 15; is always tired and short of breath

Blood Analysis: Red cells—shaped like crescent moons

Disease Diagnosis: Sickle-cell anemia

Case History: Female, oriental, age 14; has a fever, sore throat, and frequent nosebleeds

Blood Analysis: Red cells—low in number; White cells—high in number  
Blood cell rank—white = 1, red = 2, platelets = 3

Disease Diagnosis: Leukemia (leuk = white, emia = blood)

Case History: Male, white, age 68; has frequent headaches, nosebleeds, shows high blood pressure, a very red complexion

Blood Analysis: Red cells—a very high number

Disease Diagnosis: Polycythemia (poly = many, cyth = cell, emia = blood)

Case History: Female, white, age 22; has sudden appearances of purple marks under the skin, bruises easily, blood does not clot easily after a cut

Blood Analysis: Platelets—very few in number

Blood cell rank—red = 1, white = 2, platelets = 3

Disease Diagnosis: Thrombocytopenia purpura (thrombo = platelet, cyto = cell, penia = shortage, purpura = purple)

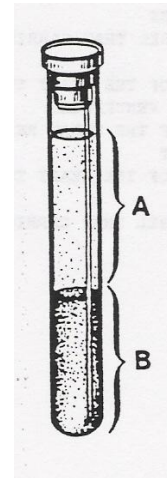
## QUESTIONS

1. What is the function of
  - a. red blood cells? \_\_\_\_\_
  - b. white blood cells? \_\_\_\_\_
  - c. platelets? \_\_\_\_\_
2. How many
  - a. red blood cells are in a drop of normal blood? \_\_\_\_\_
  - b. white blood cells are in a drop of normal blood? \_\_\_\_\_
  - c. platelets are in a drop of normal blood? \_\_\_\_\_
3. Rank your answers given to question 2 as to the most common (1) to the least common (3). \_\_\_\_\_
4. Do your rankings for normal blood in Table 1 agree with your answer to question 3? \_\_\_\_\_
5. Explain why a person with AIDS may also have pneumonia. (Keep in mind the main job of white blood cells). \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
6. The rank of blood cells in a normal person and one with polycythemia is the same. How can you conclude that the person has polycythemia? \_\_\_\_\_  
\_\_\_\_\_
7. The rank of blood cells in a normal person and one with sickle-cell anemia is the same. How can you conclude that the person has sickle-cell anemia? \_\_\_\_\_  
\_\_\_\_\_
8. Name a blood disease that shows
  - a. too many white blood cells \_\_\_\_\_
  - b. too few platelets \_\_\_\_\_
  - c. too few red blood cells \_\_\_\_\_
  - d. too many red blood cells \_\_\_\_\_
  - e. too few white blood cells \_\_\_\_\_
9. Explain why a person with thrombocytopenia purpura shows many bruises or purple marks. \_\_\_\_\_  
\_\_\_\_\_
10. Explain how the counting and appearance of blood cells can help in the diagnosis of blood diseases. \_\_\_\_\_  
\_\_\_\_\_

# REVIEW

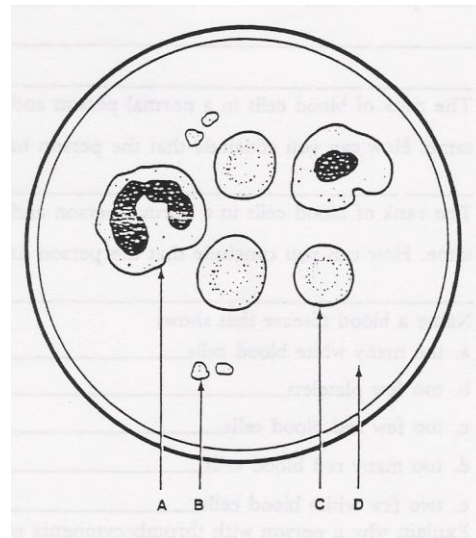
**Directions:** The diagram shows a tube of blood that has been sitting for an hour. Match the lettered parts labeled A and B with the phrases.

1. \_\_\_\_\_ blood plasma
2. \_\_\_\_\_ red in color
3. \_\_\_\_\_ blood cells
4. \_\_\_\_\_ living part of blood
5. \_\_\_\_\_ made of water, salts, food and wastes
6. \_\_\_\_\_ nonliving part of blood
7. \_\_\_\_\_ liquid part of blood



**Directions:** The diagram shows how blood might look through a high-power microscope. Match the lettered parts with the phrases on the left. Write the letter of the correct choice on the blank provided.

8. \_\_\_\_\_ white blood cell
9. \_\_\_\_\_ red blood cell
10. \_\_\_\_\_ platelet
11. \_\_\_\_\_ increases in an infection
12. \_\_\_\_\_ yellow liquid
13. \_\_\_\_\_ destroys bacteria
14. \_\_\_\_\_ lacks nucleus when mature
15. \_\_\_\_\_ carries oxygen
16. \_\_\_\_\_ important in clotting
17. \_\_\_\_\_ contains plasma proteins
18. \_\_\_\_\_ lives for about 120 days
19. \_\_\_\_\_ cell type that is related to anemia
20. \_\_\_\_\_ lives for about 10 days





# BLOOD

**Directions:** Write the letter of your choice that best completes the statement.

1. \_\_\_\_\_ Blood carries chemical wastes to the  
a. Brain                      b. kidneys                      c. skin                      d. stomach
2. \_\_\_\_\_ White blood cells can destroy  
a. Bacteria                      b. dead cells                      c. viruses                      d. a, b, and c
3. \_\_\_\_\_ Immunity is the body's way of protecting against  
a. Disease                      b. blood clots                      c. hemophilia                      d. anemia
4. \_\_\_\_\_ Mixing different blood types together may cause  
a. Leukemia                      b. anemia                      c. clumping                      d. a color change
5. \_\_\_\_\_ A healthy person has about \_\_\_\_\_ red cells in one drop of blood.  
a. 8,000                      b. 20,000                      c. 250,000                      d. 5,000,000
6. \_\_\_\_\_ A balanced diet will provide the body with the needed amount of  
a. Iron                      b. oxygen                      c. platelets                      d. carbon dioxide
7. \_\_\_\_\_ Blood is a kind of  
a. Cell                      b. tissue                      c. organ                      d. organ system
8. \_\_\_\_\_ Blood types are different because they have different  
a. Cells                      b. platelets                      c. hemoglobin                      d. proteins
9. \_\_\_\_\_ A person with \_\_\_\_\_ may have more than 100,000 white blood cells in one drop of blood.  
a. Anemia                      b. leukemia                      c. type A blood                      d. HIV/AIDS
10. \_\_\_\_\_ When you have an infection, \_\_\_\_\_ cells help destroy bacteria.  
a. white blood                      b. platelet                      c. hemoglobin                      d. red blood
11. \_\_\_\_\_ Blood will deliver which of the following to all your body cells?  
a. carbon dioxide                      b. waste                      c. oxygen                      d. body heat
12. \_\_\_\_\_ Blood will pick up which of the following from all your body cells?  
a. Oxygen                      b. waste                      c. nutrients                      d. platelets
13. \_\_\_\_\_ AIDS is caused by a(n) \_\_\_\_\_ that invades one kind of white blood cell.  
a. Bacterium                      b. virus                      c. amoeba                      d. fungus