Lesson 10.1: Learning the Key Terms

Directions: Place the letter of the best definition next to each key term.

1. buffy coat
2. coagulation
3. diapedesis
4. erythropoiesis
5. erythropoietin (EPO)
6. fibrin
7. formed elements
8. hematocrit
9. hemoglobin
10. hemolysis
11. hemostasis
12. plasma
13. platelet plug
14. platelets
15. red blood cells
16. white blood cells

A. the process by which red blood cells are produced
B. the process by which the enzyme thrombin and the protein fibrinogen combine to form fibrin, a fiber that weaves around the platelet plug to form a blood clot; takes between 2 and 15 minutes to complete
C. gathering of platelets that forms a small mass at the site of an injury
D. a long, thread-like fiber created by the combination of thrombin and fibrinogen; weaves around the platelet plug to form a blood clot
E. the percentage of total blood volume that is composed of red blood cells
F. part of the formed elements of the blood; contain hemoglobin, a protein responsible for oxygen and carbon dioxide exchange; also known as erythrocytes
G. the rupture of red blood cells as a result of disease or old age
H. the solid components of blood; red blood cells, white blood cells, and platelets
I. a thin layer of white blood cells and platelets that lies between the red blood cells and plasma in a blood sample that has gone through a centrifuge
J. part of the formed elements of the blood; fight infection and protect the body through various mechanisms
K. an essential molecule of the red blood cell that serves as the binding site for oxygen and carbon dioxide; composed of two molecules: globin and heme
L. the passage of blood or any of its formed elements through the blood vessel walls into body tissues
M. the sequence of events that causes a blood clot to form and bleeding to stop
N. a hormone secreted by the kidneys that stimulates the production of red blood cells
O. the liquid component of blood
P. part of the formed elements of the blood; play a vital role in blood clotting
Lesson 10.1: Study Questions

Directions: Answer the questions below on a separate sheet of paper. Studying the answers will help you prepare for the chapter test.

1. What are the three main functions of blood?
2. What does blood carry to the kidneys and to the lungs?
3. What is the basic structure of blood?
4. What percentages of the blood are composed of the formed elements and plasma?
5. What is hematocrit?
6. Why do athletes have higher blood volumes?
7. Why is the blood in arteries a brighter red than blood found in the veins?
8. What is the impact of thicker, or more viscous, blood?
9. Blood plasma contains three types of proteins: fibrinogen, albumin, and globulin. What functions do these proteins perform?
10. Which protein(s) help with blood clot formation?
11. What causes the composition of blood to vary minute to minute?
12. Where are blood cells manufactured?
13. Which type of blood cell conducts gas exchange?
14. Why is hemoglobin known as the binding site?
15. Explain the process of erythropoiesis and its purpose.
16. What substances, vitamins, and minerals are needed for RBC production?
17. Describe the process and function of phagocytosis.
18. What part of blood is responsible for immune responses such as producing antibodies?
19. How do the five white blood cells differ in function?
20. What are the four steps of hemostasis?
21. As a blood clot retracts, what is happening to the fibrin threads?
Lesson 10.1: Identifying Blood Cells

**Directions:** Label the figure with the appropriate callouts from the list provided.

basophil
eosinophil
lymphocyte
monocyte
neutrophil
platelets
red blood cells
red bone marrow
white blood cells
yellow bone marrow

1.  
2.  
3.  
4.  
5.  
6.  
7.  
8.  
9.  
10.
Lesson 10.1: The Stages of Hemostasis

Directions: Label the figure with the appropriate callouts from the list provided. Identify the stages of hemostasis and the events happening during each step of the process.

blood clot formation
chemicals released by platelets
clotting factors released
collagen fibers exposed
endothelin release
causes constriction
platelet adhesion
platelet aggregation
platelet plug formation and coagulation
platelets cluster to repair wall
platelets gather
RBCs and WBCs are trapped in mesh
release of coagulation inhibitors and other chemicals
site of injury
tissue factor released
vessel wall injury and constriction
Lesson 10.2: Learning the Key Terms

Directions: Use the terms listed below to fill in the sentence blanks.

agglutination  antigen  Rh factor  universal donor
antibody  erythroblastosis fetalis  RhoGAM  universal recipient

1. A(n) _____________________________ is a cell that circulates in plasma and attacks red blood cells with foreign antigens.
2. _____________________________ is an immune serum that prevents a mother’s blood from becoming sensitized to foreign antibodies from her fetus.
3. _____________________________ is the antigen of the Rh blood group that is found on the surface of red blood cells; people with this are “positive” (+) and those lacking it are “negative” (–).
4. A person with type AB blood is a(n) _____________________________, since type AB blood has neither A nor B antibodies, meaning the person can safely receive a transfusion of any blood type.
5. The process by which red blood cells clump together, usually in response to an antibody, _____________________________.
6. A severe hemolytic disease of a fetus or newborn caused by the production of maternal antibodies against the fetal red blood cell antigens, _____________________________ usually involves Rh incompatibility between the mother and fetus.
7. Type O blood has no antigens that can be attacked by the host’s blood, so a(n) _____________________________ is a person with type O blood.
8. A protein on the surface of RBCs that is used to identify blood type, a(n) _____________________________ is a molecule on the surface of cells that identifies cells as either “self” or “nonself” (foreign) cells.
Lesson 10.2: Study Questions

Directions: Answer the questions below on a separate sheet of paper. Studying the answers will help you prepare for the chapter test.

1. What are the four blood types?
2. What makes blood types different from each other?
3. Are blood type distributions roughly the same in all the world’s countries?
4. The presence (or absence) of which type of molecule helps the body distinguish its own cells from foreign invaders?
5. What blood types might a child have if her parents are type AB and type O?
6. What blood types might a child have if his parents are both type AB?
7. What happens when there are foreign antigens in a body?
8. Explain why people with type AB blood are universal recipients.
9. How does type O blood differ from type AB blood?
10. What happens when a person is transfused with a blood type that conflicts with their own?
11. What type(s) of blood can a type A blood person receive?
12. What is the Rh factor?
13. Besides blood transfusions, what other condition can sensitize the body to the Rh factor?
14. What test is available to help detect blood diseases and disorders?
Lesson 10.2: Blood Type Family Tree

**Directions:** Create a family tree for your family featuring each member’s blood type. Include as many family members as you can—siblings, parents, aunts, uncles, grandparents, and even cousins. If you do not know a family member’s blood type, determine which types would be possible based on the blood types of other relatives. For example, if you know your Aunt Lori has O blood, but your Uncle Mike has type A blood, you know that their daughter Brooke must have either type O or type A blood. A sample is provided for your reference.
Lesson 10.3: Learning the Key Terms

Directions: Place the letter of the best definition next to each key term.

1. acute lymphocytic leukemia (ALL) - A. a procedure in which excess metals, such as iron, are removed from the blood
2. acute myeloid leukemia (AML) - B. the drawing of blood; a standard treatment for polycythemia
3. anemia - C. the most common anemia; caused by an insufficient dietary intake of iron, loss of iron from intestinal bleeding, or iron-level depletion during pregnancy
4. aplastic anemia - D. a condition in which blood does not clot properly due to the absence of a clotting factor
5. chelation therapy - E. a form of leukemia characterized by overproduction of granulocytes
6. chronic lymphocytic leukemia (CLL) - F. a severe anemia caused by the inability of the intestines to absorb vitamin $B_{12}$, which is essential for the formation of red blood cells; usually develops in older adults
7. chronic myeloid leukemia (CML) - G. the most common form of leukemia in adults over 70 years of age; characterized by overproduction of lymphocytes
8. Cooley’s anemia - H. a condition that affects the body’s ability to produce fully developed hemoglobin and red blood cells
9. hemophilia - I. a cancer of the plasma cells in bone marrow
10. iron-deficient anemia - J. a rare but serious condition in which the bone marrow is incapable of making new red blood cells
11. jaundice - K. a blood disorder characterized by yellow-colored skin and whites of the eyes
12. leukemia - L. a disease in which the red blood cells are shaped like a sickle, or crescent, rather than a disk; caused by irregularly shaped hemoglobin molecules in the red blood cells
13. multiple myeloma - M. a form of leukemia characterized by extremely high levels of lymphocytes; most often found in middle-age adults
14. pernicious anemia - N. a condition in which the bone marrow manufactures too many red blood cells; caused by prolonged altitude exposure and a genetic mutation
15. phlebotomy - O. the most common form of leukemia in adults; develops when the bone marrow produces too many myeloblasts
16. polycythemia - P. a condition characterized by a decrease in the number of red blood cells or an insufficient amount of hemoglobin in the red blood cells
17. sickle cell anemia - Q. a cancer caused by the production of an extremely high number of immature white blood cells in the bone marrow
Lesson 10.3: Study Questions

Directions: Answer the questions below on a separate sheet of paper. Studying the answers will help you prepare for the chapter test.

1. What happens to red blood cells in a patient with anemia?
2. What are the three main causes of anemia?
3. List the types of acquired anemias.
4. What is the most common type of anemia? How prevalent is it?
5. Describe three causes of iron-deficient anemia.
6. What causes aplastic anemia?
7. Describe pernicious anemia, including its causes and symptoms.
8. What are some of the chronic conditions than can contribute to the development of anemia?
9. Which two anemias are inherited conditions?
10. Describe how sickle cell anemia affects the red blood cells. What serious effects can this disease have?
11. Why are sickle cell anemia patients prone to stroke?
12. What effect does Cooley’s anemia have on the blood? How is this disease treated?
13. What is the danger of frequent transfusions for patients with Cooley’s anemia?
14. What symptoms characterize jaundice?
15. If you are missing a clotting factor for coagulation, what condition are you suffering from?
16. Polycythemia is a condition in which the bone marrow manufactures too many red blood cells. How is this a threat to a patient’s health?
17. How do the symptoms of acute and chronic leukemia differ?
19. Why does multiple myeloma often lead to bone fractures and bone pain?
Chapter 10: Inspiring Others to Donate Blood

Directions: Design a poster or PowerPoint presentation to convince people to donate blood. You will need to do research using your school’s library or online sources to provide convincing statistics and information. The following questions and topics should guide your research. Be as creative as you can when designing your presentation or poster—remember the goal is to inspire people to donate blood. Brainstorm your ideas in the space provided below.

Supply
What are the needs of blood banks and hospitals on a daily, weekly, or annual basis? How frequently are there insufficient blood supplies?

Overcoming objections
What could some objections be to donating blood? risk of infection? or are needles just scary?

How to give and help
Research and provide links or contact information for people to donate blood. Be aware that some people cannot donate blood, although they want to. Are there alternatives for such individuals?
**Purpose**
In this activity you will learn more about blood by identifying its components.

**Materials**
your textbook, your body

**Procedure**

**Blood Components**
1. Label the following blood components in the diagram below: platelets, white blood cells, plasma, red blood cells, blood vessel.

   ![Diagram of blood components]

   A. ____________________________  B. ____________________________

   C. ____________________________  D. ____________________________  E. ____________________________

2. What process was used to change a whole blood sample into what is shown in the test tube diagram below? ______________________________________________________________________________________

3. What is the blood sample called after this process (#2)? __________________________________________

4. Draw an arrow to and label the following portions in the tube: buffy coat, formed elements, plasma.

5. What percent of this sample is made up of red blood cells? __________________________

6. What percent of this sample is made up of white blood cells and platelets? __________________________

7. What percent of this sample is plasma? __________________________
Blood Type

Determine the blood type from the following erythrocytes. In the chart below, list the blood type, the antigens present on the surface of the erythrocyte, and the antibodies in the plasma.

Key: △ “A antigen”  ◆ “B antigen”

<table>
<thead>
<tr>
<th>Blood Type</th>
<th>Antigen(s)</th>
<th>Antibodies</th>
</tr>
</thead>
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<td><img src="image11.png" alt="Image" /></td>
<td><img src="image12.png" alt="Image" /></td>
</tr>
</tbody>
</table>

Conclusions

List the components of the buffy coat.

1. _______________________________________________________________________________________
2. _______________________________________________________________________________________

List the plasma proteins and function of each.

3. _______________________________________________________________________________________
4. _______________________________________________________________________________________
5. _______________________________________________________________________________________
6. _______________________________________________________________________________________
7. _______________________________________________________________________________________

List the granular leukocytes.

8. _______________________________________________________________________________________
9. _______________________________________________________________________________________
10. _____________________________________________________________________________________

List the agranular leukocytes.

11. _____________________________________________________________________________________
12. _____________________________________________________________________________________
13. What blood type is the universal donor? ________________________________
14. What blood type is the universal recipient? ________________________________
15. What blood type is not possible in the offspring of two AB parents? _____________________
Chapter 10 Practice Test

Completion: Carefully read the following statements. Write the term that completes the statement in the spaces provided.

1. _____________________________ is a pale yellow fluid of the blood composed of 90% water.
2. _____________________________ produce antibodies helpful to immune responses.
3. _____________________________ allow the body to distinguish between its own cells and any foreign cells.
4. A person with type AB blood is called a(n) _____________________________.
5. Yellow-colored skin and whites of the eyes are characteristics of _____________________________.

True/False: Indicate whether each statement below is true or false by circling either T or F.

T F 6. Oxygen and carbon dioxide attach to the white blood cells.
T F 7. Transportation, regulation, and protection are the three main functions of blood.
T F 8. People with type O blood are universal donors because they have both antigens A and B in their red blood cells.
T F 9. If one of the two parents has AB blood, the child cannot have type O blood.
T F 10. Some diseases and disorders of the blood are caused by environmental factors, poor diet, or even old age.

Multiple Choice: Circle the correct answer.

11. To what organ does blood carry waste?
   A. kidneys          C. heart
   B. liver            D. stomach

12. Which white blood cells are “first responder” active phagocytes?
   A. basophils
   B. eosinophils      C. lymphocytes
   D. neutrophils

13. What does a complete blood count (CBC) measure?
   A. RBCs and WBCs
   B. RBCs, WBCs, and marrow volume
   C. RBCs, WBCs, and platelets
   D. RBCs, WBCs, marrow volume, and platelets

14. Which anemia is caused by the inability of the intestines to absorb vitamin B_{12}?
   A. anemia caused by chronic disease
   B. pernicious anemia
   C. aplastic anemia
   D. iron-deficient anemia

15. Which form of leukemia is characterized by overproduction of granulocytes?
   A. chronic myeloid leukemia (CML)
   B. chronic lymphocytic leukemia (CLL)
   C. acute myeloid leukemia (AML)
   D. acute lymphocytic leukemia (ALL)
Matching: Match each key term to its definition by writing the letter of the definition in the space provided.

16. erythroblastosis fetalis  
A. long and thread-like, this weaves around the platelet plug to form a blood clot

17. hemoglobin  
B. the solid components of blood; red blood cells, white blood cells, and platelets

18. antibody  
C. an essential molecule of the red blood cell that serves as the binding site for oxygen and carbon dioxide

19. leukemia  
D. part of the formed elements of the blood, it plays a vital role in blood clotting

20. formed elements  
E. the process by which red blood cells clump together, usually in response to an antibody; can block small blood vessels and cause hemolysis

21. polycythemia  
F. a cell that circulates in plasma and attacks red blood cells with foreign antigens, or antigens that are different from those of the host

22. anemia  
G. a severe hemolytic disease of a fetus or newborn caused by the production of maternal antibodies against the fetal red blood cell antigens

23. fibrin  
H. a condition characterized by a decrease in the number of red blood cells or an insufficient amount of hemoglobin in the red blood cells

24. platelets  
I. a cancer caused by the production of an extremely high number of immature white blood cells in the bone marrow

25. agglutination  
J. a condition in which the bone marrow manufactures too many red blood cells; caused by prolonged altitude exposure and a genetic mutation

Art Labeling: Locate each of the following items on the drawing by placing the corresponding letter on the blanks provided.

26. platelets
27. plasma
28. neutrophil
29. hematocrit
30. eosinophil
31. red blood cells
32. buffy coat
33. lymphocyte
34. monocyte
35. basophil

Short Answer: Answer the following questions using what you have learned in this chapter.

36. Explain how blood cells are manufactured.

37. What purpose does the collapsed center of the red blood cell serve?