ANSWERS TO CHAPTER 11

CONTENT LEARNING ACTIVITY

Plasma
1. Plasma; 2. Water; 3. Albumin and sodium ions; 4. Globulins; 5. Fibrinogen

Formed Elements
1. Erythrocytes; 2. Platelets; 3. Hematopoiesis

Erythrocytes
A. 1. Nucleus; 2. Hemoglobin; 3. Heme; 4. Globin; 5. Carbonic anhydrase
B. 1. Proerythroblasts; 2. Erythropoietin; 3. Increases; 4. Macrophages; 5. Bilirubin; 6. Jaundice
C. 1. Hemoglobin; 2. Heme; 3. Globin; 4. Iron; 5. Bilirubin

Leukocytes and Platelets
1. Ameboid movement; 2. Granulocytes; 3. Neutrophil; 4. Basophil; 5. Eosinophil; 6. Lymphocyte; 7. Monocyte; 8. Platelet; 9. Megakaryocytes

Preventing Blood Loss
A. 1. Smooth muscle; 2. Integrins; 3. Thromboxane; 4. Fibrinogen; 5. Prothrombinase; 6. Thrombin; 7. Fibrin; 8. Clot
B. 1. Anticoagulant; 2. Clot retraction; 3. Serum; 4. Fibrinolysis; 5. Plasmin; 6. t-Pa; 7. Thrombus; 8. Embolus

Blood Grouping
A. 1. Transfusion; 2. Antigens; 3. Antibodies; 4. Agglutination; 5. Hemolysis; 6. Blood groups
B. 1. Type A blood; 2. Type O blood; 3. Recipient; 4. Type O blood; 5. No reaction; 6. Transfusion reaction
C. 1. Rh-positive; 2. Hemolytic disease of the newborn; 3. Rh-positive; 4. Rh-negative; 5. Anti-Rh_O(D)

Diagnostic Blood Tests
1. Type and cross match; 2. Complete blood count; 3. Red blood cell count; 4. Hematocrit; 5. White blood cell count; 6. White blood cell differential; 7. Platelet count; 8. Prothrombin time; 9. Blood chemistry

QUICK RECALL

1. Functions of blood: 1. Transport of gases, nutrients, and waste products; 2. Transport of processed molecules; 3. Transport of regulatory molecules; 4. Regulation of pH and osmosis; 5. Maintenance of body temperature; 6. Protection against foreign substances; 7. Clot formation
2. Heme: Transports oxygen. Iron in heme is reused to produce new hemoglobin, the rest of heme becomes bilirubin which is excreted in bile; Globin: Transports carbon dioxide. Broken down into amino acids
3. Blood oxygen decrease results in increased erythropoietin release from the kidneys. Erythropoietin stimulates erythrocyte production.
4. Neutrophil - phagocytosis; basophil - stimulates inflammation; eosinophil - inhibits inflammation; lymphocyte - immune response, e.g., antibody production; monocyte - becomes a macrophage (a large phagocytic cell)
5. Platelet plug; release chemicals necessary for the chemical reactions of clotting
6. Prothrombinase converts prothrombin to thrombin. Thrombin converts fibrinogen to fibrin.
7. Antigens on the surface of erythrocytes react with antibodies in the plasma. As a result, erythrocytes clump (agglutination) or rupture (hemolysis).

WORD PARTS

1. erythrocyte; proerythroblast; erythropoietin
2. leukocyte; leukemia
3. thrombocyte; prothrombin; thrombin; thrombus
4. hematopoiesis; erythropoietin
5. hemoglobin; hematocrit; hematopoiesis; hemophilia
6. basophil; eosinophil; neutrophil; hemophilia

MASTERY LEARNING ACTIVITY

1. E. Blood performs all the functions listed.

2. D. Platelets are formed elements.

3. D. Erythrocytes do not have a nucleus. They are the most numerous formed element, are disk-shaped cells, and are produced in red bone marrow.

4. D. Heme is involved with oxygen transport, and globin with carbon dioxide transport. Carbonic anhydrase is an enzyme involved in the chemical reaction that transforms carbon dioxide into bicarbonate ion for transport.

5. C. Decreased blood oxygen levels stimulates the release of erythropoietin from the kidneys. The erythropoietin stimulates erythrocyte production in red bone marrow.

6. B. Globin is broken down into amino acids that can be used to synthesize proteins. Heme is broken down into bilirubin and iron. The iron can be reused to form new hemoglobin molecules.

7. C. The most common leukocytes are neutrophils. They phagocytize microorganisms and other substances.

8. B. Monocytes give rise to macrophages. They are the largest-sized leukocytes and are a type of agranulocyte.

9. B. Eosinophils inhibit inflammation, whereas basophils promote inflammation.

10. B. During platelet adhesion, platelets stick to collagen exposed by blood vessel damage. This activates platelets, and in the platelet release reaction, they release ADP and thromboxanes, which activate additional platelets. In platelet aggregation, the activated platelets express integrins, called fibrinogen receptors, which bind the platelets together to form a platelet plug.

11. D. Exposure to collagen fibers in a torn blood vessel results in chemical reactions that lead to the production of prothrombinase. Prothrombinase converts prothrombin to thrombin. Thrombin converts fibrinogen into fibrin, the clot.

12. D. Plasminogen is converted into plasmin, which breaks down the clot. Antithrombin and heparin are anticoagulants. Fibrinogen is converted into fibrin, which forms a clot.

13. A. Type AB blood has A and B antigens, but no A or B antibodies. If type AB blood is given to a person with type O blood, the A and B antibodies in the type O blood react with the A and B antigens in the type AB blood to cause a transfusion reaction.

14. C. The anti- Rh_o (D) is antibodies that bind to any Rh-positive erythrocytes from the fetus that may have entered the mother's blood. This prevents the mother from becoming sensitized to the Rh-positive antigen.

15. B. The hemoglobin test determines the amount of hemoglobin in a given volume of blood. Anemia can be caused by reduced amounts of hemoglobin.

FINAL CHALLENGES

1. Impairment of kidney function can result in decreased erythropoietin production. Thus erythrocyte production decreases and anemia can result. If a tumor causes overproduction of erythropoietin, polycythemia can result.

2. When a person accustomed to living at sea level moves to a higher altitude, there is a decreased ability to get enough oxygen. This can seriously impair athletic performance. The low blood oxygen, however, stimulates erythropoietin release from the kidneys, which increases erythrocyte production. After enough erythrocytes are produced, they increase the ability of the blood to pick up oxygen, and athletic performance improves.

3. In hemolytic disease of the newborn, Rh antibodies from the mother enter the blood of the fetus and cause agglutination and hemolysis of fetal erythrocytes. The donor's Rh-negative blood has no Rh antigens to trigger these reactions, so the donor's erythrocytes are not destroyed. They can function to carry oxygen and carbon dioxide until they wear out.

4. The mother should include adequate amounts of vitamin B_{12} and folic acid (to ensure erythrocyte production), iron (to ensure hemoglobin production), and vitamin K (to ensure proper blood clotting).