1. General Characteristics of Blood

Write the answers that match the statements in the spaces at the right.

1) pH range of the blood. __________
   7.35–7.45

2) Liquid portion of blood. __________
   Plasma

3) Blood cells and platelets. __________
   Formed elements

4) Percentage of blood formed by liquid portion. __________
   55%

5) Percentage of blood formed by RBCs, WCBs, and platelets. __________
   45%; <1%

6) Average range of blood volume in males. __________
   5–6 liters

7) Average range of blood volume in females. __________
   4–5 liters

8) Basic function of blood. __________
   Transport of materials

2. Red Blood Cells

Write the answers that match the statements in the spaces at the right.

1) Shape of erythrocytes. __________
   Biconcave disks

2) Red pigment in erythrocytes. __________
   Hemoglobin

3) Primary function of RBCs is transport of _____. __________
   Oxygen and carbon dioxide

4) Iron-containing portion of hemoglobin. __________
   Heme

5) Normal range of RBCs/mm³ in males. __________
   4.6–6.0 million

6) Normal range of RBCs/mm³ in females. __________
   4.2–5.0 million

7) Tissue-forming RBCs in children and adults. __________
   Red bone marrow

8) Hormone-stimulating RBC production. __________
   Erythropoietin

9) Organs releasing the hormone that stimulates RBC production. __________
   Kidneys, liver

10) Organ producing intrinsic factor. __________
    Stomach

11) Vitamins required for RBC production. __________
    B₁₂, folic acid

12) Intrinsic factor enables absorption of _____. __________
    Vitamin B₁₂

13) Cells from which RBCs originate. __________
    Hemocytoblasts

14) Average life span of RBCs. __________
    120 days

15) Organs where old RBCs are destroyed. __________
    Spleen; liver

16) Phagocytic cells destroying RBCs. __________
    Macrophages

17) Portion of heme that is recycled. __________
    Iron-containing portion

18) Portion of heme that is excreted. __________
    Non-iron portion

19) Organ where heme breakdown occurs. __________
    Liver
3. White Blood Cells

a. Write the answers that match the statements in the spaces at the right.

1) Cell from which WBCs originate. ____________________________________________

2) Normal range of WBCs/mm$^3$ of blood. _______________________________________

3) Basic function of WBCs is defense against _______. ____________________________

4) Where most functions of WBCs occur. _________________________________________

5) Group of WBCs with cytoplasmic granules. _____________________________________

6) Group of WBCs lacking these granules. _________________________________________

7) WBCs with lavender-staining granules. _________________________________________

8) WBCs with blue-staining granules. ____________________________________________

9) Largest leukocytes. __________________________________________________________

10) Smallest leukocytes. ________________________________________________________

11) WBCs with red-staining granules. ____________________________________________

12) Form 20% to 25% of WBCs. ________________________________________________

13) Migrate into tissues to become macrophages. _________________________________

14) First WBCs attracted from blood into damaged tissues. _______________________

15) WBCs that move into tissues to complete clean-up of tissue damage. ___________

16) Form 60% to 70% of leukocytes. _____________________________________________

17) Release histamine in allergic reactions. ______________________________________

18) WBCs that neutralize histamine. _____________________________________________

19) Become mast cells after entering tissues. ______________________________________

20) Destroy parasitic worms. __________________________________________________

21) Produce antibodies. ________________________________________________________

22) Compose 3% to 8% of leukocytes. __________________________________________

23) Compose 0.5% to 1.0% of leukocytes. _________________________________________

24) Compose 2% to 4% of leukocytes. ___________________________________________

25) Two major phagocytic WBCs. ______________________________________________

b. Use colored pencils to draw these white blood cells as they appear after staining.
4. Platelets

Write the answers that match the statements in the spaces at the right.

1) Alternate name for platelets.
   **Thrombocytes**

2) Size compared to size of RBCs.
   **Much smaller**

3) Number of platelets per mm$^3$ of blood.
   **256,000–500,000**

4) Cells that fragment to form platelets.
   **Megakaryocytes**

5) Two functions of platelets.
   **Plug broken vessels**
   **Start clot formation**

5. Plasma

Write the answers that match the statements in the spaces at the right.

1) Constitutes over 90% of plasma.
   **Water**

2) General term for dissolved substances.
   **Solute**

3) Most abundant plasma proteins.
   **Albumins**

4) Plasma proteins that are antibodies.
   **Globulins**

5) Plasma protein converted into fibrin.
   **Fibrinogen**

6) Plasma proteins transporting lipids.
   **Globulins**

7) Plasma proteins helping to regulate pH and osmotic pressure of the blood.
   **Albumins**

8) Organ forming most plasma proteins.
   **Liver**

9) Nitrogenous wastes of protein breakdown.
   **Urea; uric acid**

10) Collective term for inorganic ions in the blood plasma.
    **Electrolytes**

6. Hemostasis

Write the answers that match the statements in the spaces at the right.

1) Three processes of hemostasis in order of occurrence.
   **Blood vessel spasm**
   **Platelet plug formation**
   **Blood clot formation**

2) Constriction of damaged blood vessel.
   **Blood vessel spasm**

3) Formed elements that temporarily plug break in damaged blood vessel.
   **Platelets**

4) Substance released by platelets and damaged tissues that starts clotting process.
   **Prothrombin activator**

5) Electrolyte required for clotting to occur.
   **Ca$^{++}$**

6) Threadlike strands forming a blood clot.
   **Fibrin**

7) Cells that enter clot to form new connective tissue and repair damage.
   **Fibroblasts**

8) Enzyme converting fibrinogen into fibrin.
   **Thrombin**
7. Human Blood Types

Write the answers that match the statements in the spaces at the right.

1) Location of antigens used in blood typing. On RBCs
   - A
   - AB
   - None
   - Anti-A
   - Anti-A, anti-B
   - Anti-Rh

2) Location of antibodies against blood typing antigens. In Plasma
   - Anti-A
   - Anti-B

3) Antigen(s) in type A blood. None
4) Antigen(s) in type AB blood. None
5) Antigen(s) in type O blood. None
6) Antibodies in type B blood. Anti-A
7) Antibodies in type AB blood. Anti-A, anti-B
8) Antibodies in type O blood. Anti-Rh
9) Antibodies in Rh− blood of person sensitized to the Rh antigen. Erythroblastosis fetalis
10) Caused by maternal anti-Rh antibodies binding with Rh antigens on fetal RBCs.

8. Disorders of the Blood

Write the answers that match the statements in the spaces at the right.

1) Reduced ability to form blood clots. Hemophilia
2) Reduced capacity to carry oxygen. Anemia
3) An excessive concentration of erythrocytes. Polycythemia
4) Infection of lymphocytes by Epstein-Barr virus. Infectious mononucleosis
5) Anemia due to a deficiency of iron. Nutritional anemia
6) Cancer producing excess of leukocytes. Leukemia
7) Anemia due to inability to absorb vitamin B₁₂. Pernicious anemia
8) Anemia due to excessive bleeding. Hemorrhagic anemia
9) Anemia due to sickling of erythrocytes. Sickle-cell anemia
10) Anemia due to premature rupture of RBCs. Hemolytic anemia
11) Anemia due to loss of red bone marrow. Aplastic anemia
12) Fetal blood contains erythroblasts. Erythroblastosis fetalis

9. Clinical Applications
   a. A person can receive platelets from anyone, no matter the blood type. How is this possible? _______
      Platelets do not have antigens on their surfaces.
   b. Chemotherapy is often used to destroy the rapidly dividing cells of a cancer. What impact would chemotherapy have on the production of blood cells? Blood cell production would decrease.
      Explain. Some dividing cells in red bone marrow would be killed by the chemotherapy.
   c. Mary’s blood type is A, Rh−. She is at the hospital for delivery of her second child, and her first child is Rh+. The attending physician wants blood available in case the baby exhibits erythroblastosis fetalis upon delivery. What blood type should he order? O, Rh−
      Explain. O, Rh− is acceptable by all blood types. Maternal anti-Rh antibodies in fetal blood will not destroy O, Rh− RBCs.