

Blood

Composition of Blood

1. What is the blood volume of an average-size adult male? 5-6 liters An average adult female? 4-5 liters
2. What determines whether blood is bright red or a dull brick-red? level of oxygenation, the more oxygen it carries, the more bright red the blood is.

3. Use the key to identify the cell type(s) or blood elements that fit the following descriptive statements. Some terms will be used more than once.

Key: a. red blood cell d. basophil g. lymphocyte
 b. megakaryocyte e. monocyte h. formed elements
 c. eosinophil f. neutrophil i. plasma

- f. neutrophil 1. most numerous leukocyte
- c. eosinophil, d. basophil, and f. neutrophil 2. granulocytes (3)
- a. red blood cells 3. also called an erythrocyte; anucleate formed element
- e. monocyte, f. neutrophil 4. actively phagocytic leukocytes
- e. monocyte, g. lymphocyte 5. agranulocytes
- b. megakaryocyte 6. precursor cell of platelets
- h. formed elements 7. (a) through (g) are all examples of these
- c. eosinophil 8. number rises during parasite infections
- d. basophil 9. releases histamine; promotes inflammation
- g. lymphocyte 10. many formed in lymphoid tissue
- a. red blood cells 11. transports oxygen
- i. plasma 12. primarily water, noncellular; the fluid matrix of blood
- e. monocyte 13. increases in number during prolonged infections
- c. eosinophil, d. basophil, e. monocyte
- g. lymphocyte, f. neutrophil 14. the five types of white blood cells

4. List four classes of nutrients normally found in plasma. Amino acids,
glucose, lipids, and vitamins

Name two gases. oxygen and nitrogen

Name three ions. Na⁺, Mg²⁺, and Cl⁻

5. Describe the consistency and color of the plasma you observed in the laboratory. corn-colored, adhesive and
viscous

6. What is the average life span of a red blood cell? How does its anucleate condition affect this life span?
100-120 days. its anucleate condition affect this life span by unabling it to reproduce
or repair damage which was caused to it during circulation.

7. From memory, describe the structural characteristics of each of the following blood cell types as accurately as possible, and note the percentage of each in the total white blood cell population.

eosinophils: white blood cells, whos functions are related to parasitic infection, 1–4% of WBC
large red-staining cytoplasmic granules.

neutrophils: white blood cells that function in phagocytosis, pale pink cytoplasm with fine granules

lymphocytes: white blood cells, which are essential components of the immune system.
small cells with spare pale blue cytoplasm and dark purple-staining nucleus

basophils: white blood cells which function in allergic response. spare darkblue cytoplasmic granules
u shaped nucleus

monocytes: white blood cells that function in phagocytosis, abundant gray-blue cytoplasm and
dark blue-purple nucleus

8. Correctly identify the blood pathologies described in column A by matching them with selections from column B:

Column A

c. leukocytosis

1. abnormal increase in the number of WBCs

d. polycythemia

2. abnormal increase in the number of RBCs

a. anemia

3. condition of too few RBCs or of RBCs with hemoglobin deficiencies

c. leukopenia

4. abnormal decrease in the number of WBCs

Column B

a. anemia

b. leukocytosis

c. leukopenia

d. polycythemia

Hematologic Tests

9. Broadly speaking, why are hematologic studies of blood so important in the diagnosis of disease?

Certain changes from the normal numbers/types of formed elements or plasma constituents are characteristic of certain disease states

10. In the chart below, record information from the blood tests you read about or conducted. Complete the chart by recording values for healthy male adults and indicating the significance of high or low values for each test.

Test	Student test results	Normal values (healthy male adults)	Significance	
			High values	Low values
Total WBC count	No data			
Total RBC count	No data			
Hematocrit				
Hemoglobin determination				
Bleeding time	No data			
Coagulation time				

11. Why is a differential WBC count more valuable than a total WBC count when trying to pin down the specific source of pathology? A differential count determines the relative percent of each type of WBC.

Increases or decreases in specific WBC populations are often indicative (diagnostic) of specific pathologies

12. What name is given to the process of RBC production? Erythropoiesis

What hormone acts as a stimulus for this process? Erythropoietin

Why might patients with kidney disease suffer from anemia? kidneys cannot make enough erythropoietin

Low EPO levels cause your red blood cell count to drop and anemia to develop.

How can such patients be treated? They can be given genetically engineered erythropoietin

13. Discuss the effect of each of the following factors on RBC count. Consult an appropriate reference as necessary, and explain your reasoning.

long-term effect of athletic training (for example, running 4 to 5 miles per day over a period of six to nine months):

Increases the RBC count. An athlete has relatively large muscle mass and needs an efficient oxygen delivery to the muscles when working.

a permanent move from sea level to a high-altitude area: The air is thinner at high altitudes and contains less oxygen. The body compensates by producing more RBCs so that the same relative amount of oxygen can be picked up and transported by the blood.

14. Define *hematocrit*. Packed cell volume; percentage of total blood volume occupied by RBCs

15. If you had a high hematocrit, would you expect your hemoglobin determination to be high or low? high
 Why? Assuming the RBCs have a normal hemoglobin content, the higher the RBC volume, the higher the hemoglobin determination.

16. What is an anticoagulant? a substance that inhibits blood clotting

Name two anticoagulants used in conducting the hematologic tests. heparin
 and sodium citrate

What is the body's natural anticoagulant? Heparin

17. If your blood clumped with both anti-A and anti-B sera, your ABO blood type would be AB

To what ABO blood groups could you give blood? AB

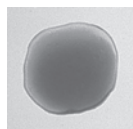
From which ABO donor types could you receive blood? A, B, AB, O

Which ABO blood type is most common? O Least common? AB

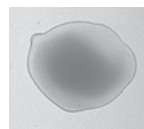
18. What blood type is theoretically considered the universal donor? O Why? These RBC have no A, B, or Rh antigens on the cell membrane, reducing the chance of a tranfusion reaction.

19. Assume the blood of two patients has been typed for ABO blood type.

Typing results
 Mr. Adams:

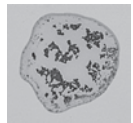


Blood drop and anti-A serum

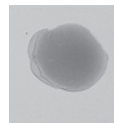


Blood drop and anti-B serum

Typing results
 Mr. Calhoon:



Blood drop and anti-A serum



Blood drop and anti-B serum

On the basis of these results, Mr. Adams has type O blood, and Mr. Calhoon has type A blood.

20. Explain why an Rh-negative person does not have a transfusion reaction on the first exposure to Rh-positive blood but *does* have a reaction on the second exposure. there are no performed anti-Rh antibodies in person's blood.
antibodies are formed after the first exposure to Rh+ blood

What happens when an ABO blood type is mismatched for the first time? _____

A transfusion reaction occurs.

21. Record your observations of the five demonstration slides viewed.

a. Macrocytic hypochromic anemia: RBCs are large and pale

b. Microcytic hypochromic anemia: RBC are small and pale

c. Sickle cell anemia: RBCs are crescent shaped

d. Lymphocytic leukemia (chronic): Large number of small abnormal Lymphocytes

e. Eosinophilia: Increased number of eosinophils

Which of the slides above (a through e) corresponds with the following conditions?

b _____ 1. iron-deficient diet

d _____ 2. a type of bone marrow cancer

c _____ 3. genetic defect that causes hemoglobin to become sharp/spiky

a _____ 4. lack of vitamin B₁₂

e _____ 5. a tapeworm infestation in the body

b _____ 6. a bleeding ulcer

22. Provide the normal, or at least "desirable," range for plasma cholesterol concentration.

130-200 _____ mg/100 ml

23. Describe the relationship between high blood cholesterol levels and cardiovascular diseases such as hypertension, heart attacks, and strokes.

High LDL levels favor cholesterol uptake and deposit in arteriosclerotic plaques, which, in turn: (1) narrow the vessel, reducing

blood flow to more distal tissues, and (2) increase the risk of thrombus formation.

Narrowing of blood vessels is one cause of hypertension. Attached thrombi or detached

thrombi are common causes of heart attack and stroke.