

Honors Physiology Blood Introduction

Name: _____
Period: _____

Objectives:

- List the components of blood
- Know the differences in types of blood
- List the functions of blood
- Describe the composition and volume of blood
- Describe the composition and function of plasma
- Describe the function of red blood cells
- Describe the formation of red blood cells

Introduction:

The living body is in constant chemical communication with its external environment. Nutrients are absorbed through the lining of the digestive tract, gases move across the delicate epithelium of the lungs and wastes are excreted in the feces and urine. These chemical exchanges occur at specialized sites or organs, but all parts of the body are linked by the circulatory (or cardiovascular) system, an internal transport network consisting of large interstates (the aorta), smaller highways (arteries and veins) and city-or cell-streets (capillaries). Although the circulatory system provides the means for substances to move throughout the body, these substances must move in blood, the only liquid tissue in the body. Since all chemical substances must move through your blood, understanding more about what's in blood will enable you to better understand diseases and homeostasis of the body.

Characteristics of Blood:

Blood can accurately be called "the river of life." Blood is the circulating fluid of the body, which (as you may recall from the tissue unit) is a type of connective tissue that contains cells suspended in a fluid matrix. Blood is the only fluid tissue in the body. It is heavier and more viscous (thick or slow flowing) than water. In addition, it has a neutral pH and accounts for about 8% of body mass (you have 5-6 liters or 6 quarts of blood). Lastly, blood consists of liquid (plasma) and solid components (also called formed elements such as red blood cells, white blood cells and platelets).

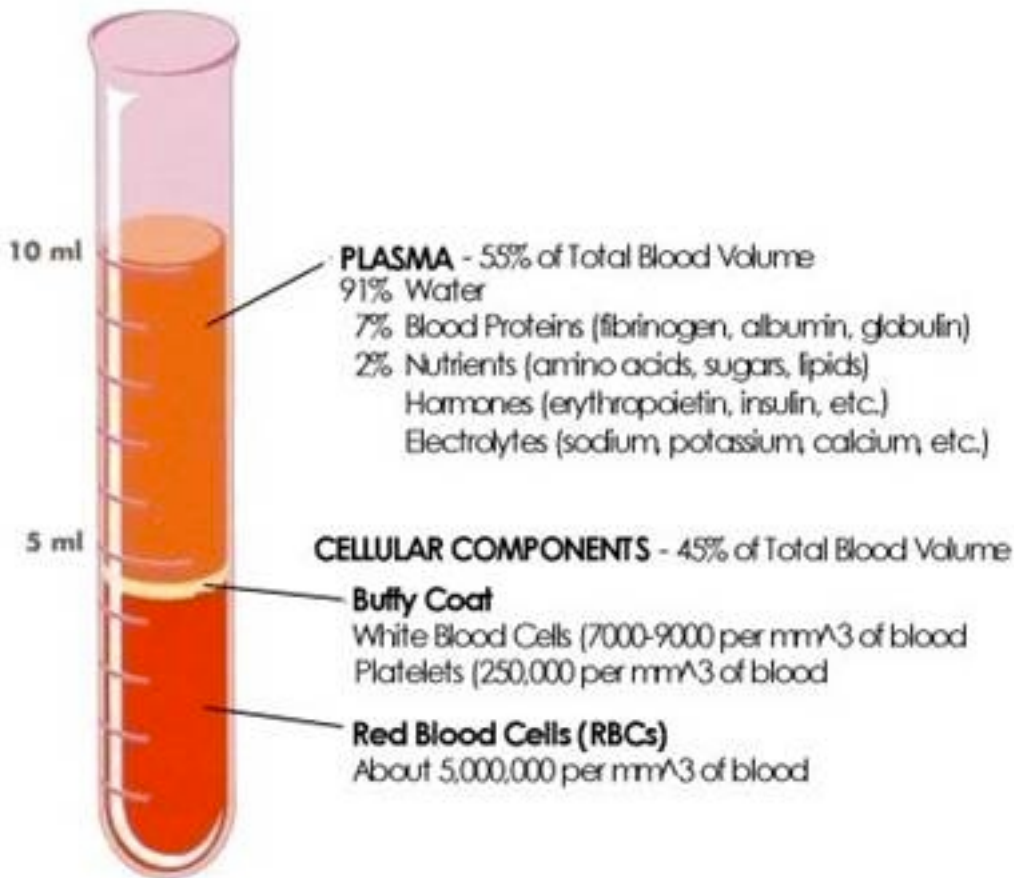
Functions of Blood:

There are three major functions of blood. With your partner, brainstorm the major functions of blood – a few hints have been left to get you started.

1. Transportation/distribution of...
2. Regulation of...
3. Protection against...

Composition of Blood:

Blood can be centrifuged (placed in a device that spins liquid/solid mixtures and forces them to separate). Once centrifuged, blood can be separated into **plasma** and **formed elements**.



Blood plasma is the watery, liquid component of blood. It suspends red blood cells, white blood cells, and platelets. Within plasma, there are many important dissolved substances, such as proteins, electrolytes, nutrients, gases, and waste products.

White blood cells (WBCs), also called leukocytes or leucocytes, are the cells of the immune system that are involved in protecting the body against both infectious disease and foreign invaders. All leukocytes are produced and derived from a multipotent cell in the bone marrow known as a hematopoietic stem cell.

The normal **platelet** count is ~250,000 per microliter of blood, but since platelets are so small, they make up just a tiny fraction of the blood volume. The principal function of platelets is to prevent bleeding. Red blood cells are the most numerous blood cell, about 5,000,000 per microliter

The **red blood cell** survives on average only 120 days. Red blood cells contain a special protein called hemoglobin, which helps carry oxygen from the lungs to the rest of the body and then returns carbon dioxide from the body to the lungs so it can be exhaled.

Production of **red blood cells** is controlled by erythropoietin, a hormone produced primarily by the kidneys. Red blood cells start as immature cells in the bone marrow and after approximately seven days of maturation are released into the bloodstream.

Directions: Using the information provided about plasma and formed elements (cellular components), answer the following discussion questions about composition of blood.

- What percent of blood is plasma? _____ Formed elements? _____

- What is the function of plasma?

There are three kinds of blood cells: red blood cells (erythrocytes), white blood cells (leukocytes) and platelets. Locate information about all three.

- What is the function of the three types of blood cells?

- Are there different numbers of each found in blood? Why?

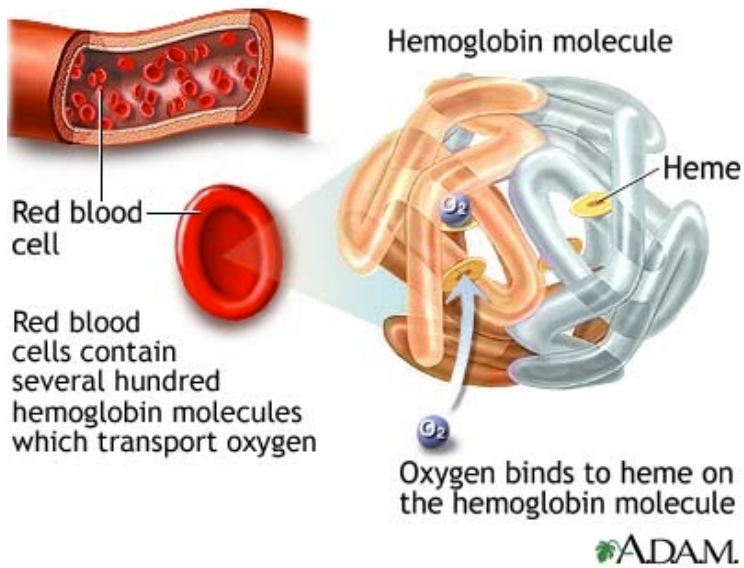
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- How and where are white blood cells formed? Red blood cells?

Create an **informative diagram** that shows the composition blood and how it is divided (include plasma and formed elements).

Red Blood Cell Structure

Red blood cells are specialized to transport oxygen and carbon dioxide within the blood stream. Notice the unusual shape of a red blood cell. Why do you think this is? One reason is that its shape gives each RBC a relatively large surface area to volume ratio that increases the rate of diffusion. A second reason is that it enables RBCs to bend and flex and squeeze through narrow capillaries. A mature RBC consists of molecules called hemoglobin. Hemoglobin is like "glue" that enables oxygen and carbon dioxide to attach or "stick" to a RBC.



Directions: Using the information provided about red blood cell structure, answer the following questions.

- Describe the function of a red blood cell. Why is an RBC such a good physiological example of structure relating to function?
- Describe hemoglobin and its function in RBCs.

Thinking critically...

- What factors may affect how much oxygen a RBC can pick up?
- What role does iron play in RBC's function and/or formation
- What affect does an iron deficiency have on the body? Why is this?