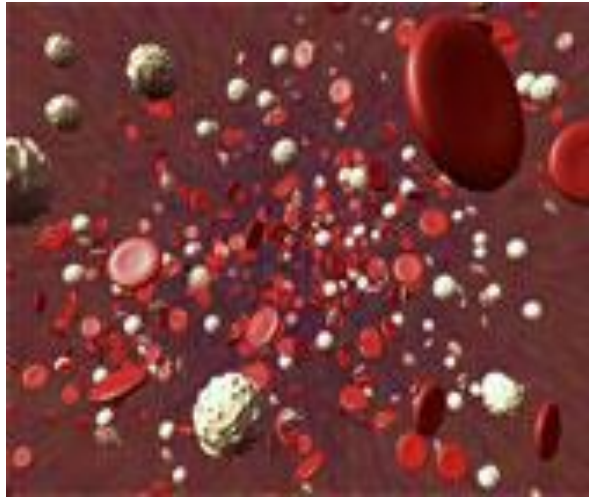


Blood

Blood: is a vital liquid tissue that provide important nutrient to all body organs and tissues and carries away waste materials.



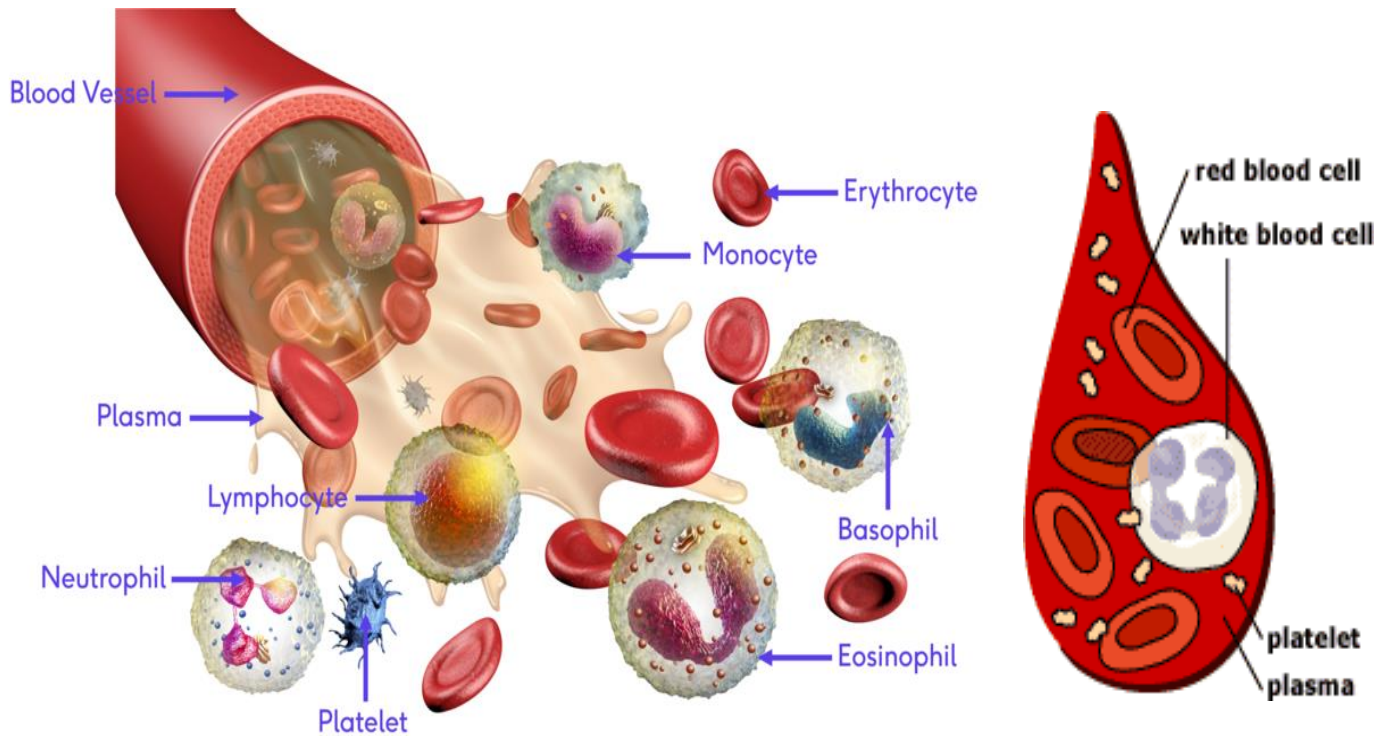
Functions of the blood

Blood performs two major functions:

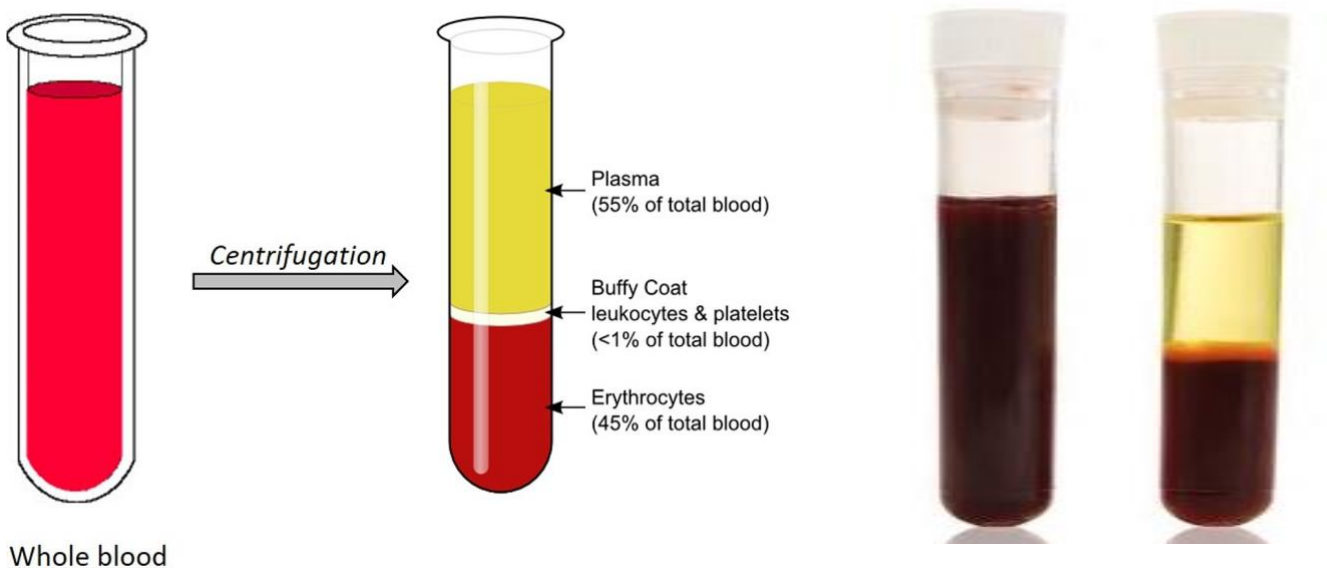
- A. **Transport** through the body of
 - 1- Oxygen and carbon dioxide
 - 2- Food molecules (glucose, lipids, amino acids)
 - 3- Ions (e.g., Na^+ , Ca^{2+} , HCO_3^-)
 - 4- Wastes (e.g., urea)
 - 5- Hormones
 - 6- Heat

- B. **Defense** of the body against infections and other foreign materials. All the WBCs participate in these defenses.

Composition of blood:



To obtain blood components, blood sample should be treated with an agent to prevent clotting by using a tube contains anticoagulant, and spins it in centrifuge by 3000 rpm for about 10 min. by that we can get main blood components.



❖ **Main blood components:**

1- **Plasma:** 55% of blood composed of liquid plasma, it's a clear yellowish liquid that forms the fluid protein of blood this watery solutions contains small amounts of minerals, salts, sugar, fats, amino acids, hormones, dissolved gases, wastes like urea and several protein, one such as protein is fibrinogen, the substance responsible for blood clotting.

Composition of blood plasma	
Component	Percent
Water	~92
Proteins	6–8
Salts	0.8
Lipids	0.6
Glucose (blood sugar)	0.1

* **Functions of plasma:**

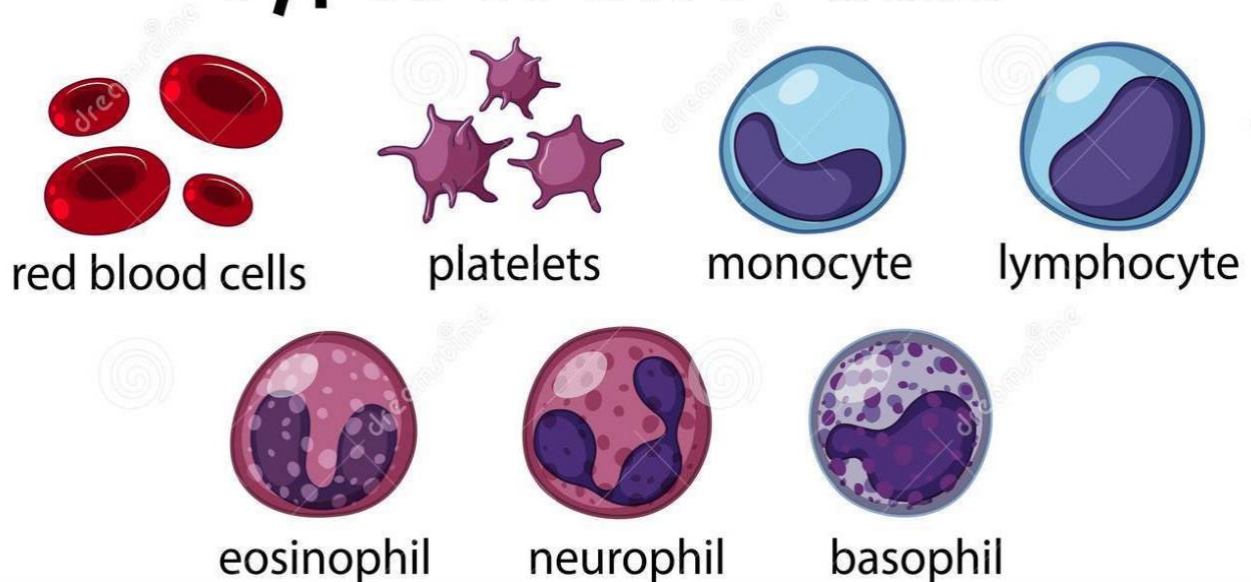
transports materials needed by cells and materials that must be removed from cells:

- 1- Various ions (Na^+ , Ca^{2+} , HCO_3^- , etc.)
- 2- Glucose and traces of other sugars
- 3- Amino acids
- 4- Cholesterol and other lipids
- 5- Organic acids (they are water-soluble compounds containing one or more carboxyl groups $-\text{COOH}$ like succinic acid + fumaric acid)
- 6- Hormones
- 7- Urea and other wastes

2- **Blood cells:**

- A- Red blood cells (RBCs) or erythrocytes
- B- White blood cells (WBCs) or leukocytes
- C- Platelets or thrombocytes

Types of Blood Cells



A- Red blood cells (RBCs) or **erythrocytes**: make up almost 45% of the blood volume, their primary function is to carry oxygen from the lungs to every cell in the body. RBCs are composed of protein and iron compound, called hemoglobin, that gives blood its red color.

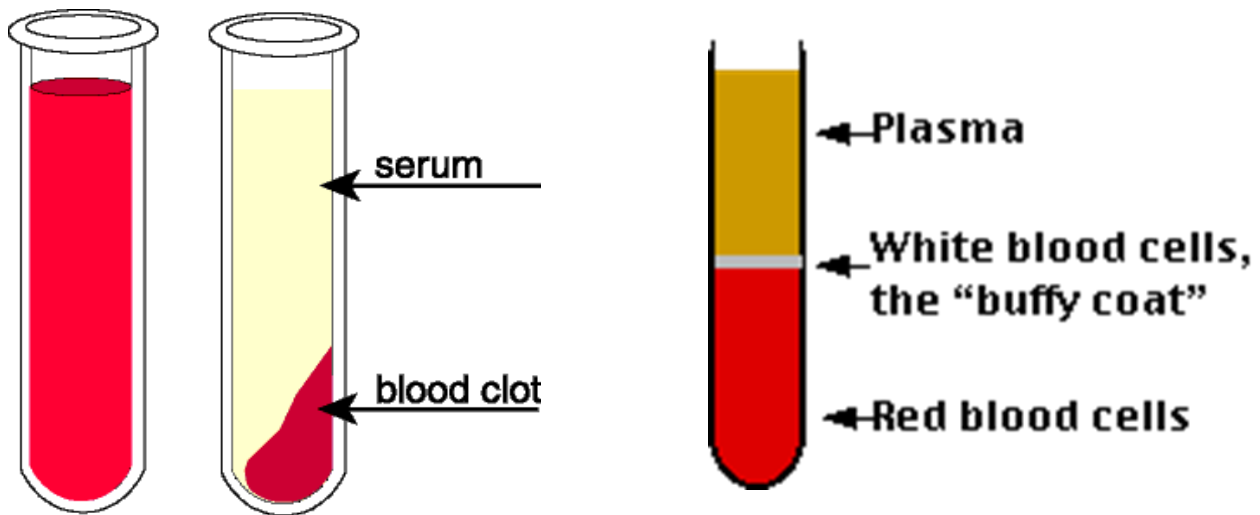
B- White blood cells (WBCs) or leukocytes: make up almost 1% of the blood volume, leukocytes protect the body from disease agents and other foreign substances in the blood stream, there are two kinds of **white blood cell**:

- 1- **Granulocytes** (neutrophils, eosinophils and basophils).
- 2- **Nongranulocytes** (lymphocytes and monocytes).

C- Platelets or **thrombocytes**: the smallest cell in the blood, its single purpose is to reinstate the process of coagulation, or forming a clot, whenever a blood vessel is broken.

What is Serum? Is it different with plasma? *

Serum is a clear yellowish liquid that remains as a liquid protein of blood after clotting has taken place. Serum is blood plasma without fibrinogen and other clotting factors. After blood is withdrawn from a vein and allowed to clot, the clot slowly shrinks.



What happens if one takes a sample of blood, treats it with an agent to prevent clotting, and spins it 3000rpm/min. for about 10min in a centrifuge?

- 1- The red cells settle to the bottom it is approximately 45%. The fraction occupied by the red cells is called the **hematocrit**. Normally it is approximately 45%. Values much lower than this are a sign of [anemia](#).
- 2- The white cells settle on top of them forming the "Buffy coat". about 1%.
- 3- 55% of blood composed of liquid plasma, it's a clear yellowish liquid fluid.