



Blood and Blood cells

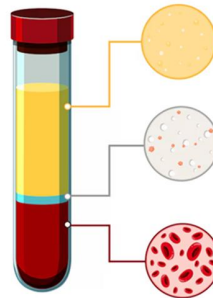


Functions of Blood

Composition of Blood

A- Blood Plasma

B- Blood Cells



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Functions of Blood



- 1. Transportation:** The blood transports dissolved gases, nutrients, hormones and metabolic wastes.
- 2. Protection:**
 - The blood prevents bleeding of damaged vessels (injuries, cuts) by clotting proteins.
 - It provides protection and defense against pathogens such as bacteria and viruses.
- 3. Regulation**
 - Blood regulates the pH and electrolyte composition of the interstitial fluids.
 - Blood regulates body temperature.

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Composition of Blood



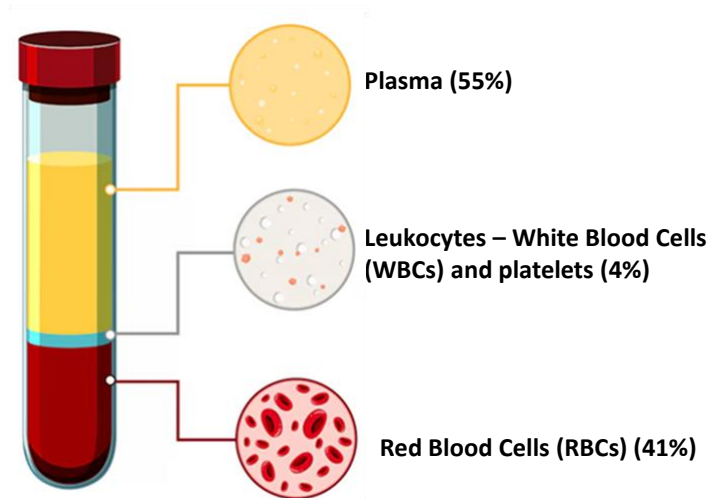
- Contains cellular and liquid components
- Blood is considered a specialized connective tissue
 - **Blood cells** = formed elements
 - **Plasma** = fluid portion and fibrinogen
- Blood volume
 - Males: 5 – 6 liters
 - Females: 4 – 5 liters
- The pH of blood is about 7.35-7.45

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Composition of Blood



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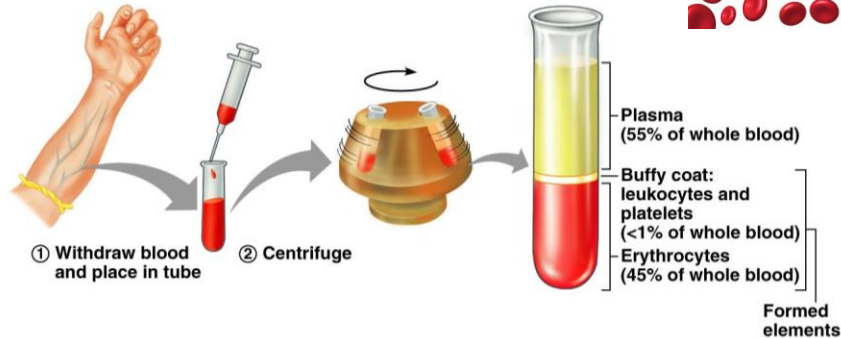
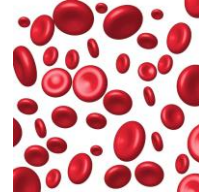


Composition of Blood



- Hematocrit – measure of % RBC

- Males: $47\% \pm 5\%$
- Females: $42\% \pm 5\%$



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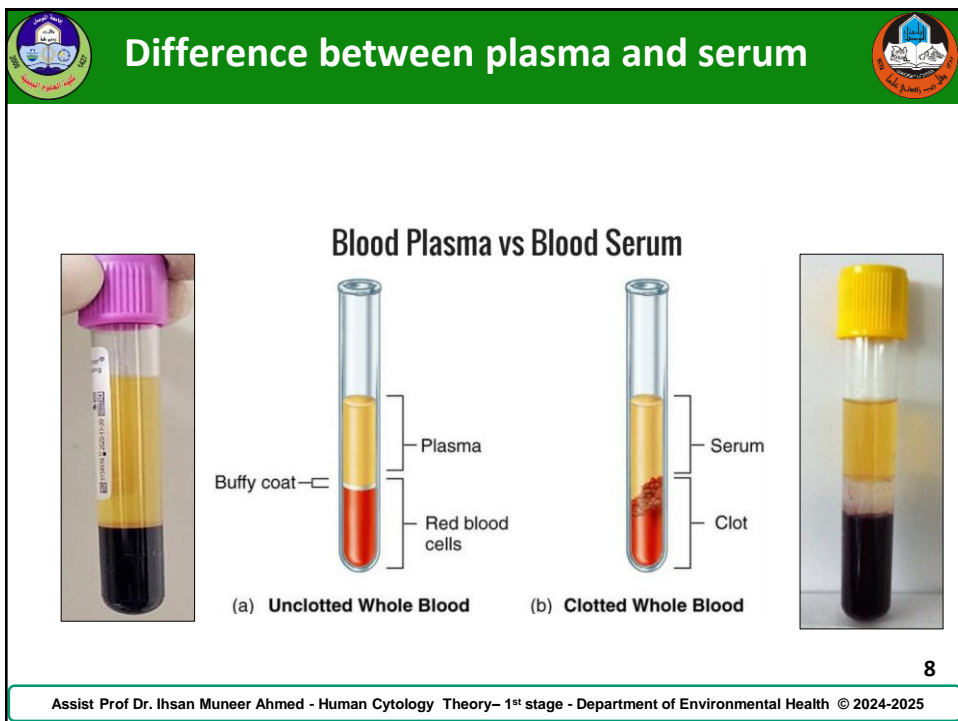
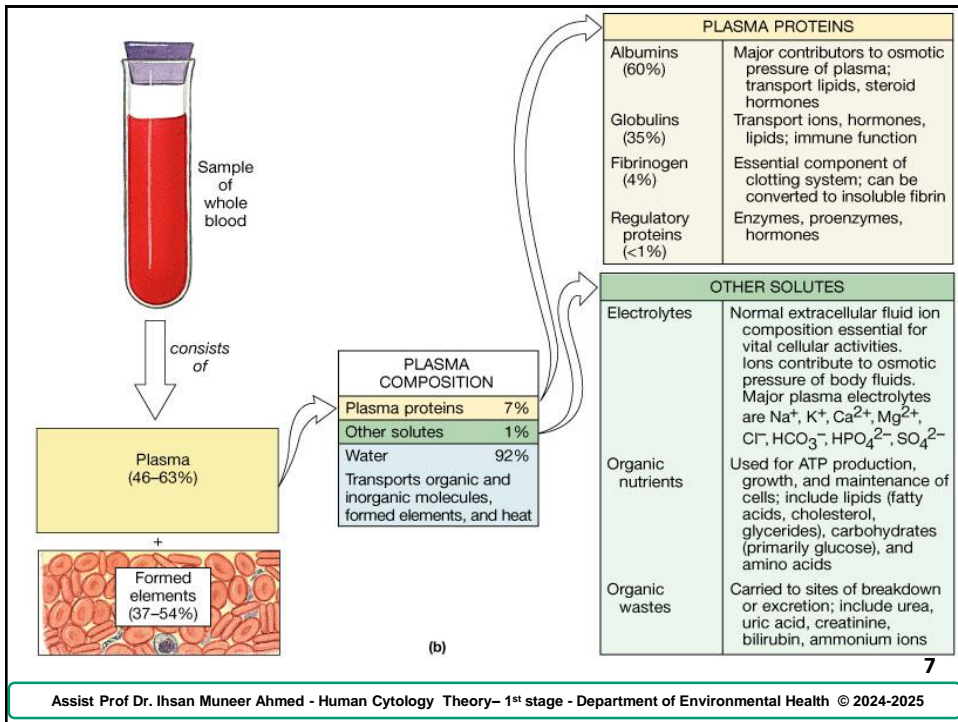
A- Blood Plasma



- Straw-colored, sticky fluid portion of blood
- Approximately 90% water
- Contains:
 - Ions – Na^+ and Cl^-
 - Nutrients – sugars, amino acids, lipids, cholesterol, vitamins and trace elements.
 - Three main proteins - Albumin (60%), globulin (35%), fibrinogen (4%).
 - Dissolved Gases – including O_2 and CO_2 Waste Products – other protein wastes such as urea and bilirubin.

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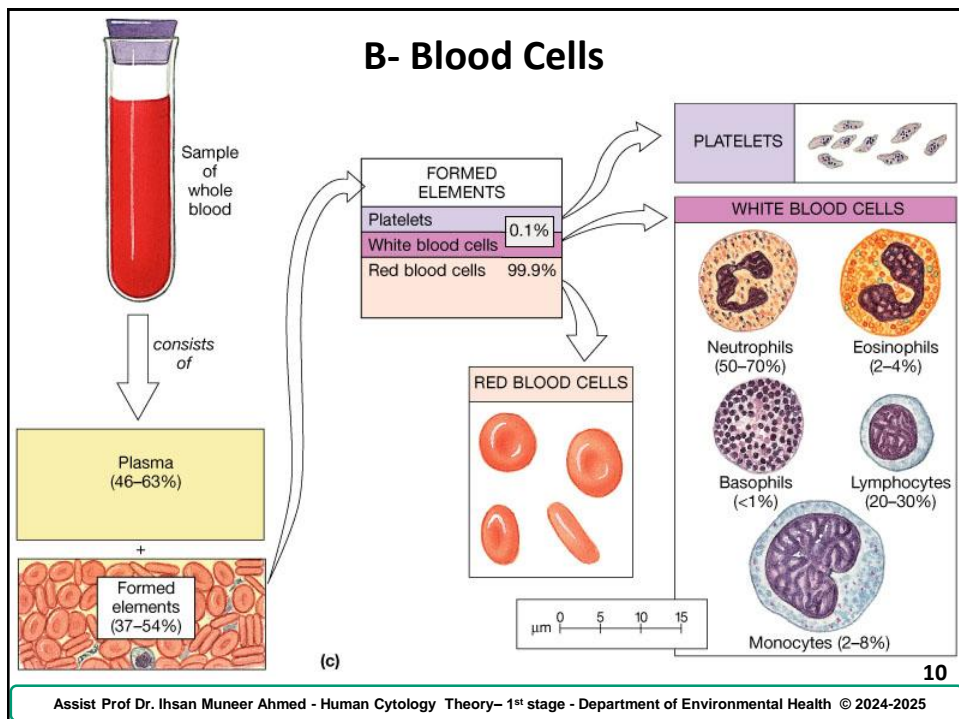
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Plasma	Serum
<p>Plasma is the Part that Contains clotting factors.</p> <p>Fibrinogen is present.</p> <p>Anticoagulants are required for the separation of plasma from the blood.</p> <p>Example:</p> <p>EDTA, Heparin, Citrate,</p>	<p>Serum is the Part of blood that does not contain clotting factors.</p> <p>Fibrinogen is absent,</p> <p>Na-anticoagulants are required for the separation of serum from blood.</p>
<p>Plasma is acquired from the spinning before clotting and is less time-consuming.</p>	<p>Serum is acquired from Spinning after clotting and is time-consuming.</p>
<p>Uses:</p> <p>Plasma is used for tests and also Plasma transfusion is done for trauma patients and patients with severe liver disease.</p>	<p>Uses:</p> <p>Serum is used for tests.</p> <p>Example:</p> <p>Enzymes test Hormon tests.</p>

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1- Erythrocytes – Red Blood Cells (RBCs)



- Oxygen-transporting cells
 - 7.5 μm in diameter (diameter of capillary 8 – 10 μm)
- Most numerous of the formed elements
 - Females: 4.3 – 5.2 million cells/cubic millimeter (1 μl)
 - Males: 5.2 – 5.8 million cells/cubic millimeter (1 μl)
- Made in the red bone marrow in long bones, cranial bones, ribs, sternum, and vertebrae
- Average lifespan 100 – 120 days

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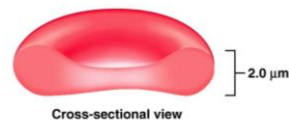
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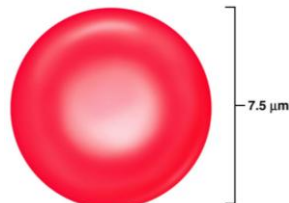
RBC Structure and Function



1. Have no organelles or nuclei.
2. Hemoglobin – oxygen carrying protein. Each RBC has about 280 million hemoglobin molecules.
3. Biconcave shape – 30% more surface area



Cross-sectional view



Top view

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2- Leukocytes – White Blood Cells (WBCs)



1. Leukocytes or WBCs.
2. Largest sized blood cells .
3. Lowest numbers in the blood (4,500 – 11,000 per microliter).
4. Formed in the **bone marrow** and some in **lymph glands**.
5. Primary cells of the immune system.
6. Fights disease and foreign invaders.
7. Contain nuclei with DNA, the shape depends on type of cell.
8. Certain WBCs produce antibodies.
9. **Life span** is from 24 hours to several years.

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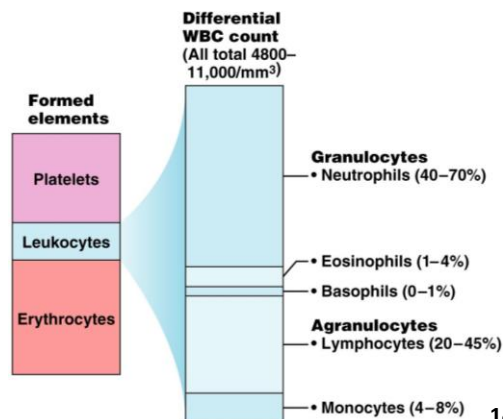
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Leukocytes – White Blood Cells (WBCs)



- Two types of leukocytes
 - Granulocytes (Neutrophils, Eosinophils, Basophils).
 - Agranulocytes (Monocytes and Lymphocytes).
- Differential WBC Count
 - Never = **Neutrophils**
 - Let = **Lymphocytes**
 - Monkeys = **Monocytes**
 - Eat = **Eosinophils**
 - Bananas = **Basophils**



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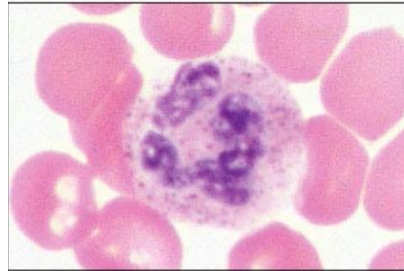
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Granulocytes



- Neutrophils – most numerous WBC
 - Phagocytize and destroy bacteria.
 - Nucleus – has two to six lobes.
 - Granules pick up acidic and basic stains.



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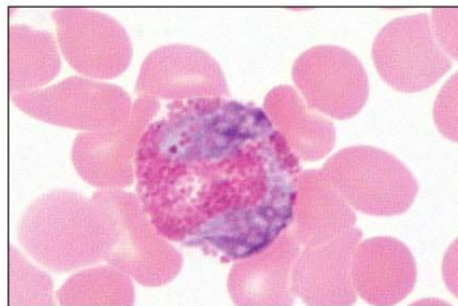
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Granulocytes



- Eosinophils – compose 1 – 4% of all WBCs
 - Play roles in ending allergic reactions, parasitic infections.



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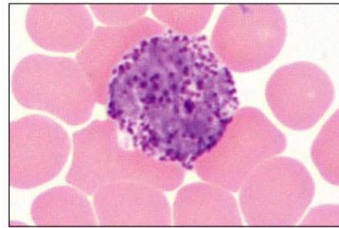
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Granulocytes



- **Basophils** – about 0.5% of all leukocytes
 - Nucleus – usually two lobes.
 - Granules secrete histamines.
 - Function in inflammation mediation, similar in function to mast cells.



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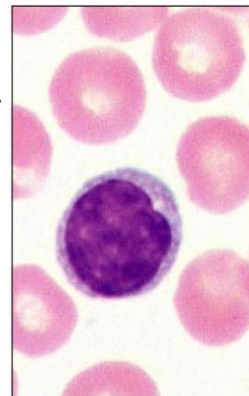
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Agranulocytes



- **Lymphocytes** – compose 20 – 45% of WBCs
 - The most important cells of the immune system.
 - Nucleus – stains dark purple.
 - Effective in fighting infectious organisms.
 - Act against a specific foreign molecule (antigen).
- **Two main classes of lymphocyte**
 - T cells – attack foreign cells directly.
 - B cells – multiply to become plasma cells that secrete antibodies.



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Agranulocytes



- Monocytes – compose 4–8% of WBCs
 - The largest leukocytes.
 - Nucleus – kidney shaped.
 - Transform into macrophages, phagocytic cells.



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White Blood Cells



Type Of White Blood Cells	% By Volume Of WBC	Description	Function
Neutrophils	60 – 70 %	Nucleus has many interconnected lobes; blue granules	Phagocytize and destroy bacteria; most numerous WBC
Eosinophils	2 – 4 %	Nucleus has bilobed nuclei; red or yellow granules containing digestive enzymes	Play a role in ending allergic reactions
Basophils	< 1 %	Bilobed nuclei hidden by large purple granules full of chemical mediators of inflammation	Function in inflammation medication; similar in function to mast cells
Lymphocytes (B Cells and T Cells)	20 – 25 %	Dense, purple staining, round nucleus; little cytoplasm	the most important cells of the immune system; effective in fighting infectious organisms; act against a specific foreign molecule (antigen)
Monocytes	4 – 8 %	Largest leukocyte; kidney shaped nucleus	Transform into macrophages; phagocytic cells

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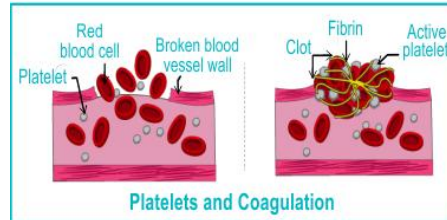


3- Platelets



1. Thrombocytes or PLTs.
2. Formed in the bone marrow.
3. Smallest of the blood cells.
4. Life span of around 8-12 days.
5. Involved in the **clotting process**.
6. 150,000 – 400,000 per microliter of blood.

testbook



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Thanks



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