

Blood Physiology

Lec 3

فصلجه نظري
مرحلة اولي

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- **Blood is a special type of fluid connective tissue that is composed of 8% of the body mass. Its properties are:**
- **Color:** bright red in artery & dark red in veins.
- **Ph:** slightly alkaline Ph(7.35-7.45).
- **Viscosity:** 3-4 times more viscous than water.
- **Volume:** about 5-6 liter.

Blood

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graph TD; Blood[Blood] --> NonCellular[Non Cellular Element]; Blood --> Cellular[Cellular Elements (45%)]; NonCellular --> Plasma[Plasma (55%)]; Cellular --> RBC[Red Blood Cells (Erythrocyte)]; Cellular --> WBC[White Blood Cells (Leukocyte)]; Cellular --> Platelets[Platelets (Thrombocyte)];
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The diagram is a hierarchical flowchart. At the top is a rounded rectangular box labeled 'Blood'. A vertical line descends from 'Blood' to a horizontal line that branches into two vertical lines. The left vertical line leads to a rectangular box labeled 'Non Cellular Element'. The right vertical line leads to a rectangular box labeled 'Cellular Elements (45%)'. From 'Non Cellular Element', a vertical line leads down to a rectangular box labeled 'Plasma (55%)'. From 'Cellular Elements (45%)', a vertical line descends to a horizontal line that branches into three vertical lines. The left vertical line leads to a rectangular box labeled 'Red Blood Cells (Erythrocyte)'. The middle vertical line leads to a rectangular box labeled 'White Blood Cells (Leukocyte)'. The right vertical line leads to a rectangular box labeled 'Platelets (Thrombocyte)'. All boxes have a green border and black text. The background on the left side of the image is a light green vertical bar with decorative circular patterns.

**Non Cellular
Element**

Plasma (55%)

**Cellular Elements
(45%)**

**Red Blood Cells
(Erythrocyte)**

**White Blood Cells
(Leukocyte)**

**Platelets
(Thrombocyte)**

COMPOSITION OF BLOOD



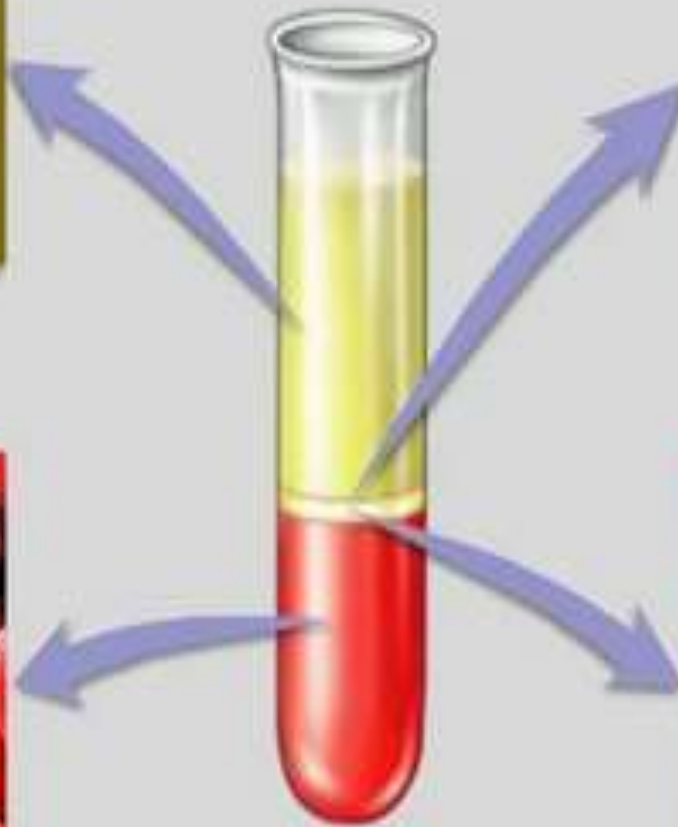
Plasma



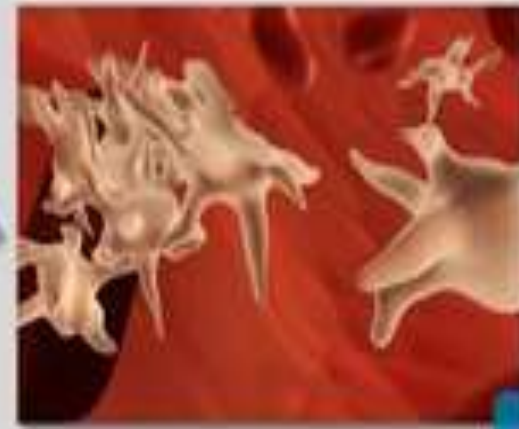
White blood cells



Red blood cells



Centrifuged blood



Platelets

Function of Blood

• **Transport**

- O₂ from lungs to body cells
- CO₂ from body cells to lungs.
- Nutrients from GIT to body cells
- Transport metabolic waste product.
- Hormones from glands to body cells.

• **Regulation**

- Regulate body Ph.
- Maintains water content of the cell.
- Maintains body temperature

• **Protection**

- Platelets and proteins help to repair damaged blood vessels.
- WBC protect against disease by phagocytosis

Plasma & Serum

- **Plasma** is the liquid part of blood . It is made up of 93% water, 7% proteins, and other solutes.
- The plasma proteins are albumin, globulins, clotting proteins (prothrombin & fibrinogen) and other proteins (enzymes and hormones).
 - Blood plasma also contains nutrients (like glucose, fatty acids, amino acids) and electrolytes - Na^+ , K^+ , Ca^{++} , Cl^- , phosphate and bicarbonate.
 - **Blood serum** is plasma without clotting protein (prothrombin and fibrinogen) and cellular components (RBC , WBC, platelet).

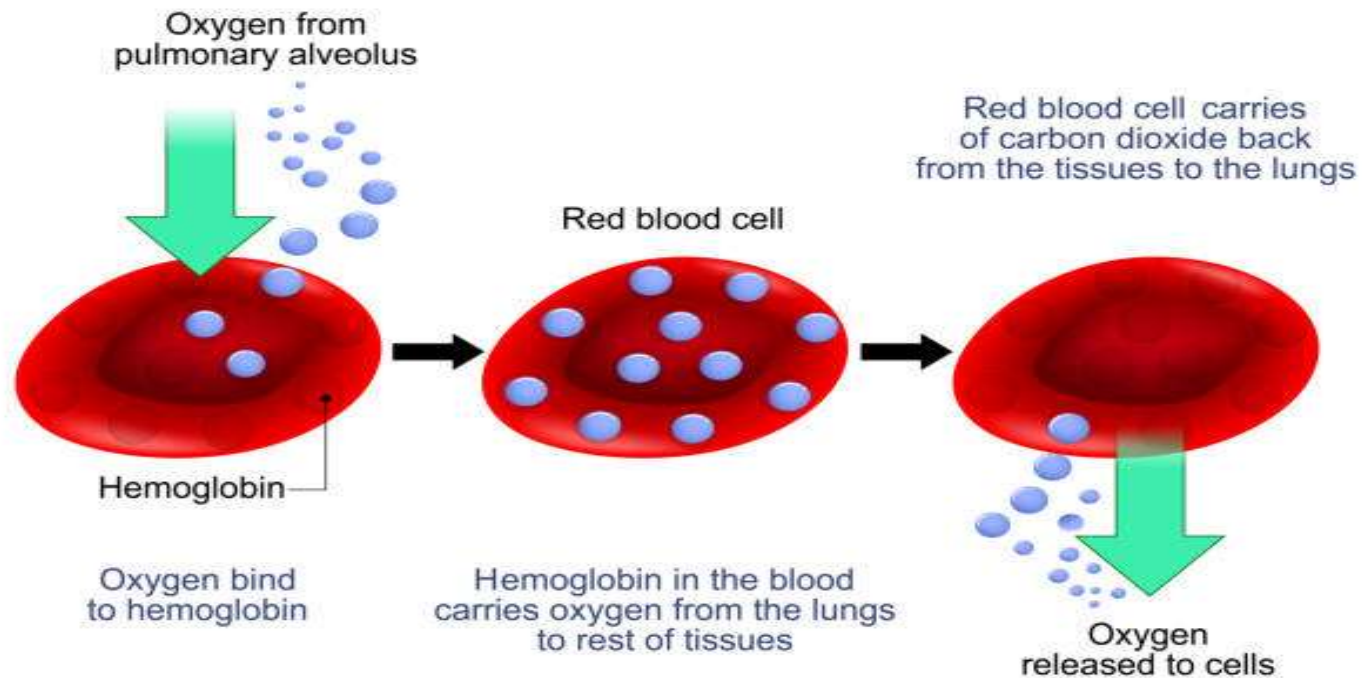
Cellular Elements of Blood

Erythrocytes (RBCs)

- ❑ The most common type of blood cell, which are small biconcave disc-shaped cells that arise from the bone marrow and they do not have a nucleus or mitochondria.
- ❑ Its containing hemoglobin(Hb) molecules which is iron containing biomolecule that can bind oxygen and it responsible for the red color of blood.
- ❑ The whole blood of men contains about 15 gm/dl of Hb, whereas, for women about 14 gm/dl.
- ❑ RBCs lives for 120 days until it removed by macrophages.

- **Function of RBCs :**

The hemoglobin within the RBCs transport **O₂** from lung to the tissues and **CO₂** from tissues to the lung.



Anemia

- Anemia means deficiency of hemoglobin in the blood, which can be caused by either few red blood cells or little hemoglobin in the cells.
- **Types Of Anemia:**
 - a) **Iron deficiency anemia.**
 - b) **Megaloblastic Anemia that includes:**
 1. **Folic Acid Deficiency Anemia**(low intake of folic acid which is necessary for DNA formation and maturation of RBCs).
 2. **B12 Deficiency Anemia** (B12 is necessary for DNA formation of RBCs).

- c) **Membrane Defects anemia** as in hereditary spherocytosis.
- d) **Hemolytic anemia** e.g :autoimmune Hemolytic anemia,
- e) **Hemoglobinopathies** e.g Thalassemia and sickle cell anemia.
- f) **Aplastic Anemia** (bone marrow failure)
- g) **Blood Loss Anemia** after rapid hemorrhage.

□ **Effect of Anemia on Circulation:**

1. Decrease the viscosity of blood.
2. Increase the amount of work needed by the heart.
3. During exercise, the oxygenation of the tissues will be reduced.