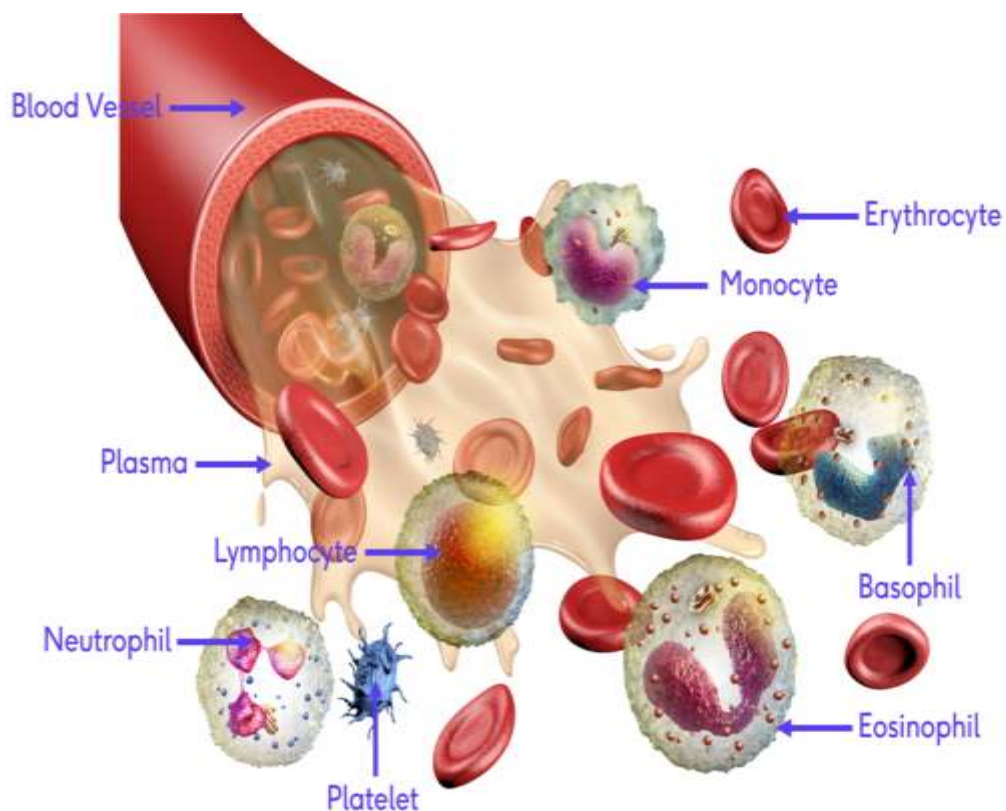


BLOOD PHYSIOLOGY

INTRODUCTION

- Blood is a connective tissue in fluid form.
- It is considered as the **‘fluid of life’** because it carries oxygen from lungs to all parts of the body and carbon dioxide from all parts of the body to the lungs.
- It is known as **‘fluid of growth’** because it carries nutrition substances from the digestive system and hormones from endocrine gland to all the tissues.
- The blood is also called the **‘fluid of health’** because it protects the body against the diseases.





PROPERTIES OF BLOOD

- 1. Color:** Blood is **red in color** because of the protein hemoglobin, which contains a red-colored compound called heme that's crucial for carrying oxygen through your blood stream. Heme contains an iron atom which binds to oxygen; it's this molecule that transports oxygen from lungs to other parts of the body.
- 2. Volume:** Average volume of blood in a normal adult is 5 L. In a newborn baby, the volume is 450 ml. It increases during growth and reaches 5 L at the time of puberty. In females, it is slightly less and is about 4.5 L. It is about 8% of the body weight in a normal young healthy adult, weighing about 70 kg.
- 3. Reaction and pH:** Blood is slightly alkaline and its pH in normal conditions is 7.4.

FUNCTIONS OF BLOOD

1. Nutrition function

- Nutrition substances like glucose, amino acids, lipids and vitamins derived from digested food are absorbed from gastrointestinal tract and carried by blood to different parts of the body for growth and production of energy.

2. Respiratory function

- Transport of respiratory gases (O₂ & CO₂) is done by the blood.



3. Excretion

- Waste products formed in the tissues during various metabolic activities are removed by blood which carried to the excretory organs like kidney, skin, liver, etc. for excretion.

4. Transport of hormones and enzymes

- Hormones which are secreted by ductless (endocrine) glands are released directly into the blood.

5. Regulation of water balance

- Water content of the blood is freely interchangeable with interstitial fluid. This helps in the regulation of water content of the body.

6. Regulation of acid-base balance

- Plasma proteins and hemoglobin acts as buffers and help in the regulation of acid-base balance.

7. Regulation of body temperature

- The high specific heat of blood, it is responsible for maintaining the thermoregulatory mechanism in the body.

8. Storage function

- Water and some important substances like proteins, glucose, sodium and potassium are constantly required by the tissues. These substances are taken from blood during the conditions like starvation, fluid loss, electrolyte loss, etc.



9. Defense function

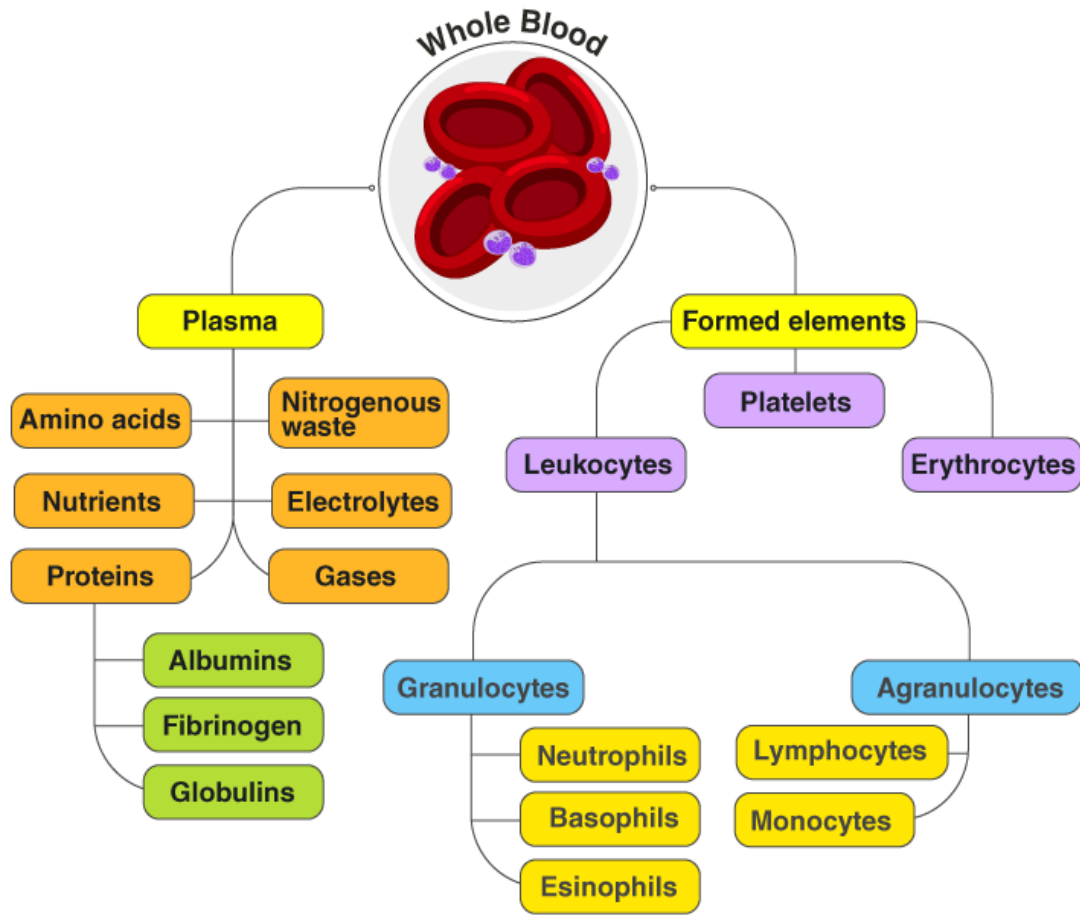
Blood plays an important role in the defense of the body. The white blood cells are responsible for this function. Neutrophils and monocytes engulf the bacteria by phagocytosis. Lymphocytes are involved in development of immunity. Eosinophils are responsible for detoxification, disintegration and removal of foreign proteins. Plasma has Immunoglobulins (antibodies) that play a role in the body's immunological defence process

FORMED ELEMENTS (CELLULAR CONTENT OF BLOOD)

Three types of cells are present in the blood:

1. White blood cells (WBC) or leukocytes
2. Red blood cells (RBC) or erythrocytes
3. Platelets or thrombocytes.

COMPOSITION OF BLOOD



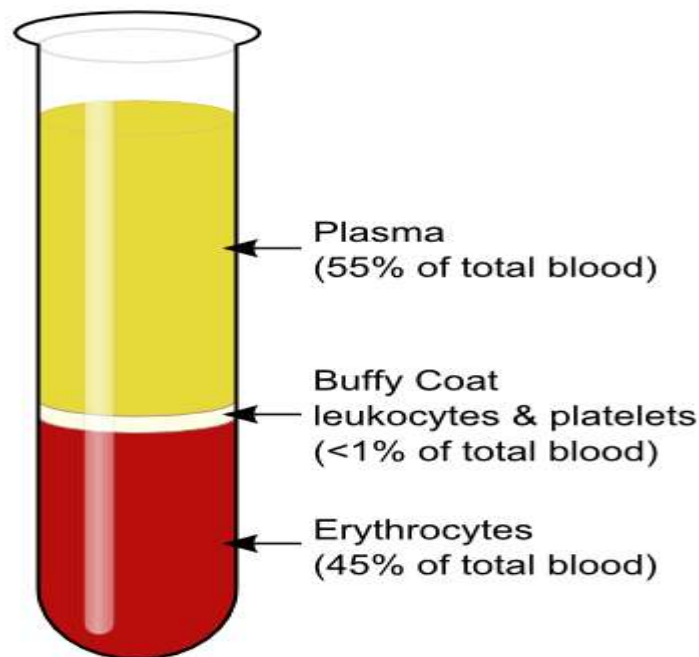
Com

position of Blood: Plasma, RBCs, WBCs and platelets



Components Of Blood

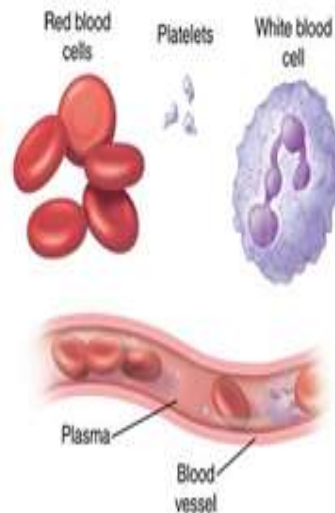
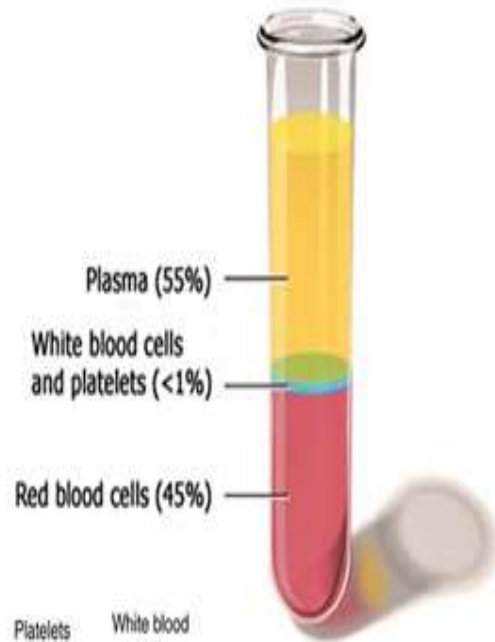
There are many cellular structures in the composition of blood. When a sample of blood is spun in a centrifuge machine, they separate into the following constituents: Plasma, buffy coat and erythrocytes. Plasma forms about 55% of the total blood volume.



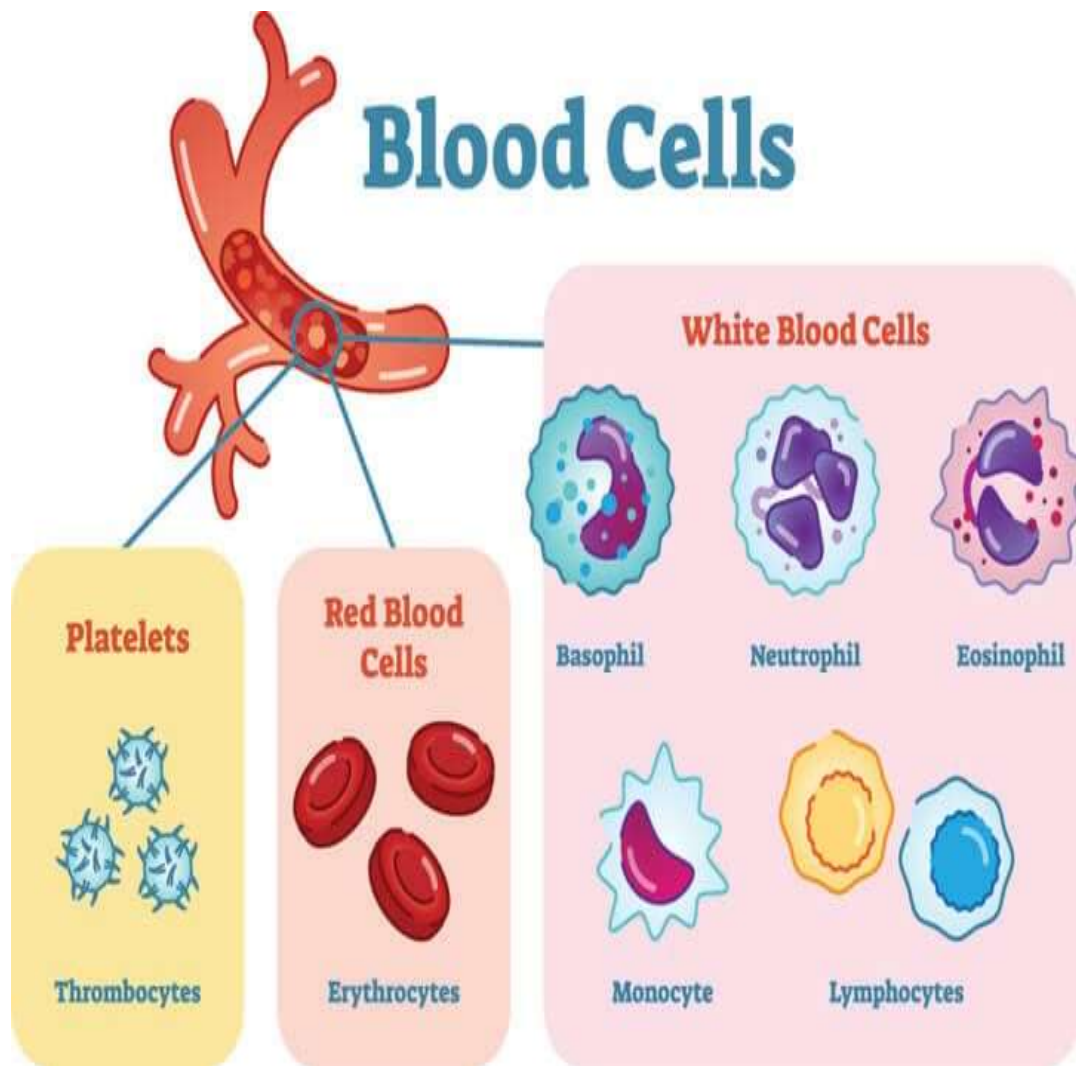
Blood

- Contains plasma
 - 90% water
 - 10% dissolved gases, salts, nutrients, enzymes, hormones and waste

- Contains red blood cells
 - Also called erythrocytes
 - Carry oxygen with the protein hemoglobin



Formed Elements:-



White blood cells (WBCs):-

(also called **leucocytes**) are the cells of the immune system that are involved in protecting the body against infection . All white blood cells are produced and derived from **multipotent** cells in the **bone marrow** known as **hematopoietic stem cells**. Leukocytes are found throughout the body, including the **blood** and **lymphatic system**.



Biomedical Engineering Department
Title of the lecture3 :- BLOOD PHYSIOLOGY
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The number of leukocytes in the blood is often an indicator of **disease**, and thus the *white blood cell count* is an important subset of the **complete blood count**. The normal white cell count is usually expressed as 4,000 to 11,000 white blood cells per microliter of blood. White blood cells make up approximately **1%** of the total blood volume in a healthy adult. However, this **1%** of the blood makes a large difference to health, because **immunity** depends on it. An increase in the number of leukocytes over the **upper limits** is called **leukocytosis**. It is normal when it is part of healthy immune responses, which happen frequently. It is occasionally abnormal, when it is **neoplastic** or **autoimmune** in origin. A decrease below the lower limit is called **leukopenia**. This indicates a weakened immune system.

The etymology: Refere to "white blood cell" which derives from the physical appearance of a blood sample after **centrifugation**. White cells are found in the **buffycoat**, a thin, typically white layer of nucleated cells between the sedimented **red blood cells** and the **blood plasma**.

white blood cells are nucleated, which distinguishes them from the anucleated red blood cells and platelets. Types of leukocytes can be classified in standard ways. Two pairs of broadest categories classify them either by structure (**granulocytes** or **agranulocytes**) or by cell lineage.