SNS COLLEGE OF ALLIED HEALTH SCIENCE

Affiliated to The Tamil Nadu Dr. M.G.R Medical University, Chennai

DEPARTMENT OF PHYSICIAN ASSISTANT

COURSE NAME : PHYSIOLOGY

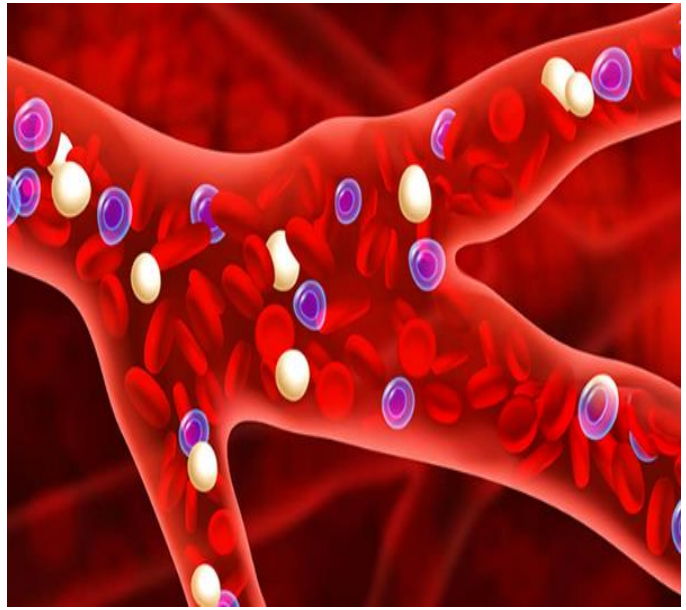
UNIT : INTRODUCTION TO PHYSIOLOGY

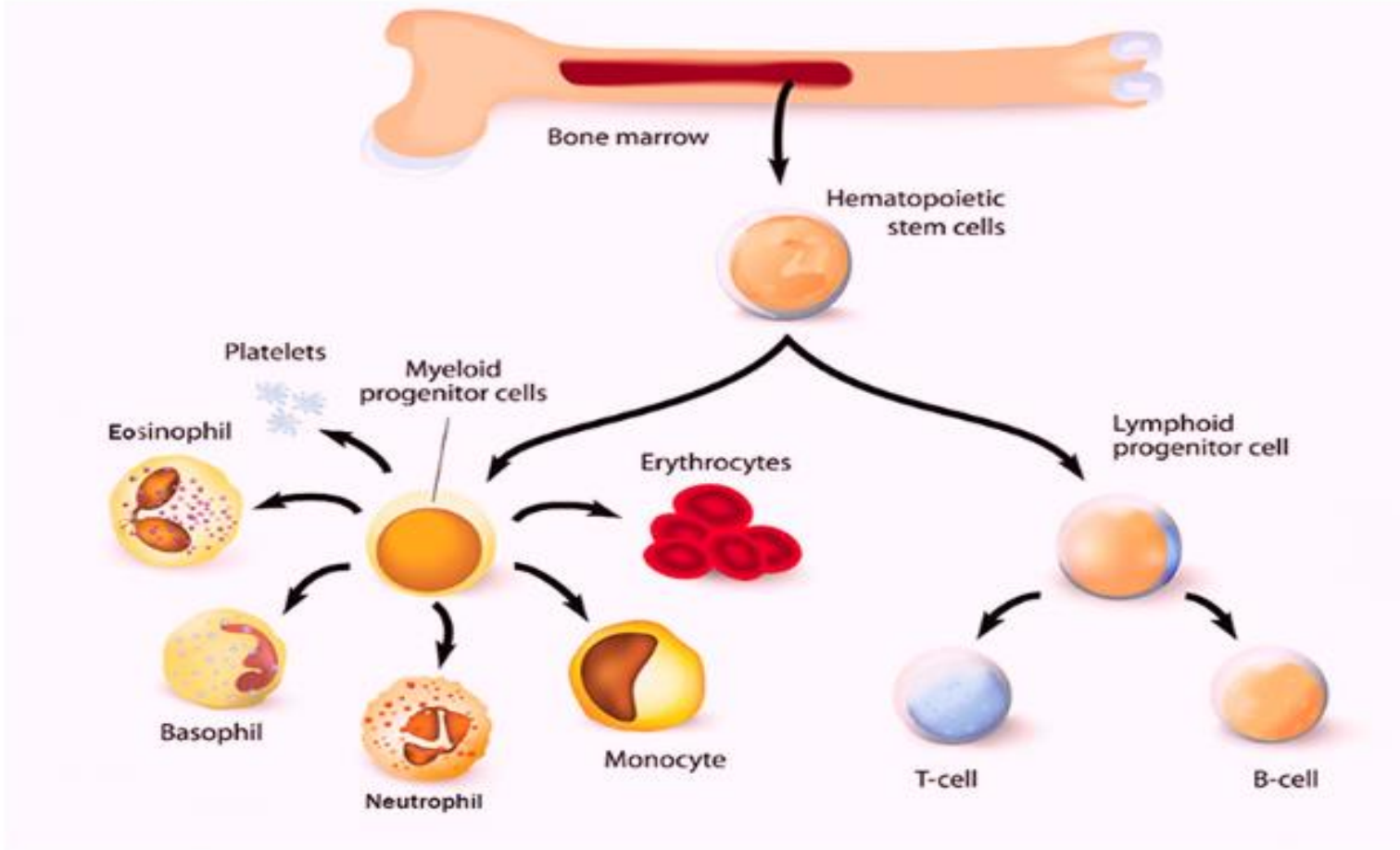
TOPICS : BLOOD - COMPOSITION AND FUNCTIONS

FACULTY NAME : Ms. SINEKA M

INTRODUCTION (Define)

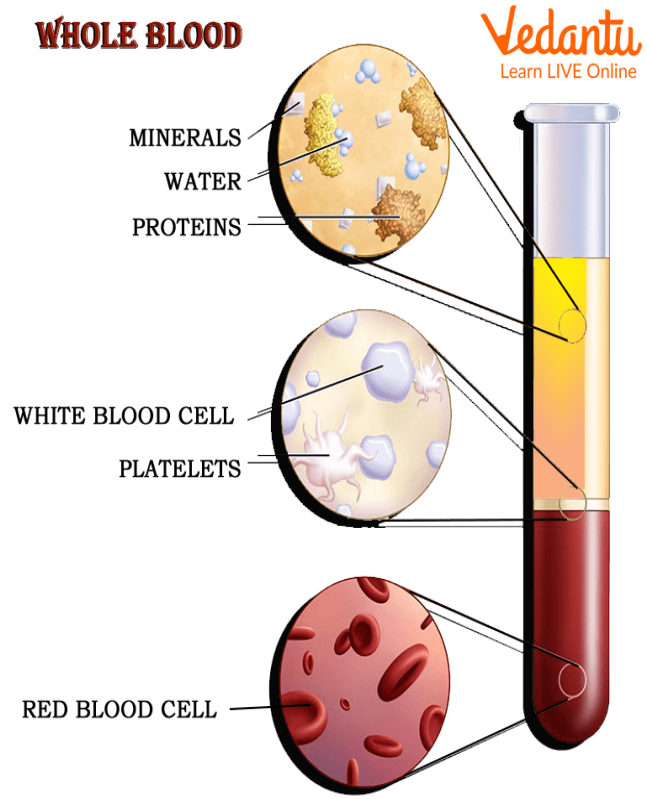
- Blood is a vital, specialized **fluid connective tissue** that circulates throughout the body, delivering essential substances and removing waste.
- It makes up about **7-8%** of an adult's body weight, typically totaling **5-6 liters.**



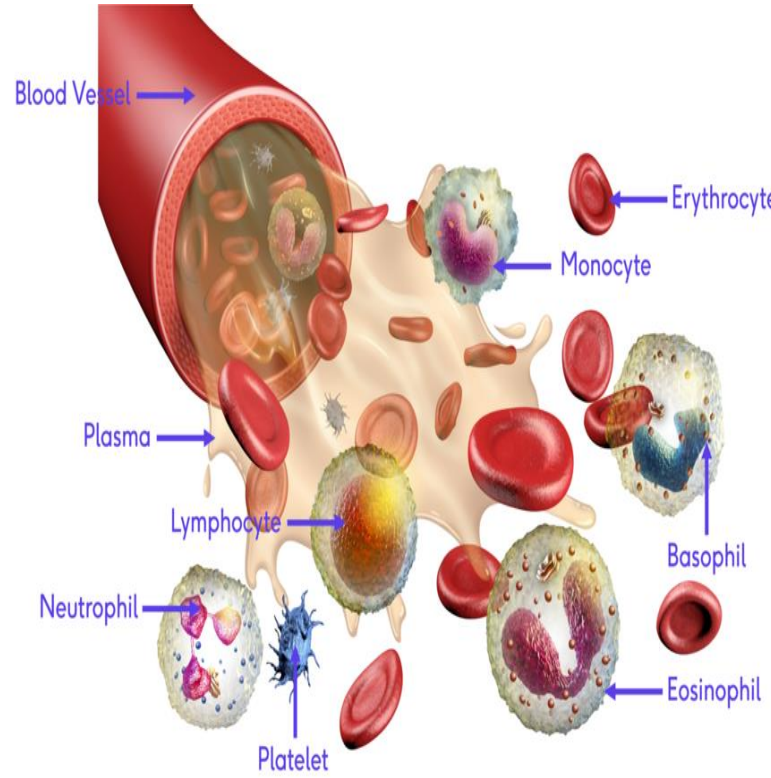

Bone marrow
Hematopoietic stem cells
Platelets
Myeloid progenitor cells
Eosinophil
Erythrocytes
Lymphoid progenitor cell
Basophil
Neutrophil
Monocyte
T-cell
B-cell

COMPOSITION OF BLOOD

- **Plasma:** **Straw-colored liquid** (92% water, 8% solutes including proteins like albumin/globulins/fibrinogen, electrolytes, nutrients, hormones, waste products).
- **Erythrocytes (RBCs):** **4.5-5.9 million/µL;** biconcave, anucleate discs containing hemoglobin for gas transport.



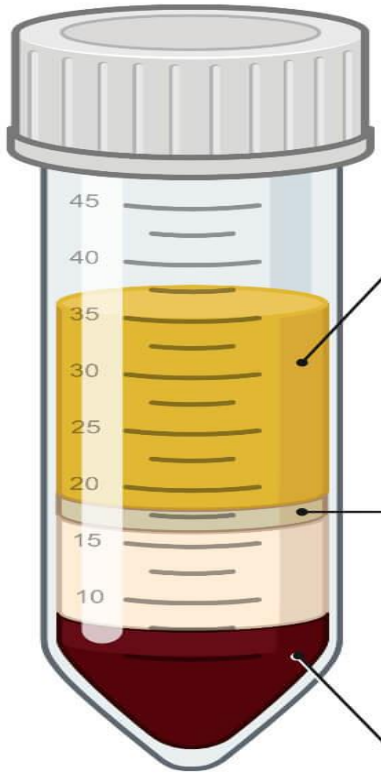
- **Leukocytes (WBCs): 4,000-10,000/µL;** include neutrophils (phagocytosis), lymphocytes (adaptive immunity), monocytes/macrophages, eosinophils (parasites/allergy), basophils (inflammation).
- **Thrombocytes (platelets): 150,000-400,000/µL;** derive from megakaryocytes for hemostasis.



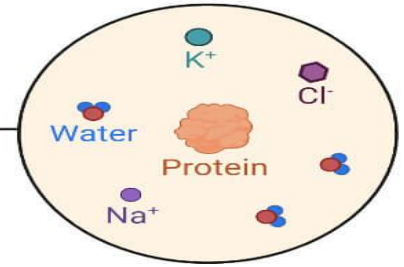
COMPOSITION OF BLOOD

COMPONENT	PERCENTAGE OF BLOOD VOLUME	KEY CONSTITUENTS/SUBTYPES	PRIMARY ROLE
Plasma	~55%	- Water (90-92%) - Proteins (7-8%): Albumin (maintains osmotic pressure), globulins (immune function), fibrinogen (clotting) - Electrolytes (e.g., Na^+, K^+, Cl^-) - Nutrients (glucose, amino acids), hormones, wastes (urea)	Fluid medium for transport; maintains blood pressure and pH balance.
Red Blood Cells (Erythrocytes)	~40-45% (of total volume; 99% of formed elements)	Biconcave discs containing **hemoglobin** (iron-rich protein)	Oxygen transport from lungs to tissues; CO_2 removal.

Composition of Blood

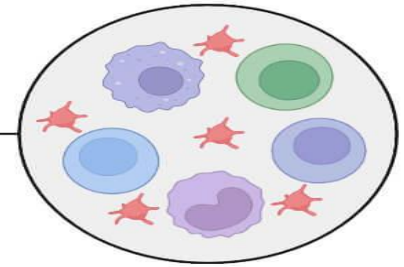


~55%



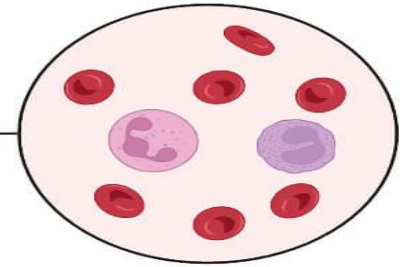
Plasma
- Water
- Proteins
- Electrolytes

1 %



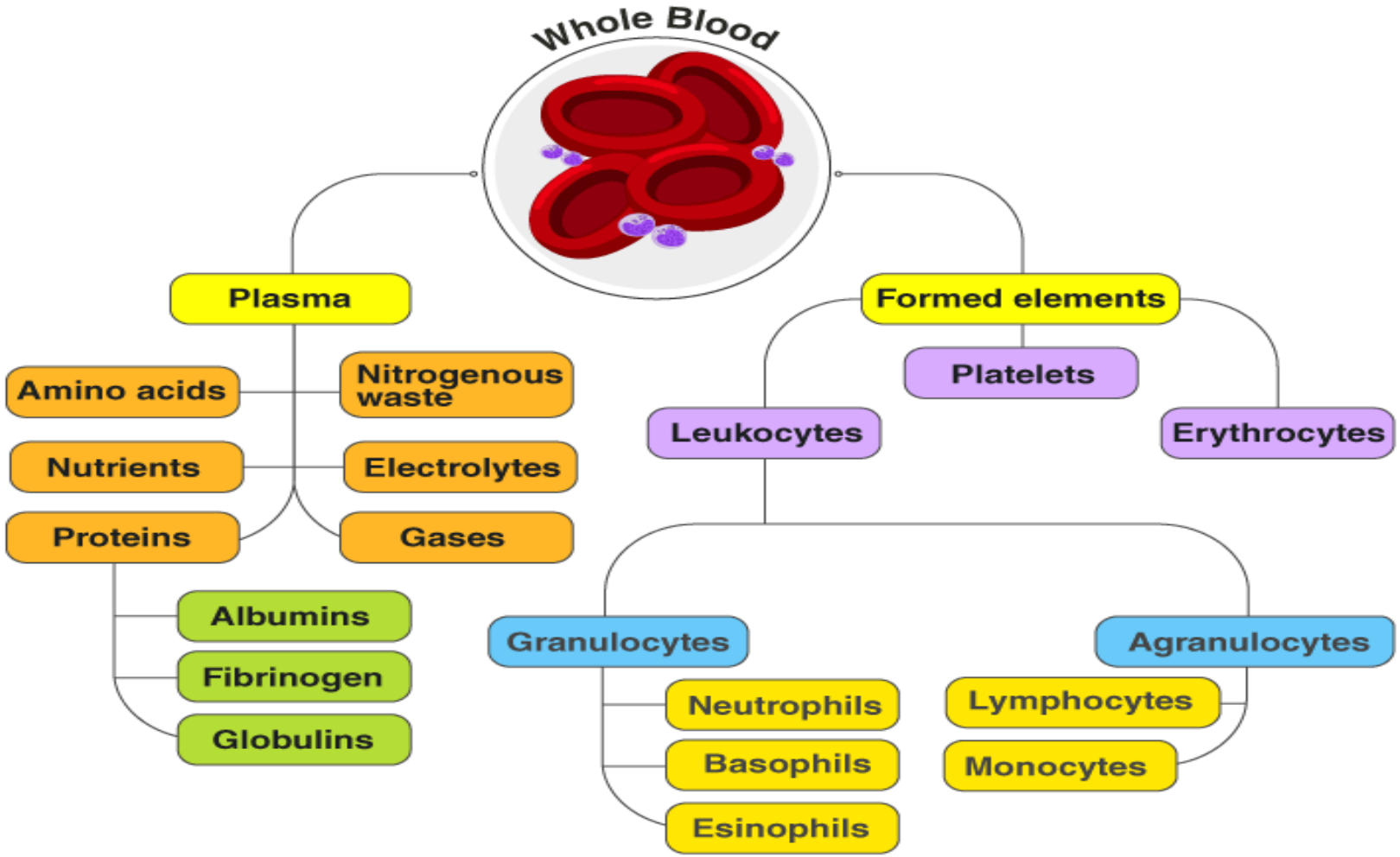
Platelets + Peripheral blood mononuclear cells (PBMCs)
- Lymphocytes
- Monocytes

~45%



Red blood cells + Polymorphonuclear cells
- Eosinophil
- Neutrophil

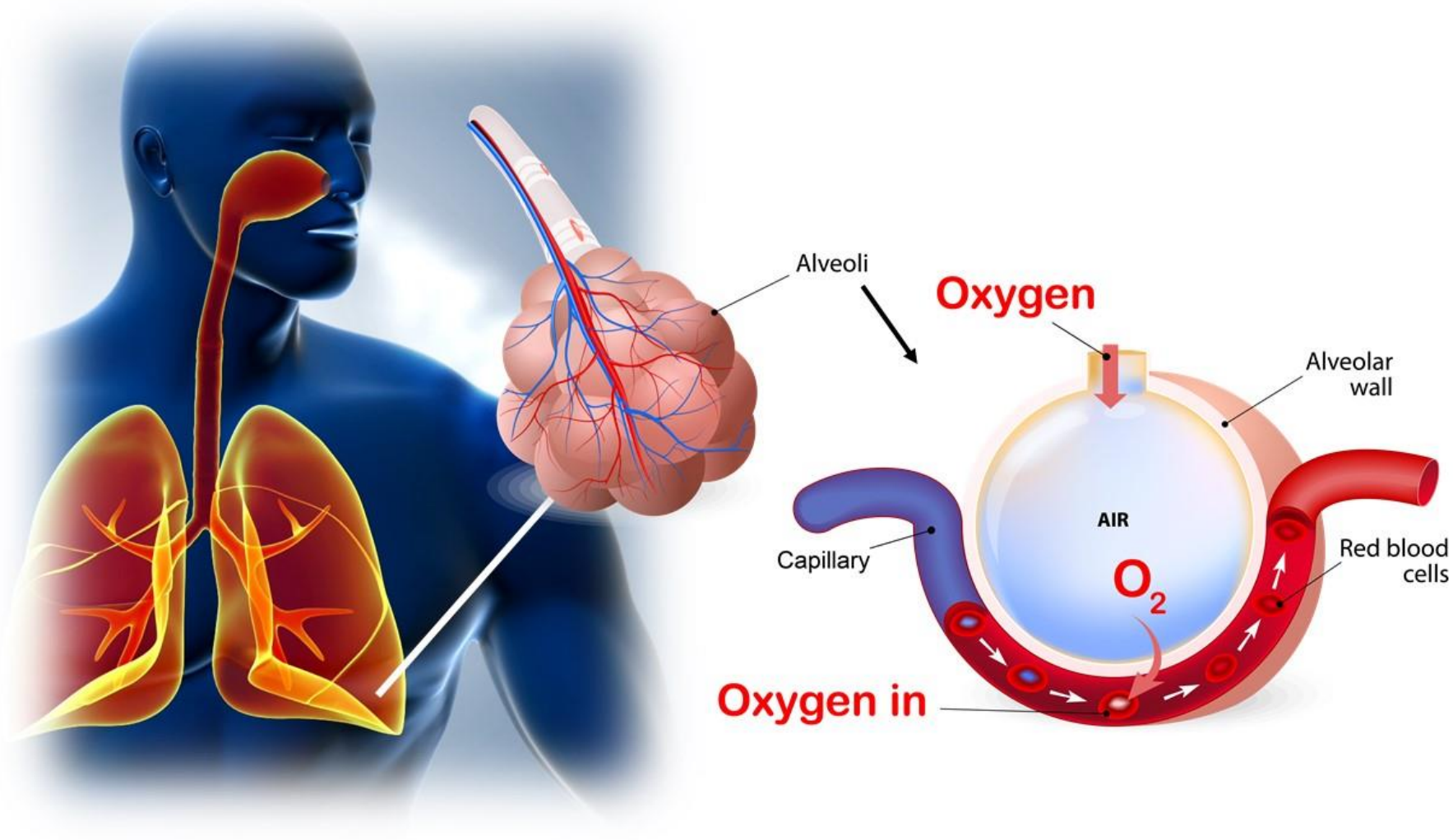
COMPONENT	PERCENTAGE OF BLOOD VOLUME	KEY CONSTITUENTS/SUBTYPES	PRIMARY ROLE
White Blood Cells (Leukocytes)	<1% (of total volume)	- Granulocytes: Neutrophils (phagocytosis), eosinophils (allergic responses), basophils (inflammation) - Agranulocytes: Lymphocytes (B/T cells for immunity), monocytes (macrophages)	Immune defense; fight infections and foreign invaders.
Platelets (Thrombocytes)	<1% (of total volume)	Cell fragments derived from megakaryocytes	Hemostasis (blood clotting) to prevent excessive bleeding.


Whole Blood
Plasma
Amino acids
Nitrogenous waste
Nutrients
Electrolytes
Proteins
Gases
Albumins
Fibrinogen
Globulins
Formed elements
Platelets
Leukocytes
Erythrocytes
Granulocytes
Agranulocytes
Neutrophils
Basophils
Esinophils
Lymphocytes
Monocytes

FUNCTIONS OF BLOOD

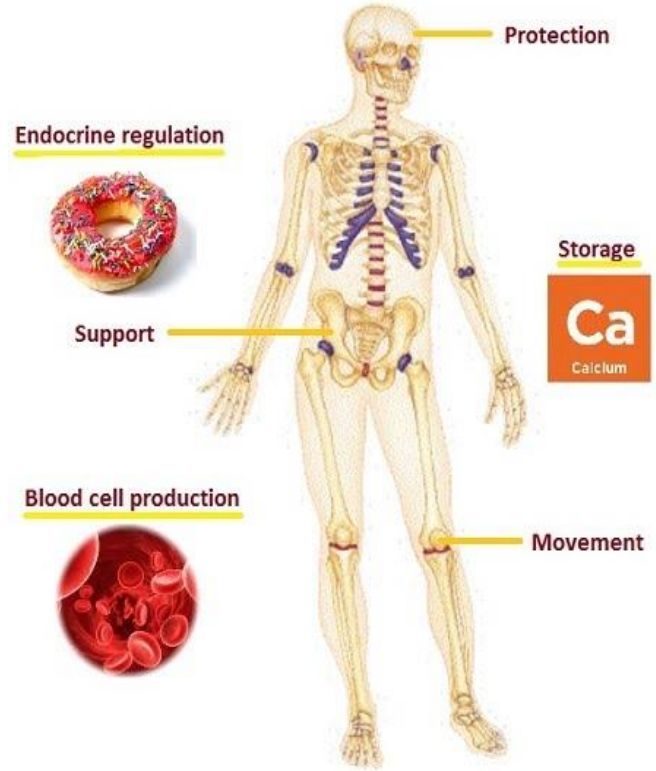
TRANSPORTATION:

- **Gases:** Carries oxygen from the lungs to the tissues and carbon dioxide from the tissues back to the lungs for exhalation.
- **Nutrients and Wastes:** Transports absorbed nutrients (glucose, amino acids, etc.) from the digestive system to cells, and moves metabolic waste products (urea, uric acid) to the kidneys and liver for removal.
- **Hormones:** Acts as a messenger system, carrying hormones secreted by endocrine glands to their target organs throughout the body.


Alveoli
Oxygen
Alveolar wall
AIR
Capillary
Red blood cells
O_2
Oxygen in

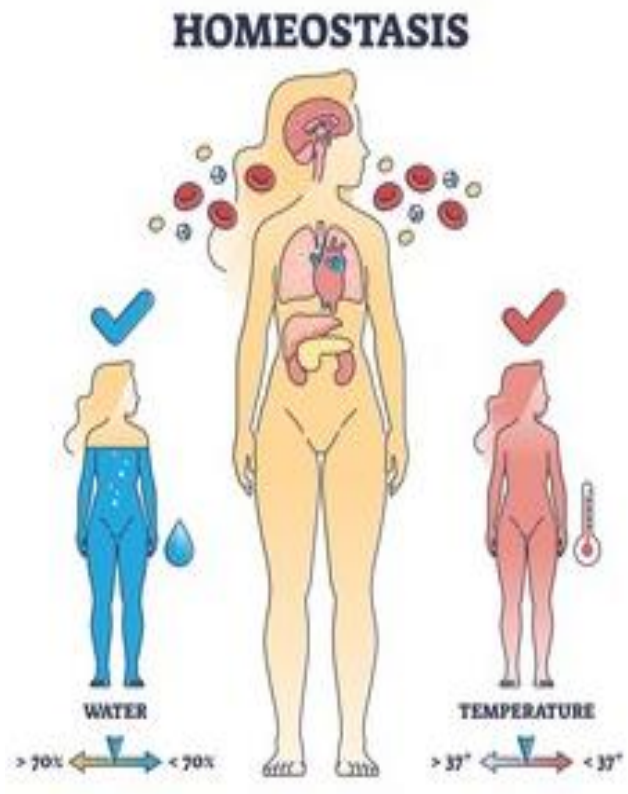
PROTECTION:

- **Immunity:** White blood cells and antibodies in the plasma fight off pathogens and destroy damaged or cancerous cells.
- **Hemostasis:** The clotting mechanism prevents blood loss when blood vessels are damaged.

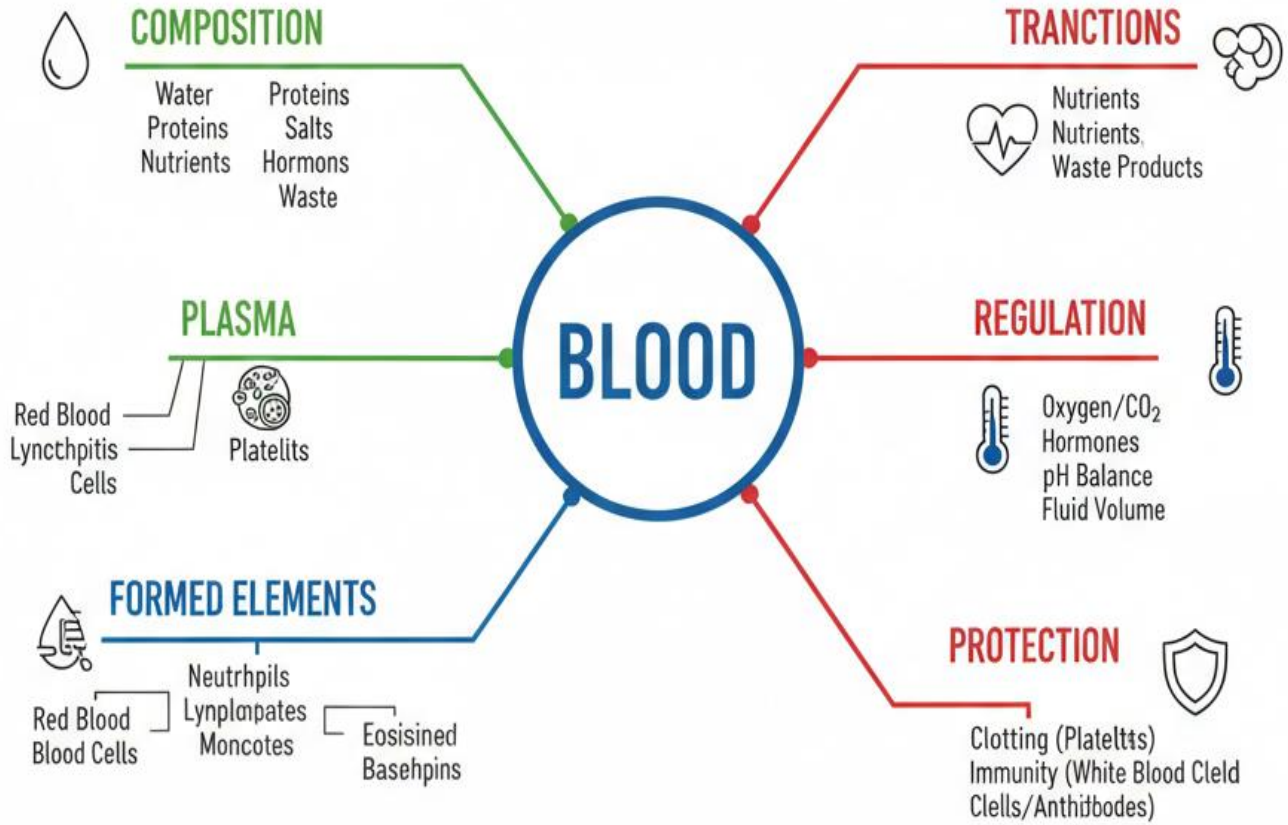


REGULATION (HOMEOSTASIS):

- **Body Temperature:** Distributes heat around the body to help maintain a stable internal temperature.
- **pH Balance:** Plasma contains buffers that help maintain blood pH within a narrow range of 7.35 to 7.45.
- **Fluid Volume:** Plasma proteins, particularly albumin, maintain the osmotic pressure that ensures a proper fluid balance between the blood and surrounding tissues.



SUMMARY


COMPOSITION
Water
Proteins
Nutrients
Proteins
Salts
Hormons
Waste
PLASMA
Red Blood
Lyncthpitis
Cells
Platelits
FORMED ELEMENTS
Red Blood
Blood Cells
Neutrhpils
Lynplapates
Moncotes
Eosisined
Basehpins
BLOOD
TRANCTIONS
Nutrients
Nutrients
Waste Products
REGULATION
Oxygen/CO_2
Hormones
pH Balance
Fluid Volume
PROTECTION
Clotting (Platelits)
Immunity (White Blood Cleld
Clells/Anthibodes)

References

- https://my.clevelandclinic.org/health/body/24836-blood
- https://www.kenhub.com/en/library/anatomy/the-blood
- https://www.hematology.org/education/patients/blood-basics