



جامعة المستقبل  
كلية التقنيات الصحية والطبية-قسم تقنيات طب  
الطوارئ

**PHYSIOLOGY PRACTICAL  
LECTURE: (1)**

**LECTURE TITLE: BLOOD PHYSIOLOGY**

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# INTRODUCTION



- **Blood** is a connective tissue in fluid form. It is a denser & more viscous than water.
- 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 nutritive 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 WHOLE BLOOD

- **Blood:** It is a type of liquid connective tissue, a complex mixture of cells, chemicals, and fluid.
- **Color:** Blood is red in color. Arterial blood is scarlet red because it contains more oxygen, and venous blood is purple red because of more carbon dioxide.
- **Volume:** The 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.

# PROPERTIES OF WHOLE BLOOD

- **BLOOD PH:** BLOOD IS ALKALINE, AND ITS PH UNDER NORMAL CONDITIONS IS 7.4
- **VISCOSITY:** BLOOD IS FIVE TIMES MORE VISCOUS THAN WATER. IT IS MAINLY DUE TO RED BLOOD CELLS AND PLASMA PROTEINS.
- **TEMPERATURE:** 38°C.

# **FUNCTIONS OF BLOOD**

## **1. Transports:**

- ✓ Dissolved gases (e.g. oxygen, carbon dioxide).
- ✓ Waste products of metabolism (e.g., water, urea)
- ✓ Hormones
- ✓ Enzymes
- ✓ Nutrients (e.g. glucose, amino acids, vitamins & minerals, glycerol).
- ✓ Plasma proteins (associated with defense, such as blood clotting and antibodies) .

# **FUNCTIONS OF BLOOD**

## **2 . Maintains Body Temperature:**

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

## **3. Controls pH:**

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

## **4. Removes toxins from the body.**

# **FUNCTIONS OF BLOOD**

## **6. Storage Function**

Water and some important substances such as proteins, glucose, sodium, and potassium are constantly required by the tissues. Blood serves as a ready-made source for these substances.

## **7. Defensive Function**

Blood plays an important role in the defense of the body. The white blood cells are responsible for this function.

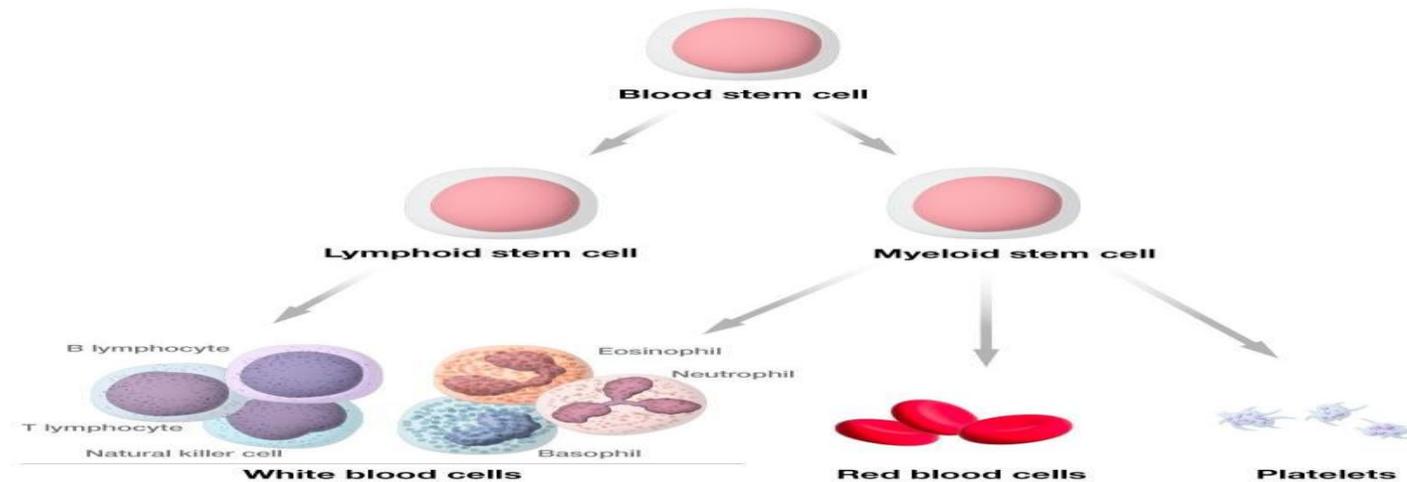
# BLOOD CELLS FORATION

**Hemopoiesis or Hematopoiesis:** formation of blood cellular components.

**1.Erythropoiesis.** Formation of RBC (erythrocytes)

**2.Leucopoiesis:** Formation of WBC (leucocytes)

**3.Thrombopoiesis:** Formation of platelets (thrombocytes).



# COMPOSITION OF BLOOD

Blood consists of about 55% of blood plasma & 45% blood cells.

White blood cells and platelets (<1%).

## 1. Cellular components:

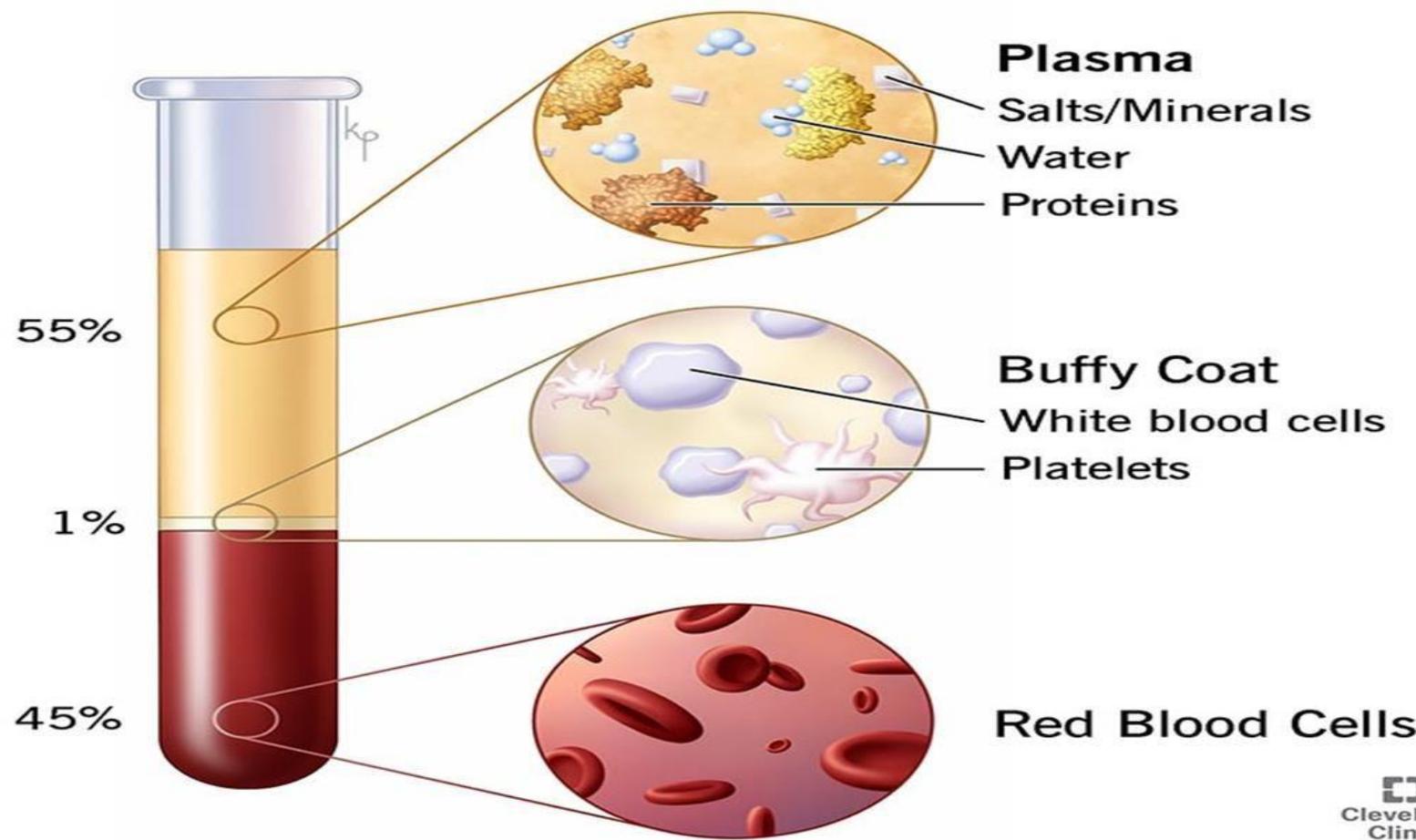
✓ Red Blood Cells (Erythrocytes)

✓ White Blood Cells (Leucocytes)

✓ Platelets (Thrombocytes)

**2. Plasma:** 95-98% water + ions + plasma proteins e.g.

(Albumin, Fibrinogen)



# COMPOSITION OF BLOOD

## a) White blood cells (leukocytes)

### 1. Granulocytes

✓ Neutrophils .

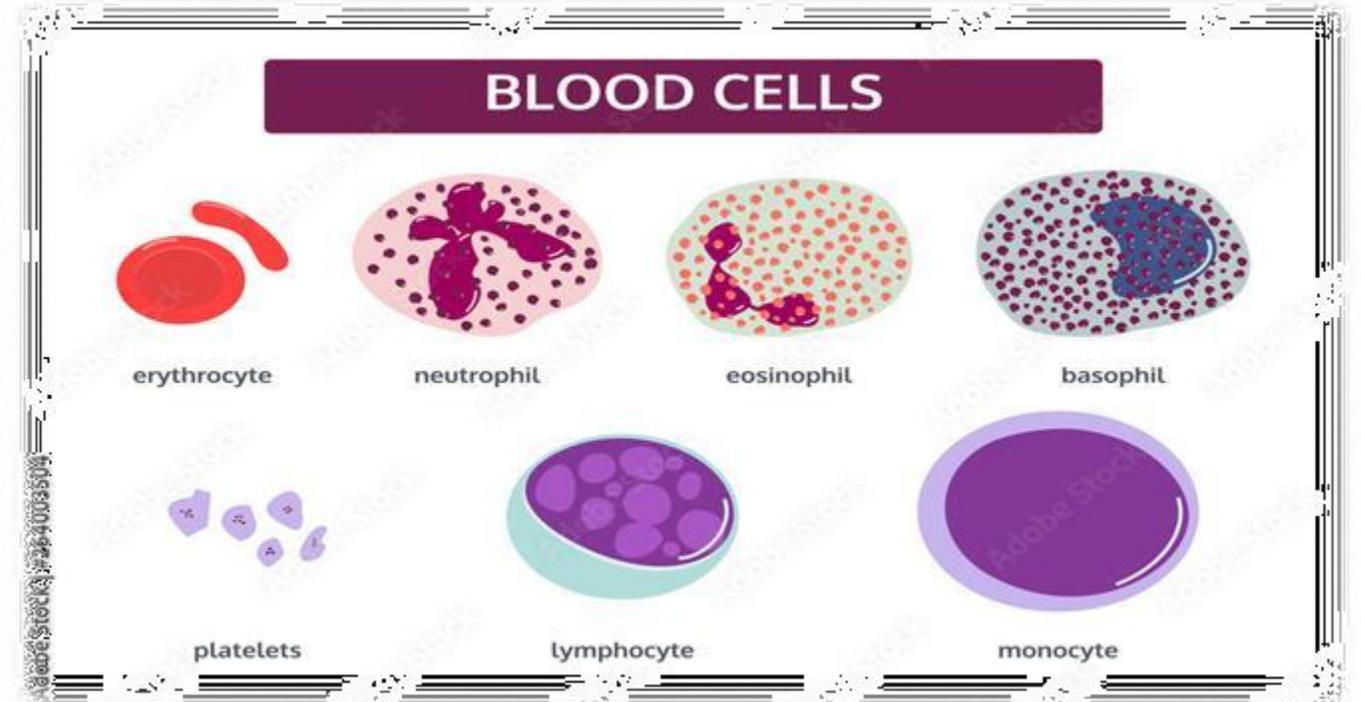
✓ Eosinophils.

✓ Basophils.

### 2. Agranulocytes

✓ Lymphocytes .

✓ Monocytes.



## **A).ERYTHROCYTES OR RED BLOOD CELLS (RBCS)**

- ► RED BLOOD CELLS ARE SMALL, NON-NUCLEATED, BICONCAVE DISC-SHAPED CELLS.
- ► THE NUMBER OF RBCS VARIES ACCORDING TO AGE, SEX, AND PHYSIOLOGICAL CONDITIONS OF THE BODY.
- ► THEY ARE RED IN COLOR DUE TO THE PRESENCE OF HEMOGLOBIN.

# ERYTHROCYTES OR RED BLOOD CELLS (RBCS)

- In fetal life erythrocytes are produced in liver, after birth they are produced in red bone marrow.
- The life span of RBCs is about 120 days & finally they are destroyed in spleen & liver.
- ➤ Normal RBC ranges are:
  - Male:** 4.7 to 6.1 millioncells per Microliter (cells/mcL)
  - Female:** 4.2 to 5.4 millioncells/mcL

# **FUNCTIONS RED BLOOD CELLS**

- 1. TRANSPORT OF OXYGEN FROM THE LUNGS TO THE TISSUES:**
- 2. TRANSPORT OF CARBON DIOXIDE FROM THE TISSUES TO THE LUNGS.**
- 3. BUFFERING ACTION IN BLOOD:**
- 4. IN BLOOD GROUP DETERMINATION:**
  - RBCS CARRY THE BLOOD GROUP ANTIGENS SUCH AS A ANTIGEN, B ANTIGEN, AND RH FACTOR.**

## **B).LEUCOCYTES OR WHITE BLOOD CELLS (WBCS)**

- ▶ Leucocytes (leuco-white, cytes-cells) are the largest blood cells.
- ▶ It is a nucleated cell.
- ▶ They are formed partially in the bone marrow (granulocytes, monocytes, and a few lymphocytes) and partially in the lymph tissue.
- ▶ The real value of the white blood cells is providing a rapid and potent defense against infectious agents.
- ▶ The normal value of leucocytes is 4,000-10,000 cells.

## **C).PLATELETS**

- Also called thrombocytes are small, colorless cell fragments in blood have no cell nucleus.
- They are derived from the bone marrow, which then enter the circulation.
- A normal platelet count in adults ranges from 150,000 to 450,000 platelets per microliter of blood.

# 2.PLASMA

Blood plasma is a pale yellow-colored fluid and its total volume in an adult is 2.5–3 L. and 55% of blood's volume. When the blood cells are removed from the blood, called blood plasma. **Blood Plasma consist of :**

1. Water (92%).
2. Solids (7-8%).

## **a).Plasma proteins:**

– Albumin(60%): the most abundant component. Important in regulation of water movement between tissues and blood.

- Fibrinogen: Responsible for formation of blood clots.



b) Inorganic salts (1%): sodium, potassium, calcium, magnesium

c) Nutrients: Glucose, amino acid, fats, vitamins

d) Waste material: Urea, uric acid, creatinine

f). Enzymes & hormones.

**3. Gases: Oxygen, carbon dioxide and nitrogen.**

***Thank  
You!***