

Anatomy and Physiology

For

The First Class

2nd Semester

Hematologic System

Blood

The Blood

- Blood is a fluid connective tissue. It circulate continually around the body, allowing constant communication between tissues distant from each other.
- Blood makes up about 7% of body weight (about 5.6 liters in a 72 Kg man). This proportion is less in women, while in children is greater (gradually decreasing until the adult level is reached).

Functions of the Blood

1. The main function of the blood is to **maintain intracellular homeostasis** by:
 - a). Carries O₂ and nutrients (glucose, amino acids, lipids, and vitamins) **to the cells.**
 - b). Carries CO₂ and other wastes (nitrates, creatine, nucleic acid) **away from the cell.**
2. **Providing intercellular communication in the body:** carries hormones (secreted by endocrine glands) to the target organs.
3. **Production and defense:** it allows cells and immunological proteins to transport from place to place where need them.
4. **Self repair mechanism:** clotting cascade.

Blood Components

- Blood is composed from 2 fractions:

- 1. Plasma**

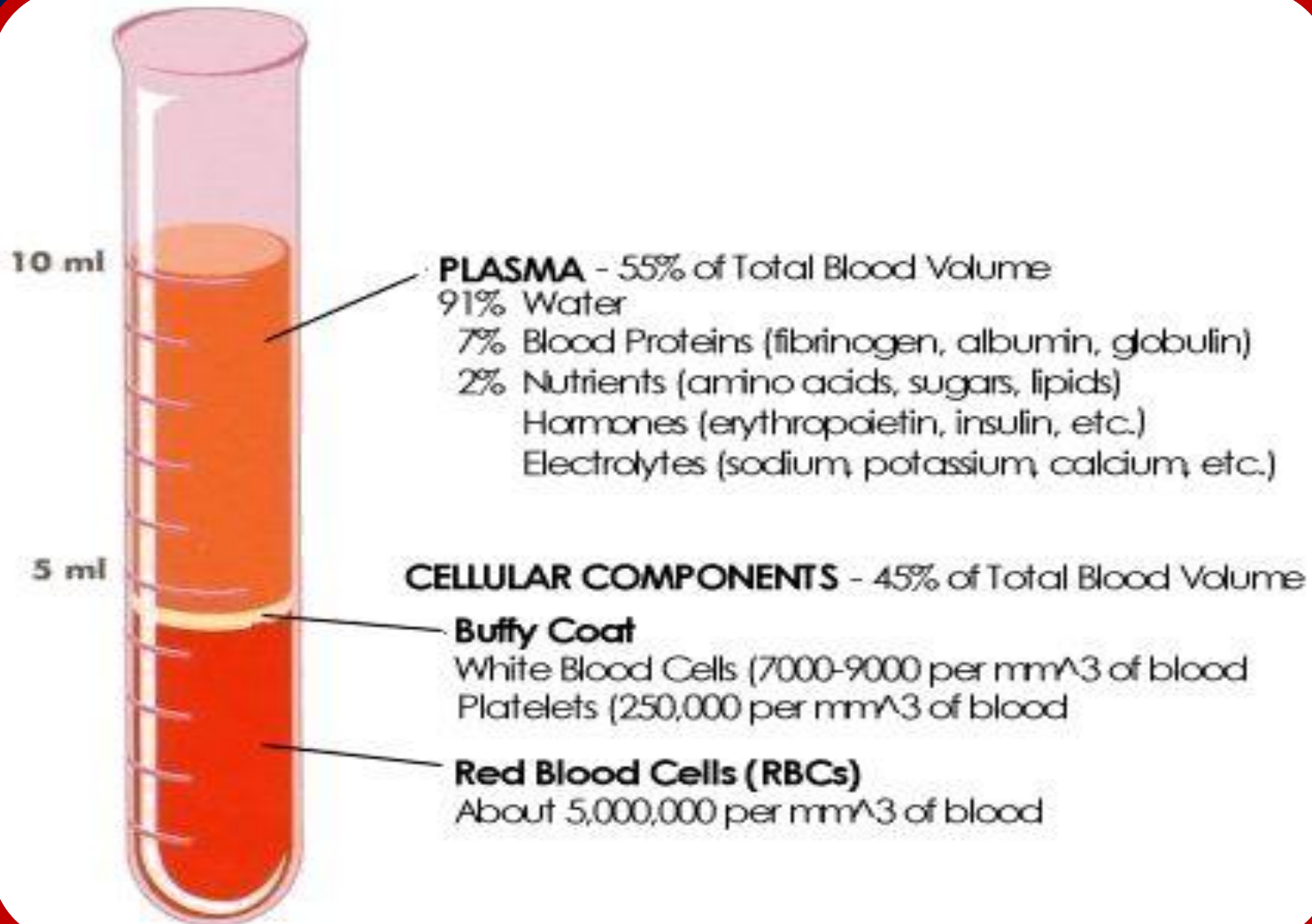
Non living extracellular matrix
composes about 55% of total blood volume.

- 2. Formed elements (living cells)**

composes about 45% of total blood volume.

- The two fractions of blood can be separated by spinning.

Hematocrit tube with blood after centrifugation
Plasma forms the supernatant, buffy coat forms the middle layer
and the red blood cells form the sediment



Components of Blood



1. Plasma – 55% total volume of blood

→ mostly liquid water (91%)

→ soluble blood proteins (7%)

→ hormones

→ electrolytes } (2%)

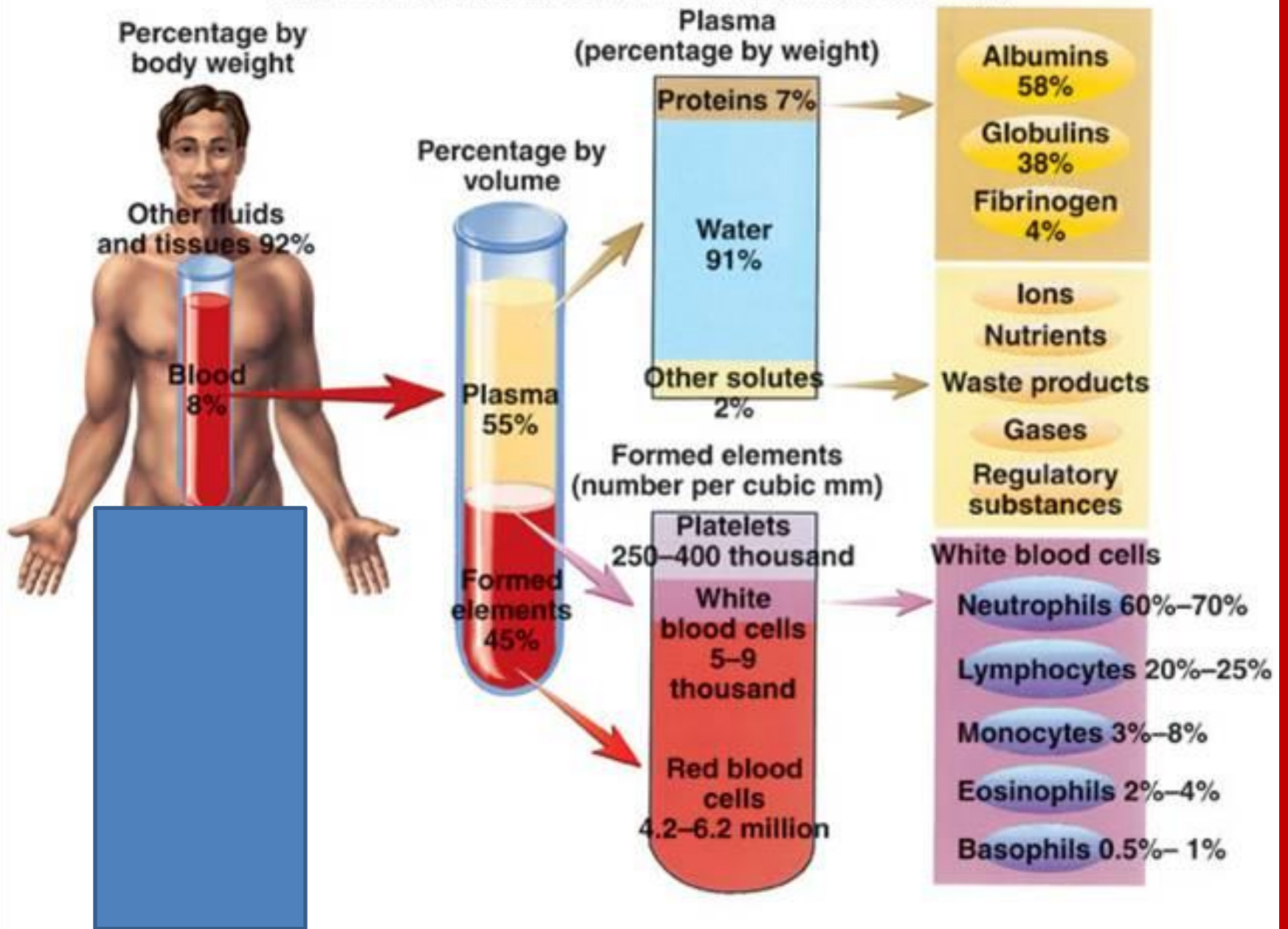
→ nutrients

2. Cellular Component – 45% total volume of blood

→ White blood cells

→ Platelets

→ Red blood cells



Plasma

- the constituents of plasma are:
 1. **Water** (90-92%)
 2. **Plasma proteins:** make up about 7% of plasma.
 - **Albumins** (about 60% of total plasma protein) They are responsible for maintain normal plasma *osmotic pressure*. Albumins also act as *carrier molecules* for free fatty acids, some drugs and steroid hormones.
 - **Globins** their main functions are: as *antibodies (immunoglobulins)*, *transportation of some hormones and mineral salts* (e.g. thyroglobulin carries the hormone thyroxin and transferrin carries the mineral iron).
 - **Clotting factors.** These are responsible for *coagulation of blood*. And inhibition of some proteolytic enzymes (e.g. macroglobulin inhibits trypsin) activities)
 3. **Inorganic salts** (electrolytes) like Ca, Na, Po₄ which are responsible for muscle contraction, transmission of nerve impulses, --ect.
 4. **Nutrients:** glucose, amino acid, fatty acids and glycerol.
 5. **Waste products** like urea, creatinine and uric acid they are carried in the blood to the kidney for excretion.
 6. **Hormones and gases**

Formed Elements

(Cellular Content of Blood)

- There are three types of blood cell:
 1. **Erythrocytes** (Red Blood Cells =RBC).
 2. **Platelets** (thrombocytes)
 3. **Leukocytes** (white blood cells = WBC) they include monocytes, lymphocytes, neutrophils, eosinophils, and basophils.

Source of Blood Cells

- Mature blood cells have a relatively short life span.
- Blood cells are synthesised mainly in the red bone marrow.
- Some lymphocytes, additionally are produced in lymphoid tissue.
- The organ or system responsible for synthesis blood cells are called hematopoietic system and the process of blood cell formation is called hematopoiesis.

Differentiation of pluripotential stem cells during hematopoiesis.

