Objectives
- To outline the components of blood.
  - Formed elements
  - Plasma
- To describe the characteristics of the vital connective tissue called blood.
- To identify the functions of blood.
- To specifically look at the formed elements of erythrocytes → Red Blood Cells.

Characteristics of Blood
Blood is a fluid tissue (connective tissue).
I. Formed elements i.e. blood cells
  - Erythrocytes
  - Leukocytes
  - Platelet
II. Plasma → nonliving fluid matrix.
  - Water
  - Dissolved materials
e.g. gases, nutrients, proteins, hormones

Composition of Blood
Characteristics
- More dense than water.
- 5 times more viscous than water.
- Slightly alkaline.
- Normal blood pH is 7.35 – 7.45.
- Temperature 100.4 degrees F.
- 8 % of the body’s weight.
- Volume is about 5-6 L in males and 4-5 L in females.
- At any one time 25% of the blood is being filtered in the kidneys.

Functions
1) Transporter
   > Oxygen (lungs to tissues)
   > Carbon dioxide (cells to lungs)
   > Nutrients
   > Metabolic wastes (cells to lungs, kidneys and sweat glands).
   > Hormones & enzymes
2) Thermoregulation
3) PH Buffering
4) Prevents fluid loss via clotting.
5) Protection from intruders

Plasma
55% of total blood volume
Mostly water (90%)
Contains dissolved solutes
Most abundant solutes are **proteins**
............... most produced by the liver.
  - **Albumin**
  - **Globulins**
Erythrocytes
Red Blood Cells

I. Physical characteristics
II. Composition
   Hemoglobin – 33% of the cells weight
III. Origin and Fate

Erythropoiesis
The process of forming blood.
Production is under the influence of
REF or EPO (hormones made by kidneys)
Produced in red bone marrow (1 oz/day)
100 billion new cells each day!

Hormonal Regulation
Erythropoiesis initiated by the enzyme
Renal Erythropoietic Factor (REF)
Released by kidneys when O2 is low.
   → Erythropoietin stimulates RBC production.
Hemoglobin

Composition:
- Tertiary, protein globin (2 alpha and 2 beta).
- Bound to the red pigment called heme.
- Each heme group contains an iron atom in the center of it.
- Each iron can bind to one oxygen*.
- Each hemoglobin can carry 4 oxygen molecules.
- Each RBC can carry 1 billion oxygen molecules.
- Can carry O₂, CO₂, and CO.
* Individuals that are iron deficient may be anemic.

Hematocrit

The percentage of RBC in the blood. Called the “blood fraction.”
a.k.a. PCV = Packed Cell Volume

In males the norm is 47% +/- 5-7%
In females the norm is 42% +/- 5%

Test to determine if patient is anemic.

Destiny of the Erythrocytes & Hemoglobin

RBC’s live approximately 120 days. Broken down by spleen & liver. Hemoglobin is recycled:
- Amino acids reabsorbed
- Iron recovered & stored as ferritin in liver
- Heme group is recycled into bilirubin → bile
- Non-recycled components are eliminated via feces.

Erythrocyte Disorders

I. Anemia
- Symptoms
- Causes
  - Insufficient number of RBC’s
  - Low hemoglobin content
- Abnormal hemoglobin
  - Types (pg 5-8 & 5-9)
  - Reticulocyte – estimates rate of RBC production.

II. Polycythemia