*Maintenance of metabolism

Blood is a connective tissue therefore it is comprised of 3 things:

1. Cells – Red blood cells (RBC) and White blood cells (WBC)
2. Fibers – Reticular fibers
3. Matrix or ground substance – Plasma

Blood Composition

- Plasma – 55% of whole blood
- Buffy Coat (fibers) - <1% of whole blood
- Cells (RBC & WBC) – 45% of whole blood

Formed elements = cells + buffy coat

Hematocrit – Percent of formed elements in the blood

- 45% - normal for men
- 40% - normal for women (due to menstrual cycle)

*If hematocrit is lower than averages, expect hemmoraging or internal bleeding.

**Plasma composition**

- 92% of water
- 7% proteins
  - Globulins – important for hormone transport (anchors proteins)
  - Albumins – Maintains blood volume and blood pressure.
    - Women are tested while pregnant to see if they have a high amount of albumins which could lead to pre eclampsia.
  - Fibrinogens – creates fibers used for clotting
- 1% other elements
  - Organic nutrients (ATP production, growth)
  - Organic wastes (excretion)
  - Electrolytes (Sodium, Potassium, Calcium, Magnesium)

**Red Blood Cells (RBC) or Erythrocytes**

- No nucleus
- No organelles
- Have a lifespan of about 3 – 4 months
- Transport gases (carry oxygen and carbon dioxide)
- Ability to carry more than a billion molecules of Oxygen
- Smallest blood cell and most abundant
- Bi-concave discs

Pattern of Rouleau – Stacking of blood cells in capillaries

**Hemoglobin (Hb)**

- Protein inside red blood cell
• Account for more than 95% of erythrocyte protein
• ~280,000 hemoglobin in each red blood cell
• It is a quaternary protein
  ○ 2 alpha chains
  ○ 2 beta chains
  ○ Heme – has iron ion (gives blood rusty red color)

**White Blood Cells (WBC) or Leukocytes**

**Wright's Stain:**
Hematoxylin blue – Basic dye which stains blue when pH is > 7
Eosin red – acidic dye which stains red when pH is < 7

Purple: pH = 7
Blue: pH > 7
Red: pH < 7

• Granulocytes
  1. Neutrophils – purple granules, multi-lobed, for bacterial infection, eats debris. Most abundant WBC.
  2. Basophils – blue granules, releases histamines (ex. Heparin)
  3. Eosinophils – red granules, bi-lobed, assists in fighting parasitic infection, attacks anything tagged with antibodies.

• Agranulocytes
  1. Lymphocytes – smallest of the white blood cells
     ○ B cells – Make antibodies (memory of immune system)
     ○ T cells – Killer cells. Attacks pathogens
  2. Monocytes – largest of the white blood cells
     ○ Phagocytic – enters tissue to become free macrophages
     ○ Kidney shaped nucleus

**Platelets**
• Cell fragments not cells
• Derive from megakaryocytes
• Involved with clotting