

# Chapter 7: Circulatory System

---

## 1. Introduction:

The circulatory system in humans is responsible for the transport of essential substances like oxygen, nutrients, hormones, and waste products. It consists of the **blood vascular system** and the **lymphatic system**.

---

## 2. Blood Vascular System:

### a) Blood:

- **Composition of Blood:**
    - **Red Blood Cells (RBCs):**
      - Structure: Biconcave, no nucleus in mammals.
      - Function: Transport oxygen using hemoglobin.
      - Adaptation: Absence of nucleus and organelles increases space for hemoglobin.
    - **White Blood Cells (WBCs):**
      - Structure: Nucleated, larger than RBCs.
      - Function: Defense against infections.
    - **Platelets:**
      - Function: Blood clotting.
  - **Blood Coagulation:**
    - A mechanism to prevent blood loss from injuries.
    - Platelets release clotting factors, converting fibrinogen to fibrin to form a clot.
  - **ABO Blood Group System:**
    - Based on the presence of antigens (A and B) on RBCs.
    - Blood groups: A, B, AB, O.
    - **Rh Factor:** Determines positive (+) or negative (-) blood type.
  - **Hepatic Portal System:**
    - Transports blood from the digestive tract to the liver for detoxification and nutrient processing.
-

### 3. Structure and Working of the Heart:

#### a) Structure:

- Four chambers: Right atrium, Right ventricle, Left atrium, Left ventricle.
- Major blood vessels:
  - **Entering the Heart:**
    - Vena Cava (from the body), Pulmonary Veins (from the lungs).
  - **Leaving the Heart:**
    - Pulmonary Artery (to the lungs), Aorta (to the body).
  - **Liver and Kidney:**
    - Hepatic Vein, Renal Vein.

#### b) Working:

- **Systole:** Contraction phase, pumping blood out.
- **Diastole:** Relaxation phase, filling the chambers.
- **Double Circulation:**
  - **Pulmonary Circulation:** Heart → Lungs → Heart.
  - **Systemic Circulation:** Heart → Body → Heart.
- **Pulse and Blood Pressure:**
  - **Pulse:** Rhythmic throbbing of arteries.
  - **Blood Pressure:** Force of blood against artery walls (measured as systolic/diastolic).

---

### 4. Blood Vessels:

- **Arteries:**
  - Thick, elastic walls to withstand high pressure.
  - Carry oxygenated blood (except pulmonary artery).
- **Veins:**
  - Thin walls, valves to prevent backflow.
  - Carry deoxygenated blood (except pulmonary vein).
- **Capillaries:**
  - One-cell-thick walls for gas and nutrient exchange.

---

### 5. Lymphatic System:

#### a) Lymph:

- Clear, yellowish fluid derived from blood plasma.

- Contains WBCs, primarily lymphocytes.
- Transports tissue fluid, proteins, and waste products.

**b) Lymphatic Organs:**

- **Spleen:** Filters blood, recycles RBCs.
- **Tonsils:** Defense against inhaled pathogens.

**c) Tissue Fluid:**

- Fluid that leaks from capillaries, providing nutrients to cells.
- Excess tissue fluid drains into lymph vessels, forming lymph.

---

**6. Significance:**

- Efficient transport of oxygen, nutrients, and waste.
  - Immunity through WBCs and lymphatic system.
  - Regulation of body temperature and pH balance.
-