**Heart**

**Anatomical Features**
- About size of fist
- 1 lb in weight
- Located in thoracic cavity
- Encased in rib cage
- Flanked by lungs
- Rests on diaphragm

**Coverings Around Heart**
- Pericardium: wrapping/membrane
- Visceral pericardium (epicardium): inner layer
- Parietal pericardium: outer layer

**Coverings Between 2 Coverings**
- Pericardial effusion: slippery serous fluid - prevents friction between layers as the heart beats

**Heart Chambers**
- Atria: collecting chambers that collect blood
- Ventricles: pumping chambers
- Septum: separates right and left sides of heart

**Heart Wall Structure**
- 3 layers:
  1. Epicardium: visceral pericardium - outer layer of heart wall
  2. Myocardium: middle layer - consists of cardiac muscle tissue (twisted & whorled) - contracts
  3. Endocardium: inner layer - thin, glistening sheet of epithelial tissue that lines chambers - continuous with linings of blood vessels leaving/entering heart

**Heart Valves**
- Help prevent backflow of blood
- Keep blood flowing in one direction
- 4 total
- Atrioventricular valves: located between atrial and ventricular chambers on each side
  - Mitral/tricuspid valve: left side
  - Triatrial: right side
- Semilunar valves: guard base of two large arteries leaving ventricular chambers
  - Pulmonary semilunar valve: guard pulmonary trunk
  - Aortic semilunar valve: guard aorta
- Chordae tendineae: tiny white connective tissue - attached to inferior side of each leaflet - anchor the flaps (valves)

**Rummary and Systemic Circulation**
- Pulmonary
  - Right side serves as pulmonary circuit pump
  - Blood flow between heart and lungs
- Systemic
  - Left side serves as systemic circuit pump
  - Blood flow between heart and rest of body

**Main Function**
- Transportation - blood is transport fluid that carries oxygen, nutrients, cell waste, hormones, etc.
**Blood Vessels**

**Arteries, Veins, and Capillaries**

- Blood vessels that carry blood away from heart
  - Pulmonary artery: carry deoxygenated blood away from right ventricle to pulmonary capillaries around the lungs
  - Aorta: (largest artery) carries oxygenated blood away from left ventricle to systemic circulation throughout whole body
  - Thick-walled
  - Thick muscle layer
  - Elastic/flexible
  - Located deep within body
  - High pressure spouts
  - No valves present

- Veins
  - Blood vessels that carry blood back to heart
  - Vena cava: return deoxygenated blood from body cells to right side of heart
    - Inferior vena cava: returns blood from below diaphragm
    - Superior vena cava: returns blood from above diaphragm
  - Pulmonary veins: return oxygenated blood from pulmonary capillaries around lungs to left side of heart
  - Thin-walled
  - Little muscle
  - Not elastic
  - Close to surface
  - Valves present
  - Low pressure

- Capillaries
  - Blood vessels that connect small arteries (arterioles) to small veins (venules) - they are thin-walled to allow for diffusion of gases, nutrients, etc.
  - Very thin-walled (one cell layer thick) to allow for diffusion
  - No muscle
  - Not elastic
  - No valves
  - Located throughout body

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**Anatomy of Blood Vessels**

1. **Tunica intima**: lines lumen (interior of vessel) - consists of thin layer of squamous epithelial cells - cells sit closely together and form a slick surface
2. **Tunica media**: bulky middle coat - mostly smooth muscle (involuntary/unstriated)
3. **Tunica externa**: outermost tunic - composed of fibrous connective tissue - supports and protects vessels
**Electrical Conduction of Heart**

- SA node - sinoatrial node - intrinsic pacemaker: initiates electrical signal which stimulates muscle contraction in atria.
- AV node - atrioventricular node: electrical signal passed from SA to AV node - causes ventricles to contract (pump blood out of heart).
- Pace of electrical conduction is regulated by signals from medulla in brain via nerve fiber.

**Heartbeat • Heart Rate**

**Heartbeat Cycle**
- Ventricles contract during systolic phase - AV valves close - semilunar valves open.
- Ventricles relax during diastolic phase - AV valves open - semilunar valves close.

**Cardiac Output**
- Amount of blood pumped out by heart in 1 min.
- Cardiac output = Stroke volume

**BP** = \( \frac{\text{systolic} \ - \ \text{diastolic}}{\text{diastolic}} \)

- "Pulse" = beats per min.
- Blood pressure: amount of pressure exerted on inside walls of blood vessels.
- Systolic pressure: pressure exerted on inside of blood vessel walls when ventricles contract and pump out blood.
- Diastolic pressure: pressure exerted on inside of blood vessel walls when ventricles relax and fill with blood.
Disorders

- **Leukemia**: Cancer - uncontrolled production of mutated, non-functional (immature) WBC's which are sent to blood in large numbers - different forms of leukemia

- **Autoimmune Diseases**: Immune system fails to recognize person's own body cells as "self" and instead perceives them as foreign - WBC's attack body's own cells
  - Juvenile diabetes (pancreas)
  - Rheumatoid arthritis (joints)
  - Multiple sclerosis (nerve cells)

- **Heart Attack (Myocardial Infarction)**: Death/damage of cardiac muscle tissue due to insufficient amount of blood flow to heart muscle tissue - possible causes include: blood clot in coronary arteries, slow heart beat, etc. - Angina pectoris is chest pain associated with MI - coronary artery bypass graft is treatment

- **Stroke**: Damage to portion of brain caused by decreased blood flow to area of brain - caused by occlusion (blockage) or rupture of cerebral blood vessel - effects would depend on what area of brain is oxygen deficient

- **Hypertension**: Lack of homeostasis - persistent high blood pressure is disorder - BP of 140/90 or higher - stress, cholesterol, fat, and salt can all cause it