• Chapter 14 - Circulatory System & Blood
Cardiovascular (Circulatory) System

Responsibilities:
• Bring oxygen, nutrients, & hormones to cells
• Remove wastes and heat
2 Main Elements of Circulatory System

• Heart – muscular pump that generates pressure

• Blood vessels – tubes that transport blood
The Heart

- Myocardium: cardiac muscle tissue
- Pericardium: surrounding sac
- Septum: wall that divides heart in two
- Two chambers in each half: Atrium & Ventricle separated by AV valve

similar to Fig 15.1, pg 334
What is a heartbeat?

- Contraction and relaxation in heart chambers that pumps blood
- Systole = contraction phase
- Diastole = relaxation phase
1. Atria contract, and fluid pressure in ventricles rises sharply.

2. Ventricles contract; blood is pumped into the pulmonary artery and the aorta.

3. Ventricles relax even as the atria begin to fill and start another cycle.

4. Fluid pressure in filling atria opens AV valves; blood flows into ventricles.

Heart sounds
Blood Vessels

Arteries → Arterioles → Capillaries → Venules → Veins
• Artery: “Pipeline”; carries blood away from heart

• Arteriole: Regulates volume of blood flow

• Capillary: Specialized for diffusion
- **Venule**: Receives blood from capillaries, also some diffusion

- **Vein**: Contains valves, can bulge greatly; carries blood toward heart
2 Circuits of Blood Flow

- **Pulmonary Circuit:** Circulates blood through lungs

![Diagram of the pulmonary circuit](image)
• Systemic Circuit: Oxygenated blood is pumped throughout the body.
Which areas use the most blood?

- Lungs: 21%
- Heart's right half: 6%
- Digestive tract: 20%
- Heart's left half: 15%
- Kidneys: 13%
- Skeletal muscle: 9%
- Brain: 5%
- Skin: 3%
- Bone: 8%
- Cardiac muscle: 3%
- All other regions: 8%
Blood

Responsibilities:
• Transport oxygen, nutrients, hormones, & wastes
• Regulate body temp, water & electrolyte balance
• Protect body against harmful organisms
Blood Basics

• Plasma: 55% of whole blood; mostly water
• Erythrocytes (RBCs): 45% of whole blood; contain hemoglobin which transports oxygen
• Leukocytes (WBCs): tiny fraction; housekeeping and defense
• Platelets: Cell fractions involved in clotting
Making new red blood cells

A: Reduced oxygen in blood
B: Developing red blood cells in red bone marrow
C: Increased oxygen in blood
D: Relieves

Kidney

RBCs
## Blood Types

<table>
<thead>
<tr>
<th>Blood Type</th>
<th>Antigens on Plasma Membranes of RBCs</th>
<th>Antibodies in Blood</th>
<th>Safe to Transfuse To</th>
<th>Safe to Transfuse From</th>
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</tbody>
</table>
If incompatible blood types are mixed, agglutination (clumping) occurs.
Rh Factor

• Antibodies not produced until 1st exposure to Rh antigen