Blood Vessels:
Arteries, Veins and Capillaries

Cycles

- Blood vessels are organized into three primary cycles

1. **Cardiac Circulation**: route taken by blood within the heart.
2. **Pulmonary Circulation**: pathway of the blood from the heart to the lungs and back.
3. **Systemic Circulation**: pathway of blood from the heart to the rest of the body, includes all blood vessels other than those associated with the lungs.

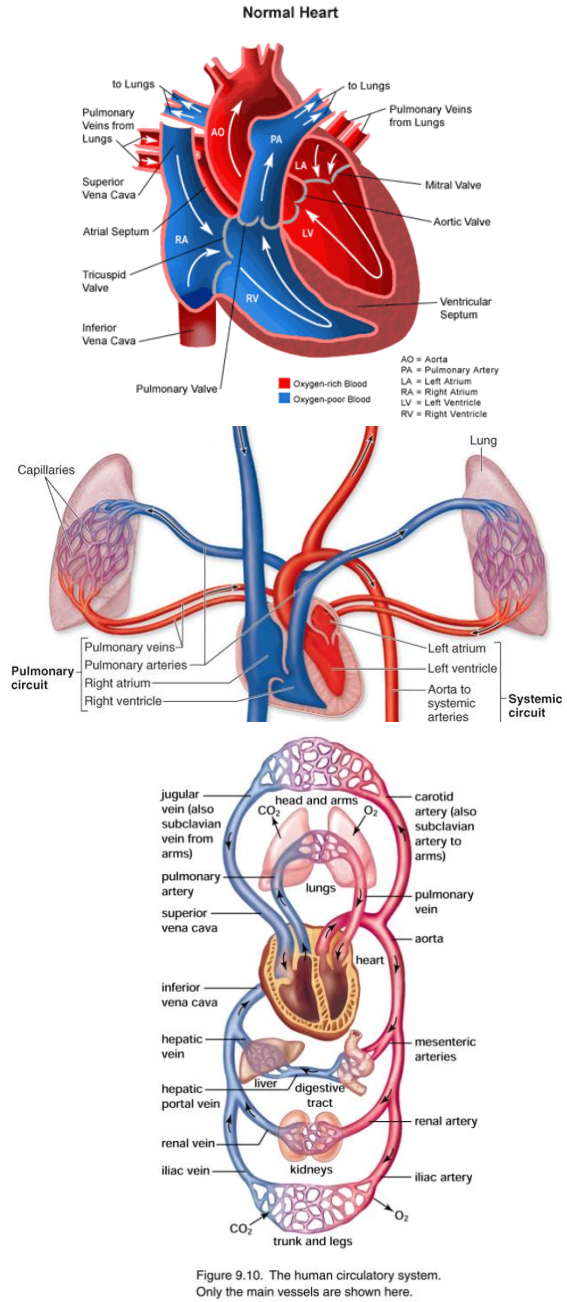
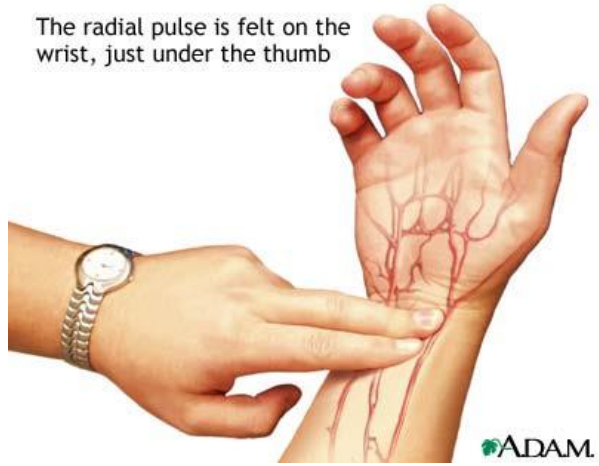


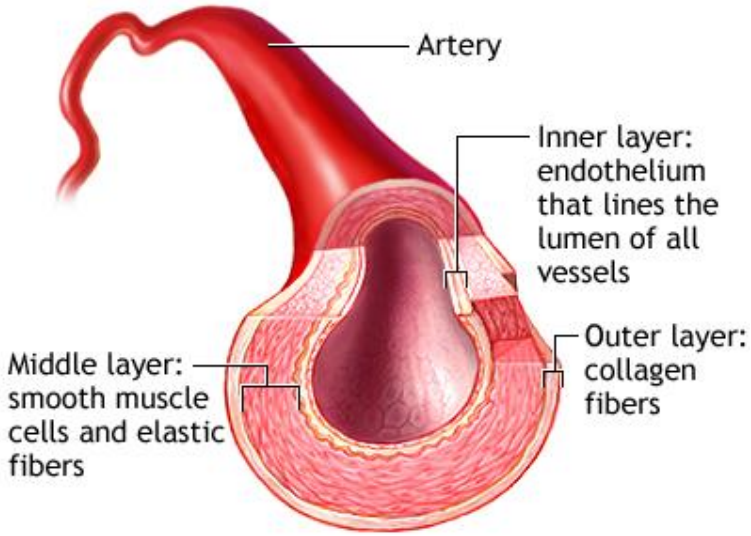
Figure 9.10. The human circulatory system. Only the main vessels are shown here.

Arteries

- Carry oxygen-rich* blood **AWAY from the heart**.
- Able to stretch and recoil
- Thick-walled, with **three layers**:
  - **Outer**: connective tissue (tissue between organs)
  - **Middle**: muscle and elastic connective tissue
  - **Inner**: connective tissue

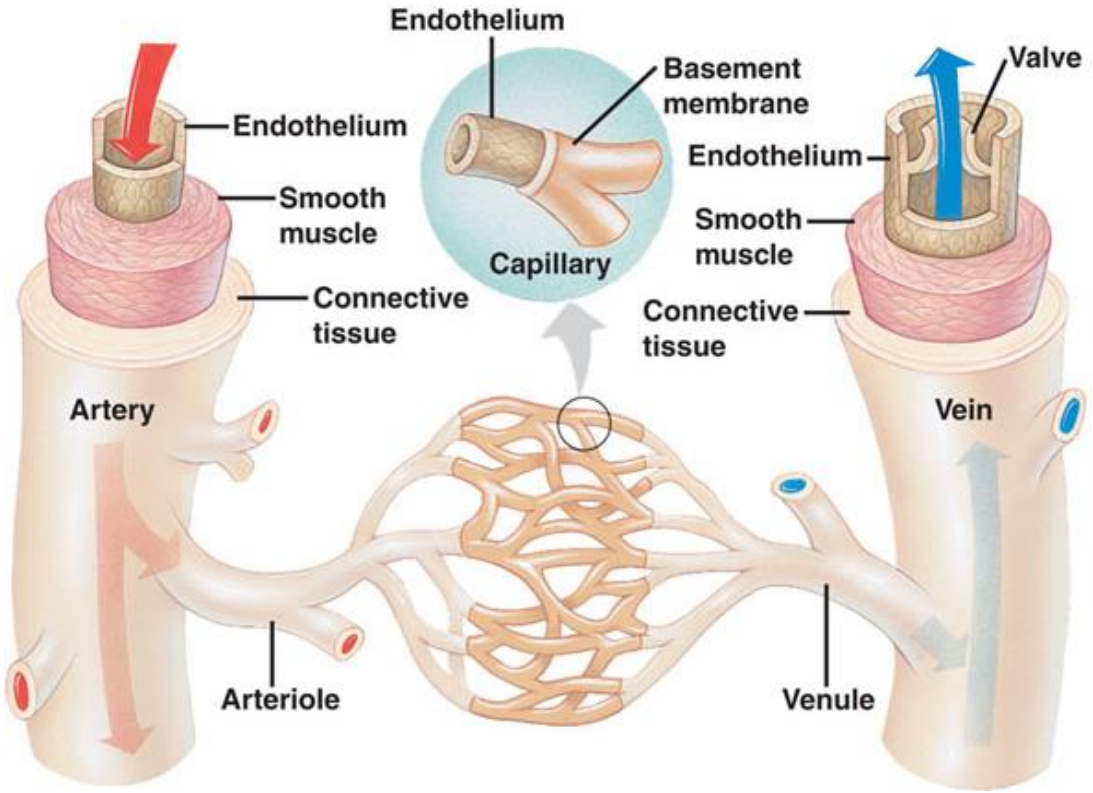
*Exception: Pulmonary Arteries carry oxygen-poor blood





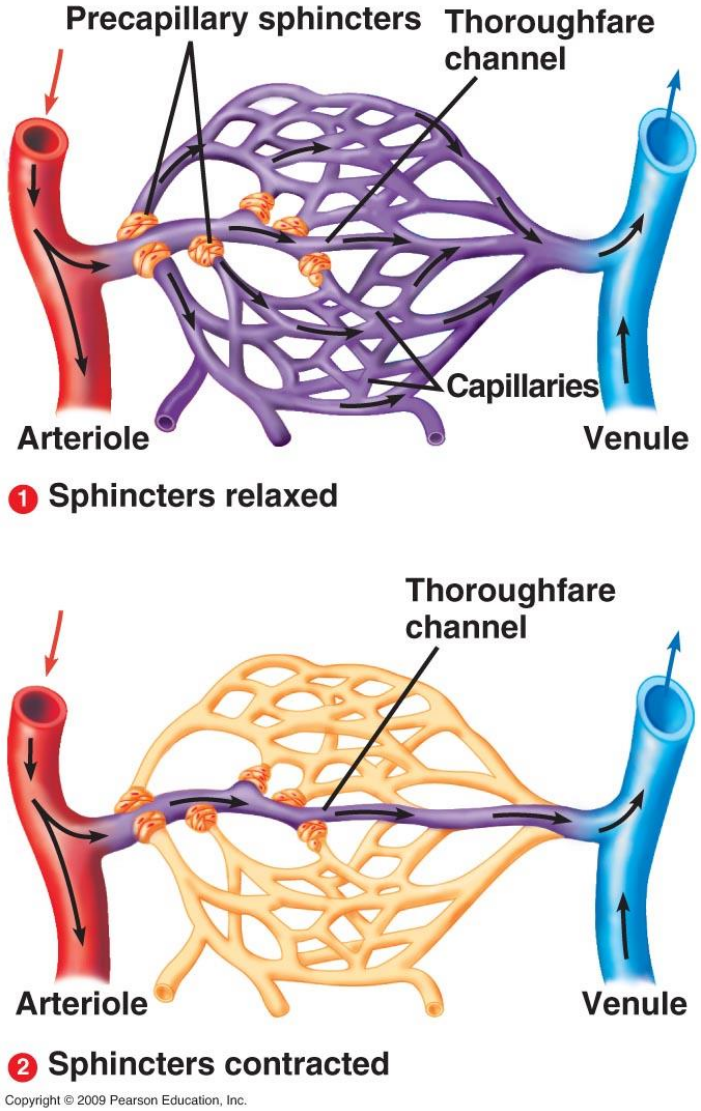
Arterioles

- Smaller arteries
- Blood flows from large arteries into arterioles
- **Middle layer**: elastic fibers and smooth muscle



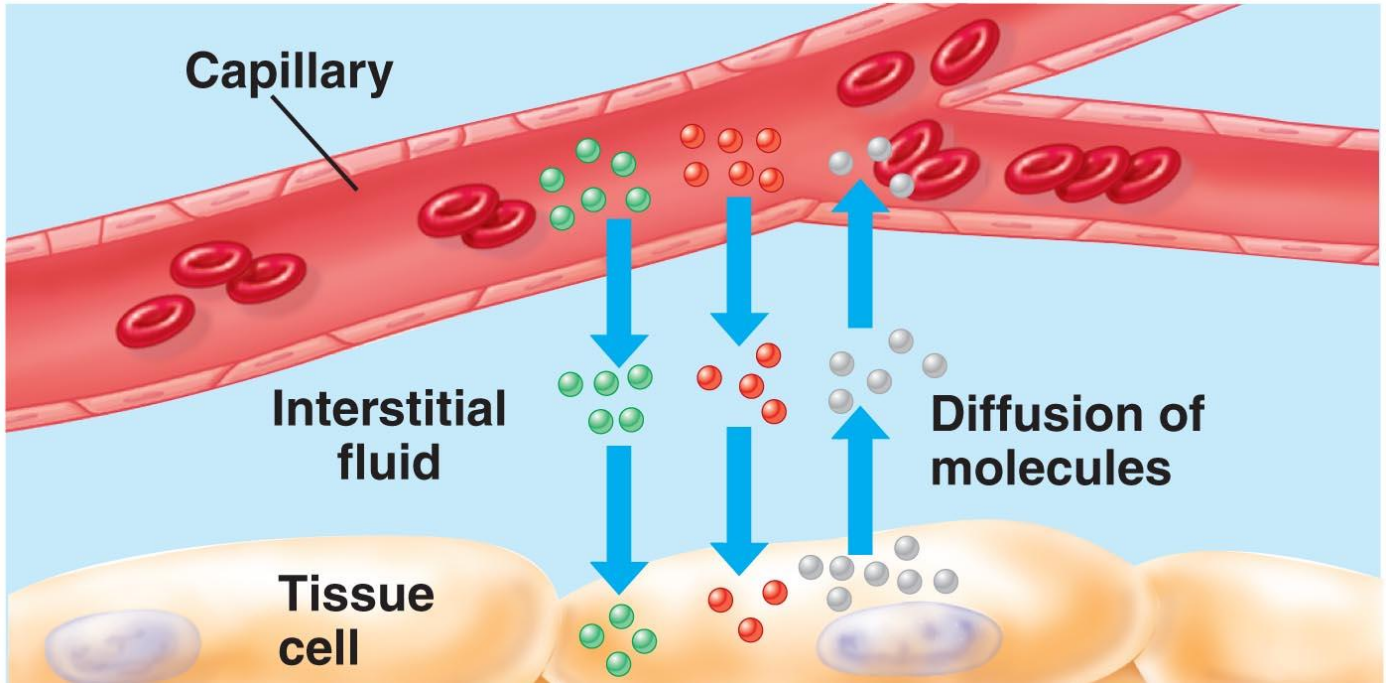
Capillaries

- Very **narrow** blood vessels.
- Blood flows into capillaries from arterioles.
- Regulated by **sphincters**
- Sphincters only open when new blood needed.
  - e.g. open in brain all the time, not always in muscle

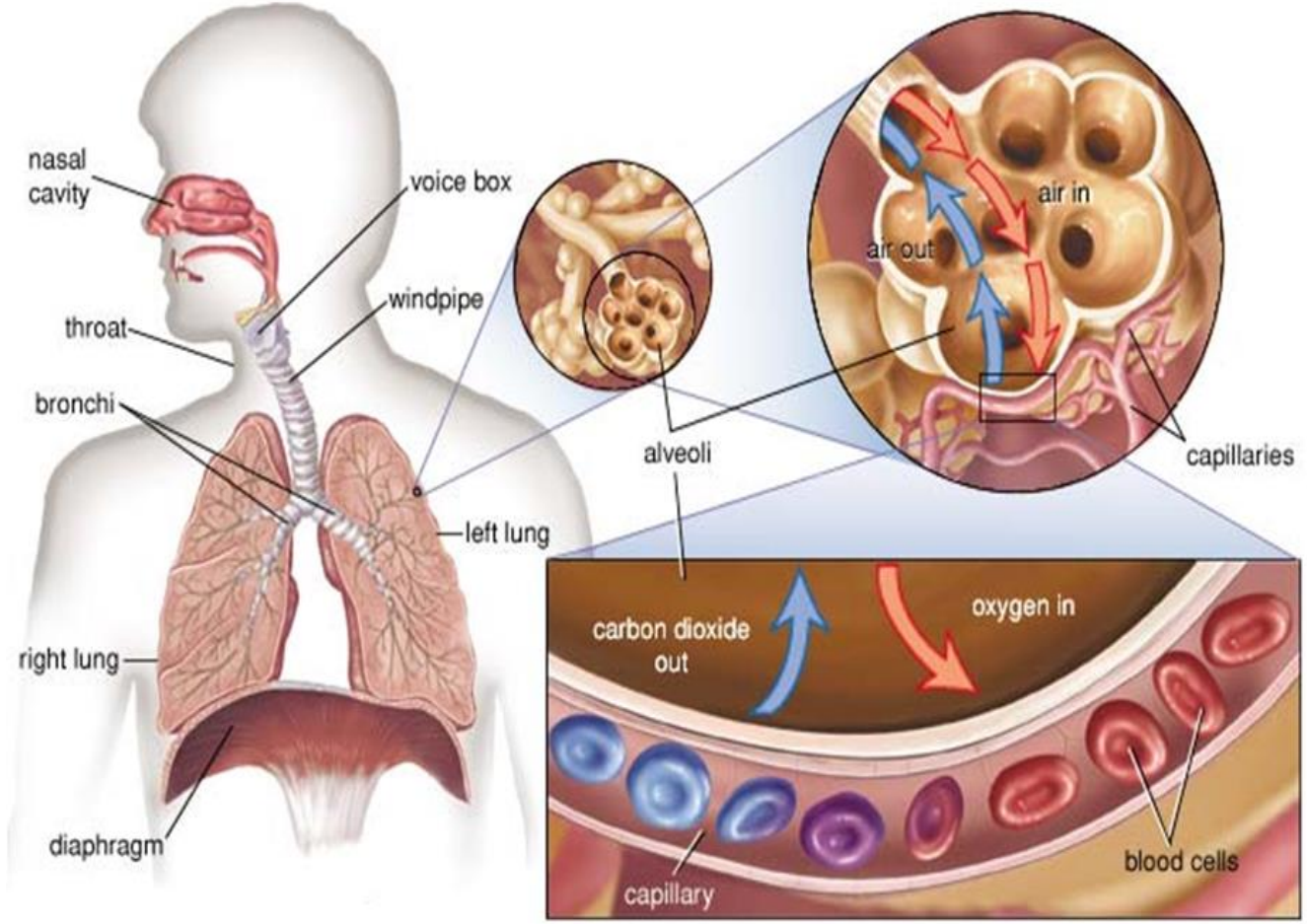


Capillaries

- **Single layer of cells**, no muscle
  - Easily ruptured, causes bruising
- Site of **GAS** and **FLUID EXCHANGE** between blood and body cells (lose O_2, pick up CO_2)

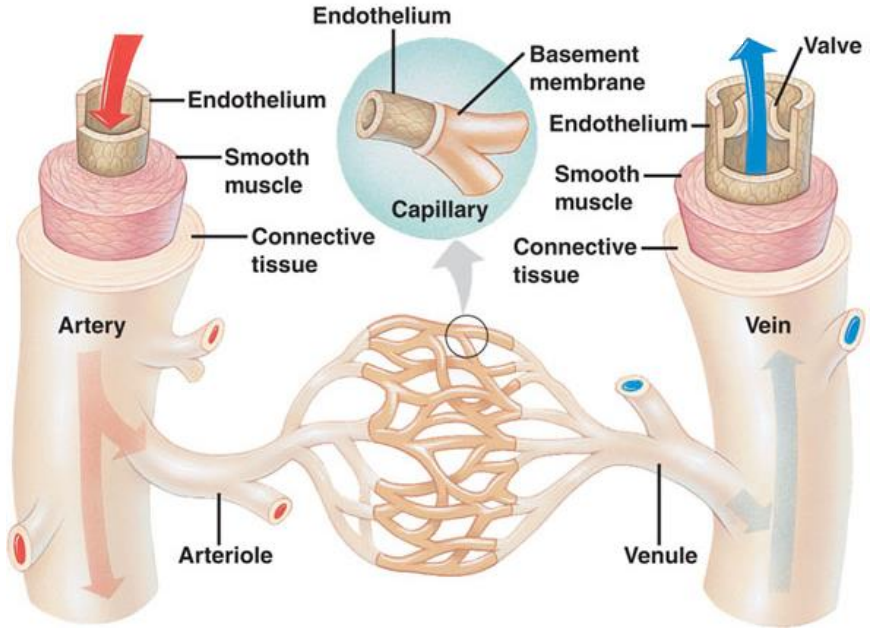


Gas Exchange



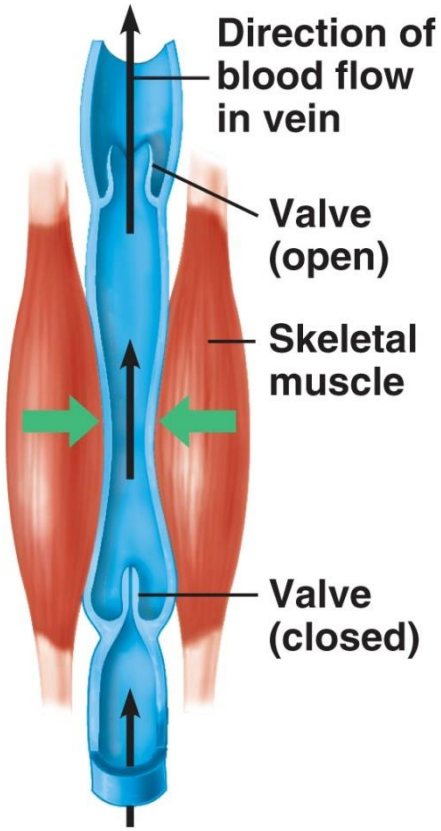
Venules

- Capillaries merge to form small veins which carry the oxygen-poor blood
- Have a **thin muscle layer**
- Venules merge to form veins



Veins

- Return oxygen-poor* blood **TO** the heart
- Lack the ability to **contract**.
- **Low blood pressure**.
  - Far away from heart.
  - Loss of fluids to tissues in the capillaries.
- Veins can prevent blood from flowing backward:
  - **One-way** (uni-directional) **valves**
  - **Skeletal muscle** of the surrounding area helps push blood through veins



*Exception: Pulmonary Veins carry oxygen-rich blood

Arteries vs. Veins

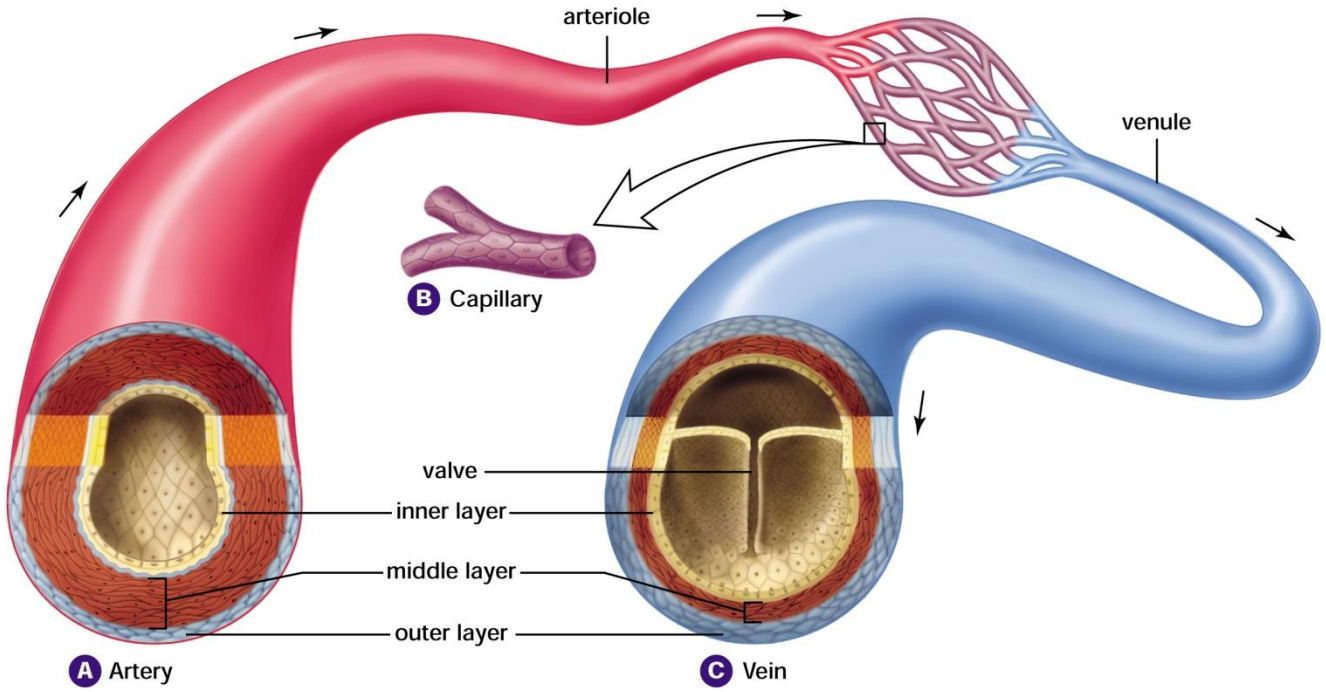


Figure 9.12. Sections through an artery, capillary, and vein. At any given moment, about 30% of the blood in your systemic circulation will be found in the arteries, 5% in the capillaries, and 65% in the veins.