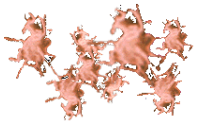
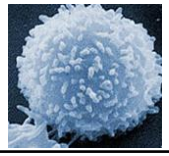
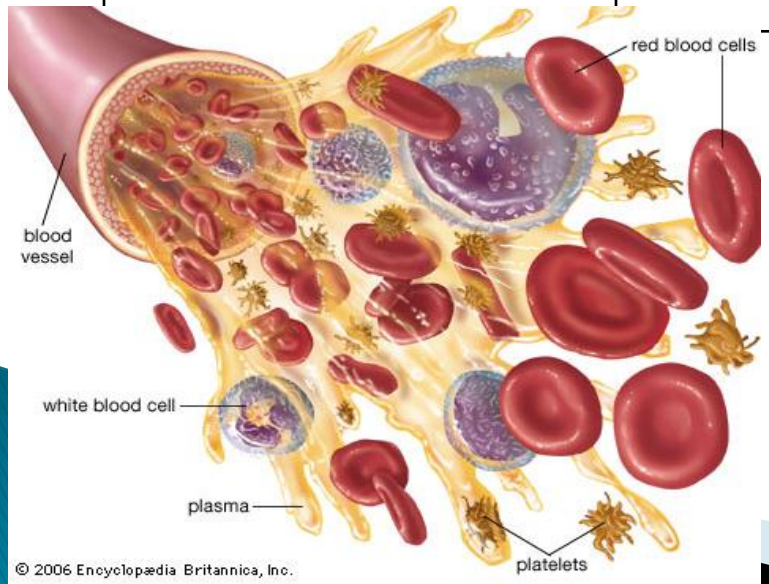
Respiratory System and Circulatory

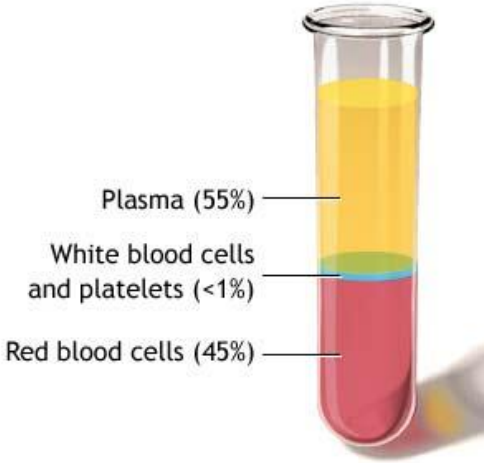
Circulatory System

- Purpose:
  - Deliver oxygen and nutrient to the cells & remove the waste
  - Transfers body heat
  - Defense
- Parts:
  - Cardiovascular System
    - Heart
    - Blood Vessels
      - Arteries
      - Veins
    - Blood
  - Lymphatic system

Blood Basics! 4-5 L in adults

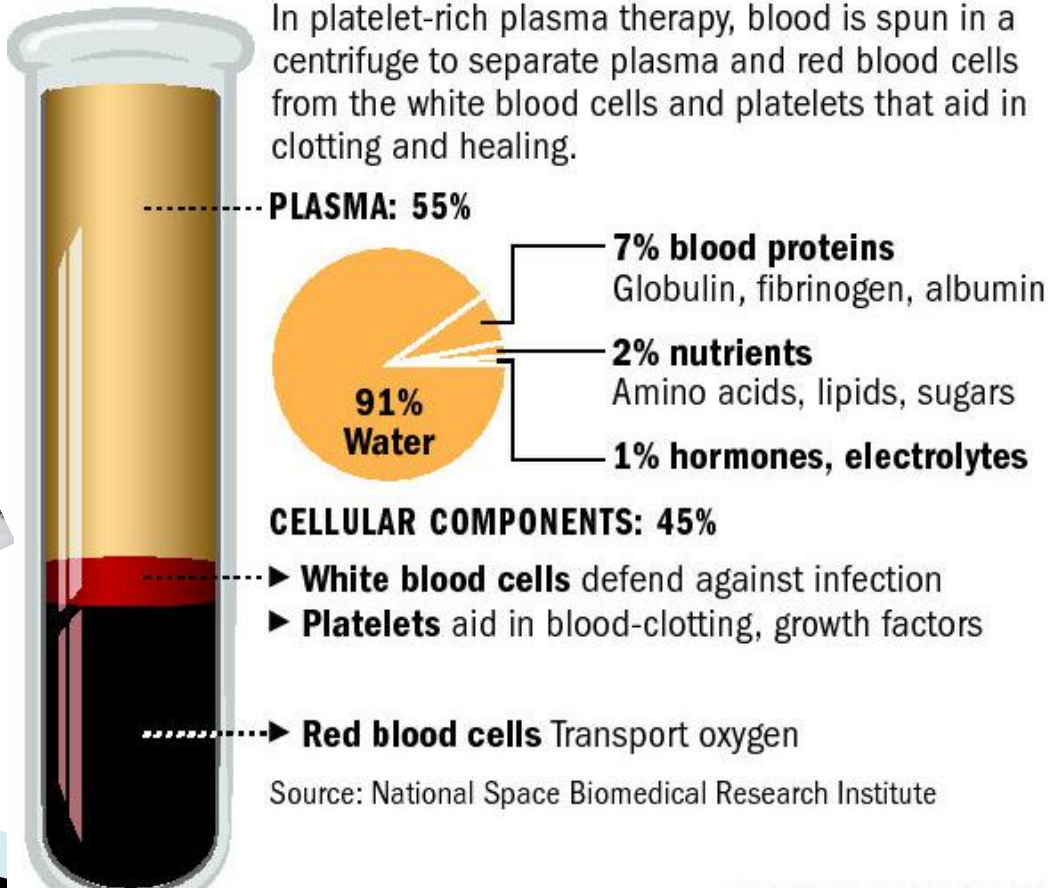
Part of Blood	Picture	Purpose
Red Blood Cells (Erythocytes)		Carry the oxygen
Platelets (Thrombocytes)		Creates the scabs
White Blood Cells (Leukocytes)		Fights off infections
Plasma		Fluid around the blood





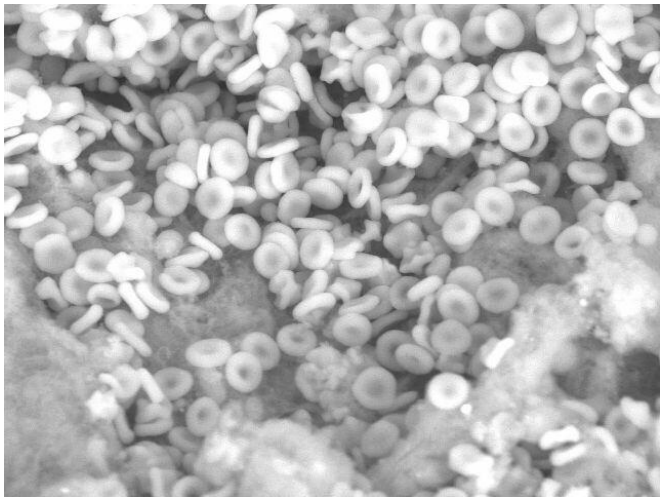
Plasma

- Plasma (55%)
  - 90% H_2O
  - 7% Protein – albumin, antibodies, enzymes, etc.
  - 3% food, waste, buffers, vitamins, salts, hormones, etc.



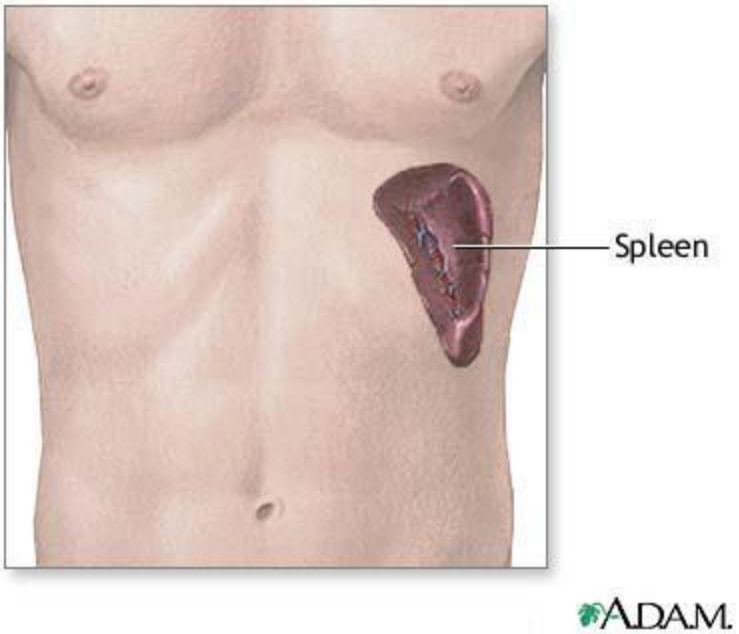
Erythrocytes

- Functions
  - Transports O_2
  - Made in marrow
  - Live 120 days
  - Hemoglobin attaches to the O_2
  - No nucleus
    - Essentially a membrane with hemoglobin

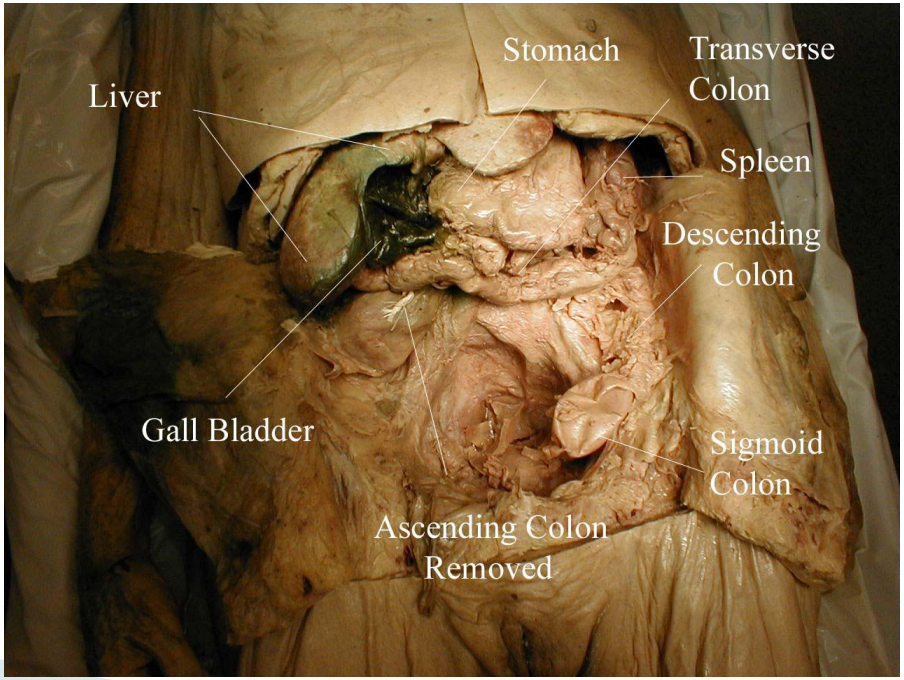


- 30 trillion in body
  - 2 million die every second

Spleen

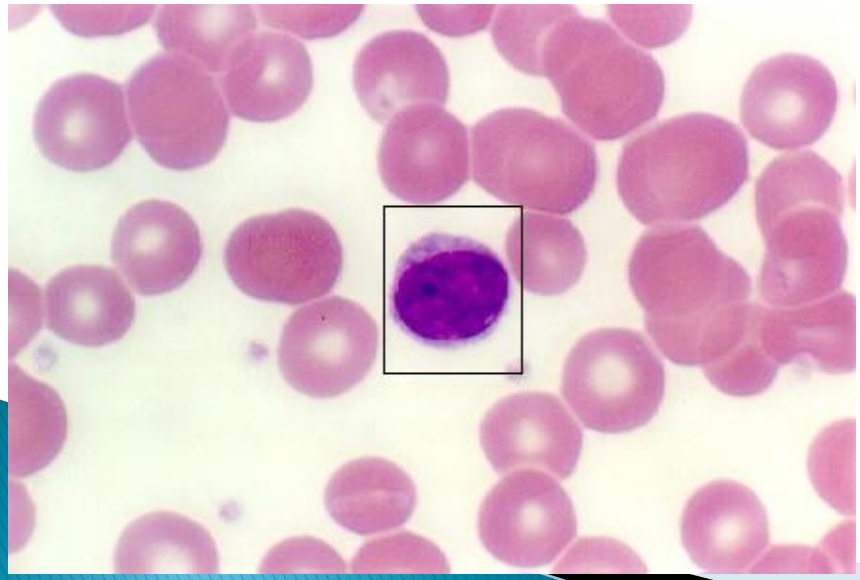


- Functions
  - Removes old RBC's (so does liver)
  - stores extra RBC's



Leukocytes – White Blood Cells

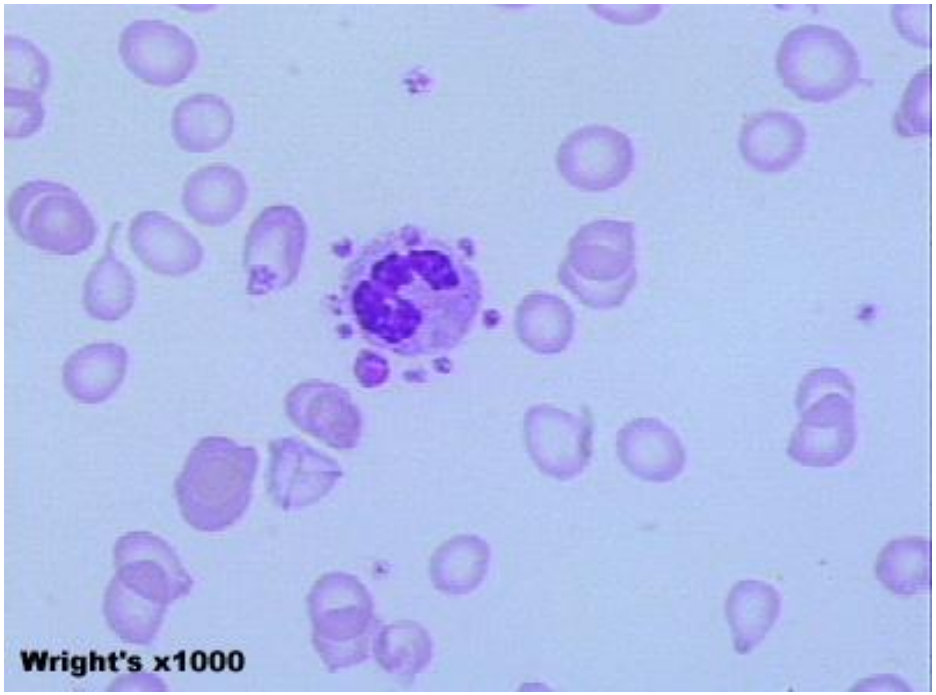
- large
- less numerous
  - Cubic cm – 4 million rbc and 7,000 wbc
- nucleated
- made in marrow



- 5 types
  - Basophil
  - Neutrophil
    - most numerous
  - Eosinophil
  - Monocytes
  - Lymphocytes (antibodies)
    - B Cells
    - T Cells

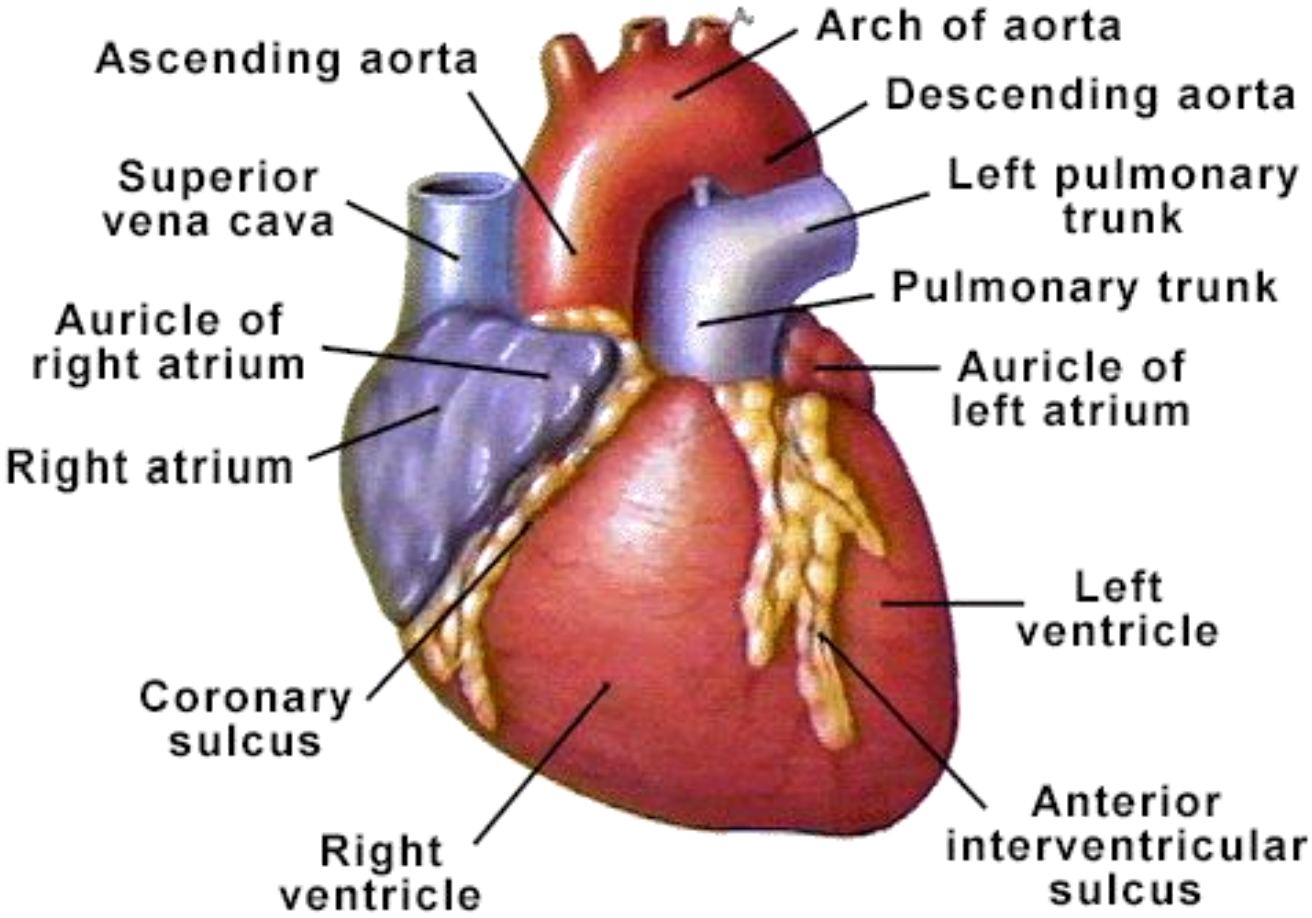
- http://www.livestrong.com/article/115591-five-types-white-blood-cells/

Platelets



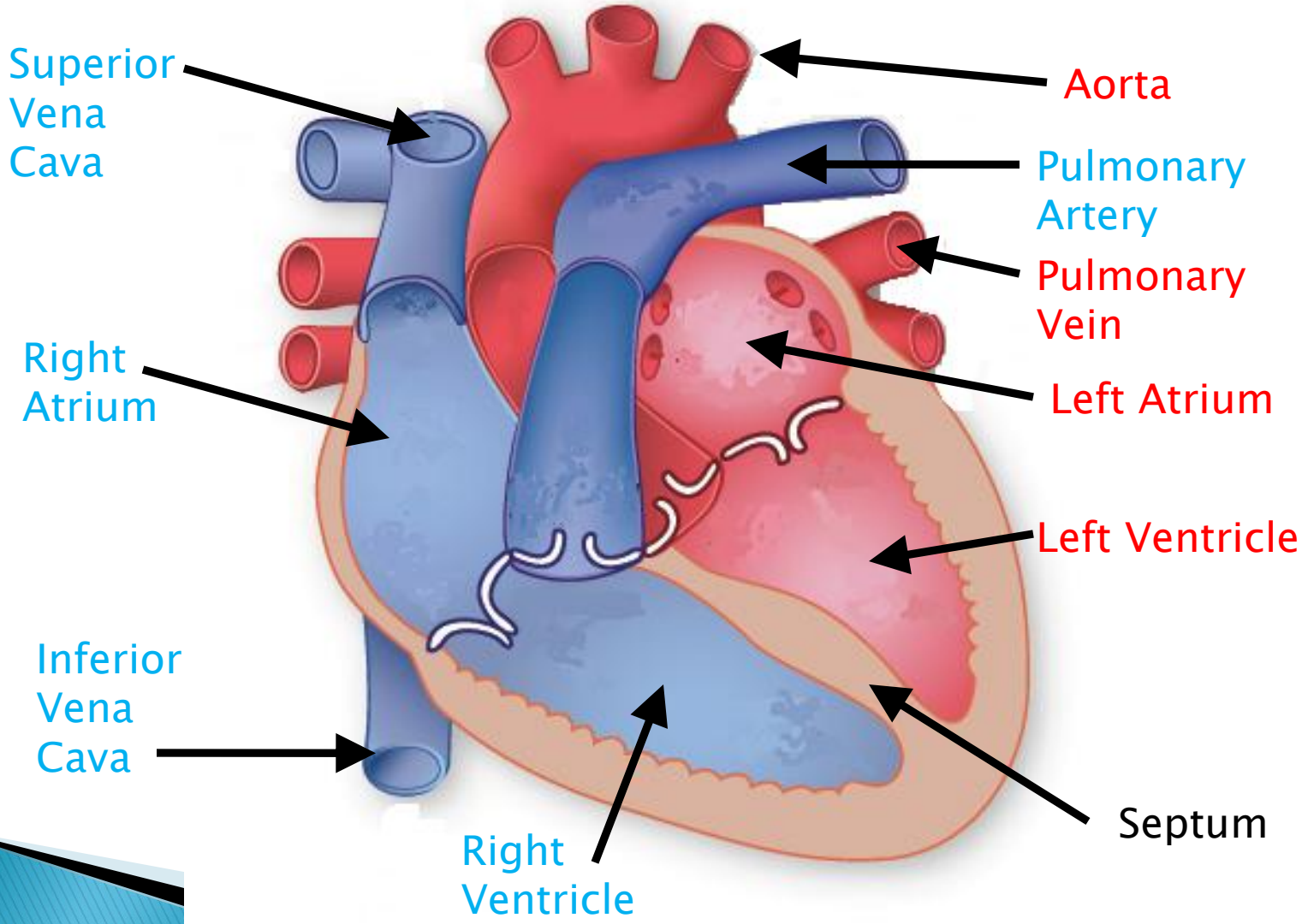
- Cell fragments
- From Bone Marrow
- Clot Blood
- Contain blood clotting factors (12
  - Series of chemical reactions
  - Creates fibrin (long sticky molecules)
  - Fibrin traps RBC to harden into clot/scab
- Short-lived

Heart (External Anatomy)

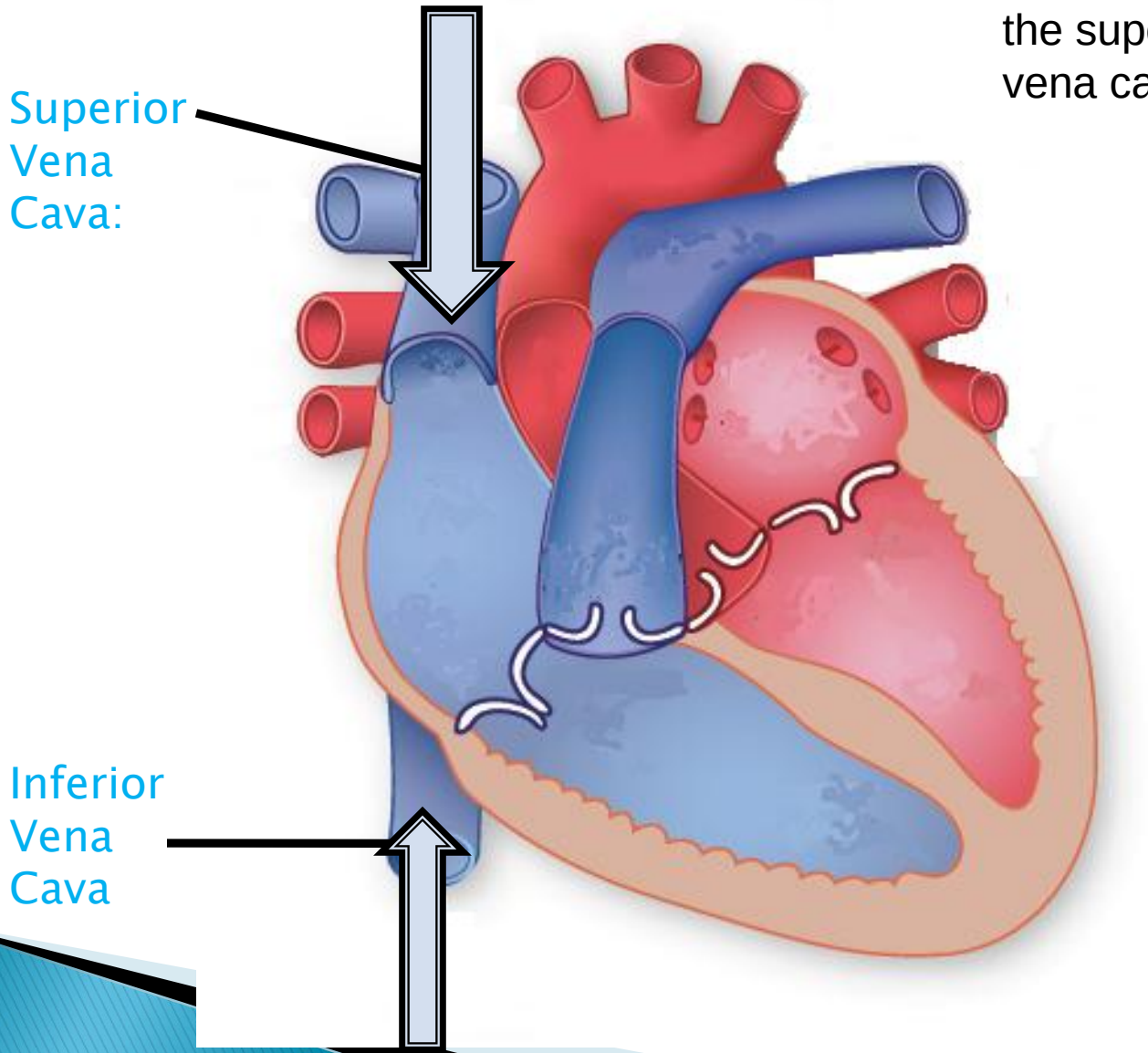


Circulatory System

Values: Prevent blood from flowing in the wrong direction



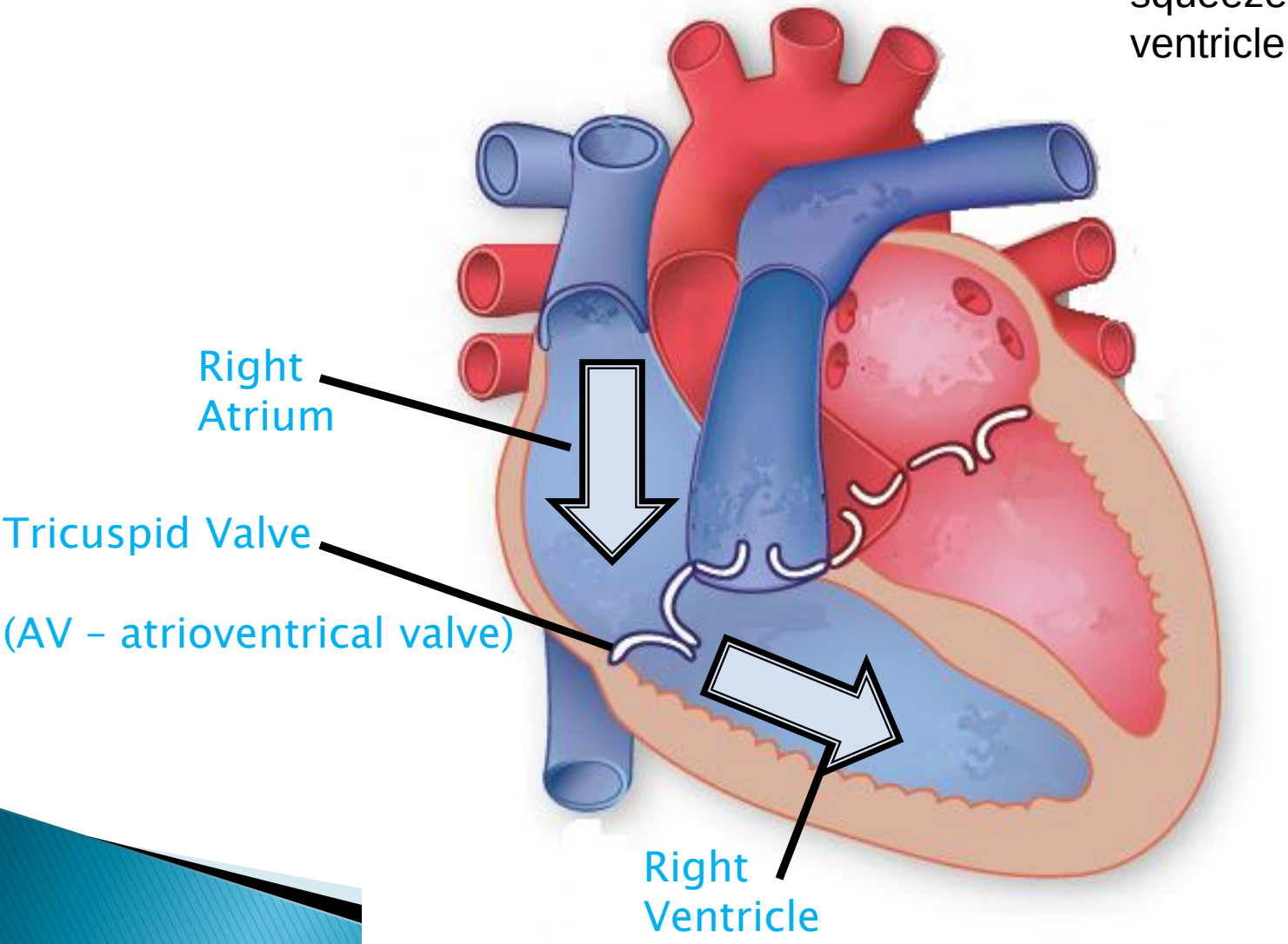
Circulatory System



STEP 1:
Blood enters the heart from the body through the superior and inferior vena cava

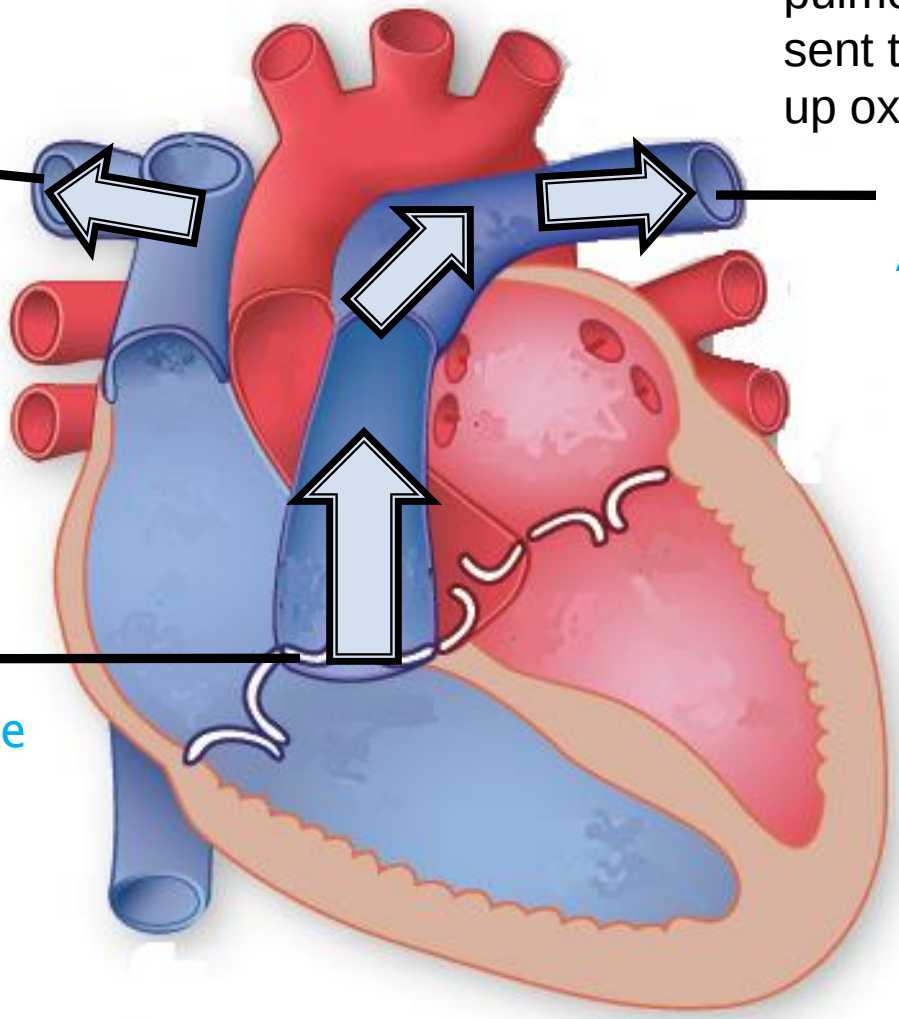
Circulatory System

STEP 2:
Blood is deposited into the right atrium and is squeezed into the right ventricle.



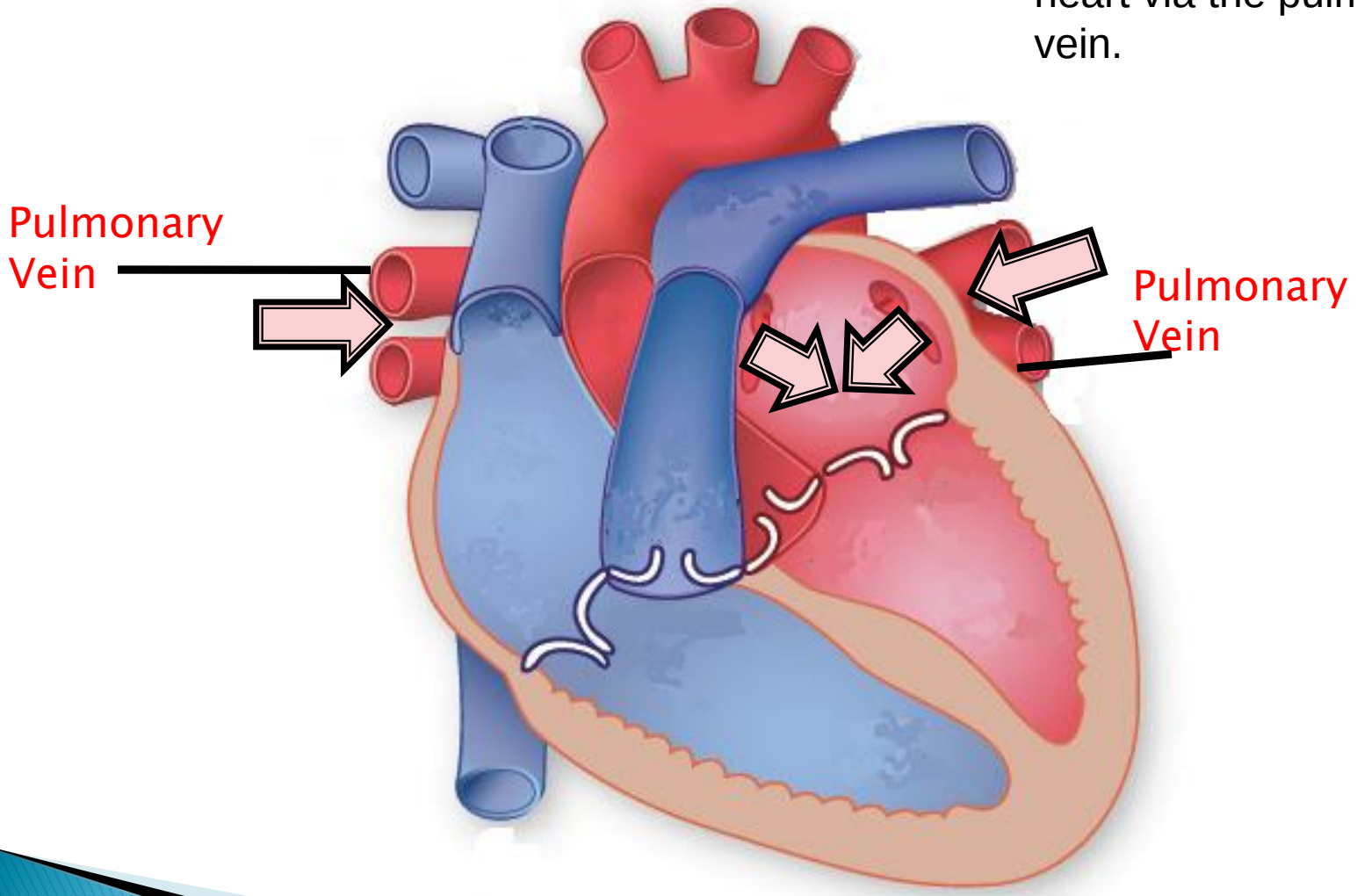
Circulatory System

STEP 3:
Blood leaves the right ventricle through the pulmonary artery and is sent to the lungs to pick up oxygen.



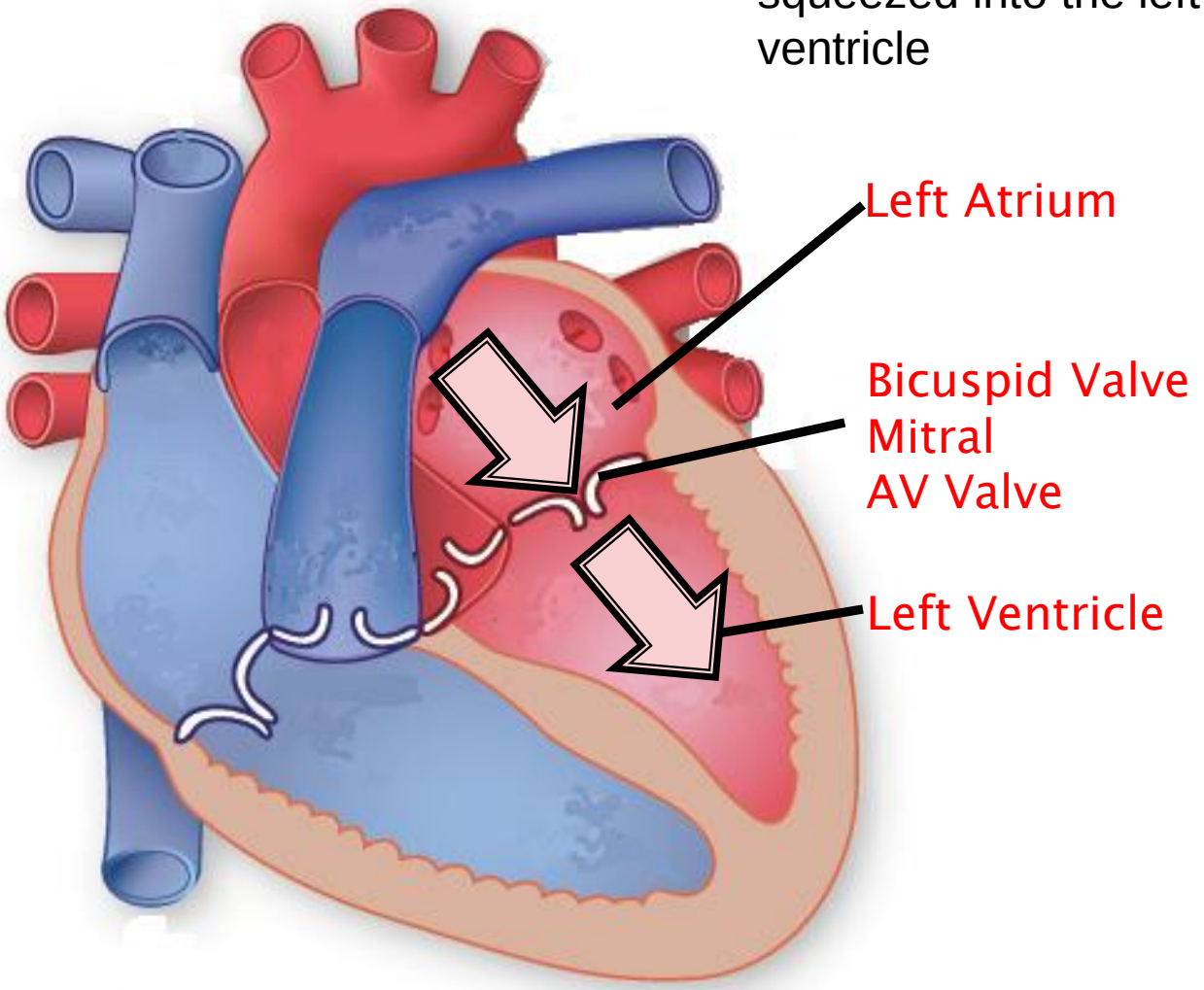
Circulatory System

STEP 4:
Blood leaves the lungs and comes back to the heart via the pulmonary vein.



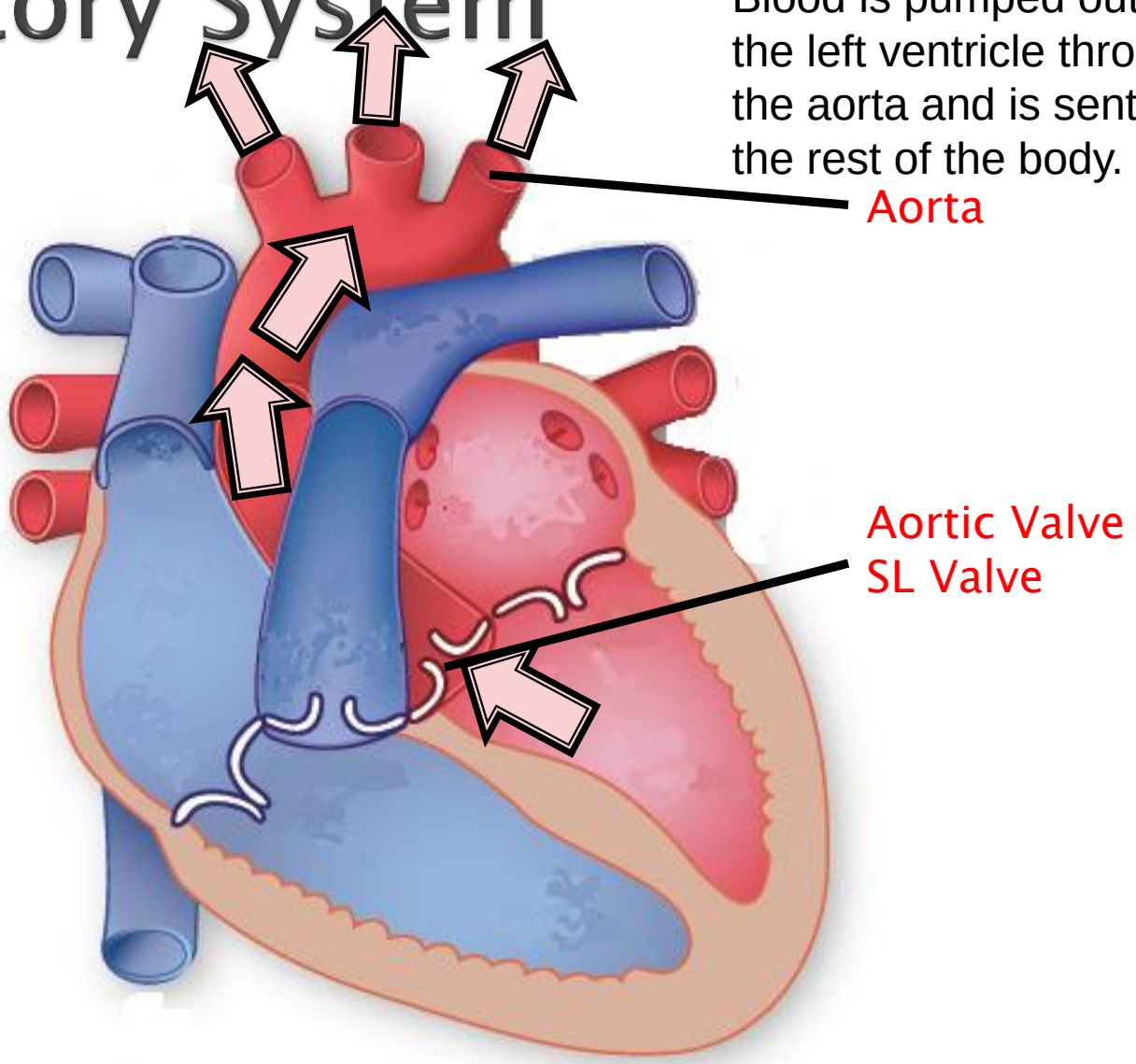
Circulatory System

STEP 5:
Blood is deposited into the left atrium and squeezed into the left ventricle



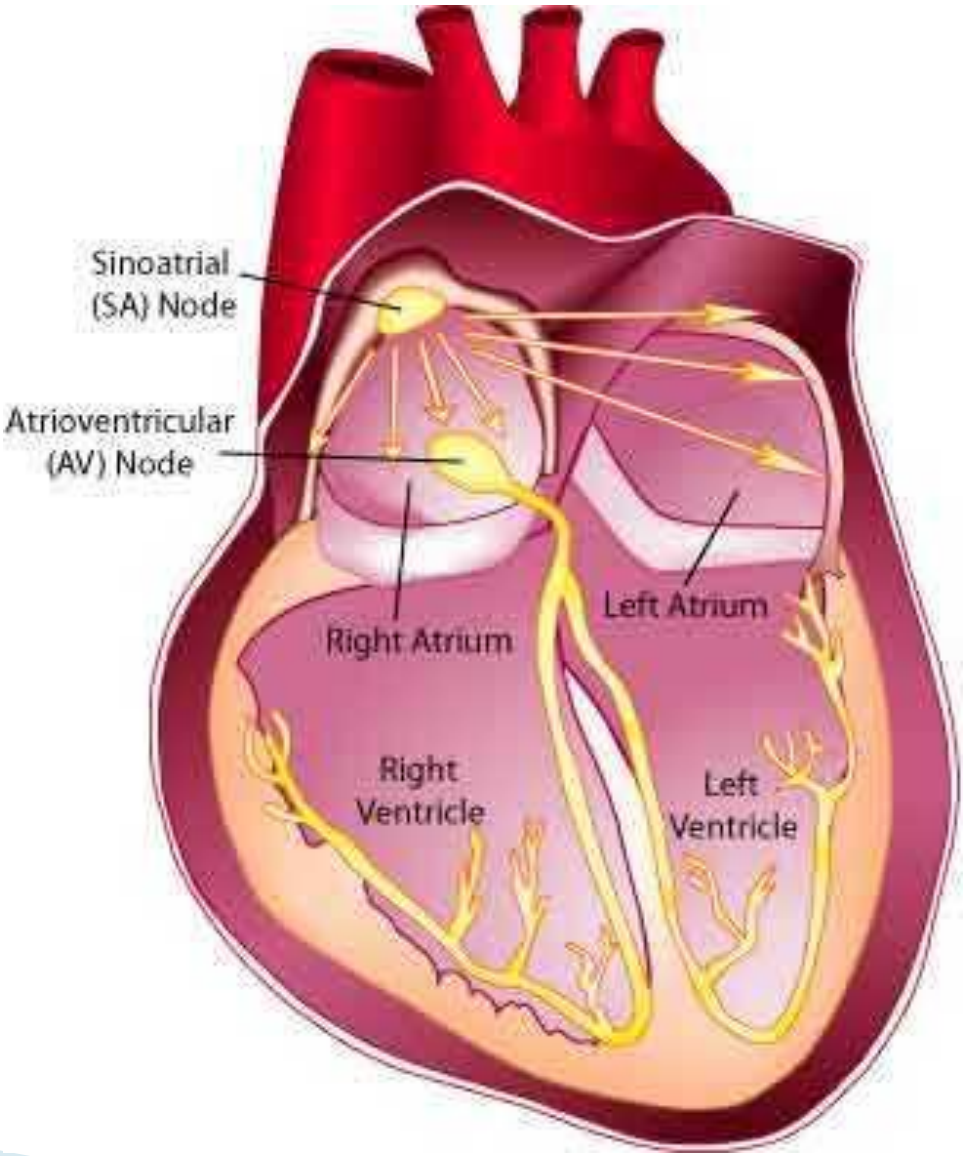
Circulatory System

STEP 5:
Blood is pumped out of the left ventricle through the aorta and is sent to the rest of the body.



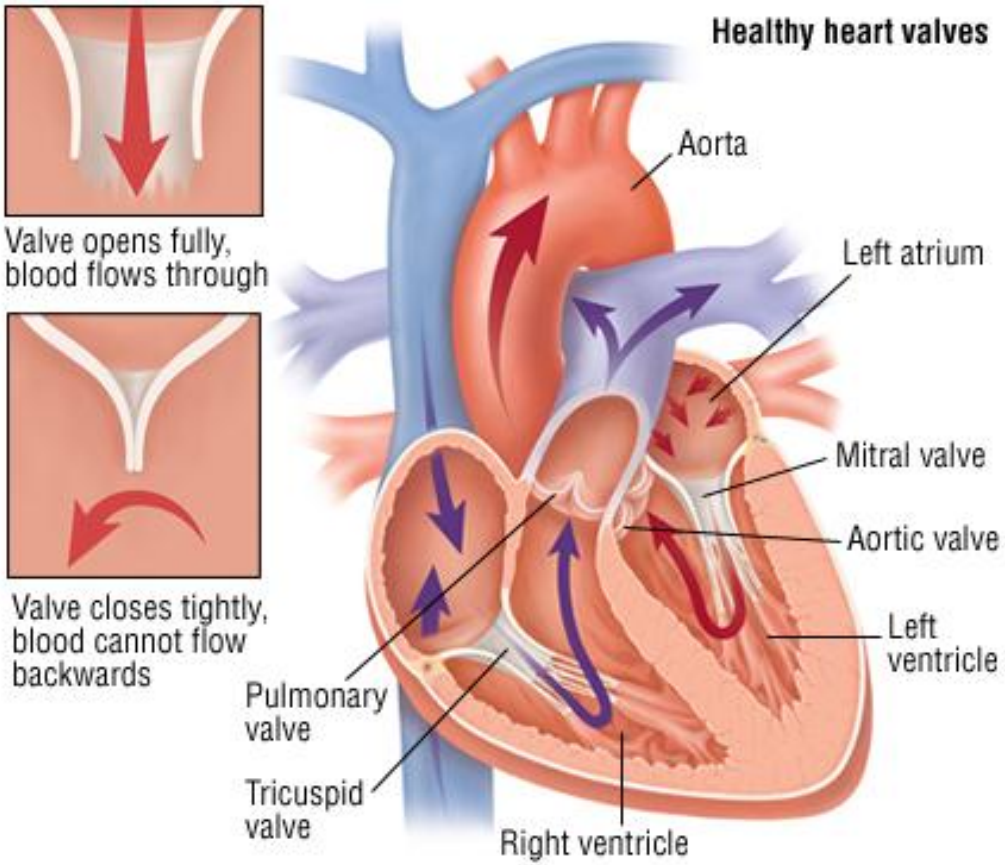
Other Parts – Control Heart Beat

- SA Valve = Pacemaker
- Electrical impulse causes atrium to contract
- Send impulse to AV node which causes ventricles to contract

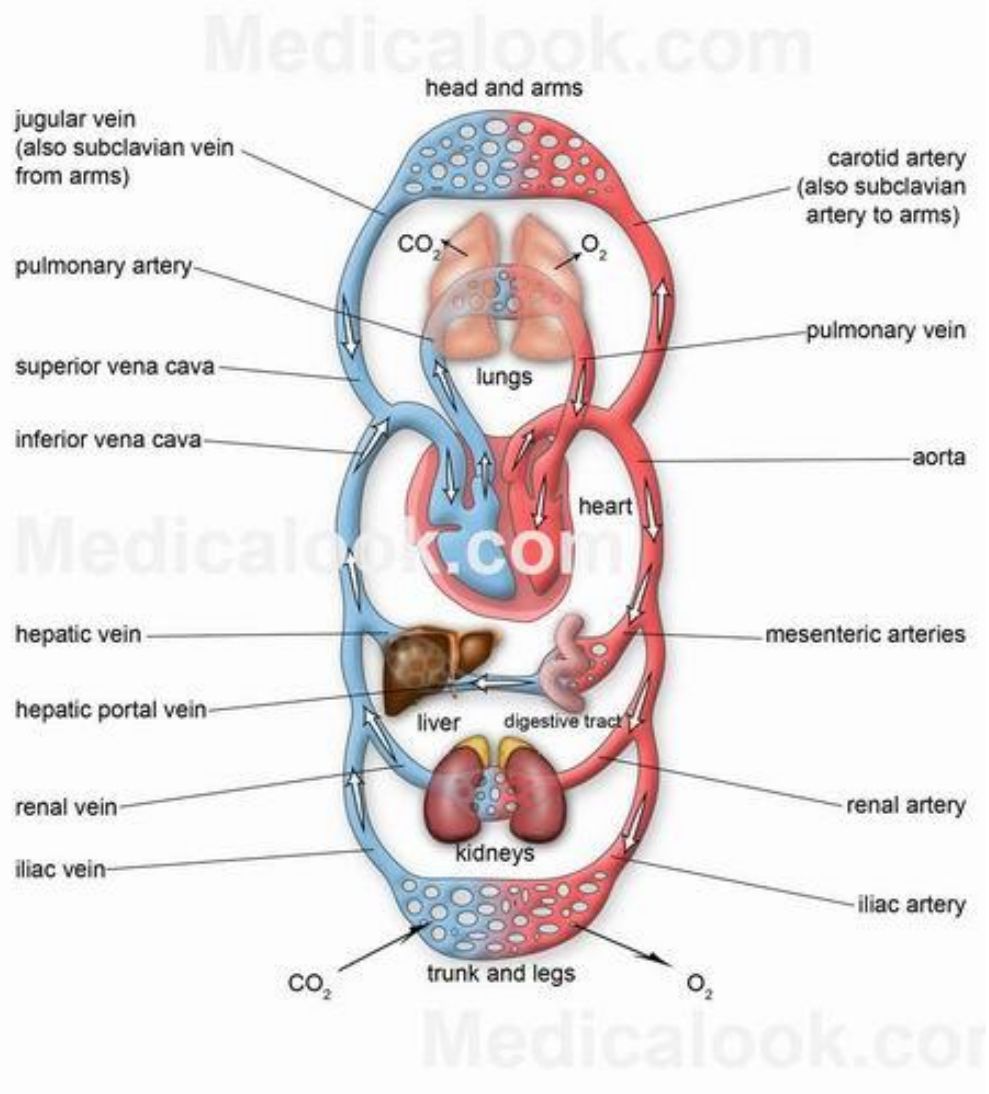


Heartbeat

- 2 Phases
  - Phase 1: Systole
    - Ventricles Contract
    - AV valves Close (Lub)
    - SL valves Open
    - Blood leaves the Heart
  - Phase 2: Diastole
    - Ventricles Relax
    - SL Valves close (Dub)
    - AV valves Open



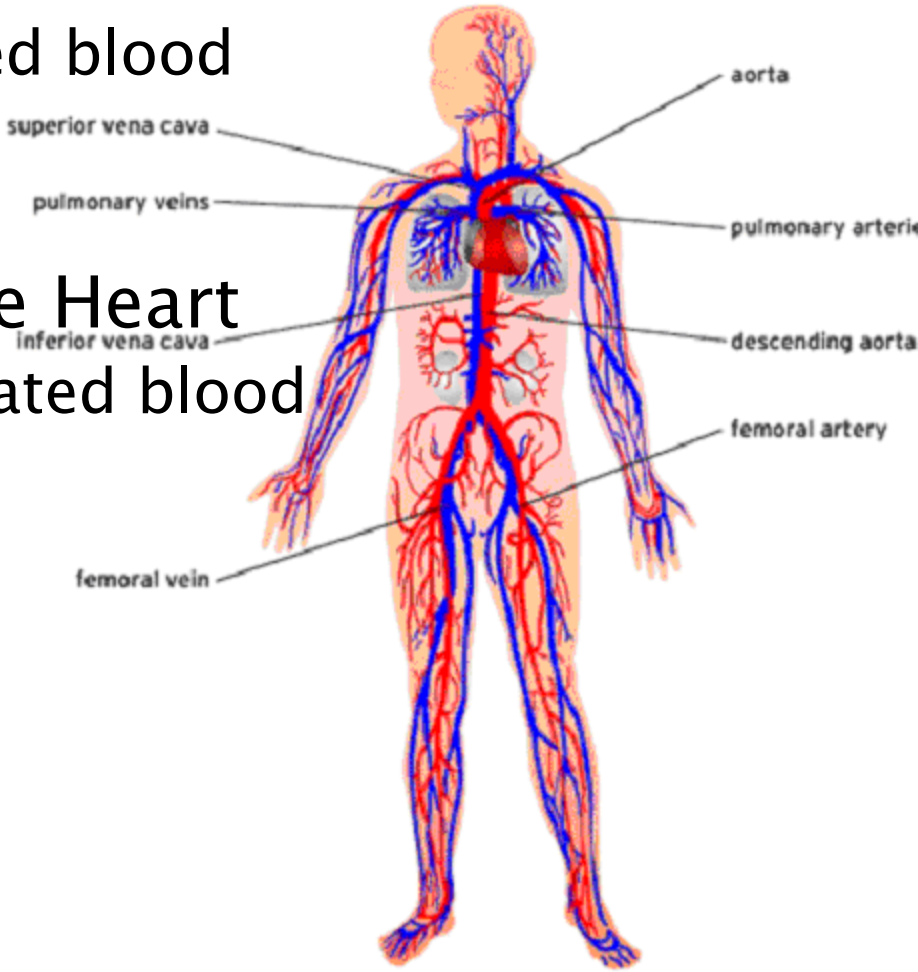
Patterns of Circulation



- One Complete System
  - **Pulmonary Circulation** – between heart and lungs
  - **Systemic Circulation** – between heart and body
    - *Coronary Circulation*: Supplying blood to heart
    - *Hepatic Portal Circulation*: Nutrient rich blood to liver
    - *Renal Circulation:* Blood to kidneys to filter wastes

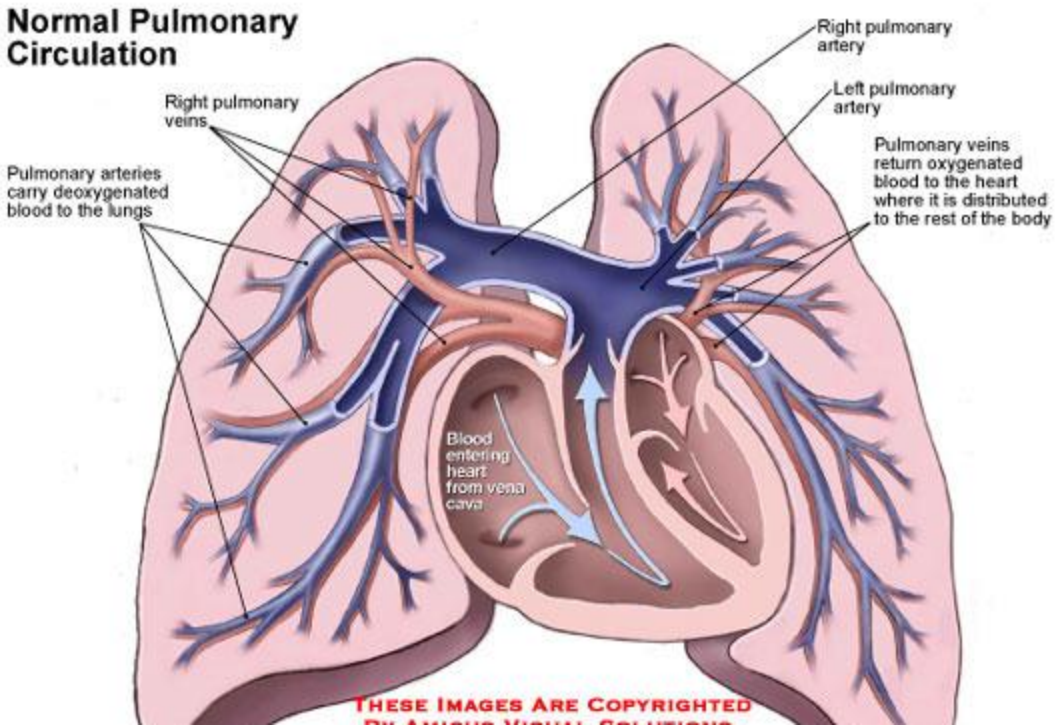
A couple of Rules: Blood Vessels

- Arteries go AWAY from the heart
  - Normally carry oxygenated blood
    - Red Blood
  - Thick Walls
- Veins come BACK to the Heart
  - Normally carry deoxygenated blood
  - Blue Blood
  - Walls are not as thick



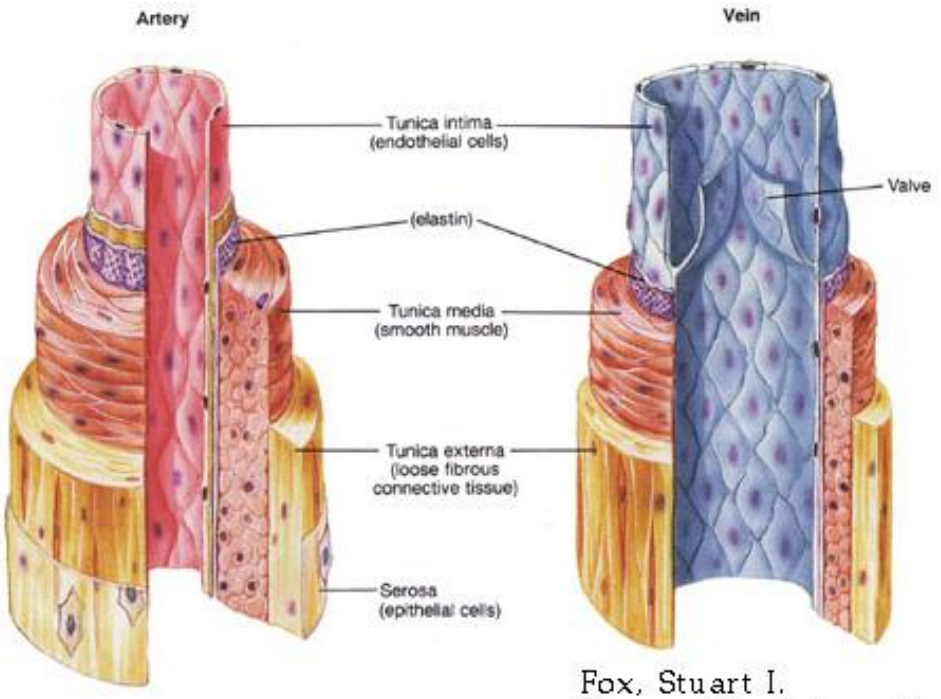
The exceptions

- Pulmonary Artery carried blood to the lungs:
  - Blood has no oxygen
- Pulmonary Vein carries blood back from lungs
  - Blood has oxygen



Blood Vessels

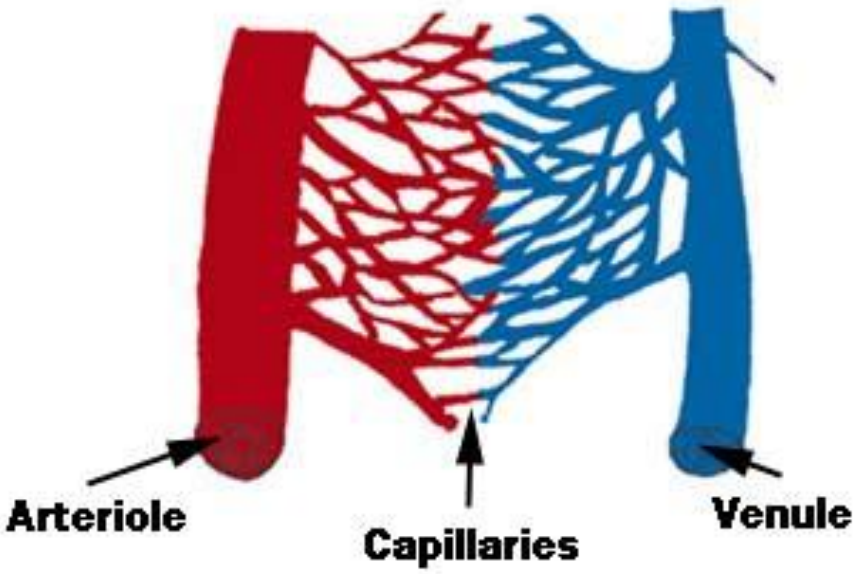
- Arteries
- Arterioles
- Capillaries
  - Within 125 micrometers from all cells
- Venules
- Veins
  - Low pressure
  - Need valves to keep blood flowing in the right direction



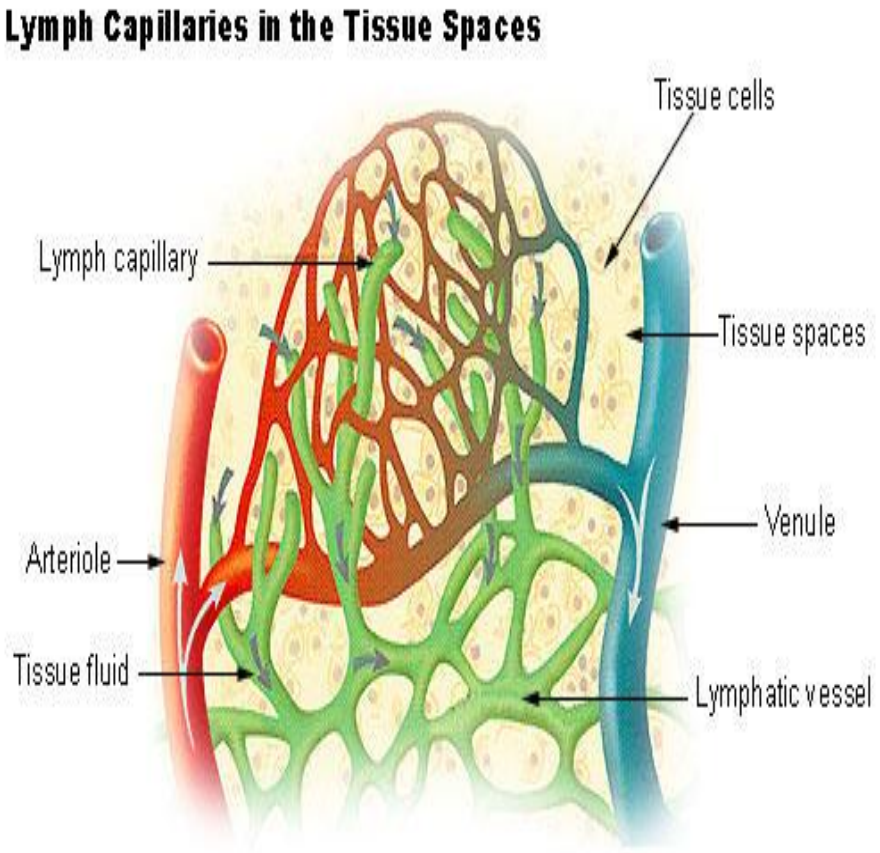
Fox, Stuart I.
Human Physiology 4th
Brown Publishers

The capillaries

- Smallest blood vessels that allow for gas exchange with the cells around them
  - Nutrients, gas and waste diffuse across the thin membrane
- Point where the arteries become veins



Lymphatic System



- collects excess tissue fluid
  - similar to plasma, but no protein
- vein like
- no pump – skeletal muscle
- drains into veins
- lymph nodes filter fluid

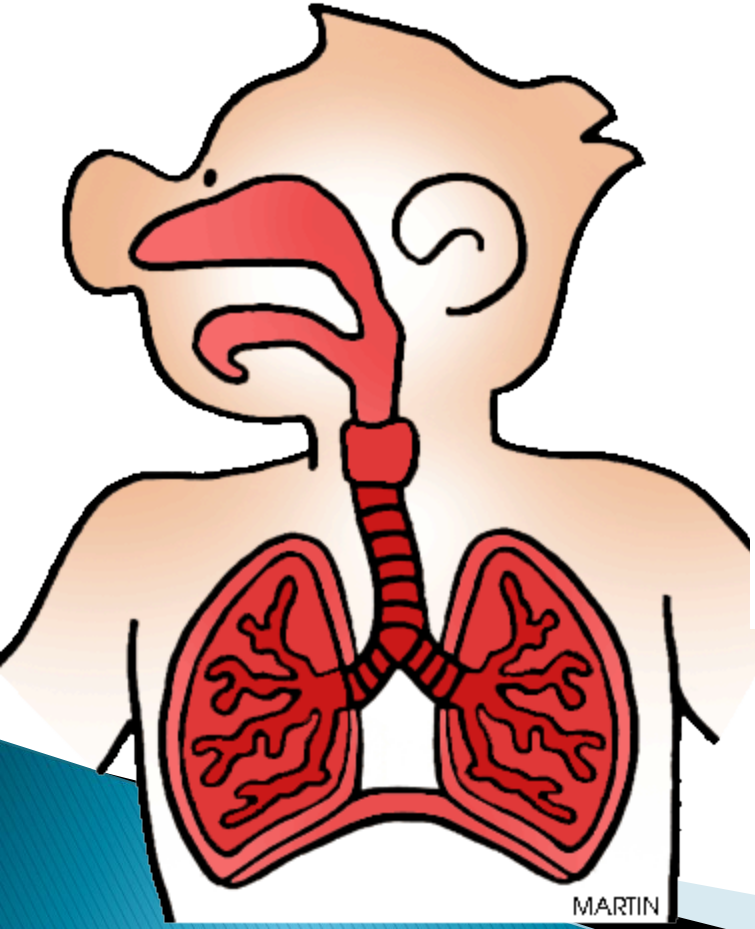
Connections

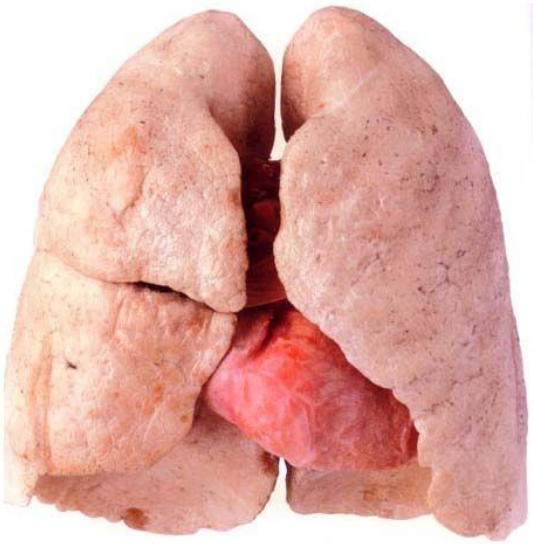
- Circulatory and Respiratory systems are highly connected

- Respiratory gets oxygen into the body
- Circulatory delivers the oxygen to the cells
- Circulatory picks up the waste CO_2
- Respiratory expels CO_2 the from the body

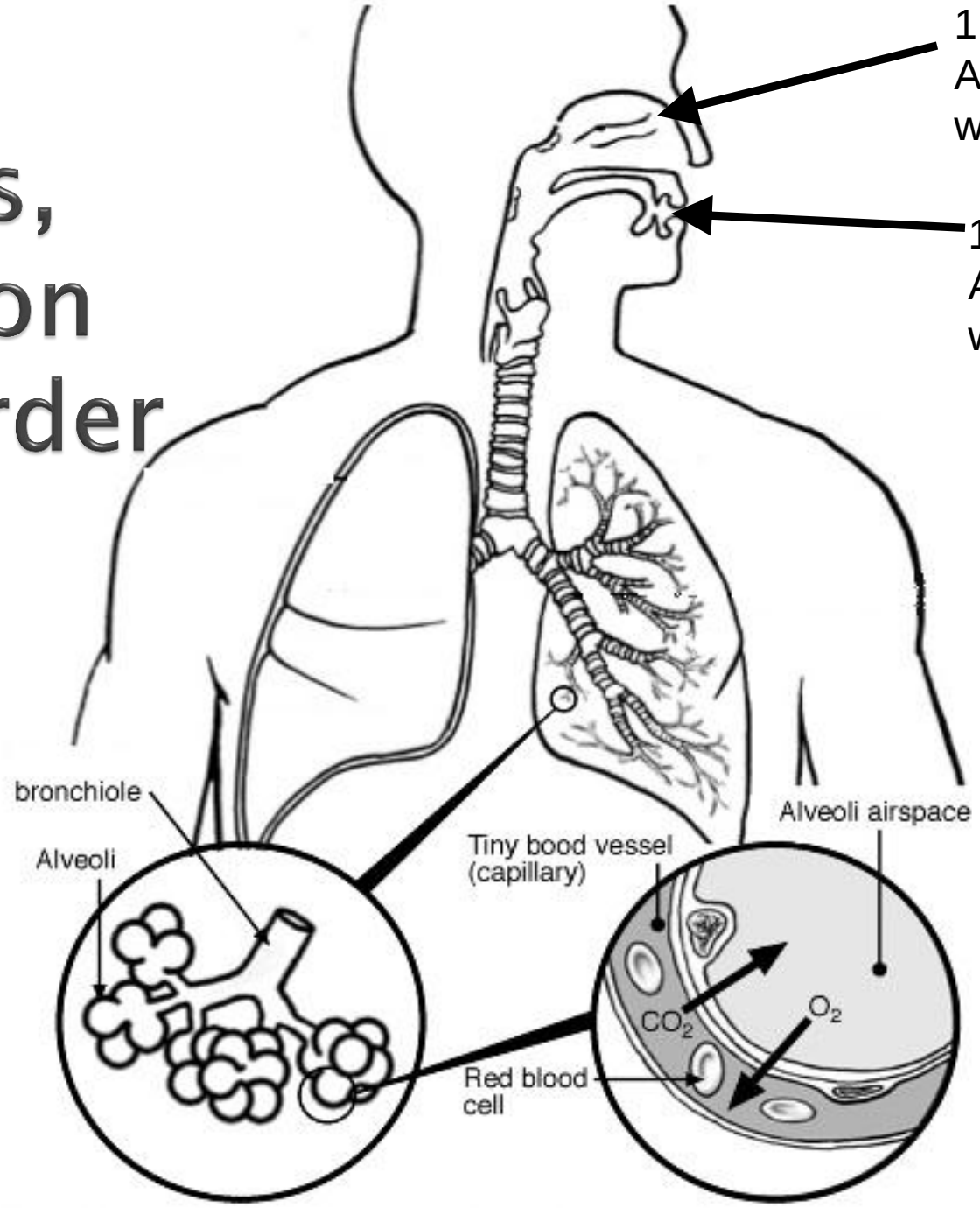
Respiratory System

- Purpose: Exchange oxygen and carbon dioxide with the body and environment





Label organs, function and order

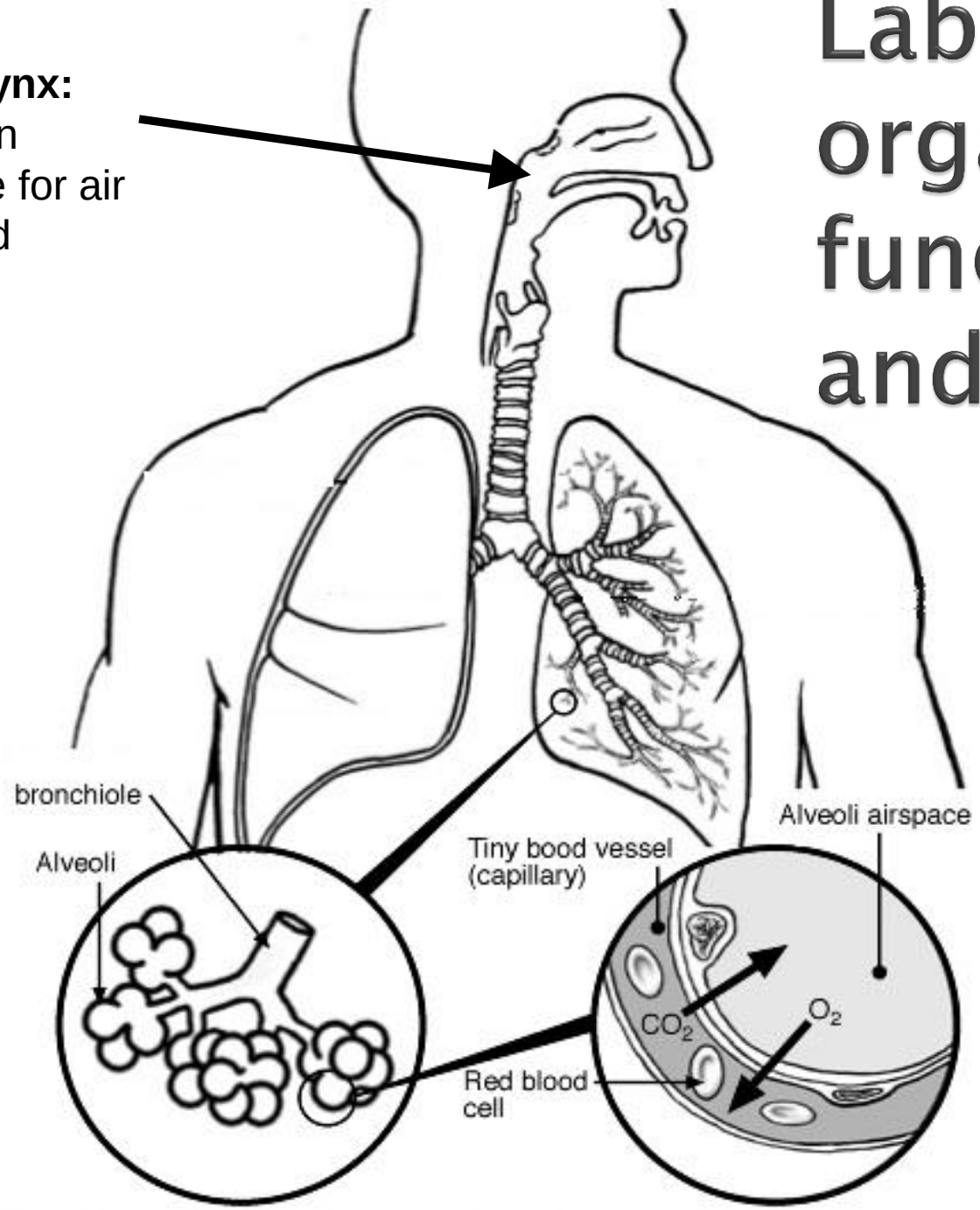


1. **Nasal Cavity:** Air enters and is warmed

1. **Oral Cavity:** Air enters and is warmed

Label organs, function and order

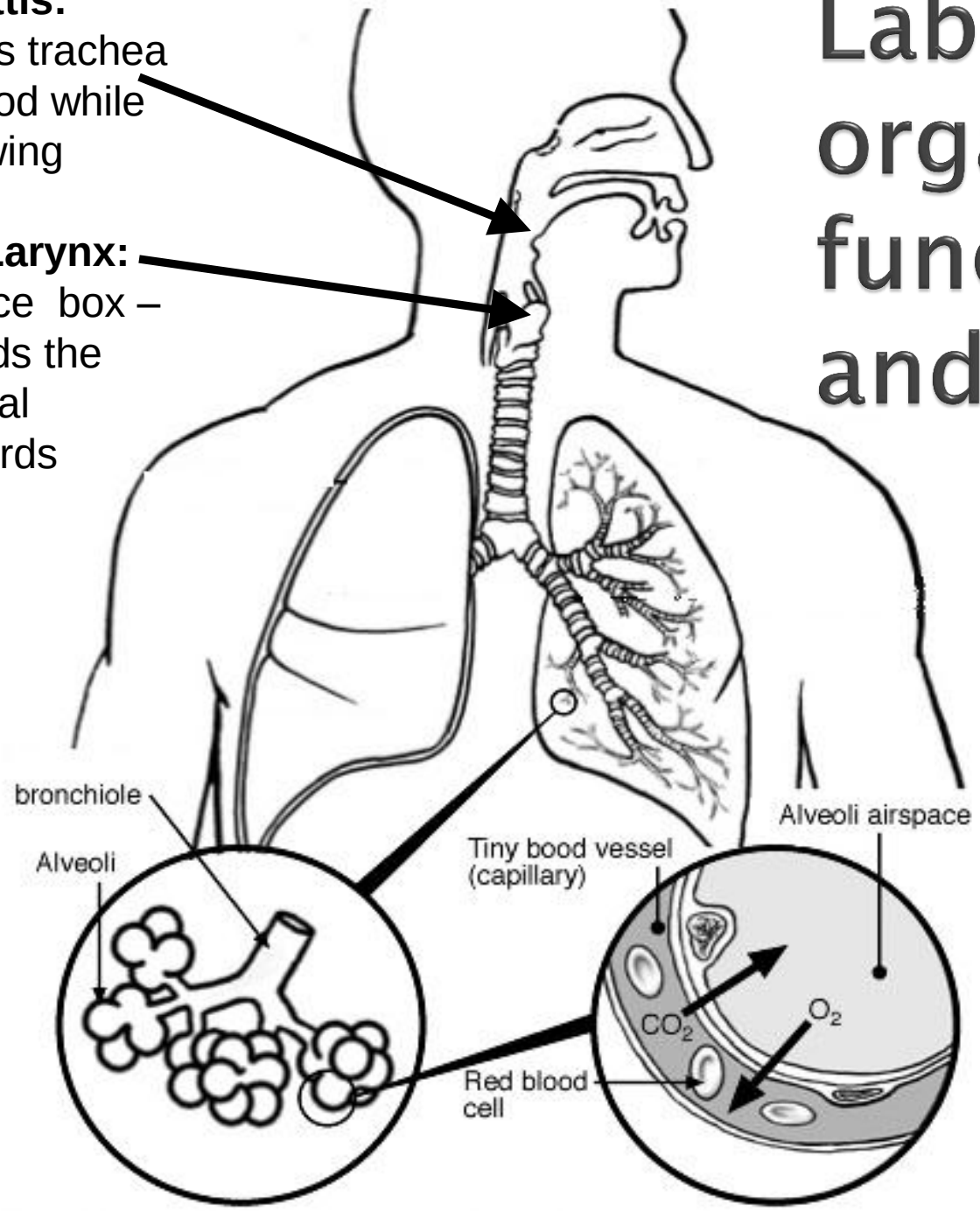
2. **Pharynx:** Common passage for air and food



Label organs, function and order

Epiglottis:
Protects trachea from food while swallowing

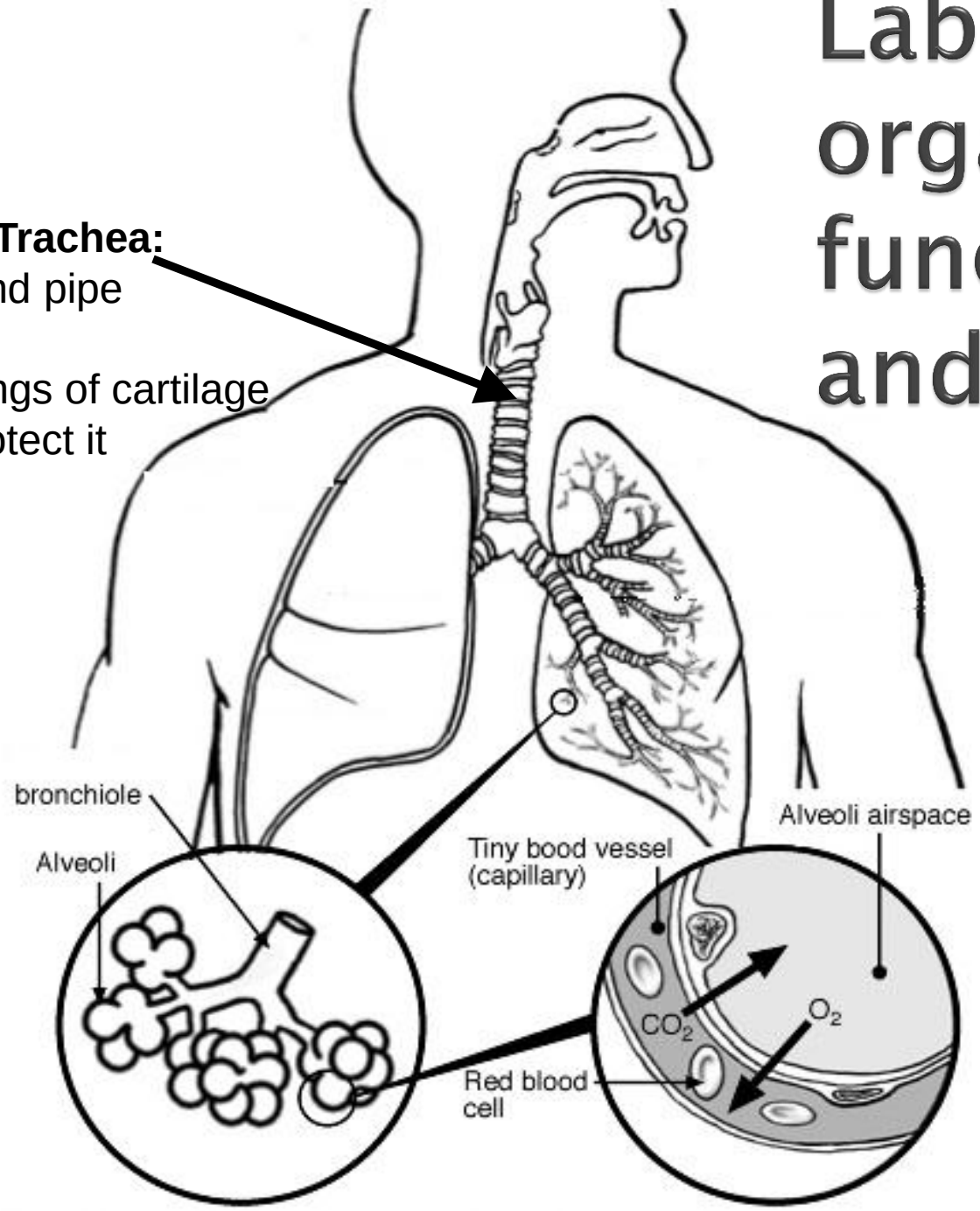
3. **Larynx:**
Voice box – holds the vocal chords



Label organs, function and order

4. **Trachea:**
wind pipe

Rings of cartilage protect it

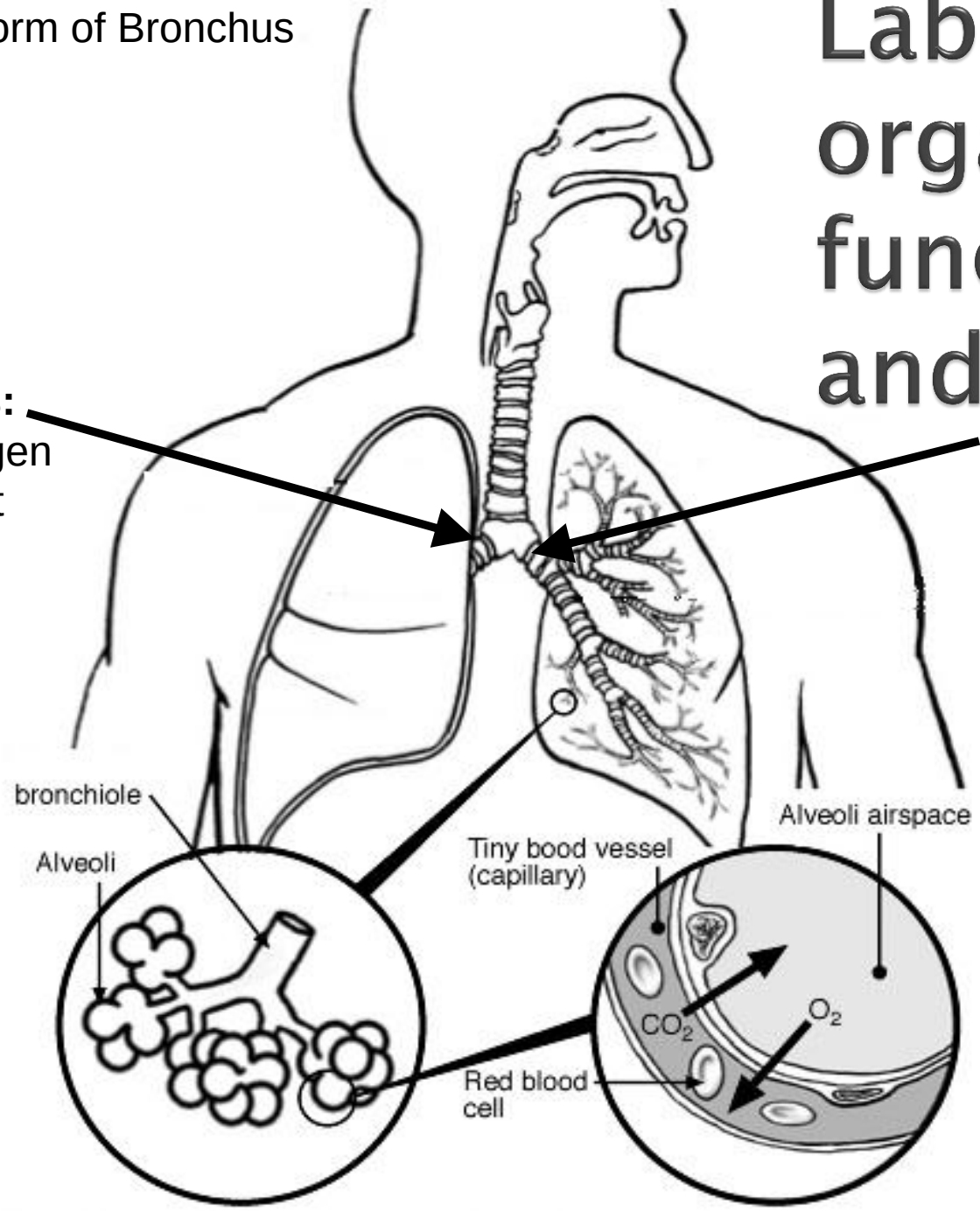


Bronchi = Plural form of Bronchus

Label organs, function and order

5. **Right Bronchus:** takes oxygen to the right lung

5. **Left Bronchus:** takes oxygen to the left lung

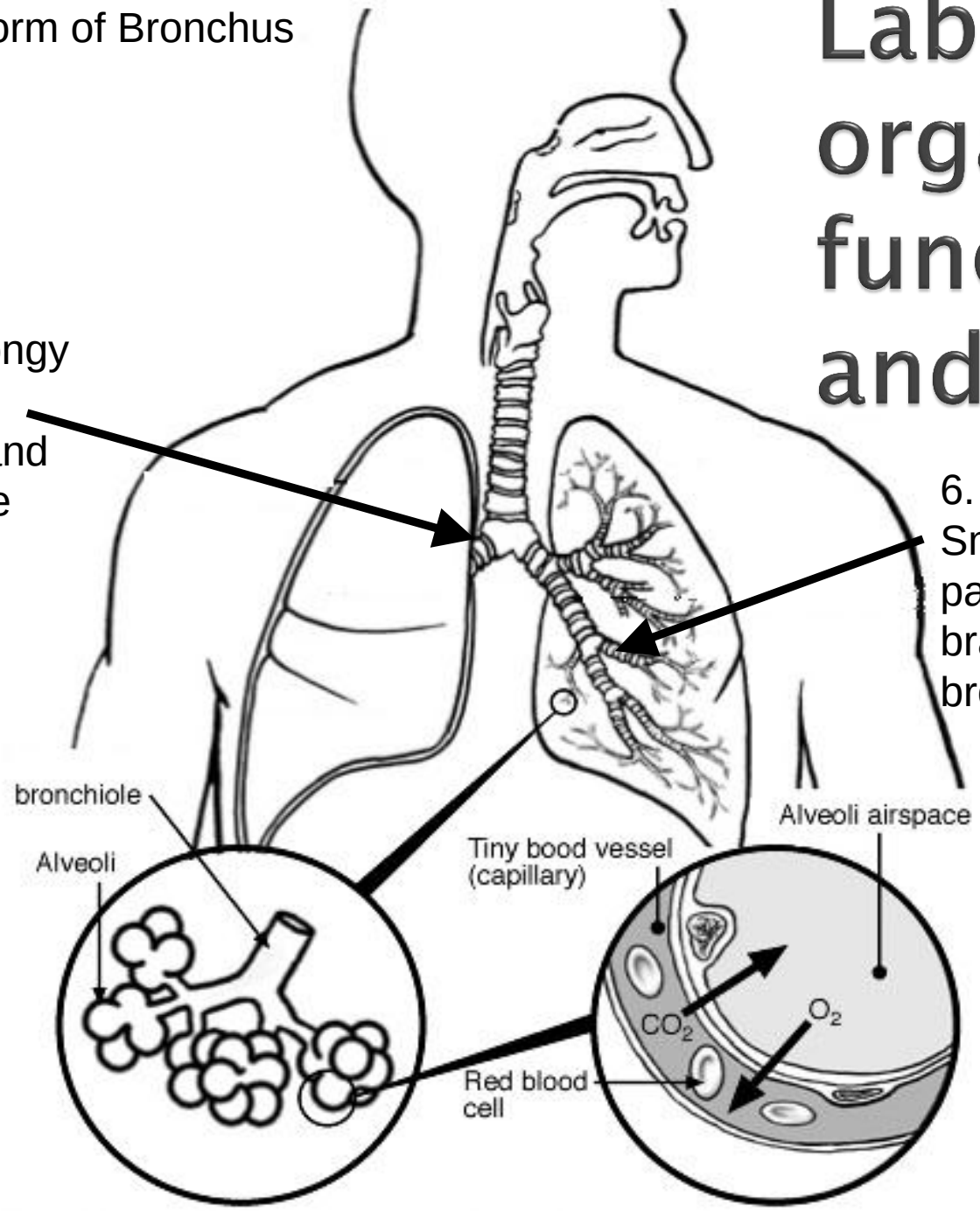


Bronchi = Plural form of Bronchus

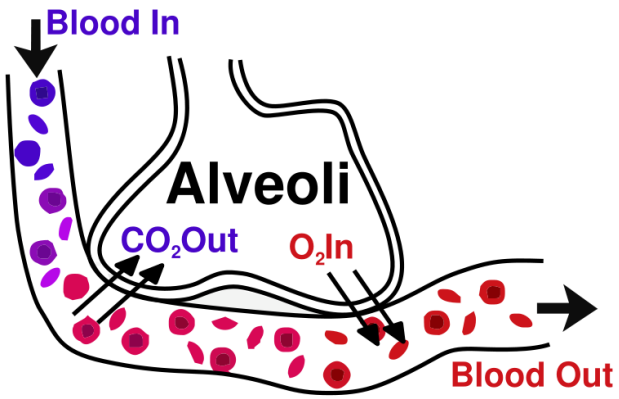
Label organs, function and order

Lung: spongy tissue that supports and houses the alveoli

6. **Bronchioles:** Smaller passageways that branch off of the bronchi

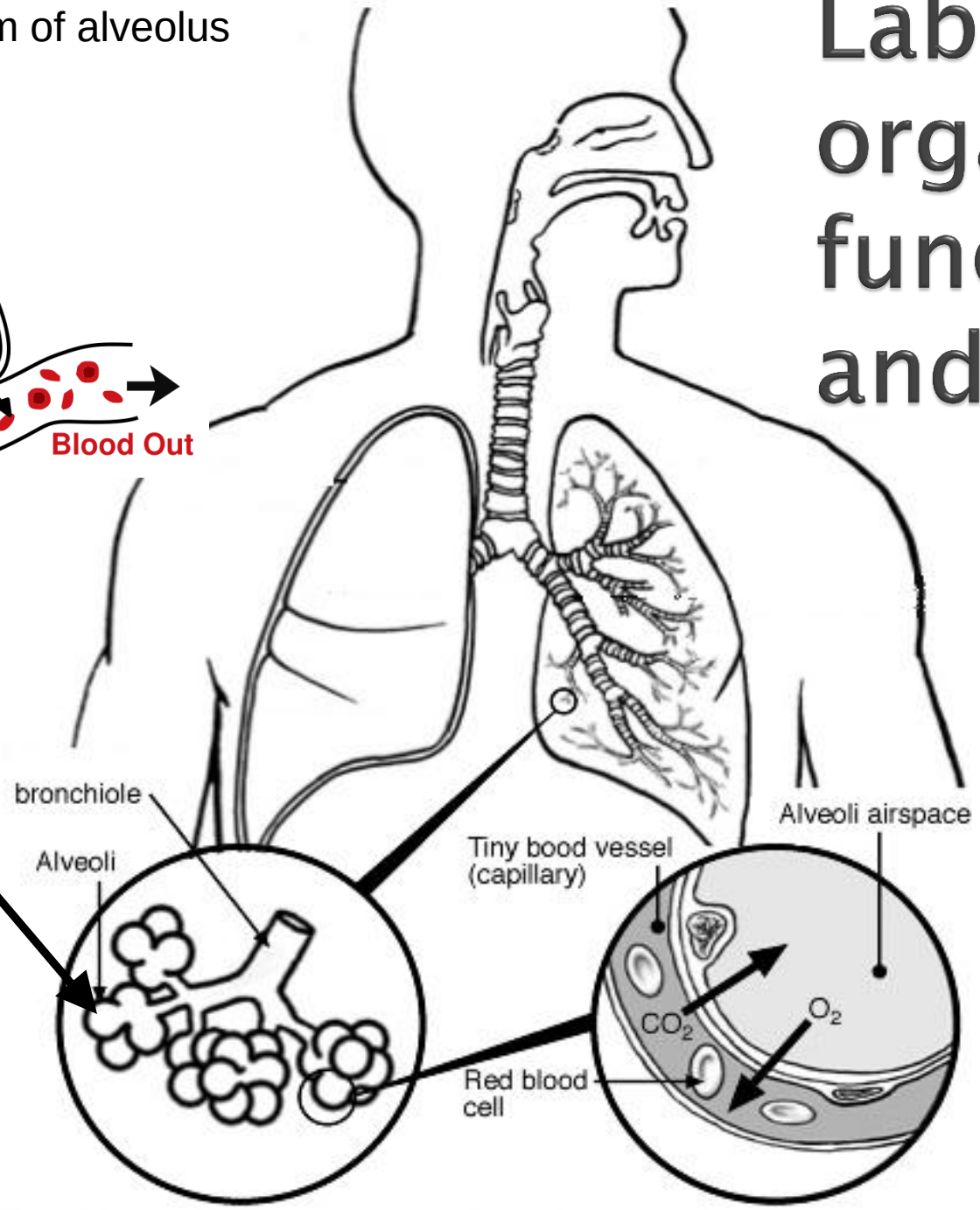


Aveoli= Plural form of alveolus

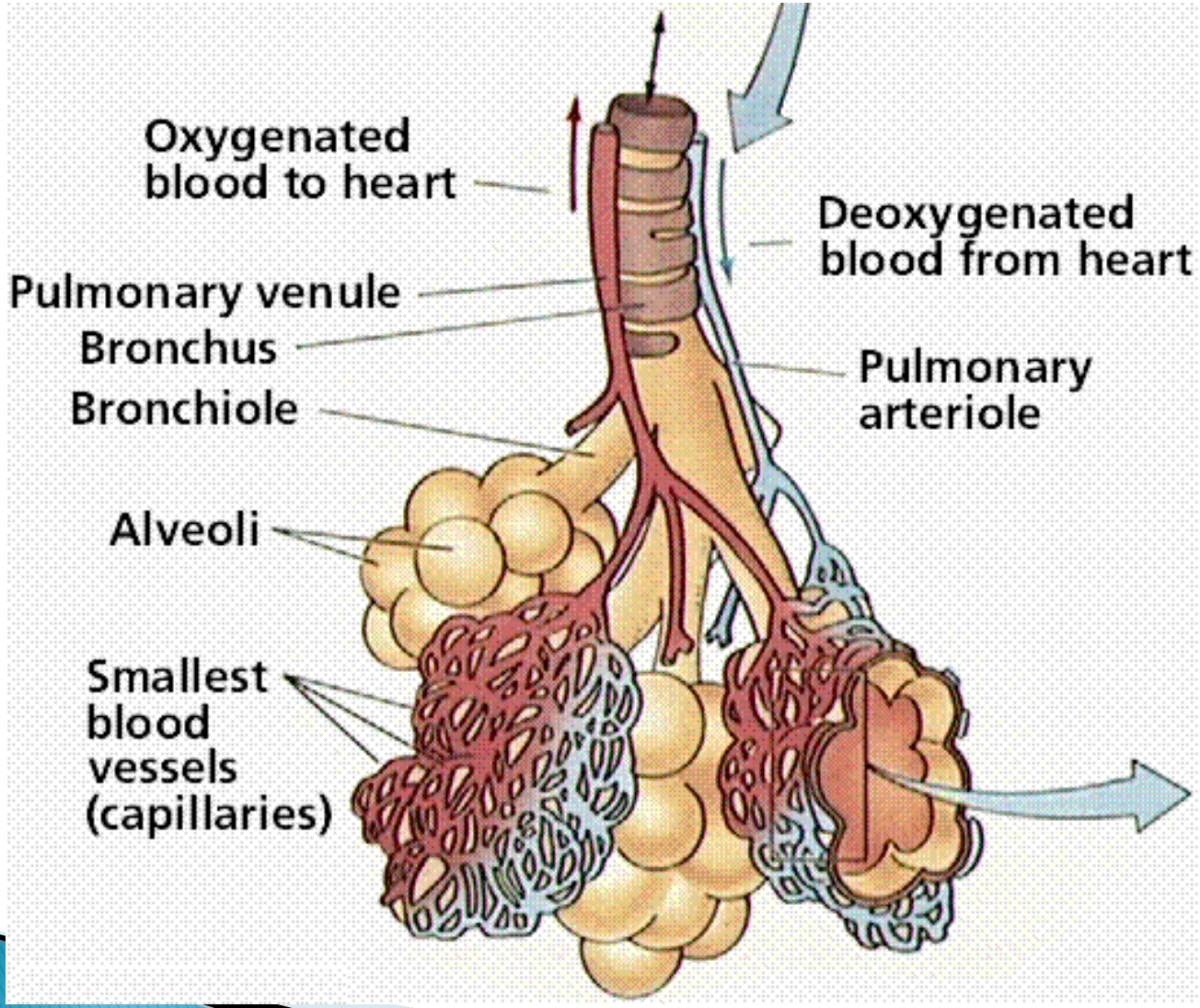


Label organs, function and order

7. **Alveolus:** Thin walled air sacs where the gas exchange occurs

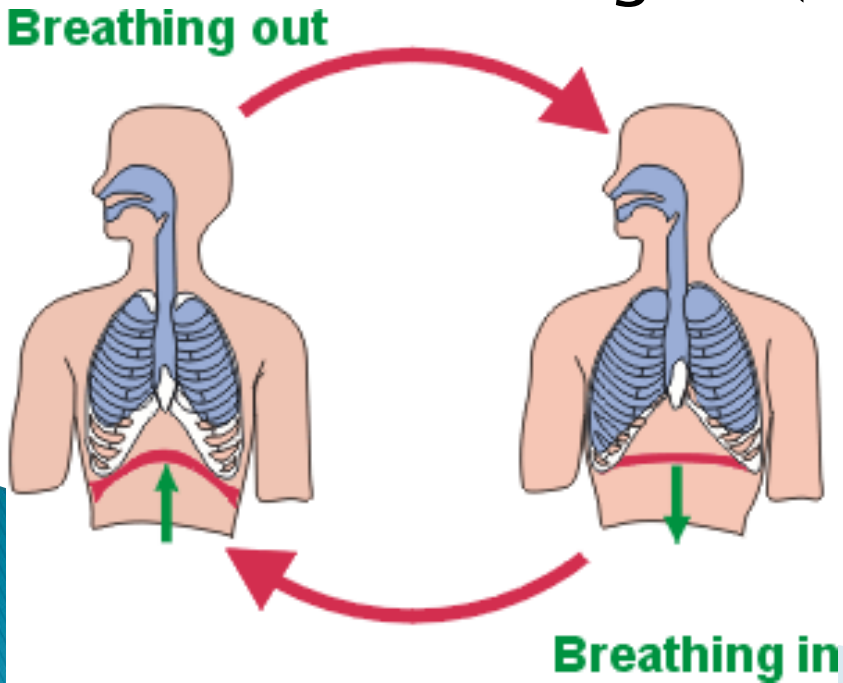


And a little bit more…



Other parts

- Lung: structure of muscle that holds all of the tubes together and opens and constricts the air passages when necessary
- Diaphragm: muscle that causes breathing
- Medulla Oblongata (brain stem) controls rate



How to Breathe:
In: Diaphragm goes down and creates space
Out: Diaphragm moves up pushing out the air

Even More!

- Cilia? Sweep mucus out of your lungs
- Mucus? Moistens the air and traps dust particles
- Rib Cage? Protection for the lungs