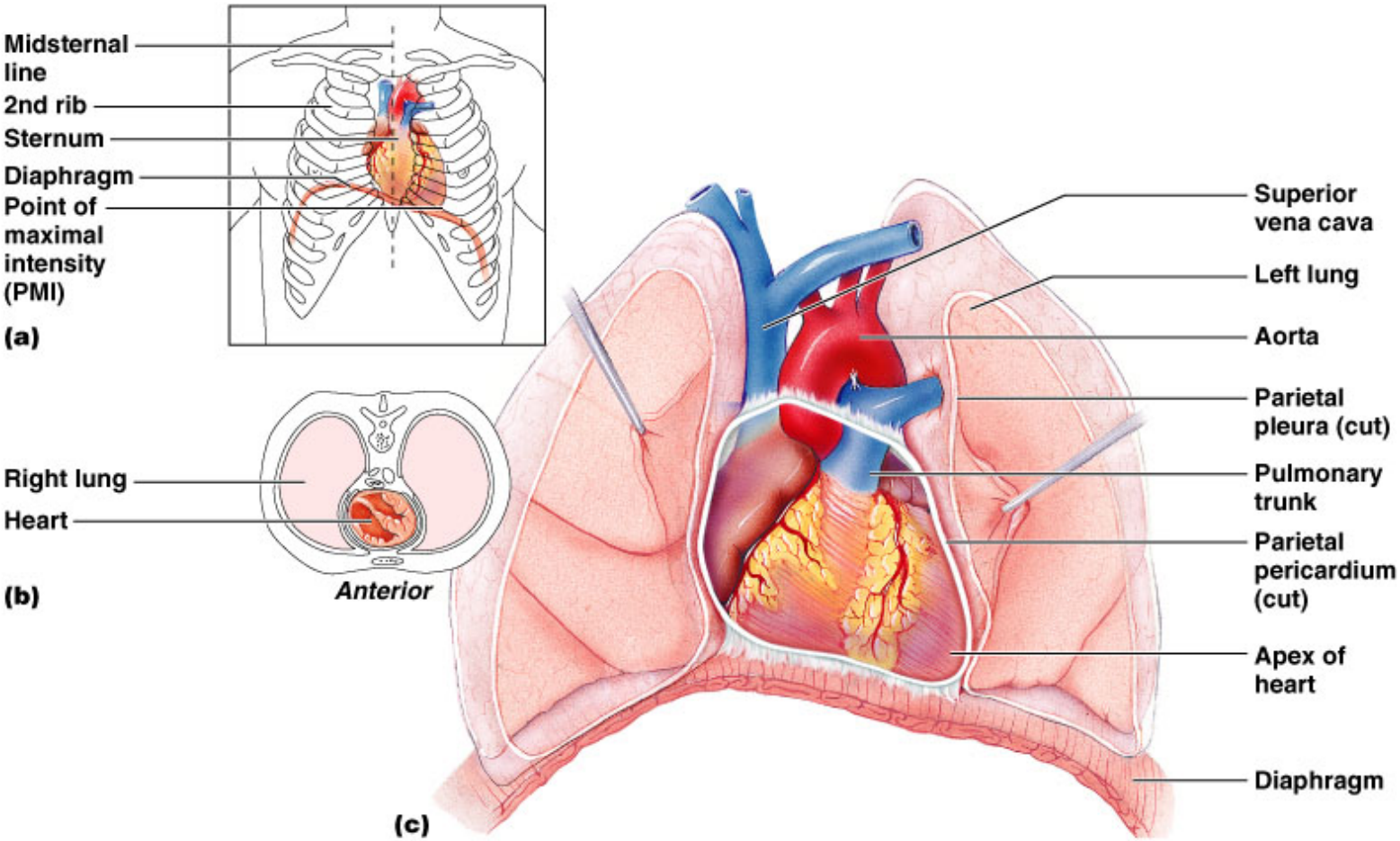
Heart

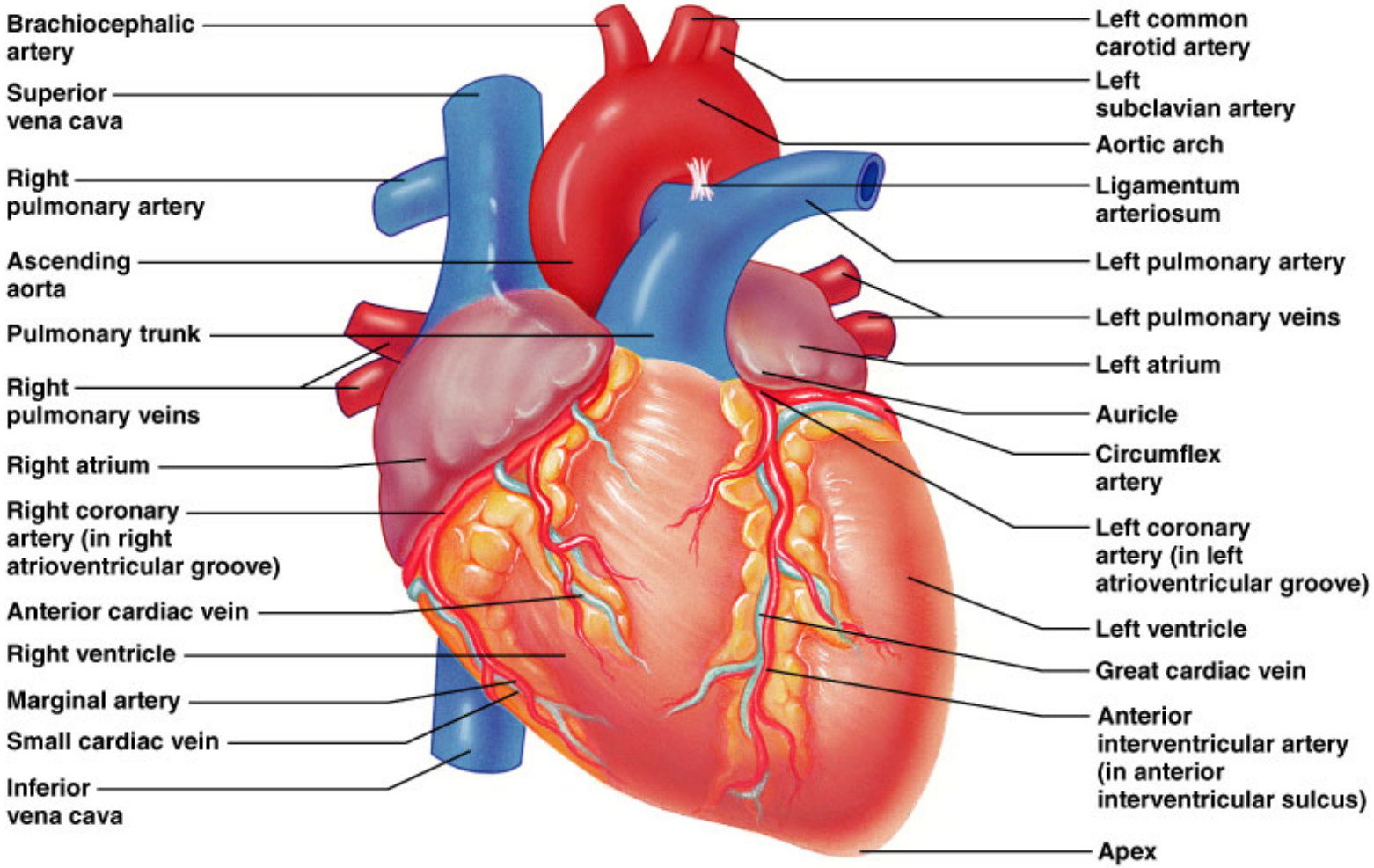
Dr. Kandula

Bio 40B lab

Location of Heart



Anatomy of Heart



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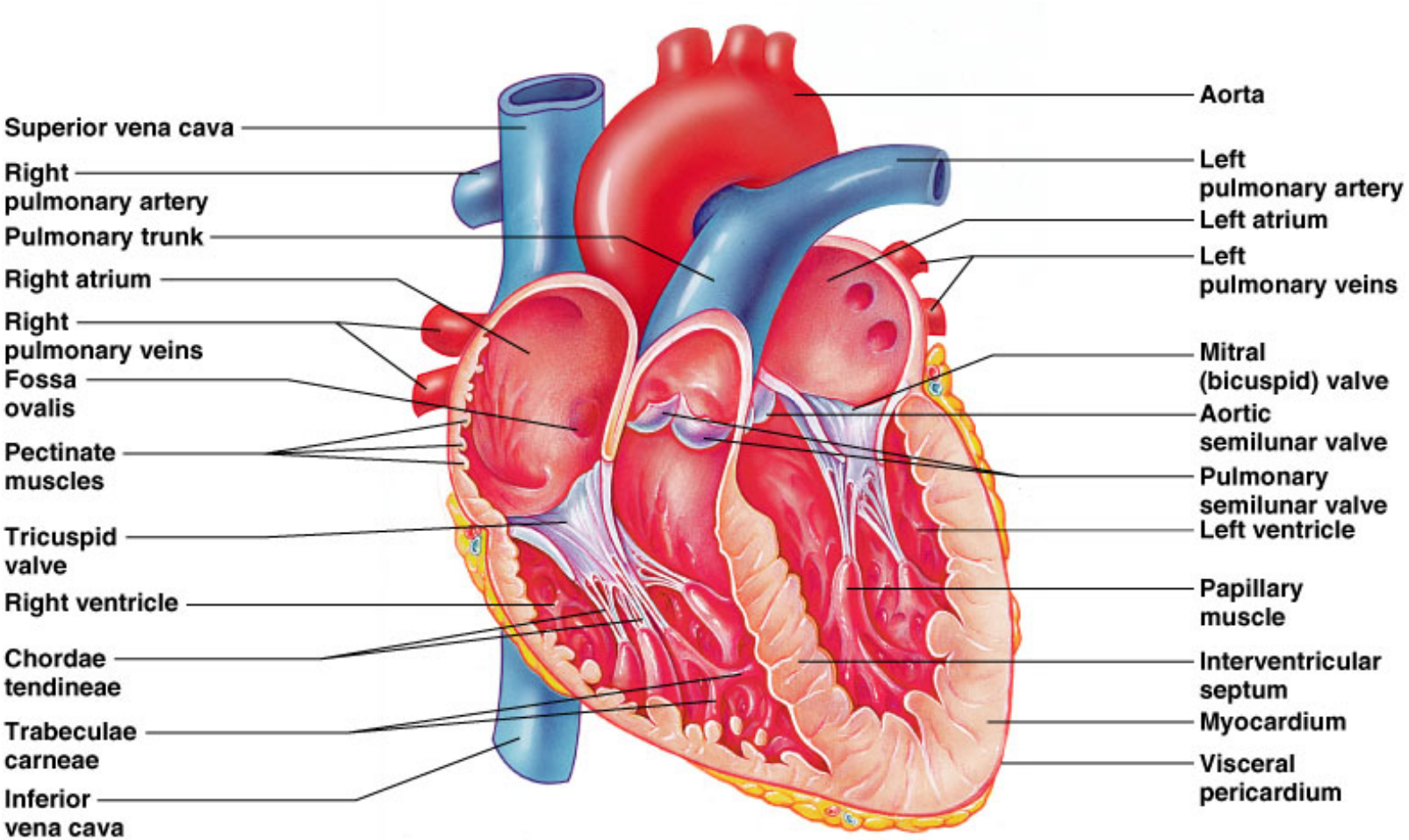
Heart Chambers



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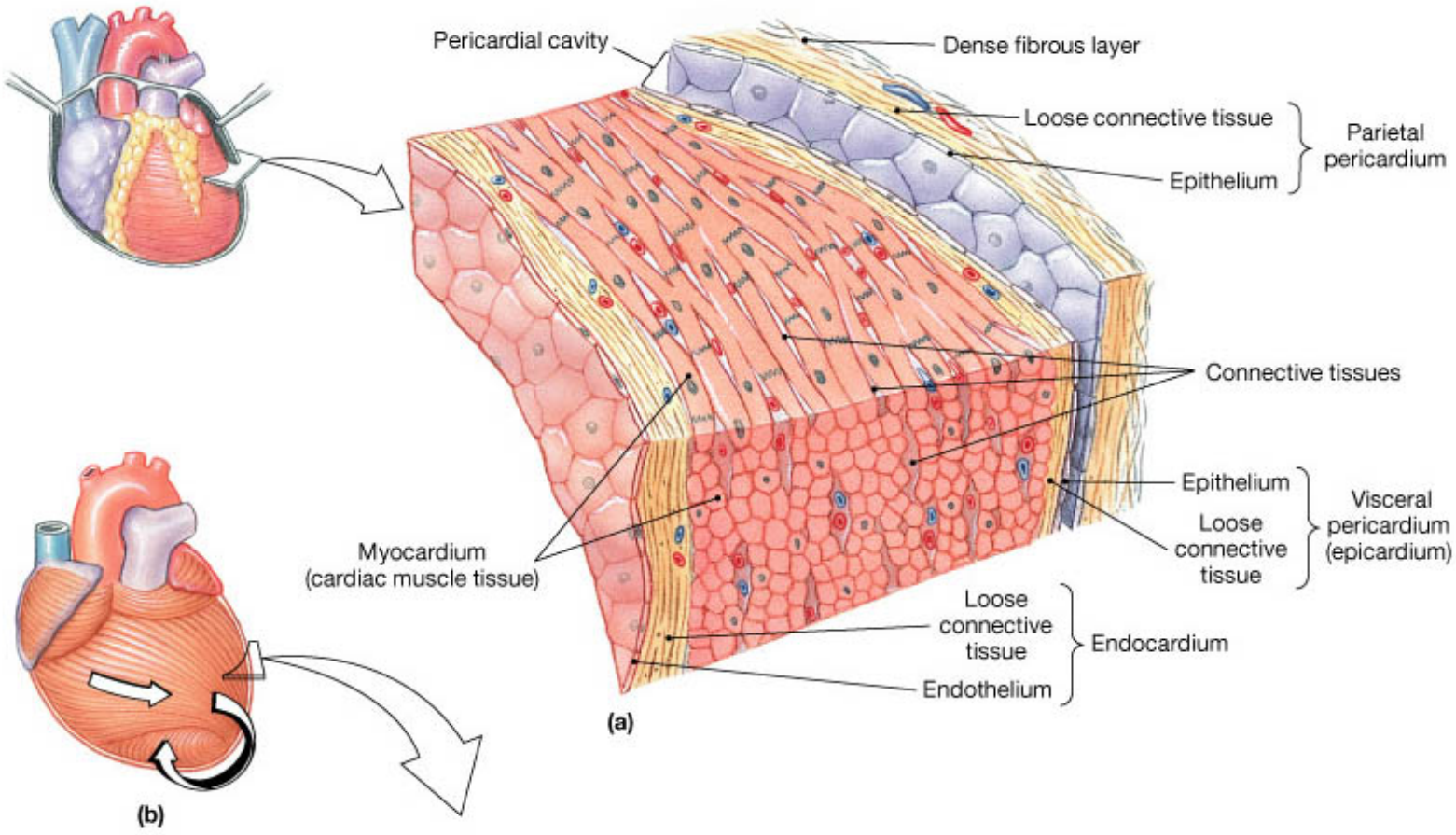
Heart Anatomy

- Location: mediastinum
  - Tip or apex faces left side
  - Top of the heart is the base
  - Fluid filled sac to protect is pericardium (visceral and parietal)
- Heart action
  - Contraction is systole
  - Relaxation is diastole
- Chambers
  - Top 2 chambers are atria where blood enters heart
  - Bottom 2 chambers are ventricles where blood exits

Anatomy of Heart Wall



Anatomy of Heart

- The heart and the proximal ends of the large blood vessels are enclosed by the **pericardium**.
- This consists of an outer fibrous bag--**fibrous pericardium** which surrounds a more delicate double-layered sac.
- Inner layer of this sac--**visceral pericardium** (**epicardium**) covers the heart
- At the base of the heart the visceral pericardium turns back on itself to become the **parietal pericardium**.
- Between the parietal and visceral layers is the **pericardial cavity** which contains serous fluid--**pericardial fluid**.
- The fluid reduces friction between the pericardial membranes when the heart moves within them

Heart Wall

- Made up of three (3) distinct layers:
- Outer/Superficial **epicardium**
- Middle/Intermediate **pericardium**
- Inner/Deep **endocardium**

Heart Wall

Epicardium

- Also called **visceral pericardium**.
- Functions as an outer protective layer.

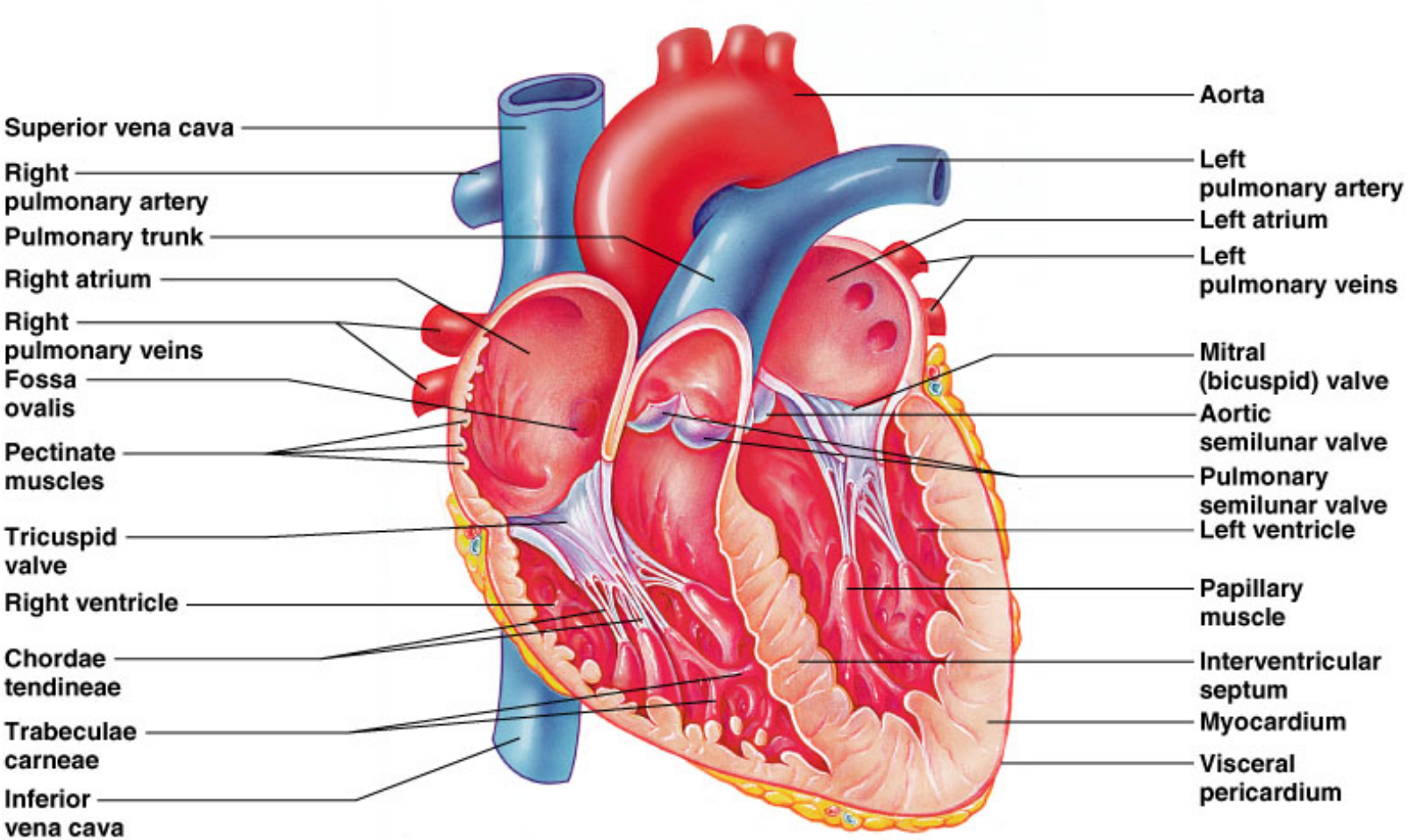
Myocardium

- Relatively thick.
- Consists largely of **cardiac muscle tissue** responsible for forcing blood out of the heart chambers.

Endocardium

- Lines all of the heart chambers and covers heart valves. Is continuous with the inner lining of blood vessels--**endothelium**.

Heart Chambers



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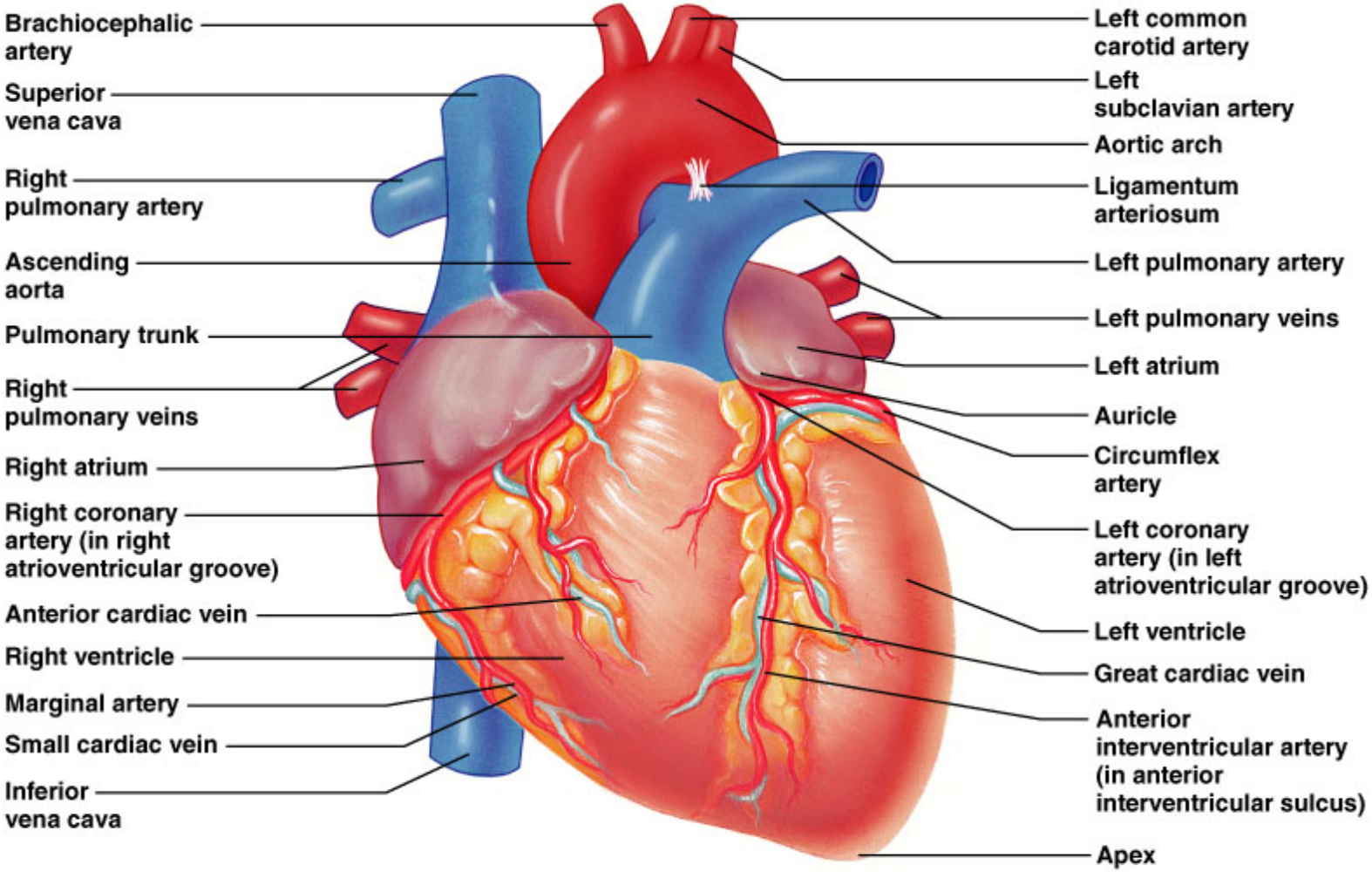
Heart Chambers

- Internally, the heart is divided into four (4) hollow chambers
- Upper chambers--**atria**
- Have relatively thin walls and receive blood from veins.
- Lower chambers—**ventricles,** which force blood out of the heart into the arteries.
- The atrium and ventricle on the right side are separated from those on the left by the **interatrial septum and interventricular septum**

Heart Anatomy

- The atrium on each side communicates with its corresponding ventricle through an opening called the **atrioventricular orifice** which is guarded by an **atrioventricular valve**.
- Grooves on the surface of the heart (sulci) mark the divisions between its chambers and also contain the major **coronary arteries**



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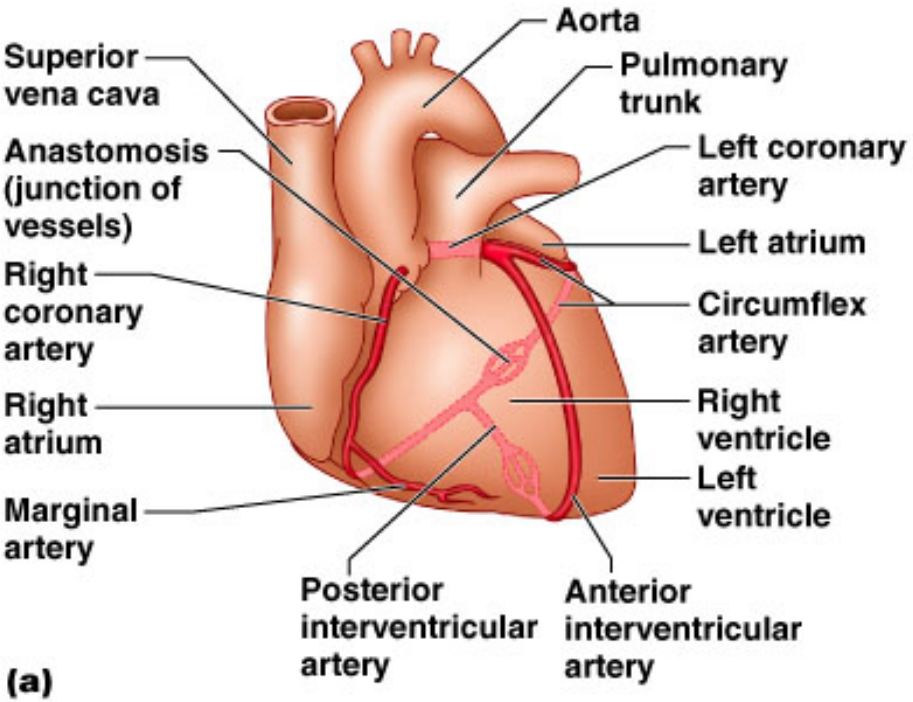
Heart Anatomy

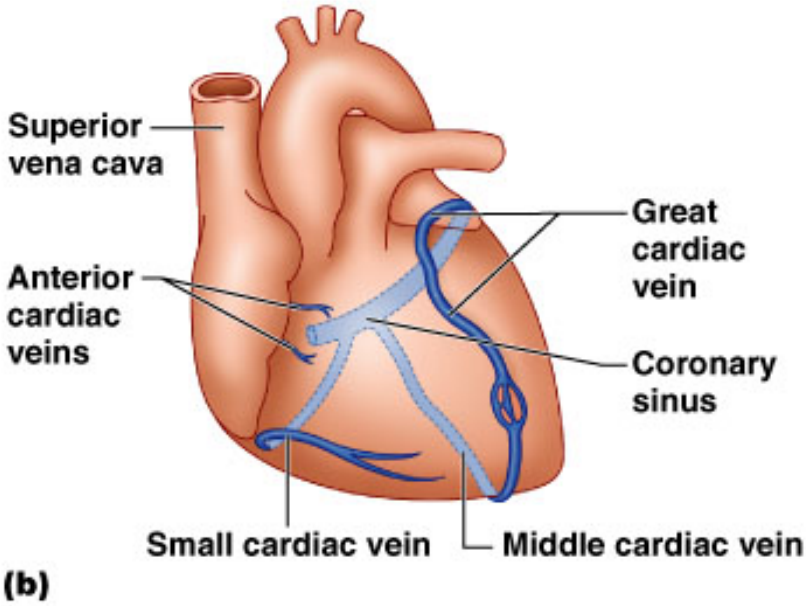
- The deepest groove is the **coronary sulcus** which encircles the heart between the atrial and ventricular portions. It contains the **coronary sinus**
- The **anterior** and **posterior interventricular sulci** indicate the location of the septum that separates the right and left ventricles.
- Small ear-like projections--**auricles**--extend outward from the atria.

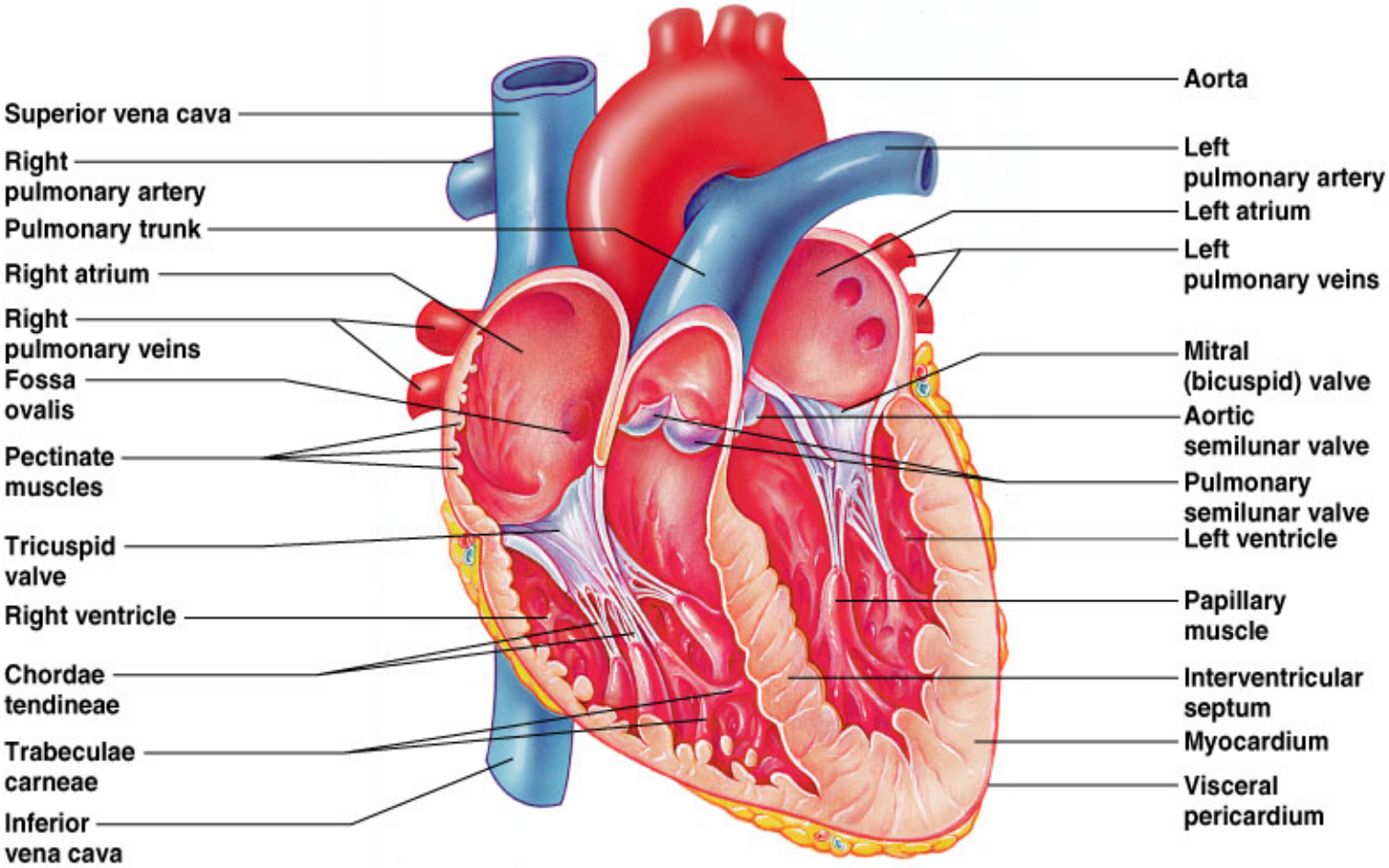
Heart Anatomy

- The **anterior inter-ventricular sulcus** contains the **left coronary artery** and the **great cardiac vein**. The **left coronary artery** supplies the **left atrium, left ventricle, interventricular septum**
- The **posterior inter-ventricular sulcus** contains the **right coronary artery** and **middle cardiac vein. Right coronary artery** supplies **the S.A. node, A.V. node, and the right atrium and right ventricle**

Cardiac Circulation







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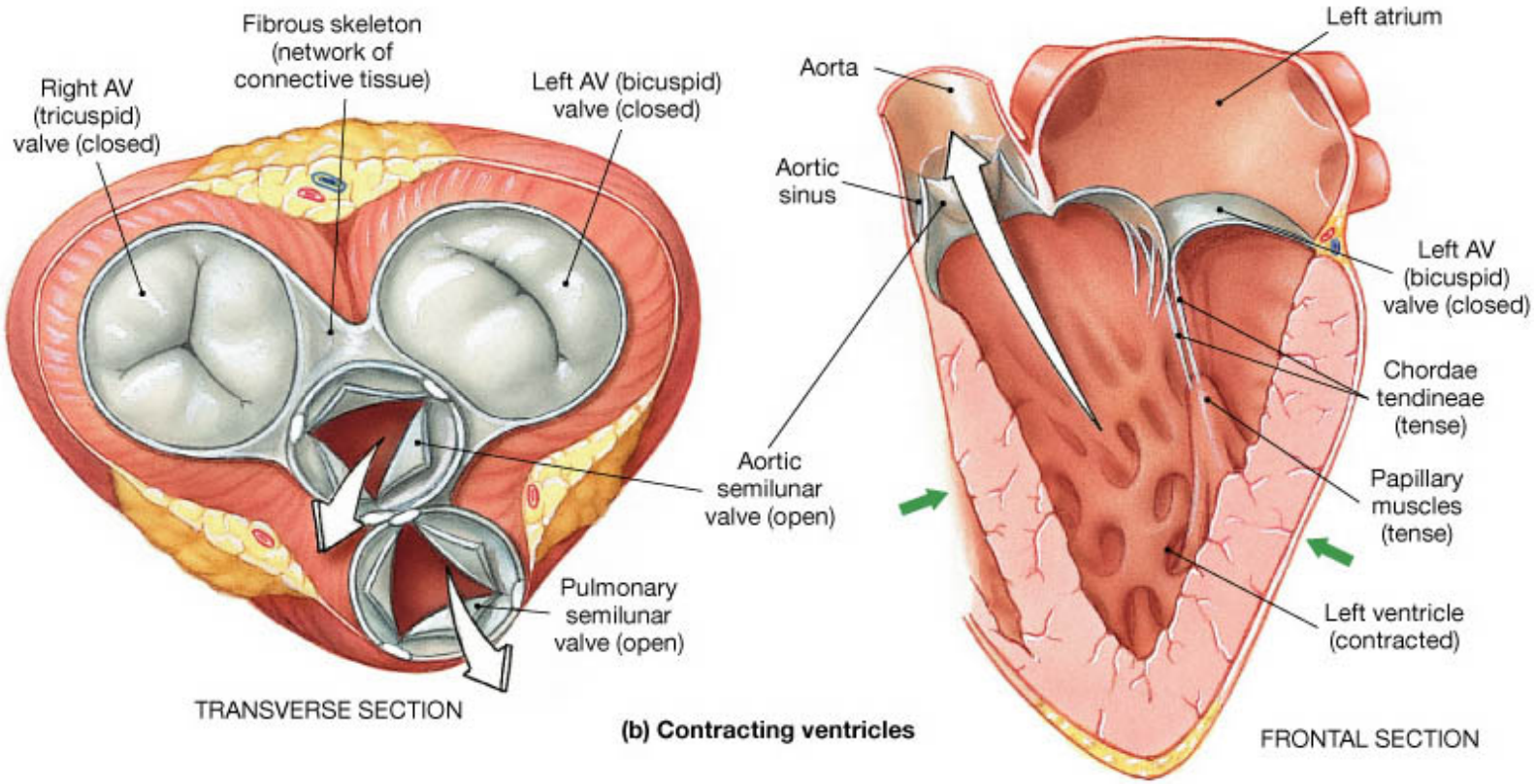
Right Atrium

- Receives blood from the **superior** and **inferior vena cavae**
- The returned blood is low in O_2 from the body.
- Also receives blood from the **coronary sinus**.
- The opening between the right atrium and right ventricle are guarded by a large **tricuspid valve**.
- *Valve permits blood to move from the right atrium into the right ventricle and prevents it from passing in the opposite direction*
- **Fossa ovalis**

Atrioventricular Valve

- **Chordae Tendineae -** *are attached to the cusps of the valve.*
- Originate from small mounds of muscle tissue**-- papillary muscle--**which project inward from the wall of the ventricle**.**
- When the **tricuspid valve** closes the chordae tendineae and papillary muscles prevent the cusps from swinging into the atrium**.**

Atrioventricular valves and Semilunar valves



Right ventricle

- The right ventricle has a much thicker wall than the right atrium. The arrangement of muscle is called **trabeculae carnae**.
- The right ventricle has much thinner walls than the left ventricle.
- Pumps blood a relatively short distance to the lungs against relatively low resistance to blood flow.
- When the right ventricles constricts, blood in the chamber is subjected to increasing pressure and the tricuspid valve closes passively.

Blood Flow through the Heart

- Blood from the right ventricle passes into the **pulmonary trunk** which divides to form the right and left **pulmonary arteries**.
- At the base of this trunk is the **pulmonary semilunar valve** which consists of three cusps.
- This valve opens when the right ventricle contracts.
- When the right ventricular muscles relax, blood begins to back up causing the semilunar valve to close
- Blood via the pulmonary arteries goes to the right and left lung where it is oxygenated

Blood Flow through the Heart

- The left atrium receives blood from four **pulmonary veins** (two from the right lung and two from the left lung).
- Blood then passes from the left atrium through the **atrioventricular orifice** which consists of two leaflets and is named the **bicuspid** or **mitral valve.**
- ***Prevents blood from flowing back to the left atrium from the left ventricle***

Blood Flow through the Heart

- When the left ventricle contracts, the bicuspid valve closes and the only exit for the blood is through the **aorta**.
- Branches of the aorta distribute blood to all parts of the body.
- At the base of the aorta is an **aortic semilunar valve** that consists of three cusps.
- It opens and allows blood to leave the left ventricle.
- When the ventricular muscles relax, this valve closes and prevents blood from backing up into the ventricle.

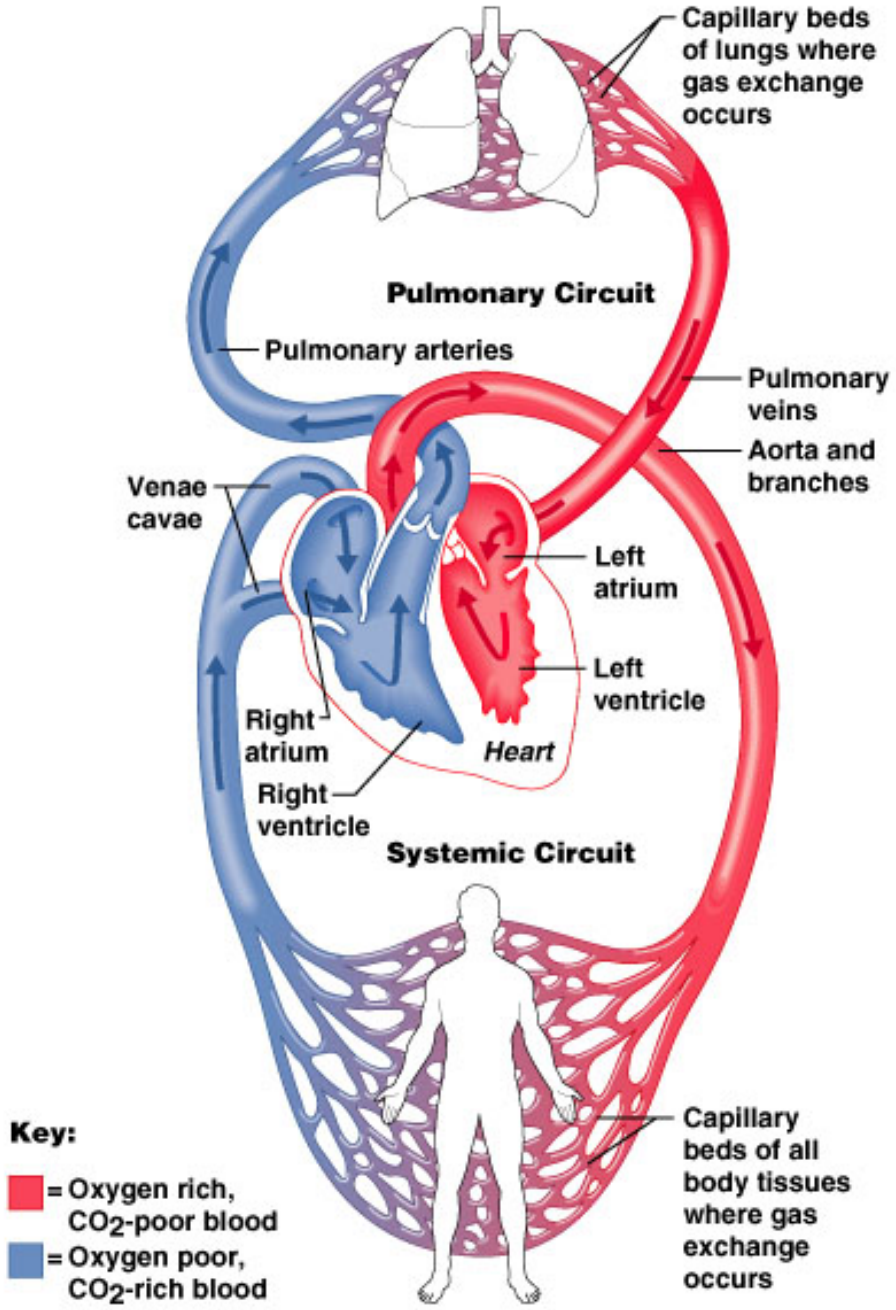
Heart valves: prevent blood backflow between chambers

- **Atrioventricular (AV) valves**
  - Between atria and ventricles
  - Left is **biscuspid or mitral valve**
  - Right is **tricuspid valve**
- **Semilunar valves**
  - Between ventricles and major arteries leaving heart
  - Right is **pulmonary semilunar valve**
    - Blood to lung via pulmonary artery

Cont…

- Left is **aortic semilunar valve**
  - Blood to whole body via aorta
- First heart sound is “lub”
  - Splashing of blood associated with closing of AV valves
- Second heart sound is “dup”
  - Splashing of blood associated with closing of semilunar valves

2 Circulatory Systems



Atrioventricular valves open
Semilunar valves closed