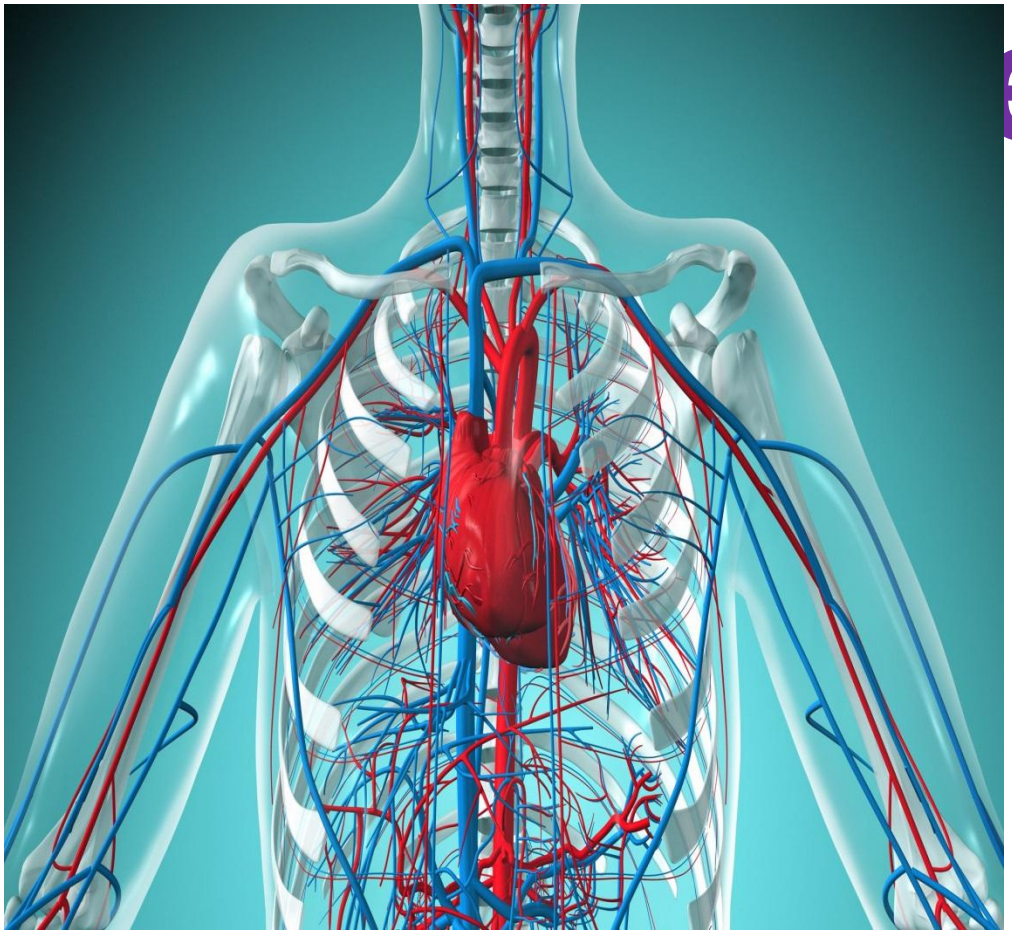
General Anatomy

Cardio-Vascular System



First Stage

2nd Term

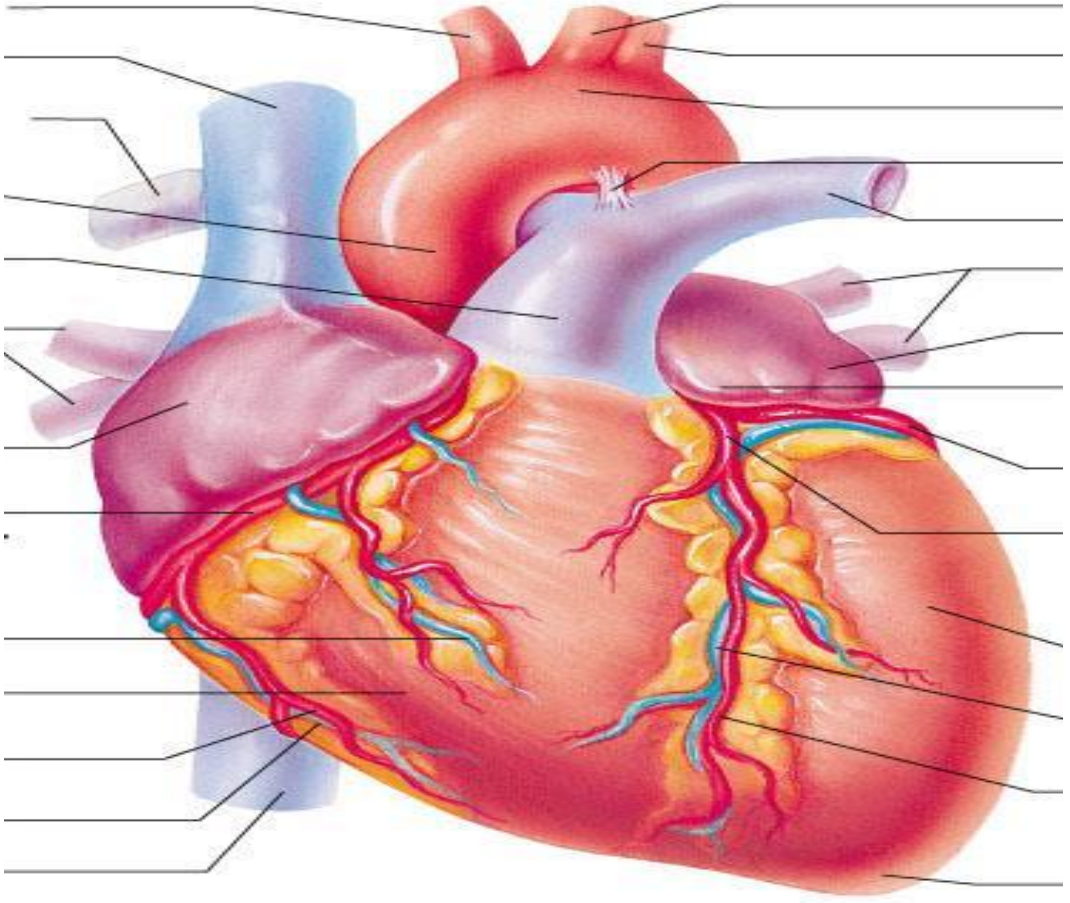
By Dr-Omar Jaff

M.B.Ch.B

Definition

The cardiovascular system: is a closed system of the heart and blood vessels the heart pumps blood into blood vessels then blood vessels circulate the blood to all parts of the body, to all cells.

The Functions: to deliver oxygen and nutrients to all body cells, transport enzymes and hormones, and to remove carbon dioxide and other waste products from the cells



The Heart

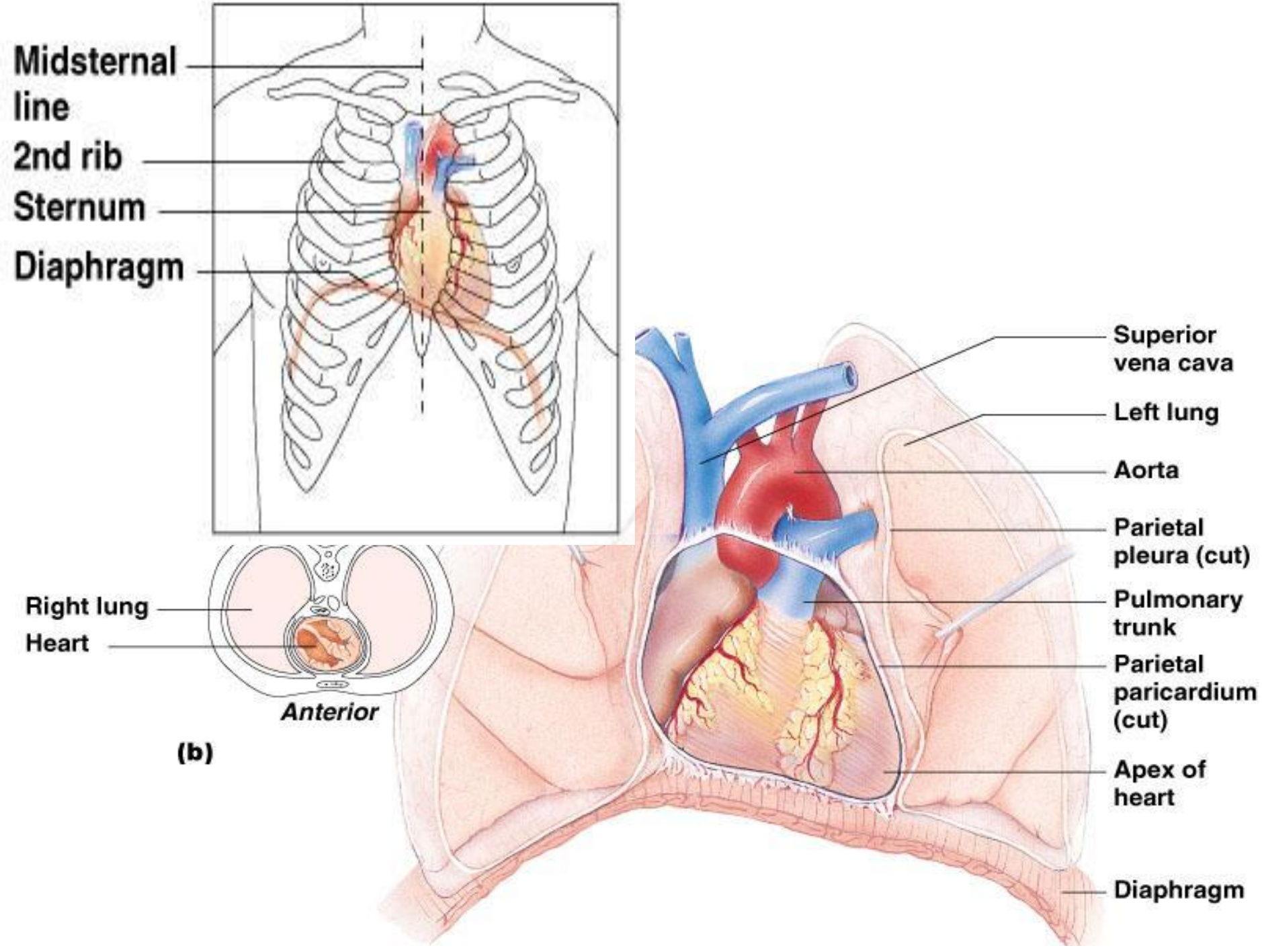
A) Anatomy of the Heart

1. Location

In thoracic cavity in the mediastinum, between the lungs.

The heart is

- **medial** to the lungs,
- **posterior** to the sternum.
- **anterior** to the vertebral column.
- and **superior** to the diaphragm.
- Its **distal** end, the apex, points to the left, terminating at the level of the 5th intercostal space.


Midsternal line
2nd rib
Sternum
Diaphragm
Right lung
Heart
Anterior
(b)
Superior vena cava
Left lung
Aorta
Parietal pleura (cut)
Pulmonary trunk
Parietal paricardium (cut)
Apex of heart
Diaphragm

Coverings of the Heart: Anatomy

a) pericardium (or pericardial sac)

1) fibrous pericardium—sac made of tough connective tissue

2) double layered serous membrane:

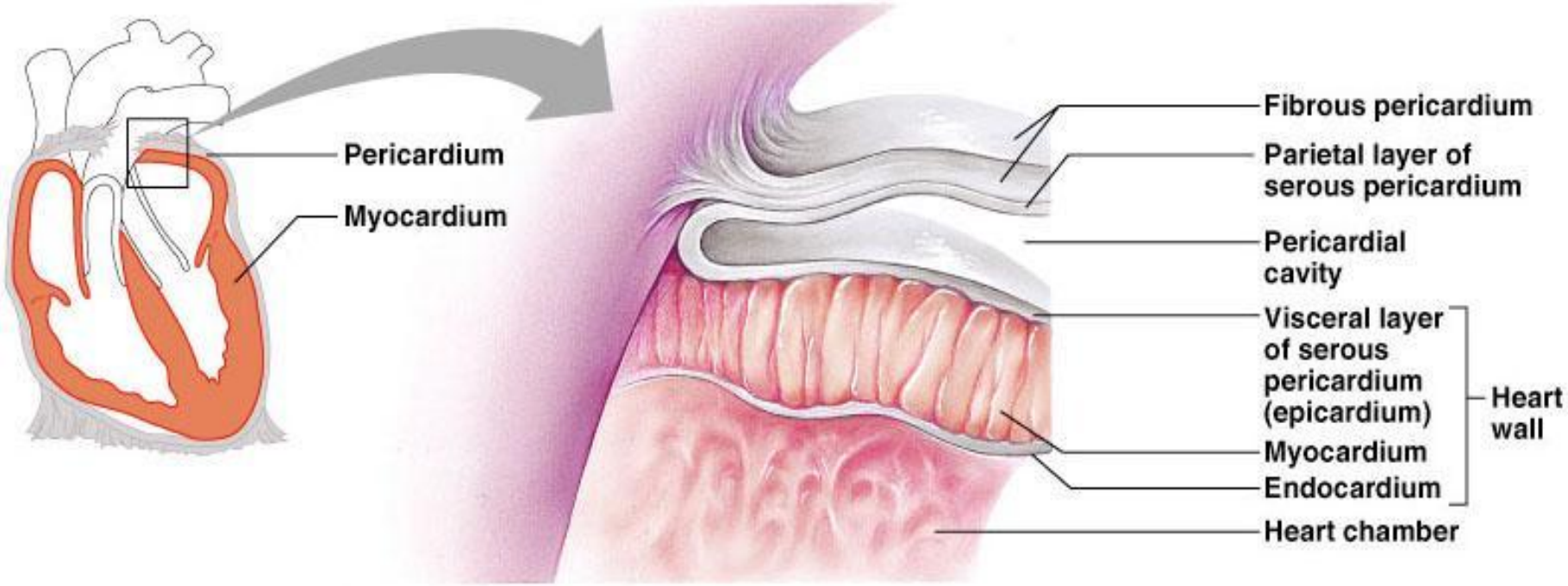
- parietal pericardium
- visceral pericardium (a.k.a. epicardium)--covers the heart

b) serous fluid fills the pericardial cavity between parietal & visceral layers

The Function of the Pericardium:

- Protects and anchors the heart
- Prevents overfilling of the heart with blood
- Allows for the heart to work in a relatively friction-free environment

Pericardial Layers of the Heart



Heart Wall

a) **epicardium** (aka visceral pericardium) outside layer of connective tissue on surface of the heart

b) **myocardium** = thick wall of cardiac muscle

c) **endocardium** = inner epithelial & connective tissue lining of heart and valves

Chambers of the heart (4)

- **atrium** (R & L)—receive blood

each atria extends into a smaller, external chamber called an **auricle**

- **ventricle** (R & L)—inferior to the atria; expel blood out of the heart

The chambers on the left are separated from the chambers on the right by a septum (wall of cardiac muscle)

- interatrial septum
- interventricular septum

External Heart: Major Vessels of the Heart

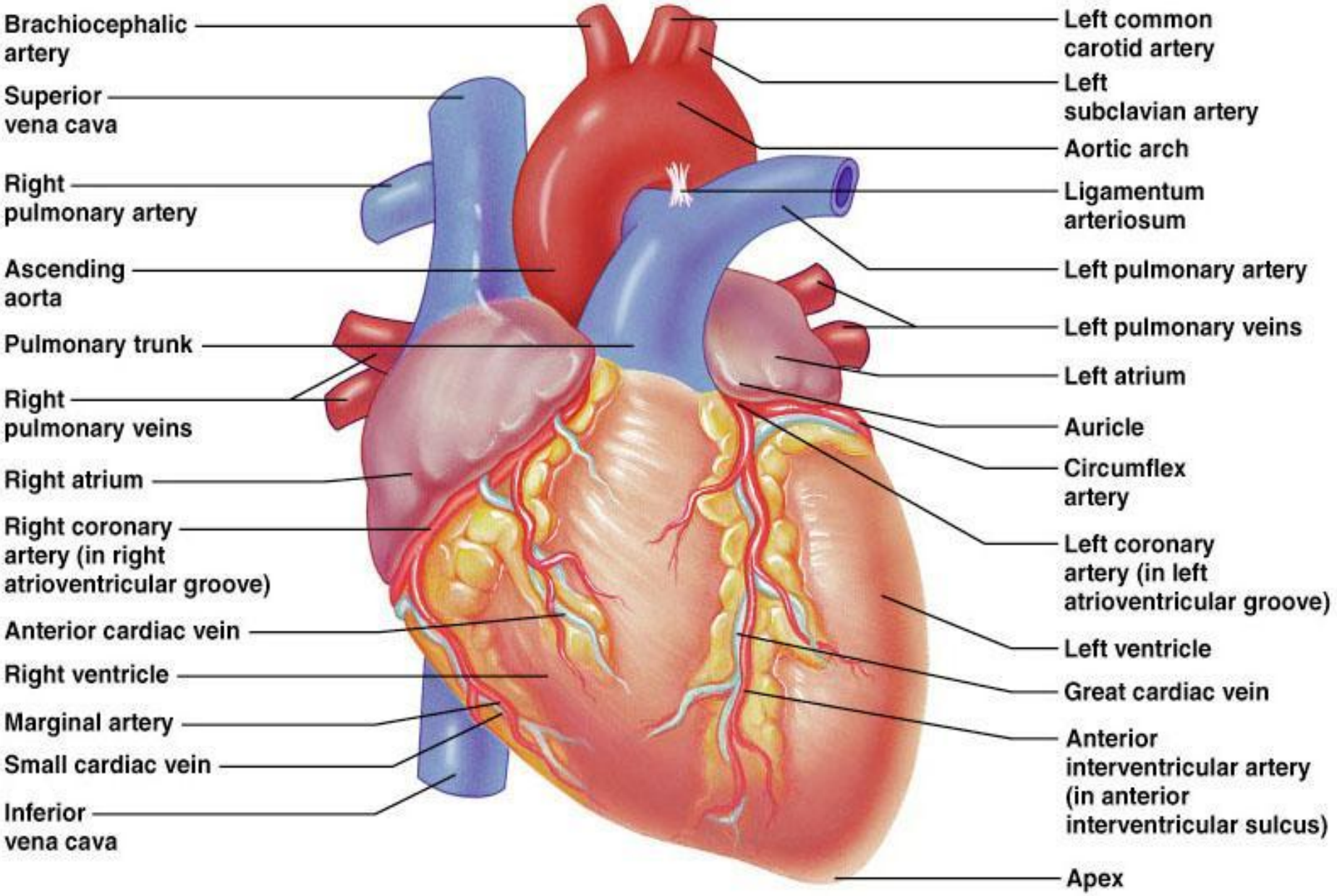
Vessels returning blood to the heart include:

1. Superior and inferior venae cavae
2. Right and left pulmonary veins

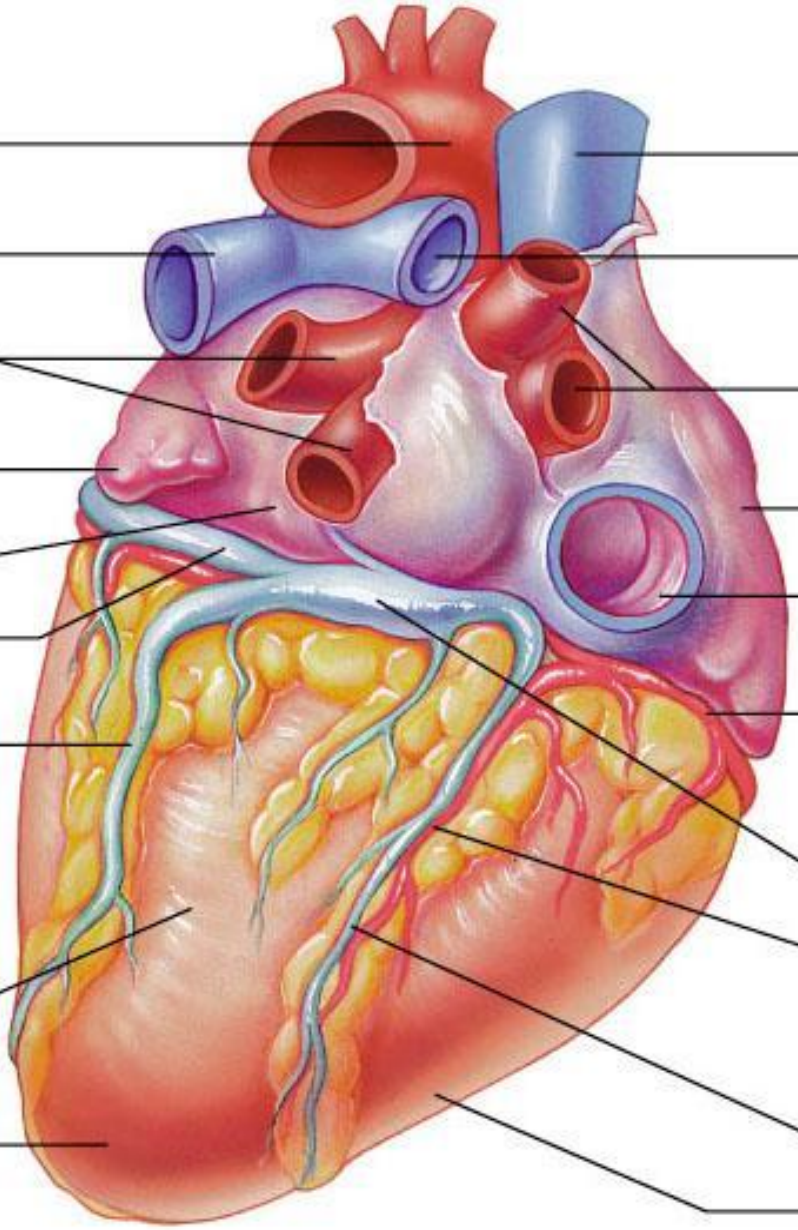
Vessels conveying blood away from the heart include:

3. Pulmonary trunk, which splits into right and left pulmonary arteries
4. Ascending aorta (three branches) –
    a. Brachiocephalic
    b. Left common carotid
    c. Subclavian arteries

External Heart: Anterior View



External Heart: Posterior View



Aorta

Left pulmonary artery

Left pulmonary veins

Auricle of left atrium

Left atrium

Great cardiac vein

Posterior vein of left ventricle

Left ventricle

Apex

(d)

Superior vena cava

Right pulmonary artery

Right pulmonary veins

Right atrium

Inferior vena cava

Right coronary artery (in right atrioventricular groove)

Coronary sinus

Posterior interventricular artery (in posterior interventricular sulcus)

Middle cardiac vein

Right ventricle

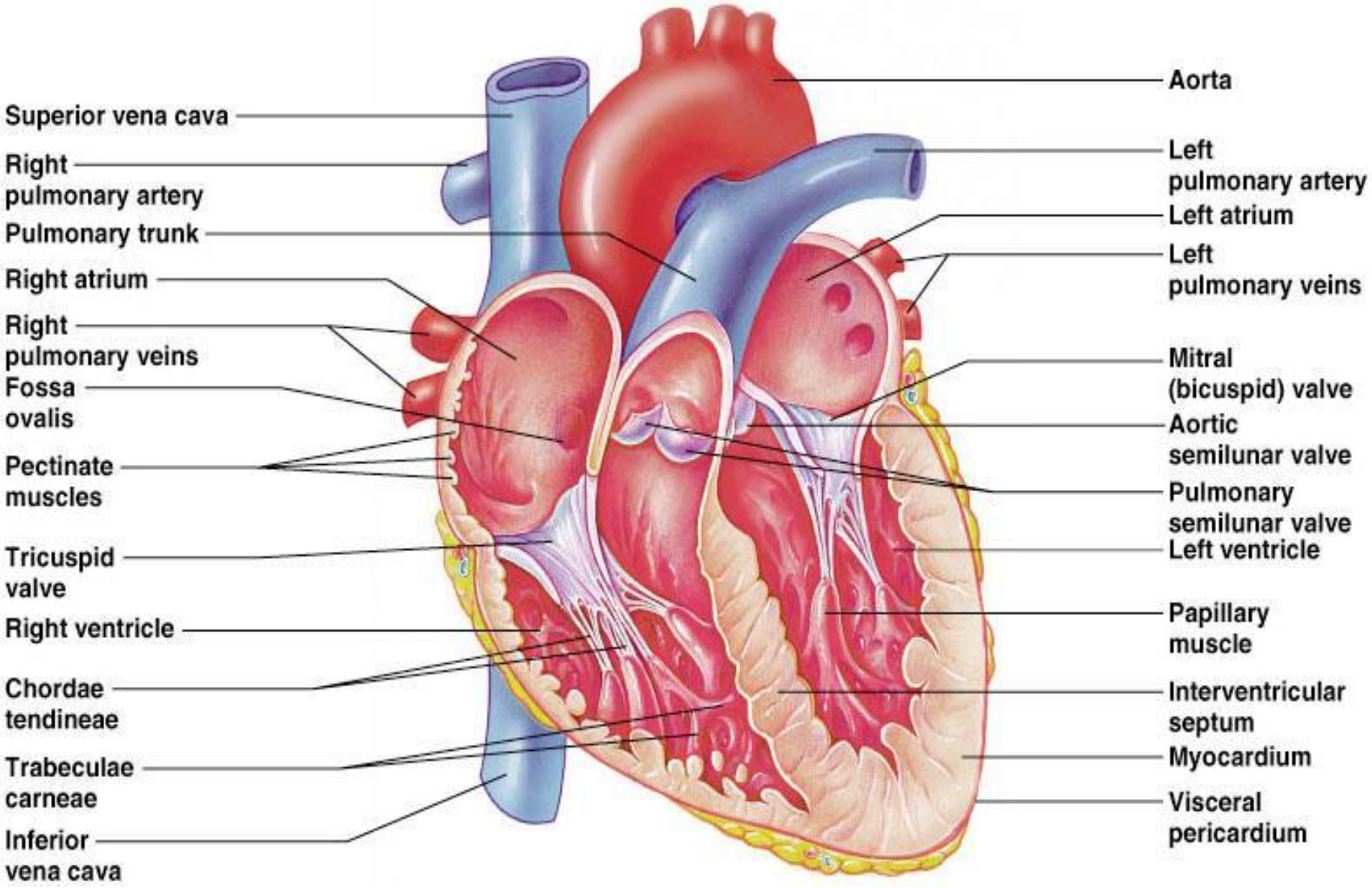
Atria of the Heart

- Atria are the receiving chambers of the heart
- **Pectinate muscles** mark atrial walls
- Blood enters **right atria** from superior and inferior venae cavae and coronary sinus
- Blood enters **left atria** from pulmonary veins

Ventricles of the Heart

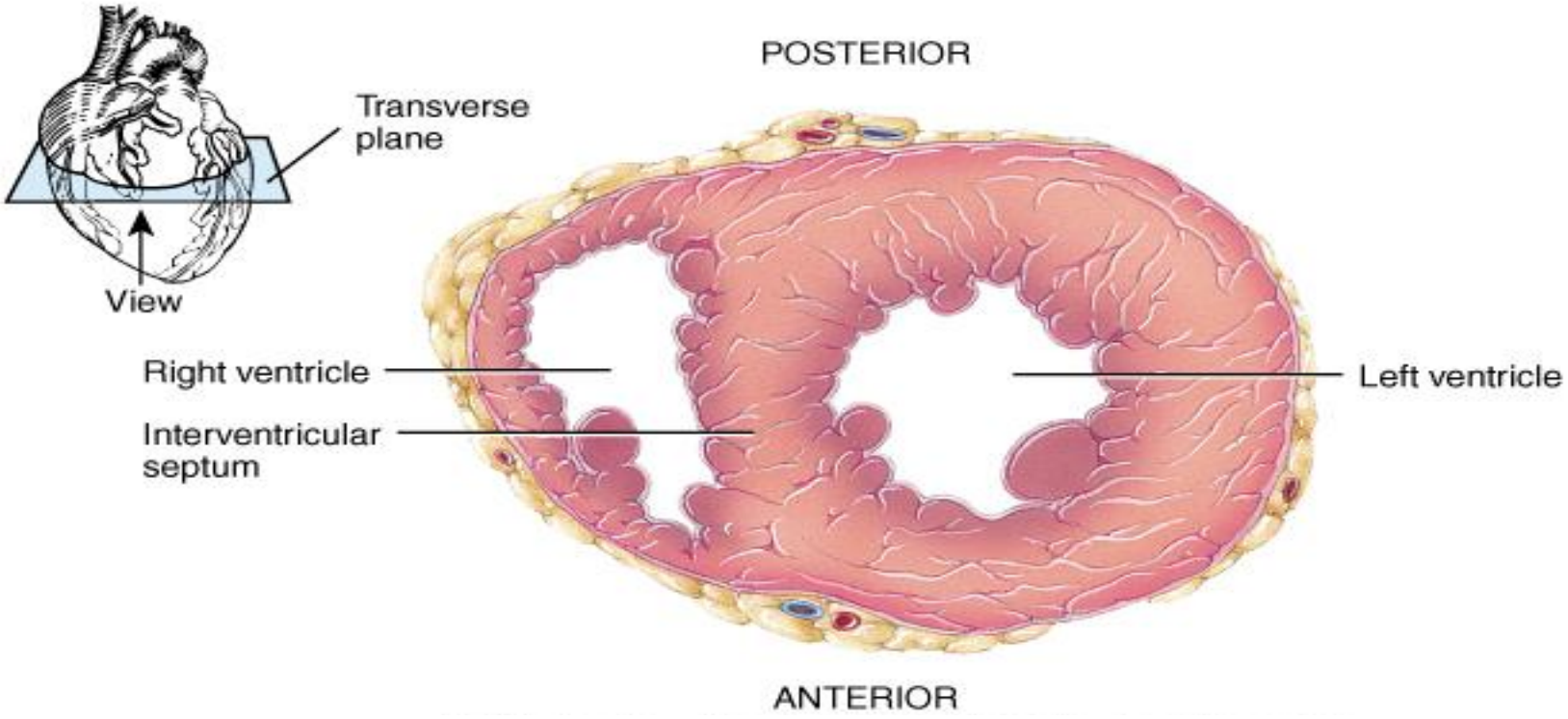
- Ventricles are the discharging chambers of the heart
- **Papillary muscles** and **trabeculae carneae muscles** mark ventricular walls
- **Right ventricle** pumps blood into the pulmonary trunk
- **Left ventricle** pumps blood into the aorta

Gross Anatomy of Heart: Frontal Section



Thickness of myocardium varies according to the function of the chamber

- **Atria** are **thin** walled, deliver blood to adjacent ventricles
- **Ventricle** walls are much **thicker** and stronger
  - right ventricle supplies blood to the lungs (little flow resistance)
  - left ventricle wall is the thickest to supply systemic circulation



**** Myocardium of left ventricle is much thicker than the right.**

Pathway of Blood Through the Heart and Lungs

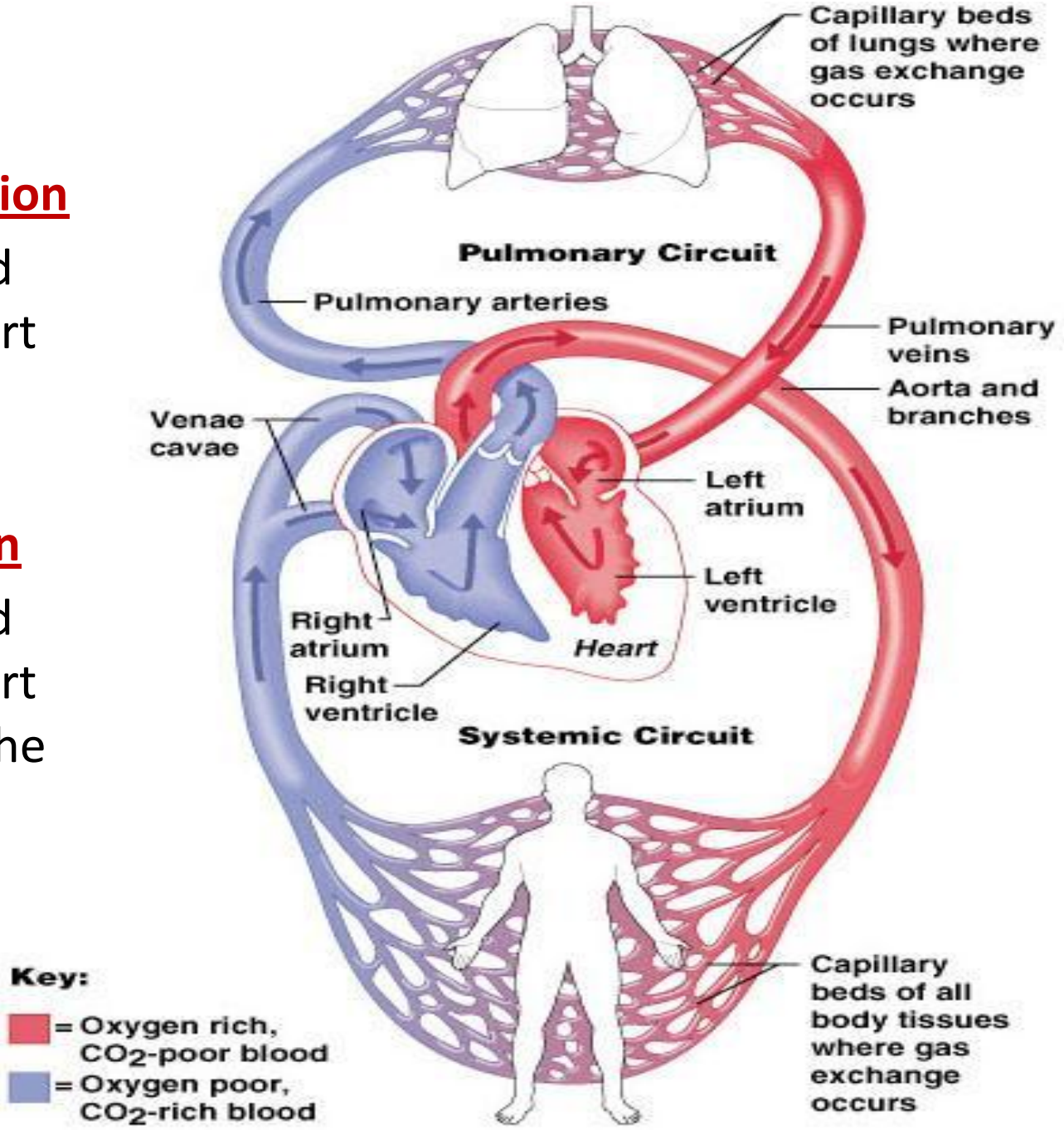
- Right atrium □ □ tricuspid valve □ □ right ventricle
- Right ventricle □ □ pulmonary **Semilunar** valve □ □ pulmonary arteries □ □ lungs
- Lungs □ □ pulmonary veins □ □ left atrium
- Left atrium □ □ bicuspid valve □ □ left ventricle
- Left ventricle □ □ aortic **Semilunar** valve □ □ aorta
- Aorta □ □ systemic circulation

Pulmonary circulation

- The flow of blood between the heart and lungs.

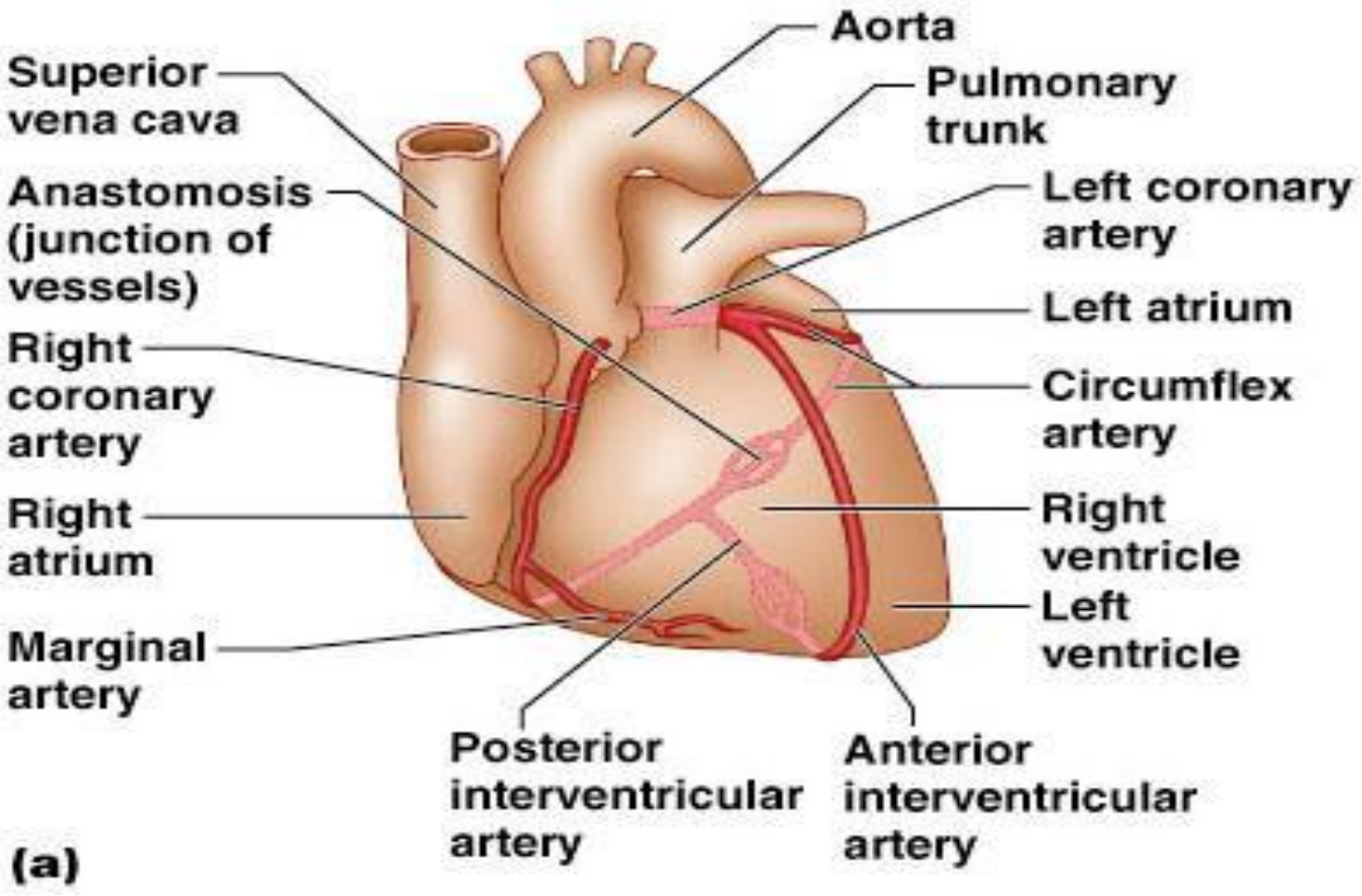
Systemic circulation

- The flow of blood between the heart and the cells of the body.

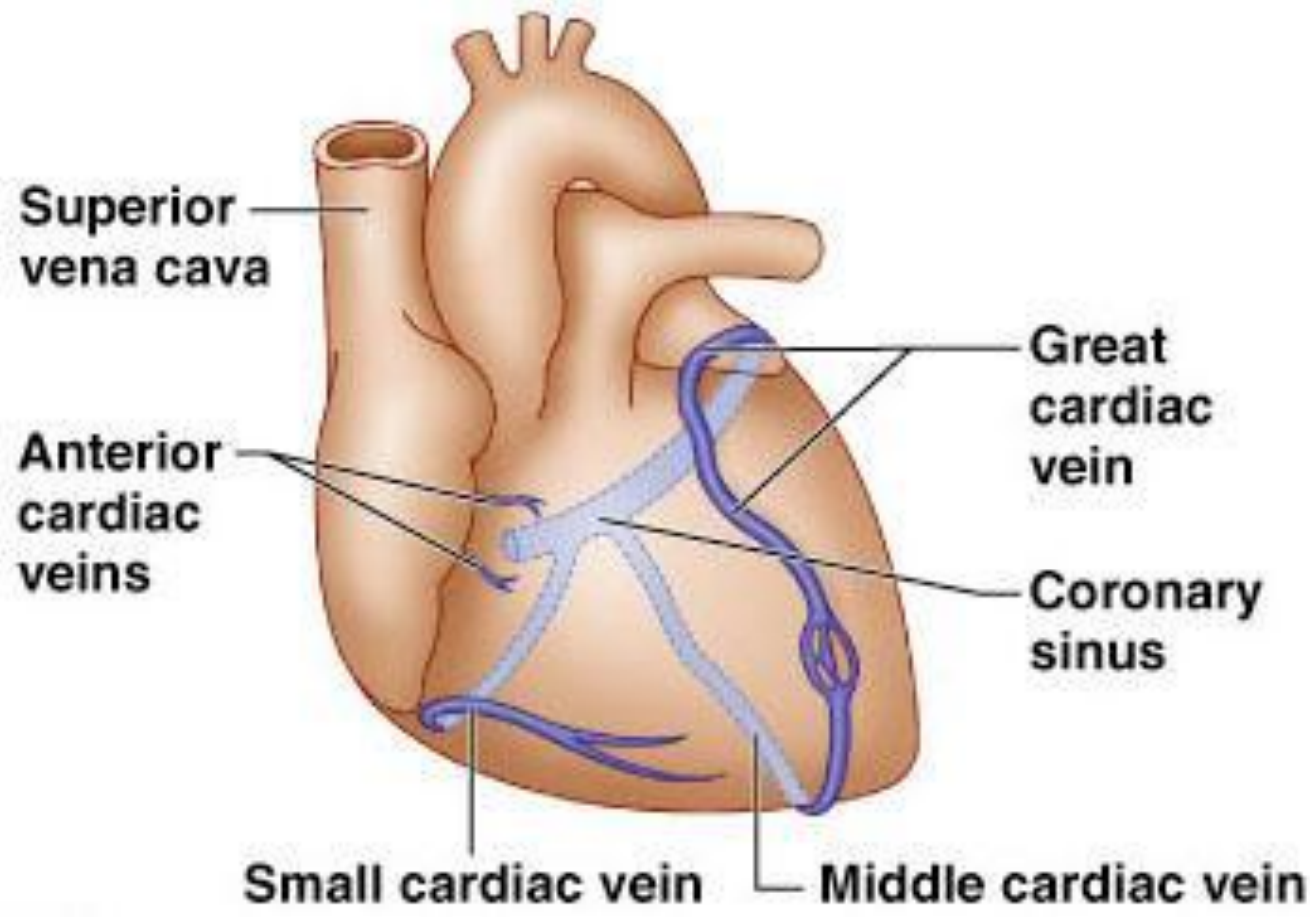


Coronary Circulation

- **Coronary circulation** is the functional blood supply to the heart muscle itself
- **Collateral routes** ensure blood delivery to heart even if major vessels are occluded



Coronary Circulation Veins



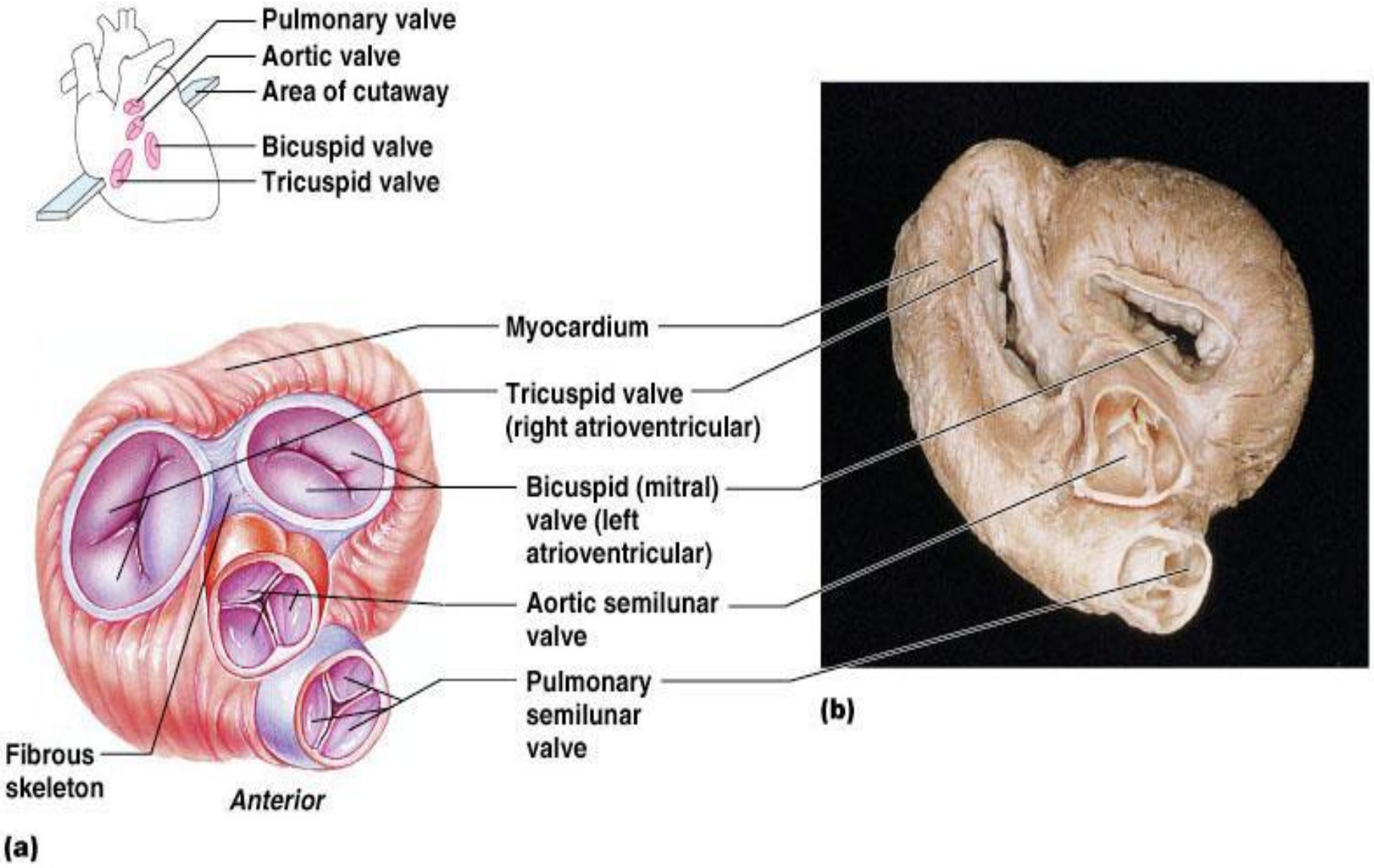
Heart Valves

- Heart valves ensure **uni-directional** blood flow through the heart

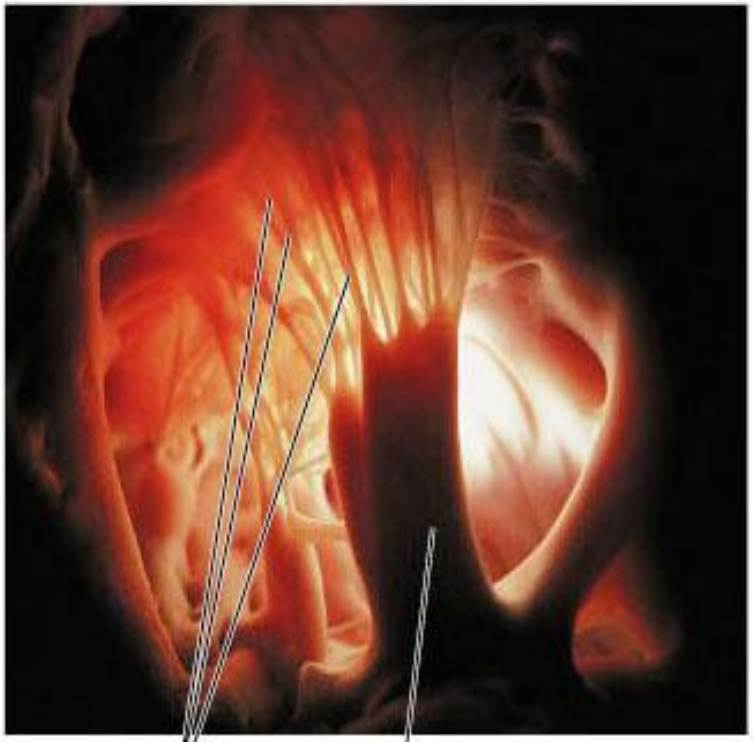
- **Atrioventricular (AV)** valves lie between the atria and the ventricles
- **AV valves** prevent backflow into the atria when ventricles contract
- Chordae tendineae anchor AV valves to papillary muscles

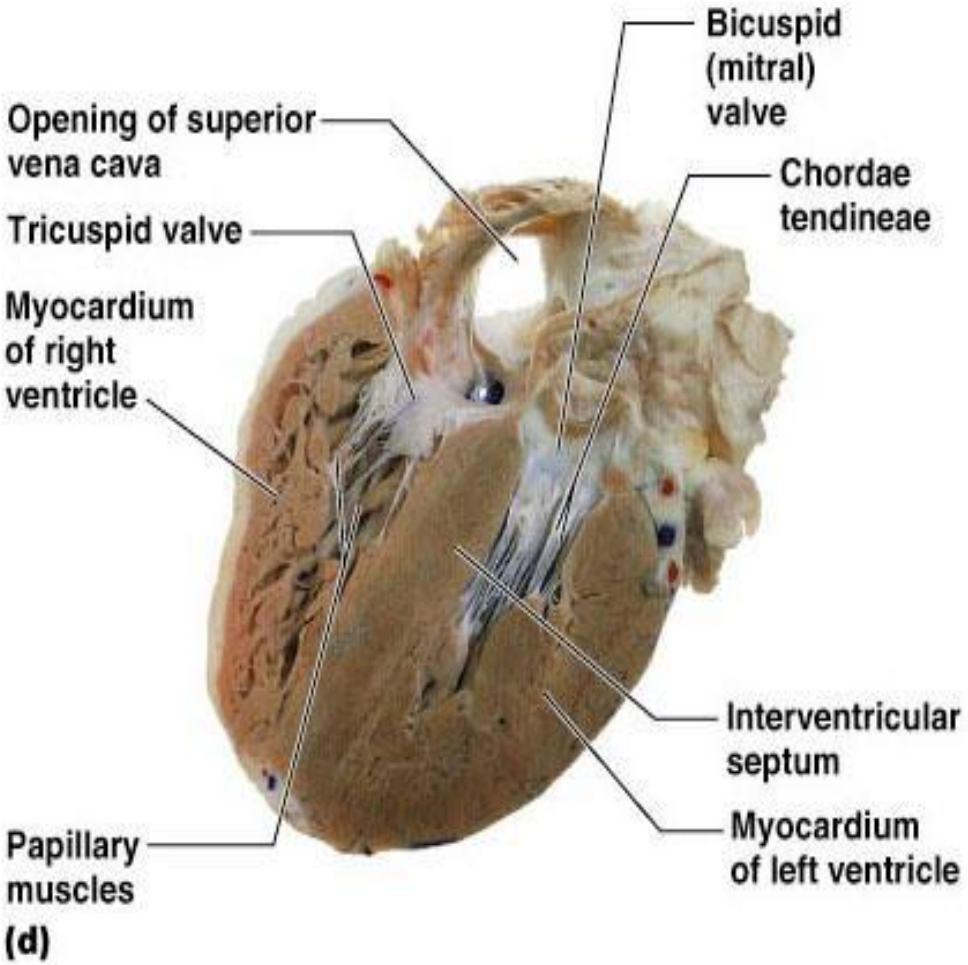
- **Semilunar valves** prevent backflow of blood into the ventricles
- **Aortic semilunar** valve lies between the left ventricle and the aorta
- **Pulmonary semilunar** valve lies between the right ventricle and pulmonary trunk

Heart Valves

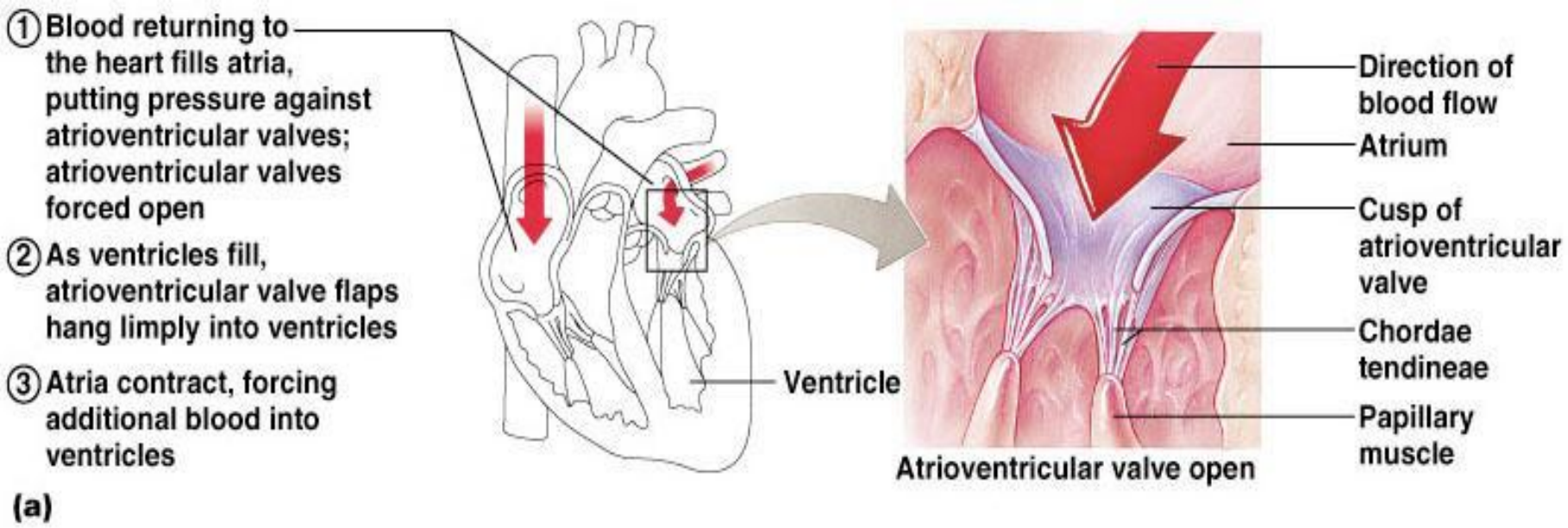


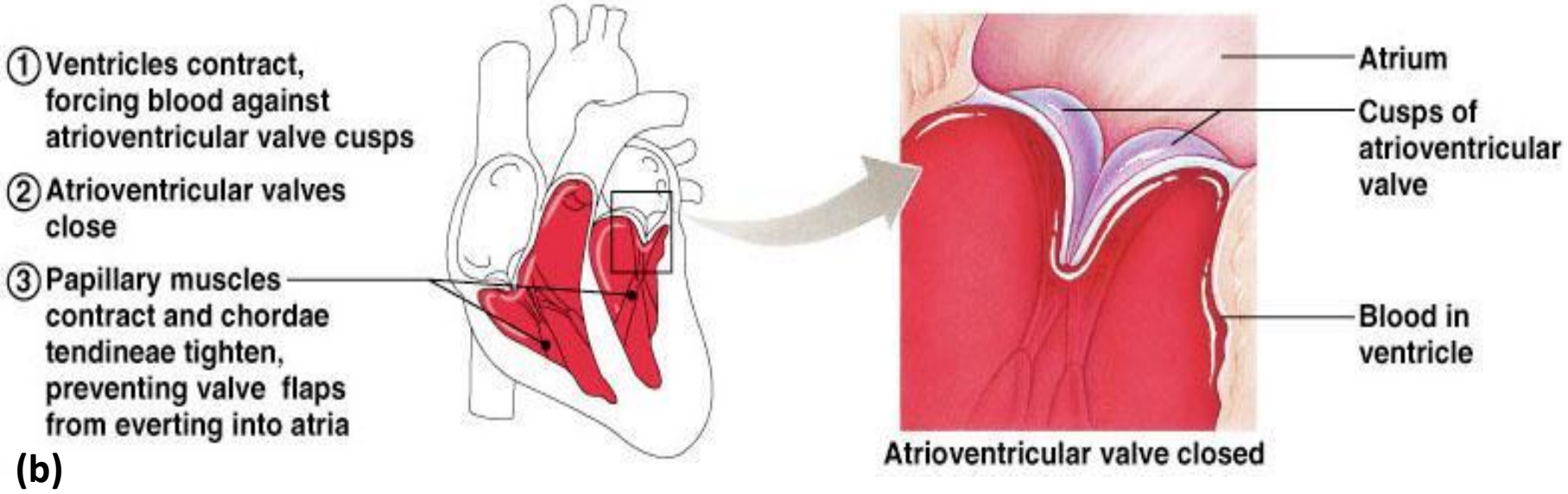
Heart Valves



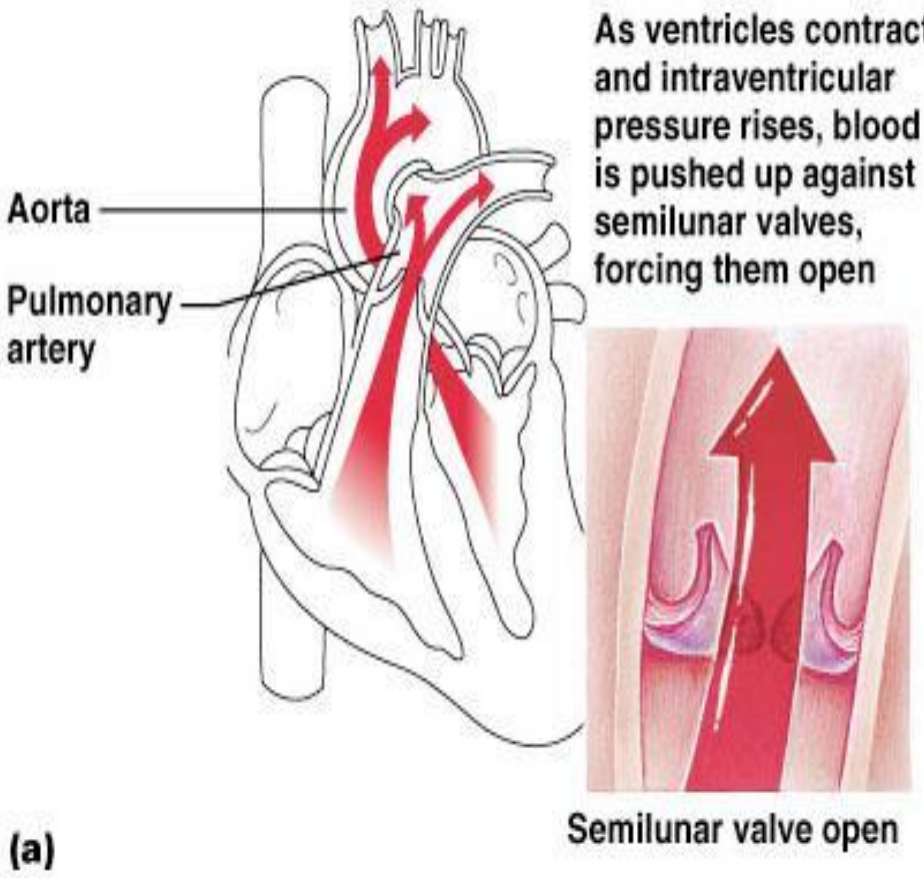


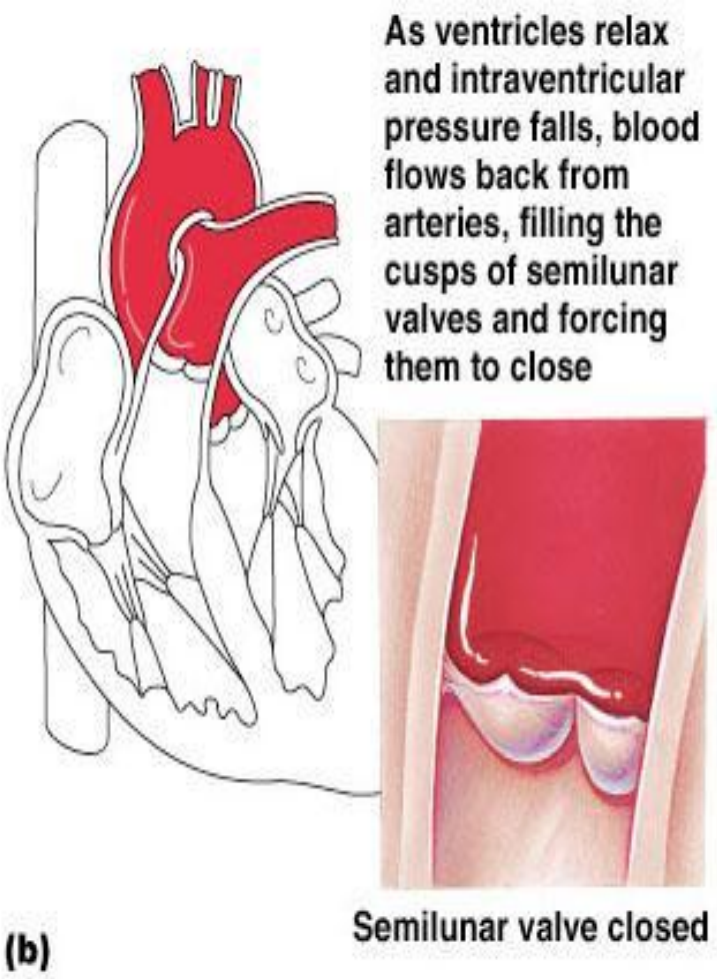
Atrio-ventricular Valve Function





Semilunar Valve Function






thank
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