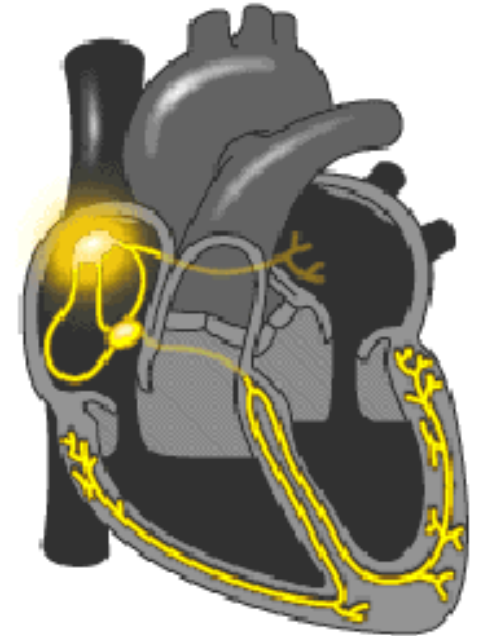


Cardiovascular System

Dr Katek Balapala

Learning objectives

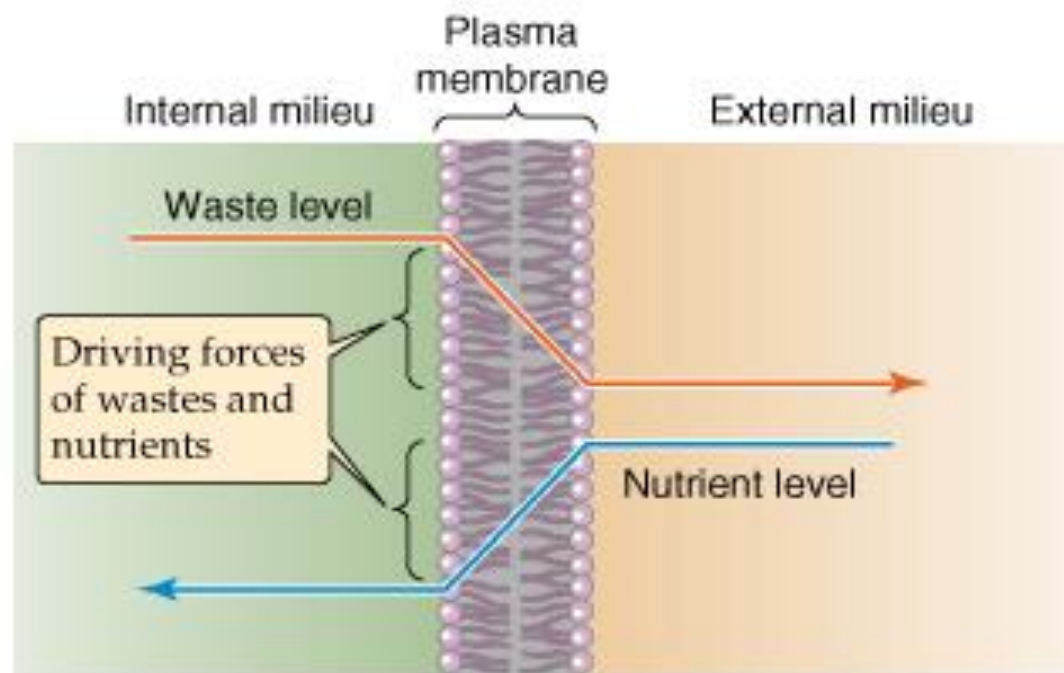
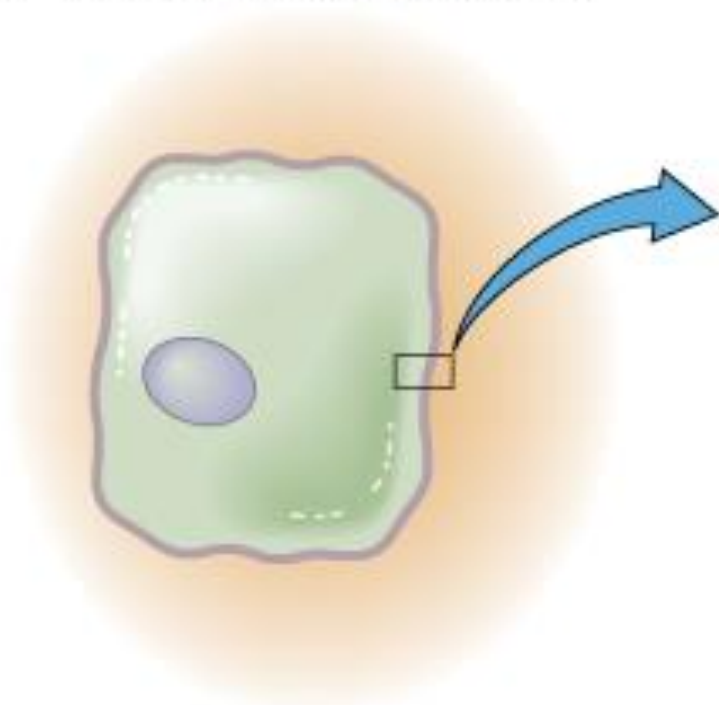
- Cardiac muscle
- Valves
- Circulation
- Coverings
- Desmosomes
- Gap junctions
- Action potential in cardiac muscle



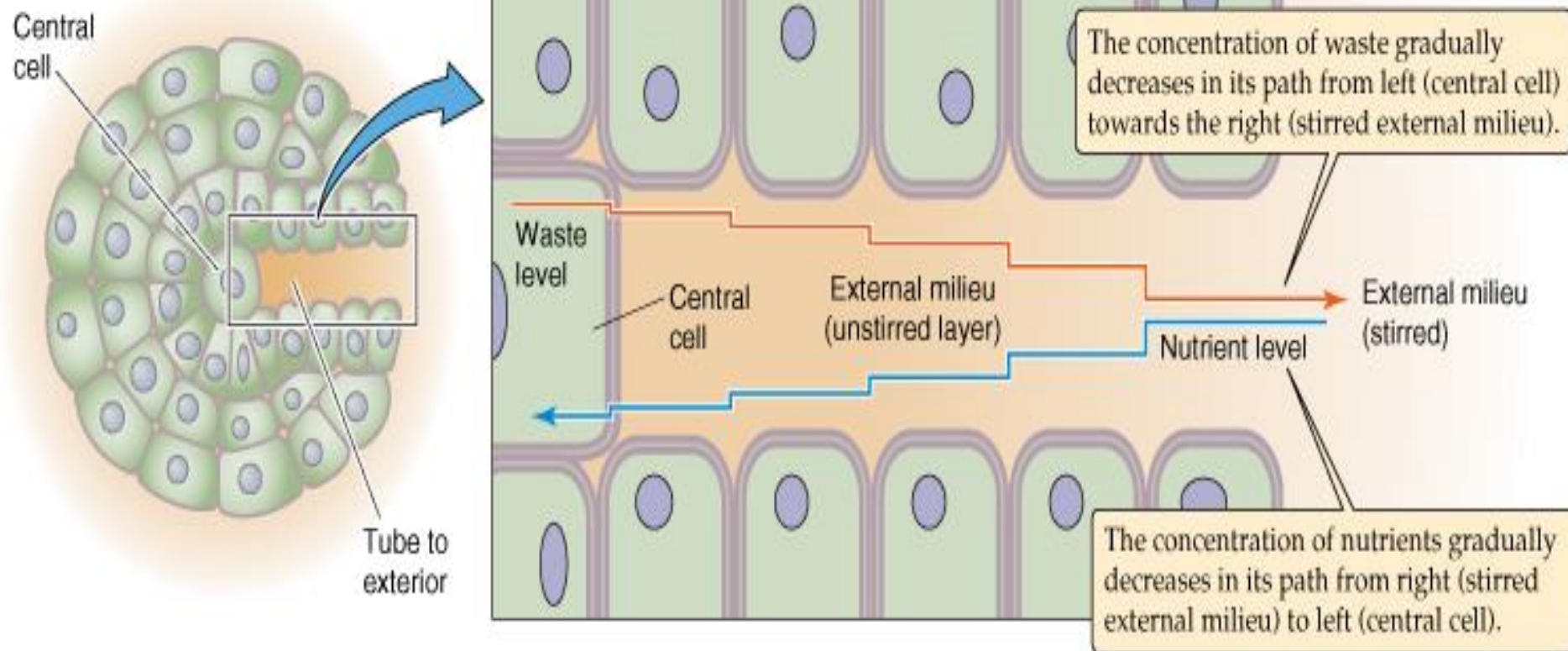
Introduction

- Why HEART is required ?

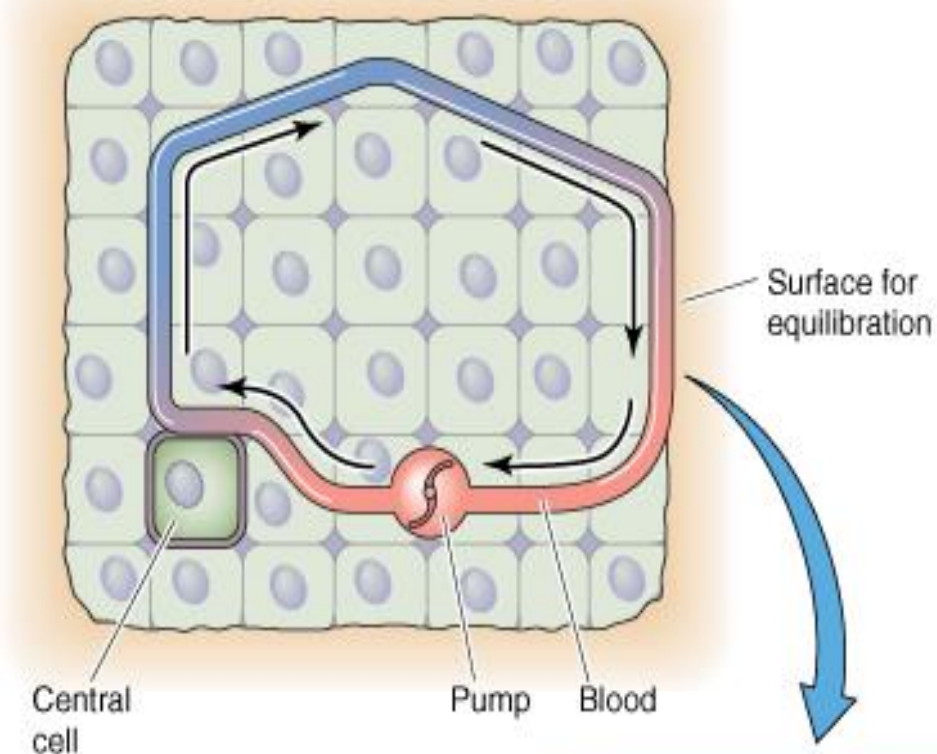
A UNICELLULAR ORGANISM



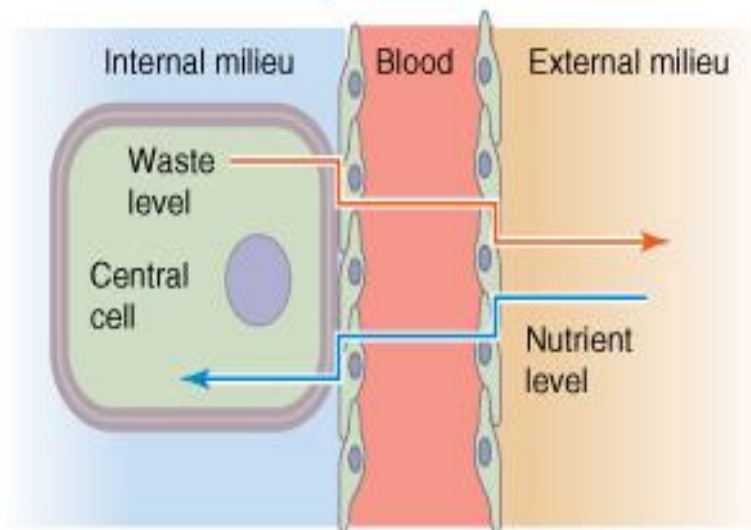
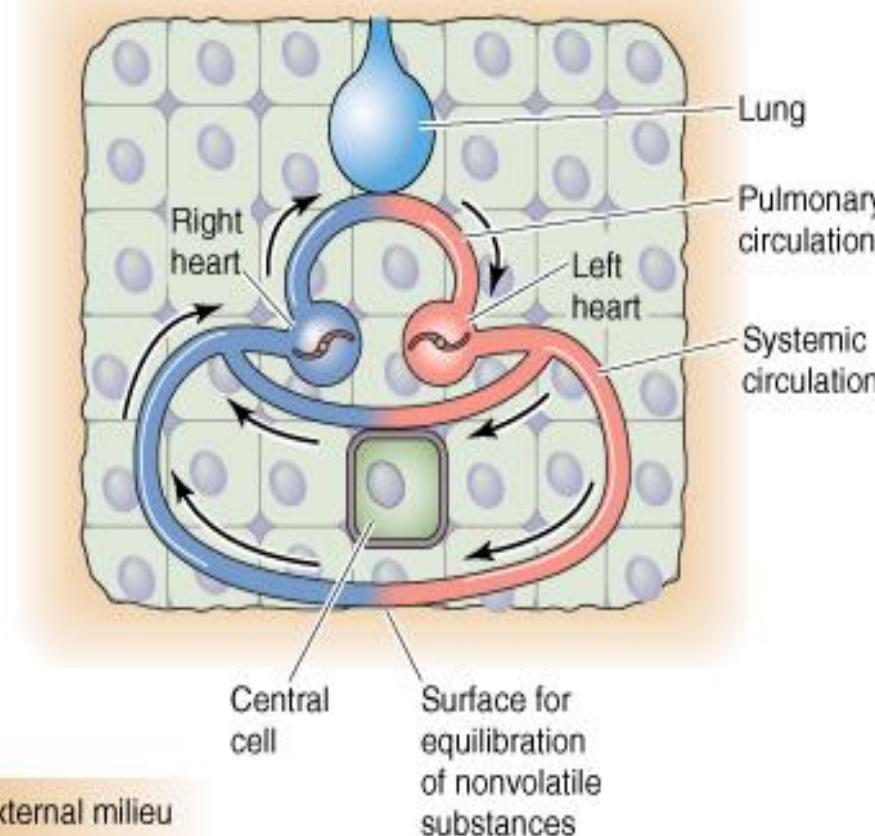
B MULTICELLULAR ORGANISM



C CIRCULATION WITH ONE PUMP



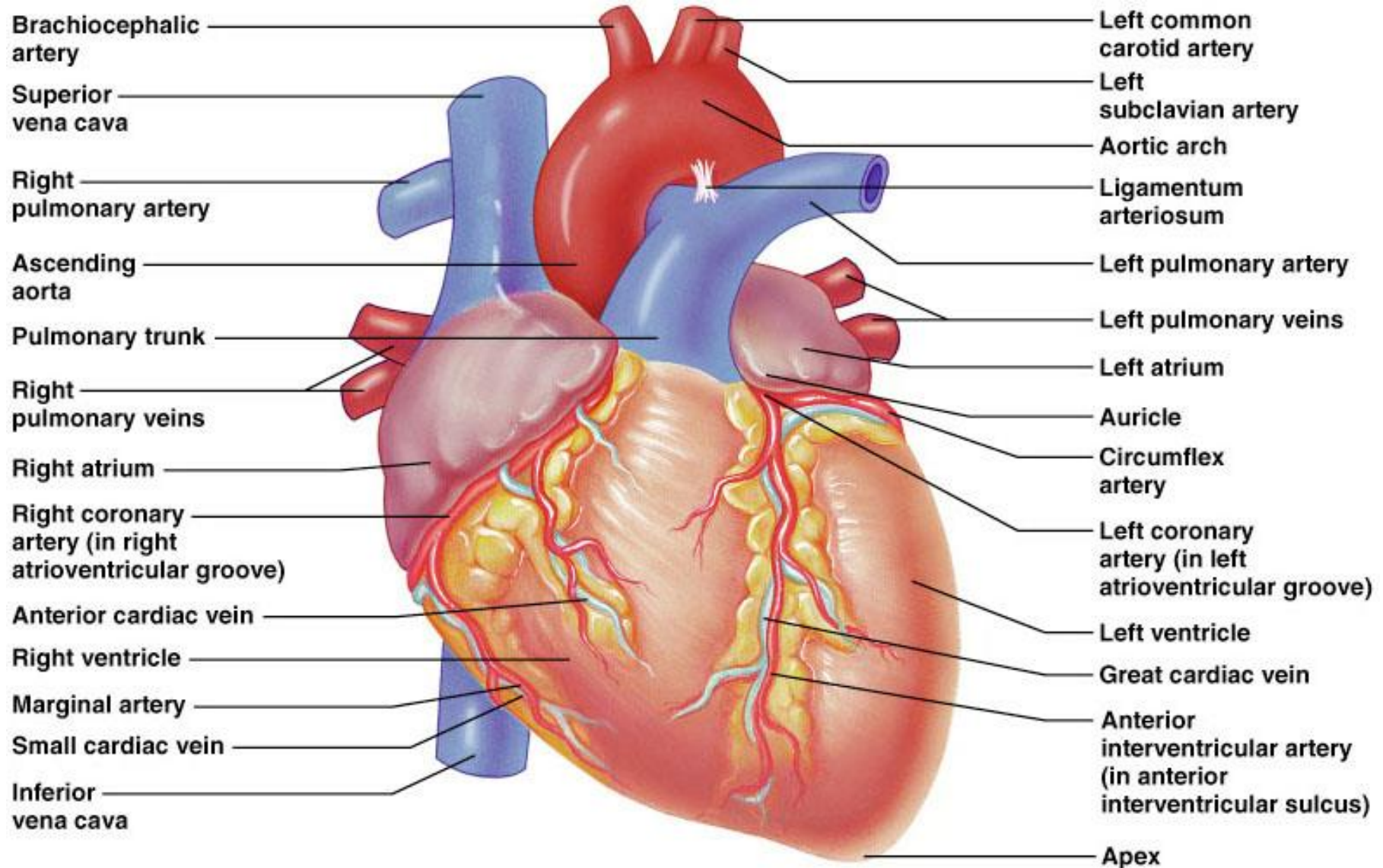
D CIRCULATION WITH TWO PUMPS / TWO CIRCUITS

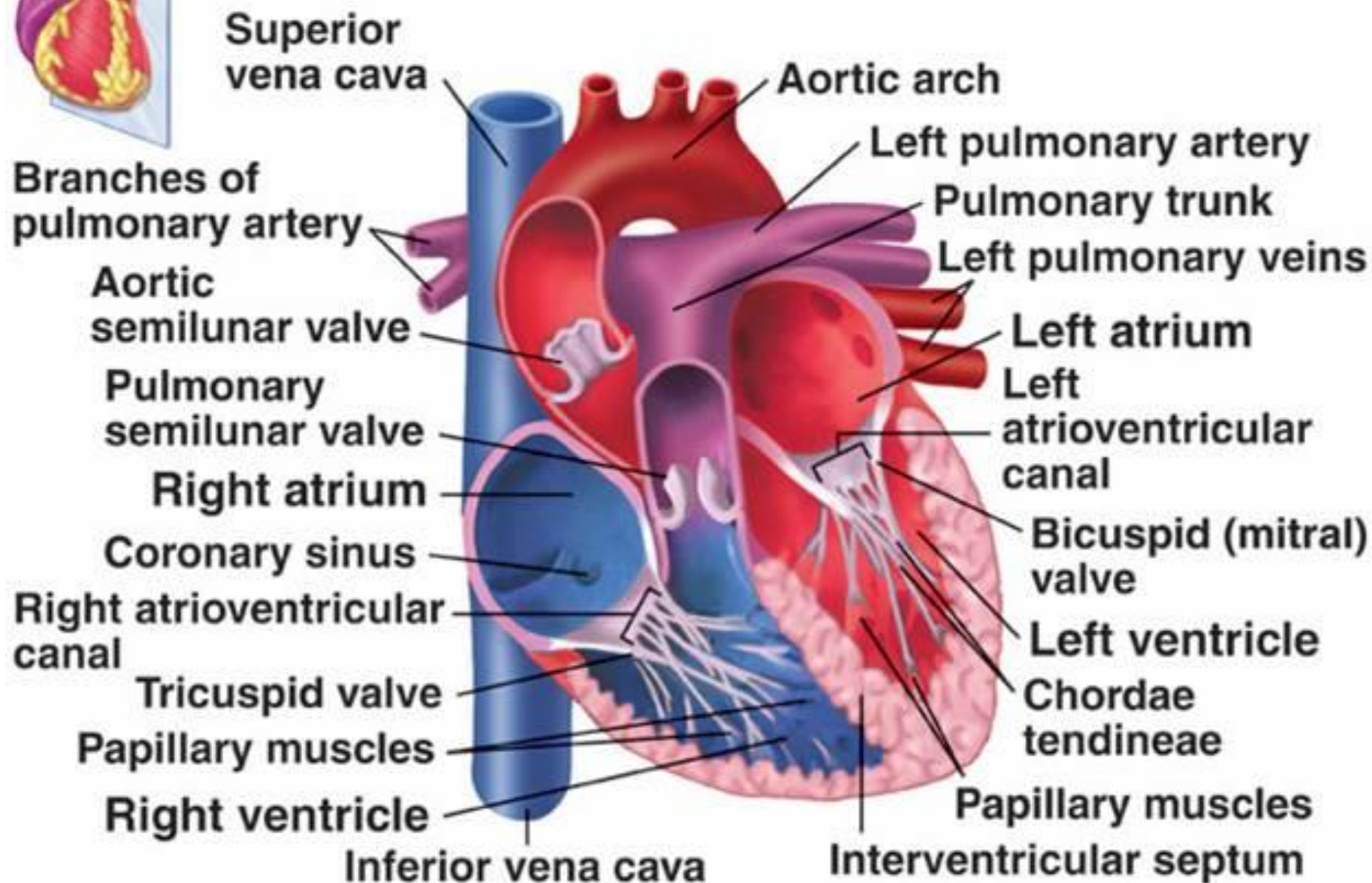


Functional Anatomy

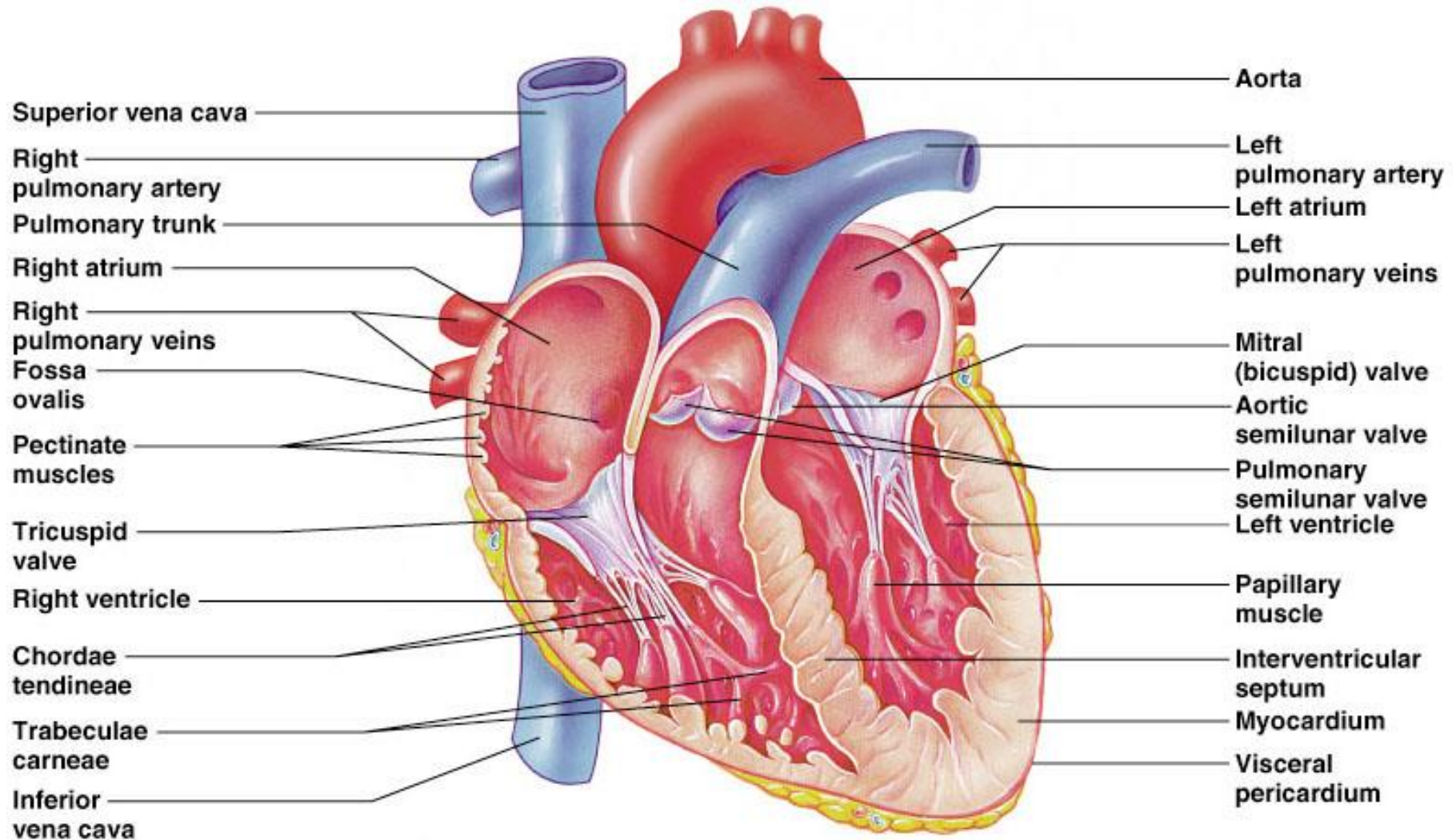
- **Chambers of heart.**
- **Valves of heart.**
- **Structure of walls of the heart**
 - **skeleton frame work.**
 - **Pericardium**
 - **Myocardium**
 - **Endocardium**

External Heart: Anterior View



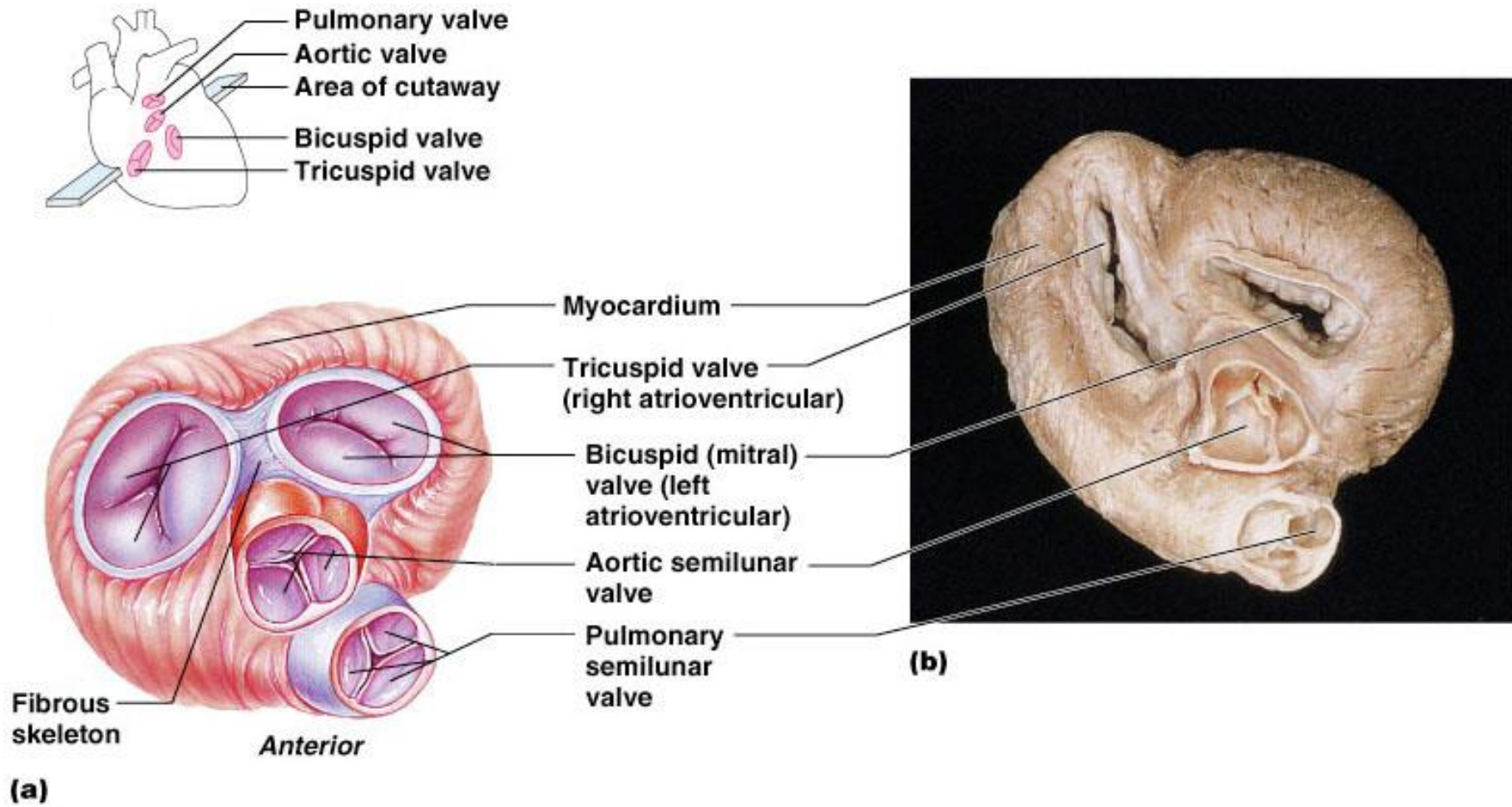


Gross Anatomy of Heart: Frontal



Draw in your book

Heart Valves



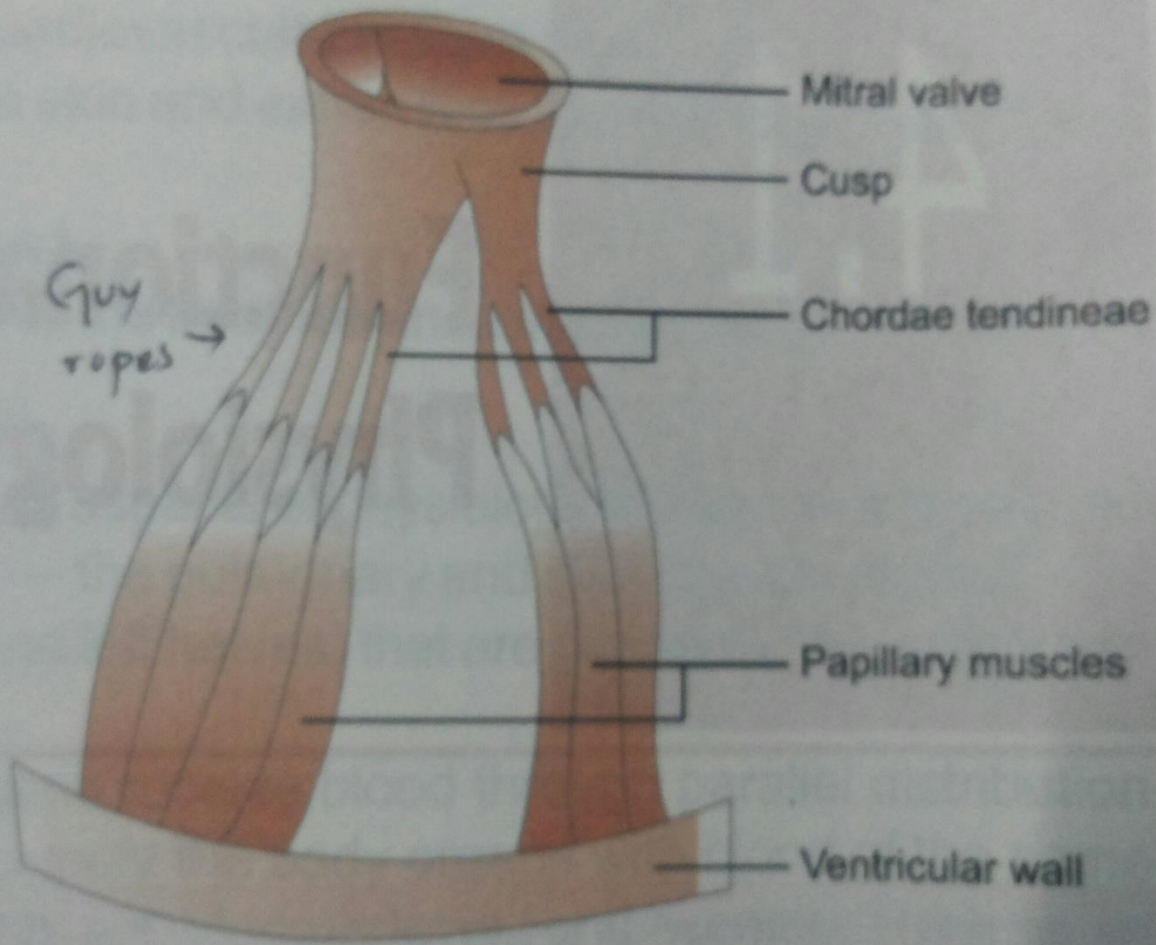
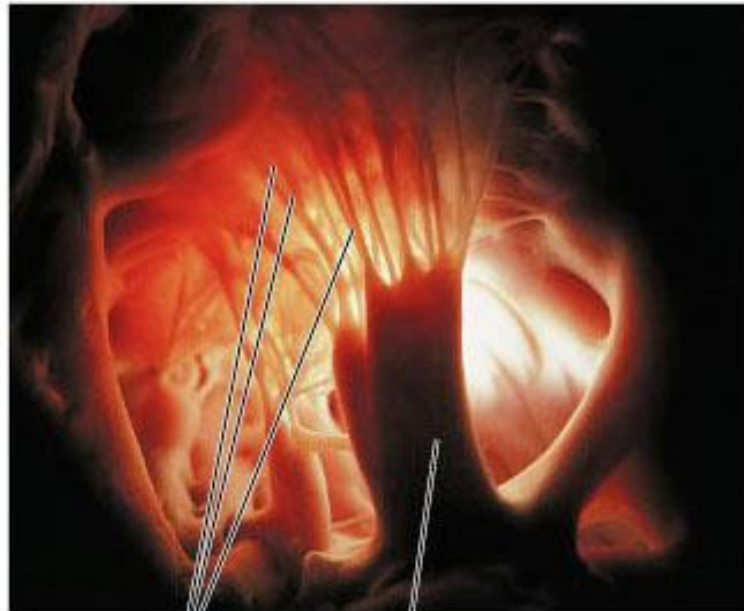


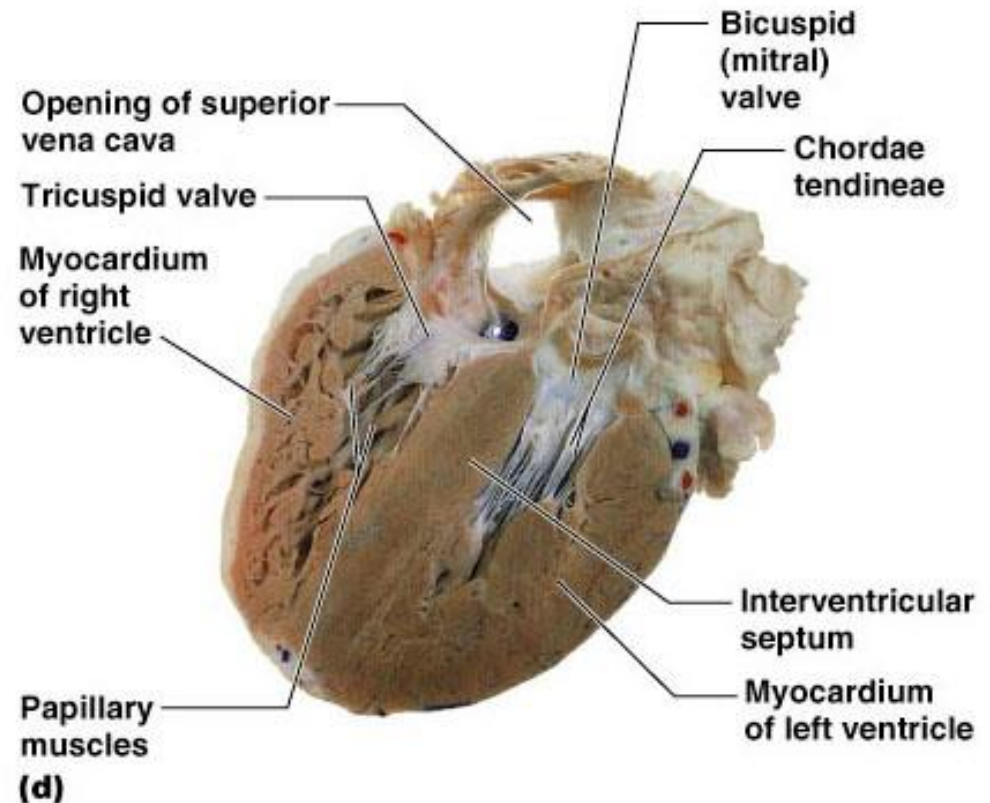
Fig. 4.1-3. Bicuspid valve attached with papillary muscles and chordae tendineae.

Heart Valves



Chordae tendineae attached to tricuspid valve flap (c)

Papillary muscle



Papillary muscles (d)

Bicuspid (mitral) valve

Chordae tendineae

Interventricular septum

Myocardium of left ventricle

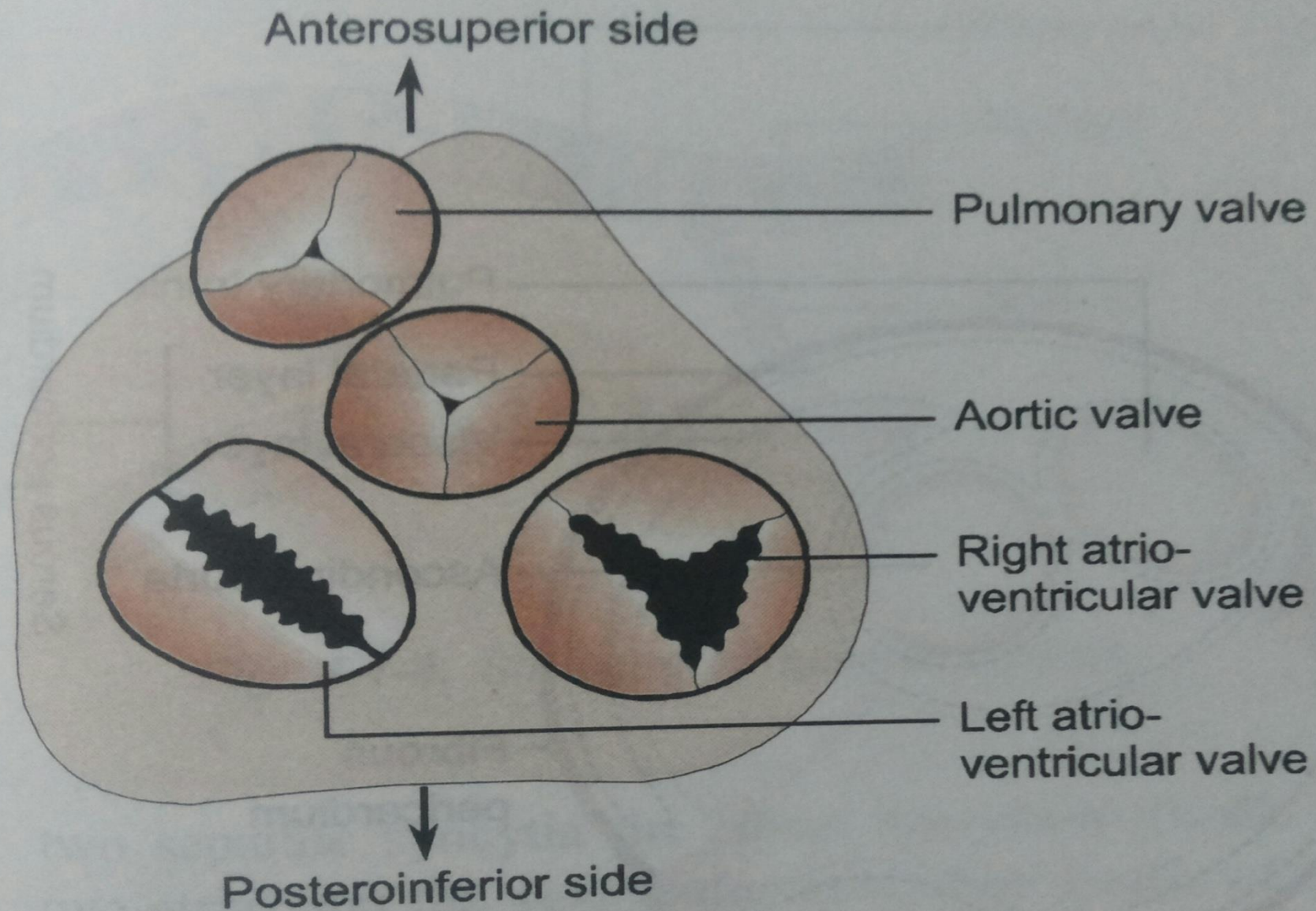
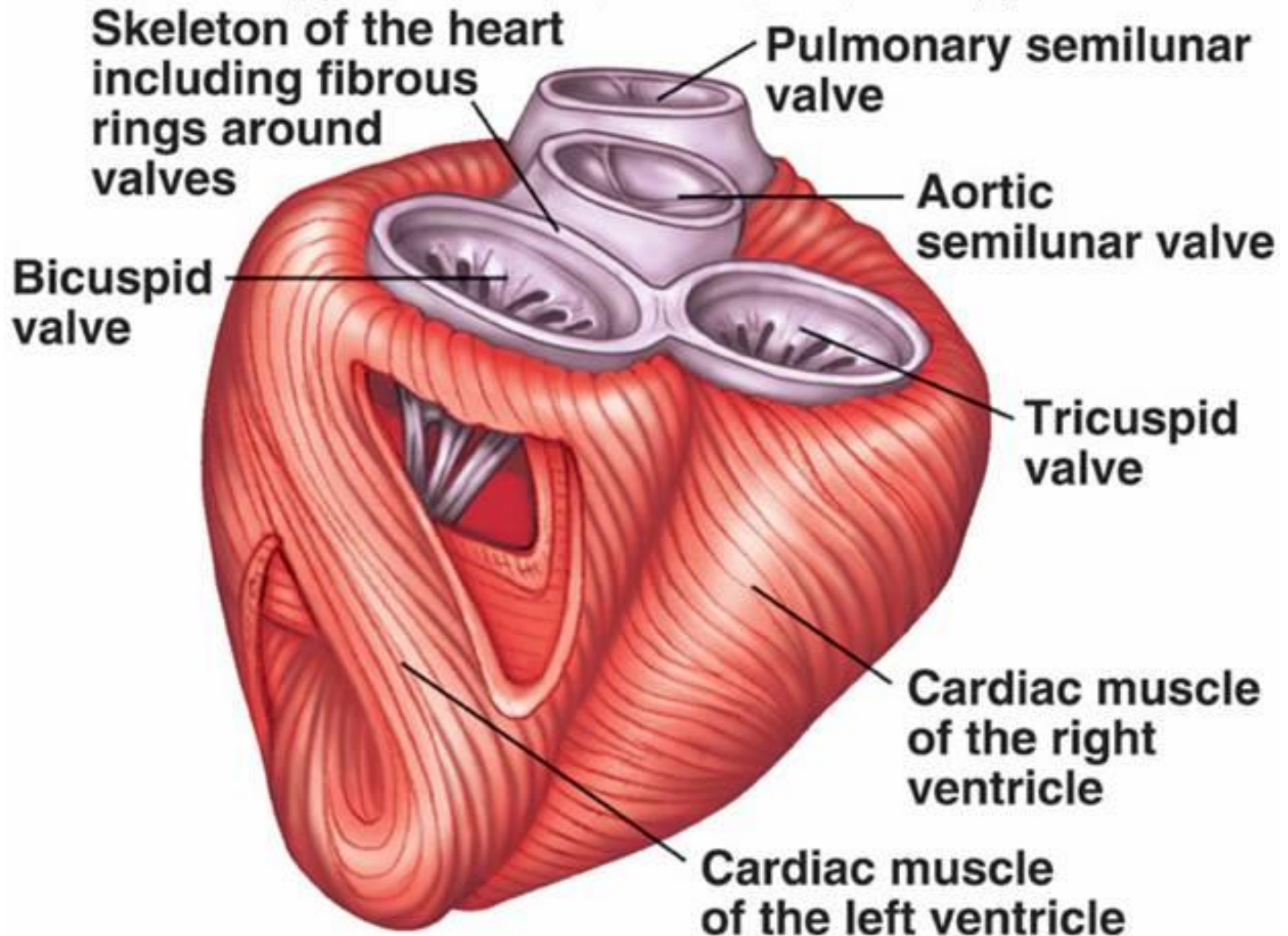
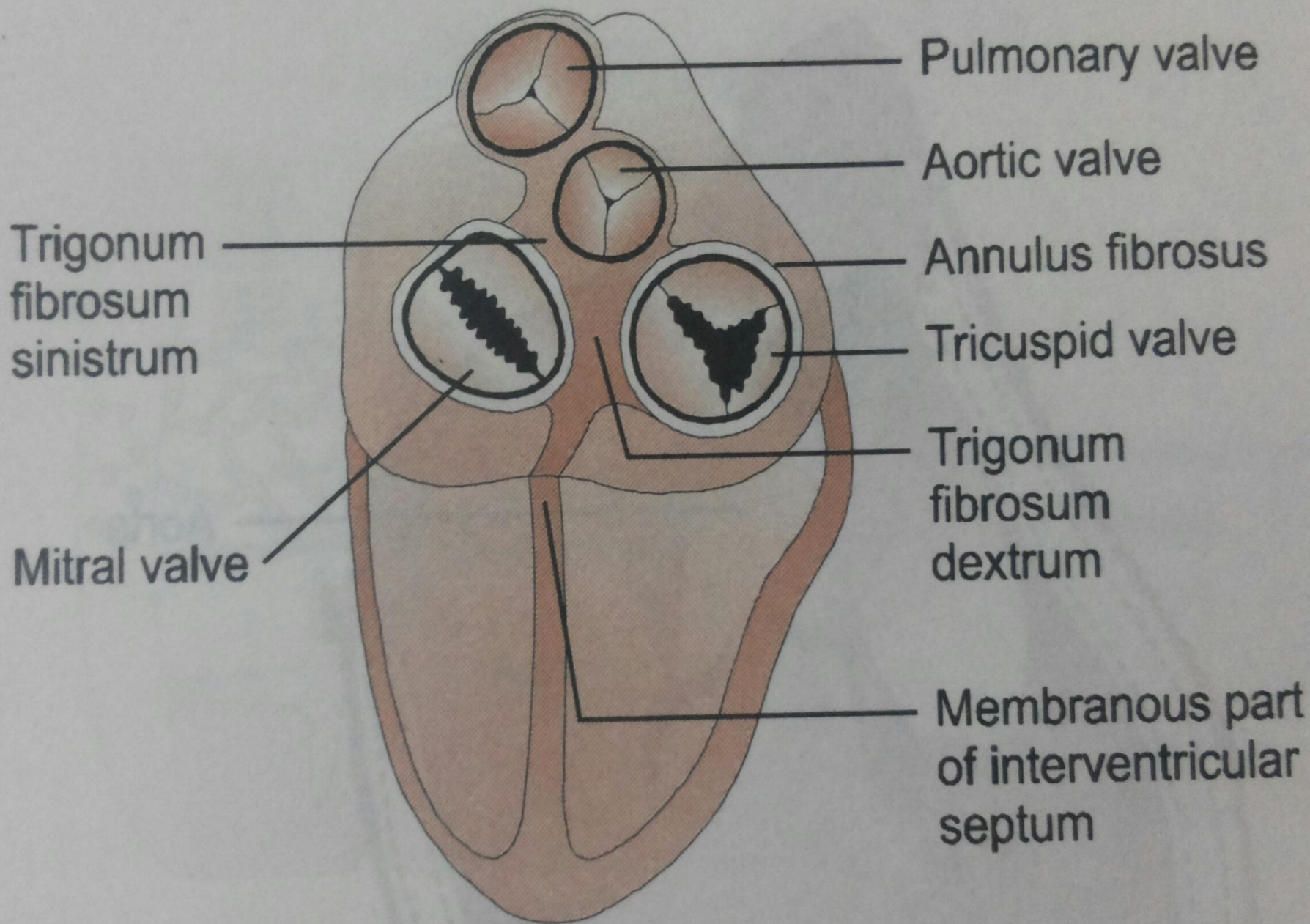


Fig. 4.1-4. Semilunar valves and atrioventricular valves viewed from the posterosuperior aspect after removing the

Skeleton of the heart

- <https://www.youtube.com/watch?v=-NLodxbLSkQ>
- <https://www.youtube.com/watch?v=agePsMW5f5A>
- <https://www.youtube.com/watch?v=PomqQu0m6Ro>





Pathway of Blood Through the Heart and Lungs

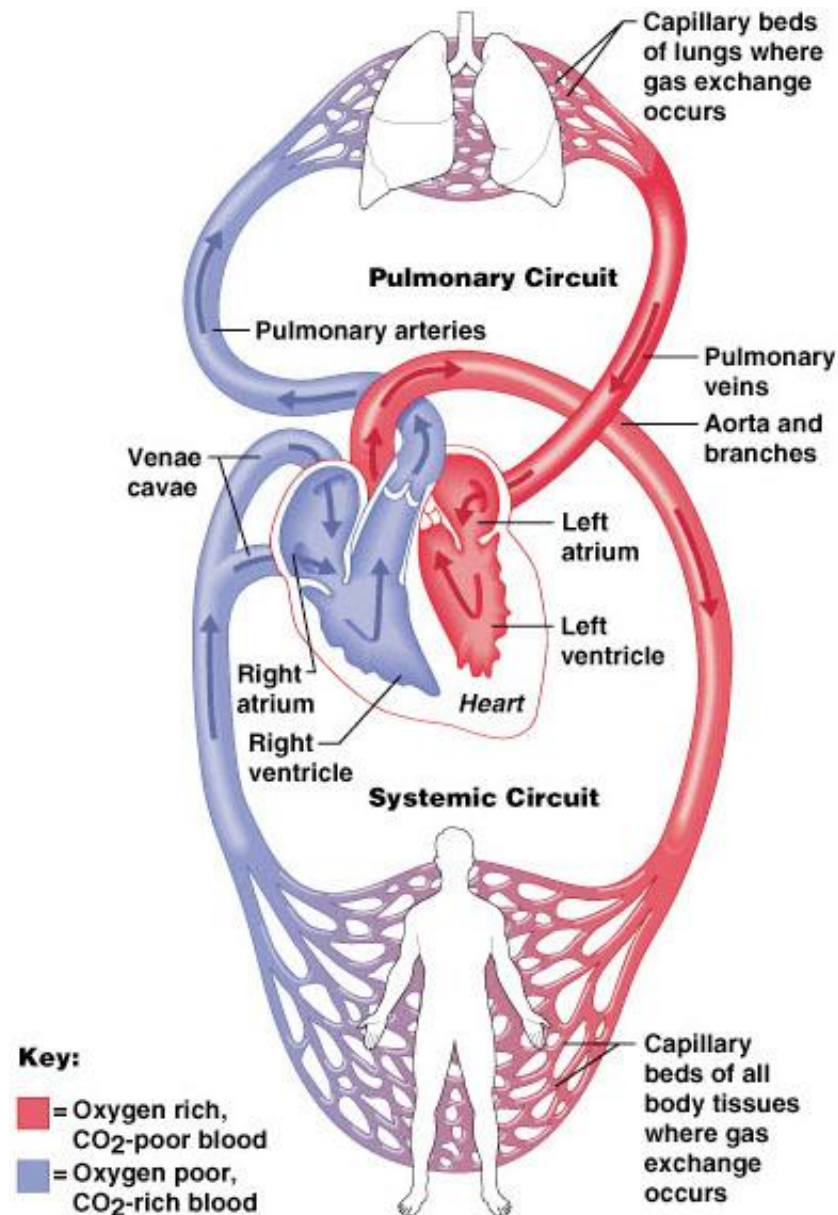


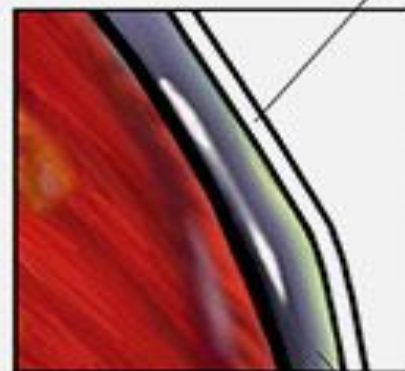
Figure 18.5

Coverings of the Heart: Anatomy

- **Pericardium** – a double-walled sac around the heart composed of:
 1. A superficial fibrous pericardium
 2. A deep two-layer serous pericardium
 - a. The parietal layer lines the internal surface of the fibrous pericardium
 - b. The visceral layer or **epicardium** lines the surface of the heart
 - They are separated by the fluid-filled pericardial cavity

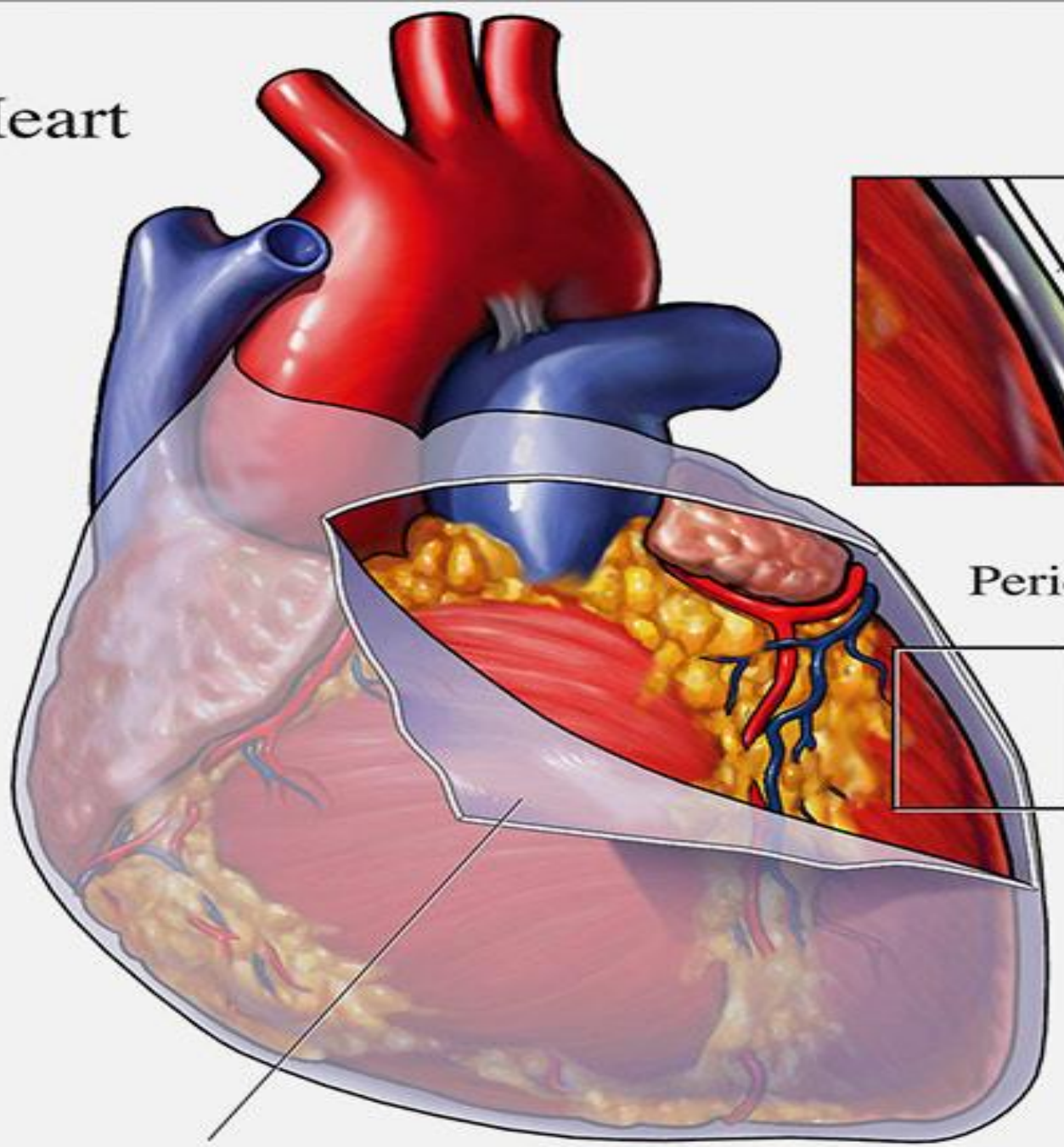
Heart

Pericardium



Pericardial fluid

Pericardium



Pericardium

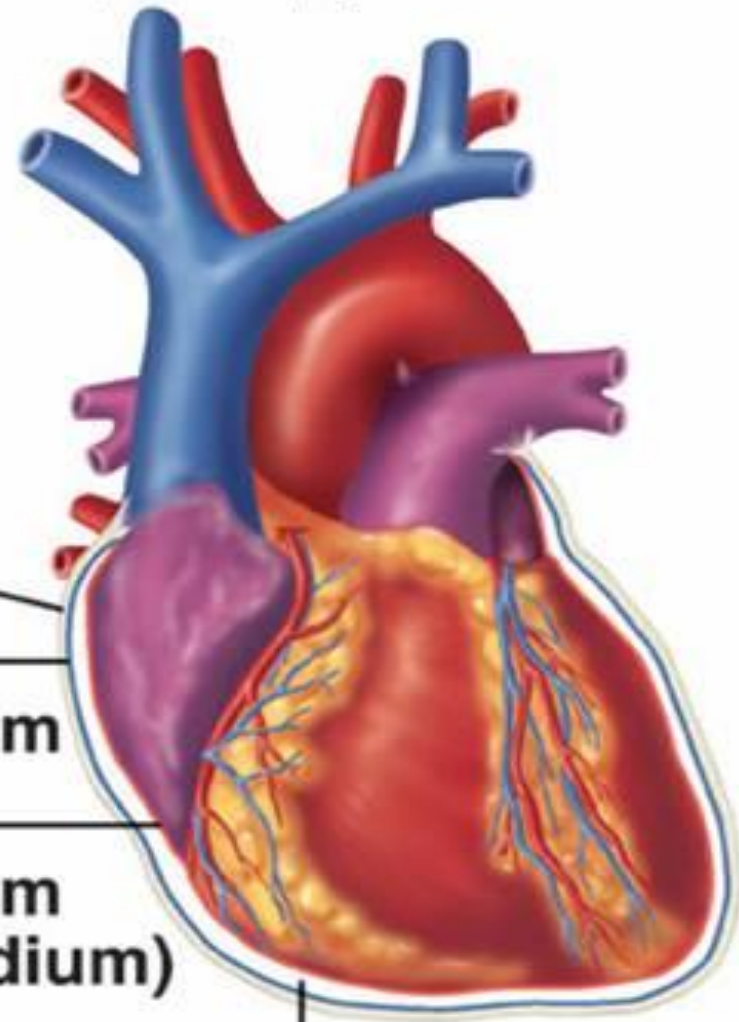
Fibrous pericardium

Serous
pericardium

Parietal
pericardium

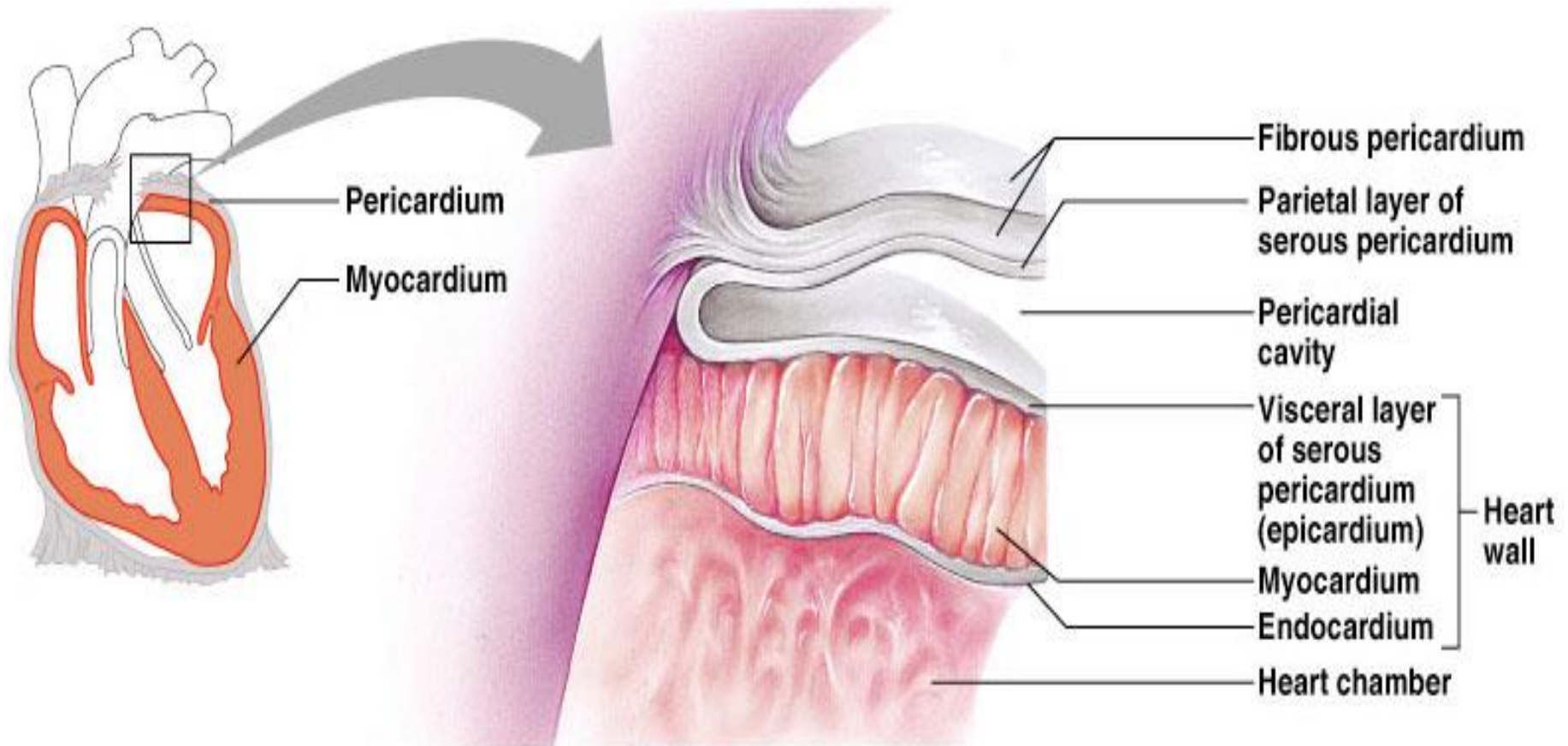
Visceral
pericardium
(or epicardium)

Pericardial
cavity filled with
pericardial fluid

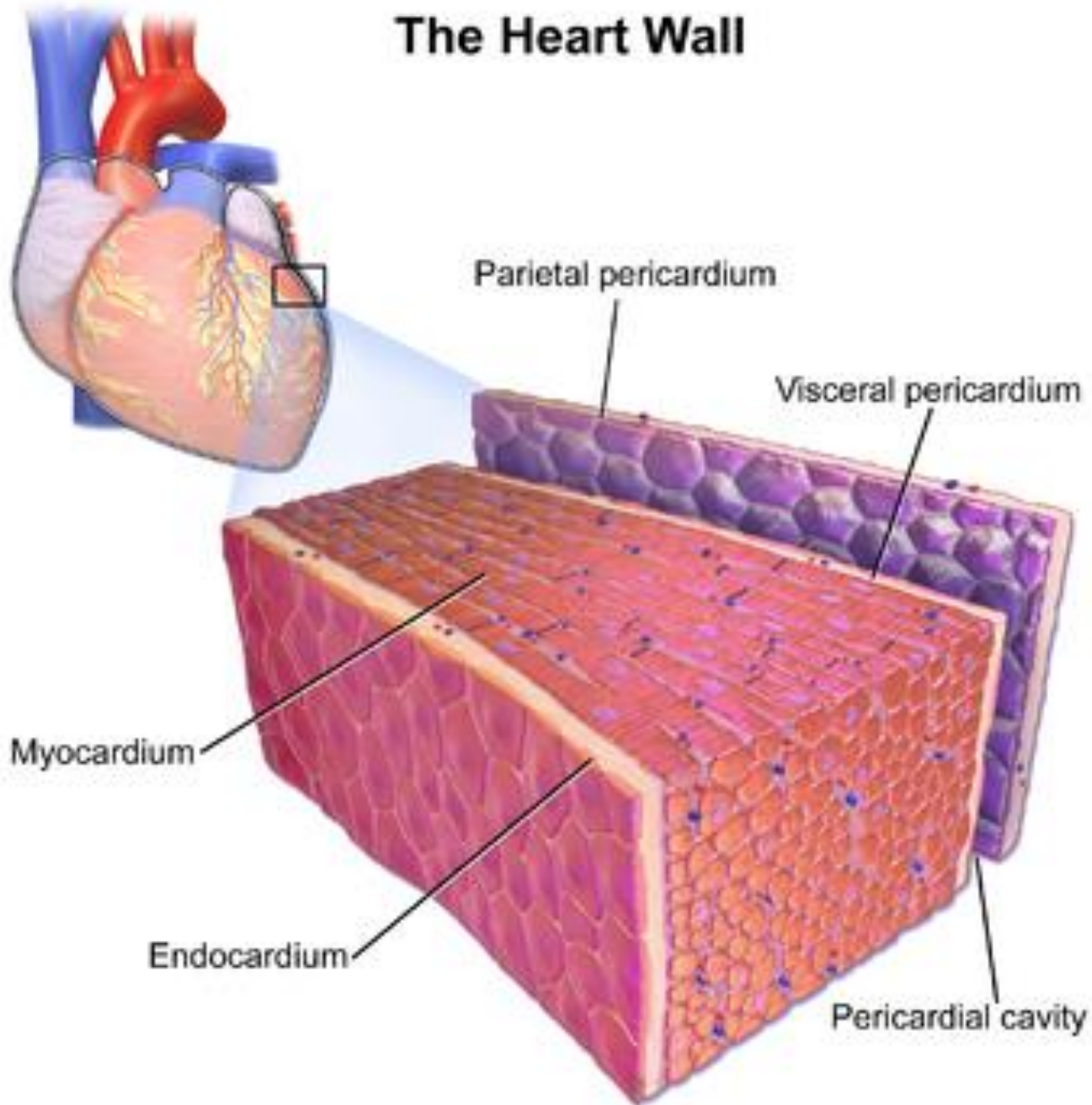


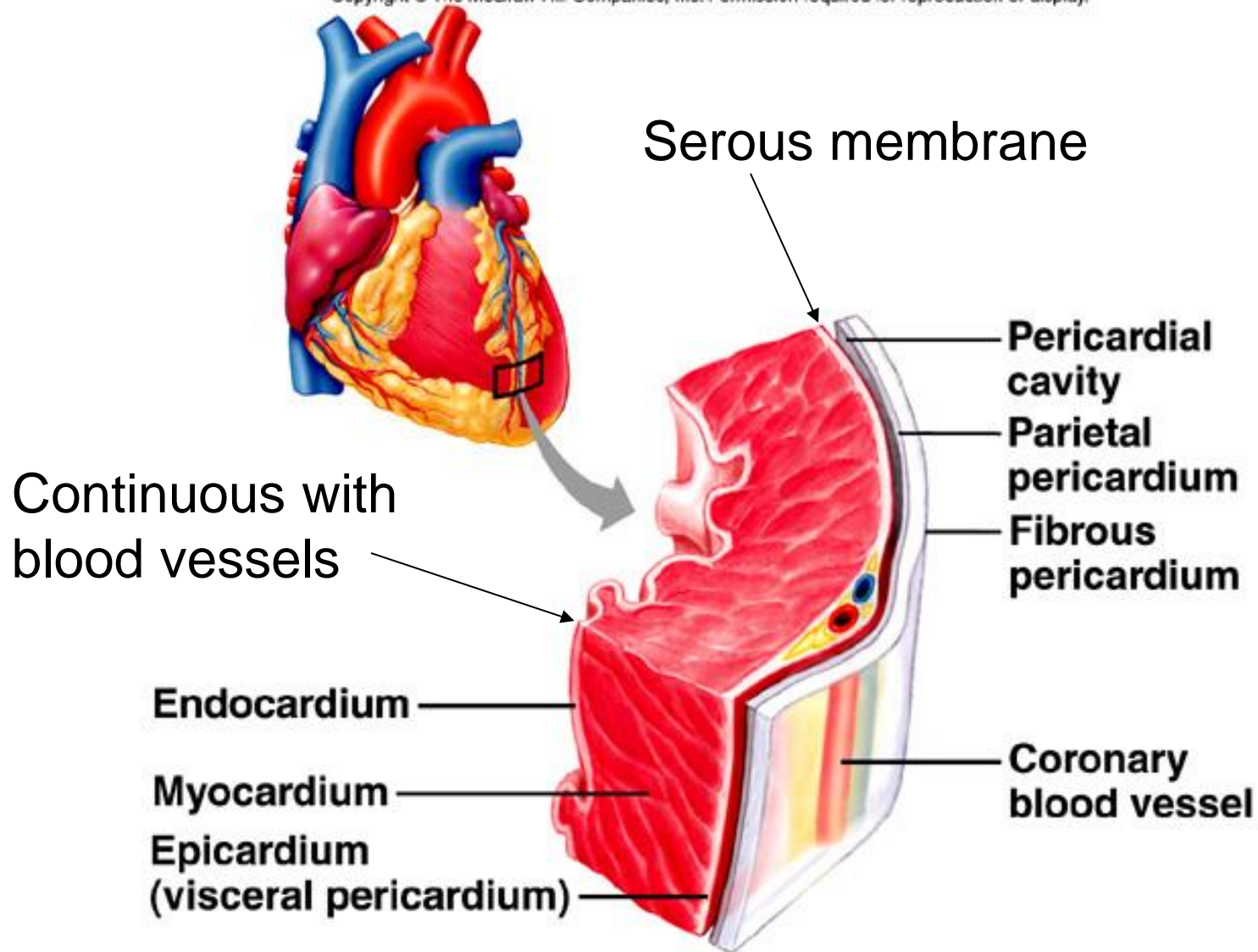
- **The Function of the Pericardium:**
 - **Protects** and anchors the heart
 - **Prevents overfilling** of the heart with blood
 - **Allows heart to work in a relatively friction-free environment.**

Pericardial Layers of the Heart

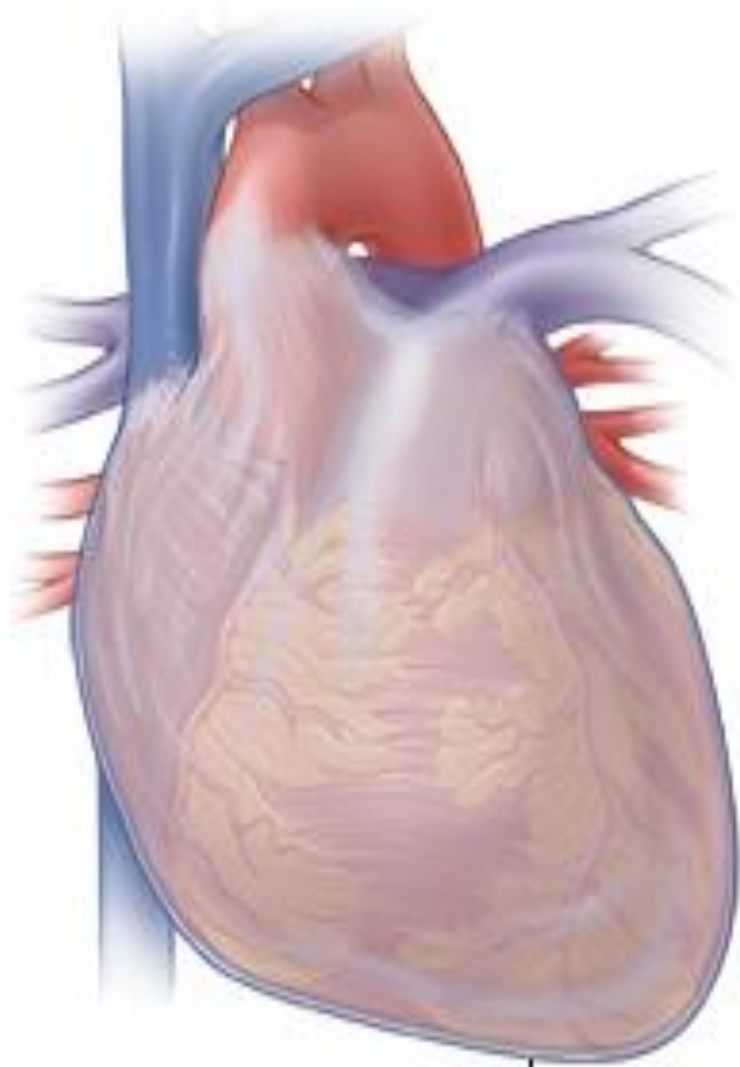


The Heart Wall



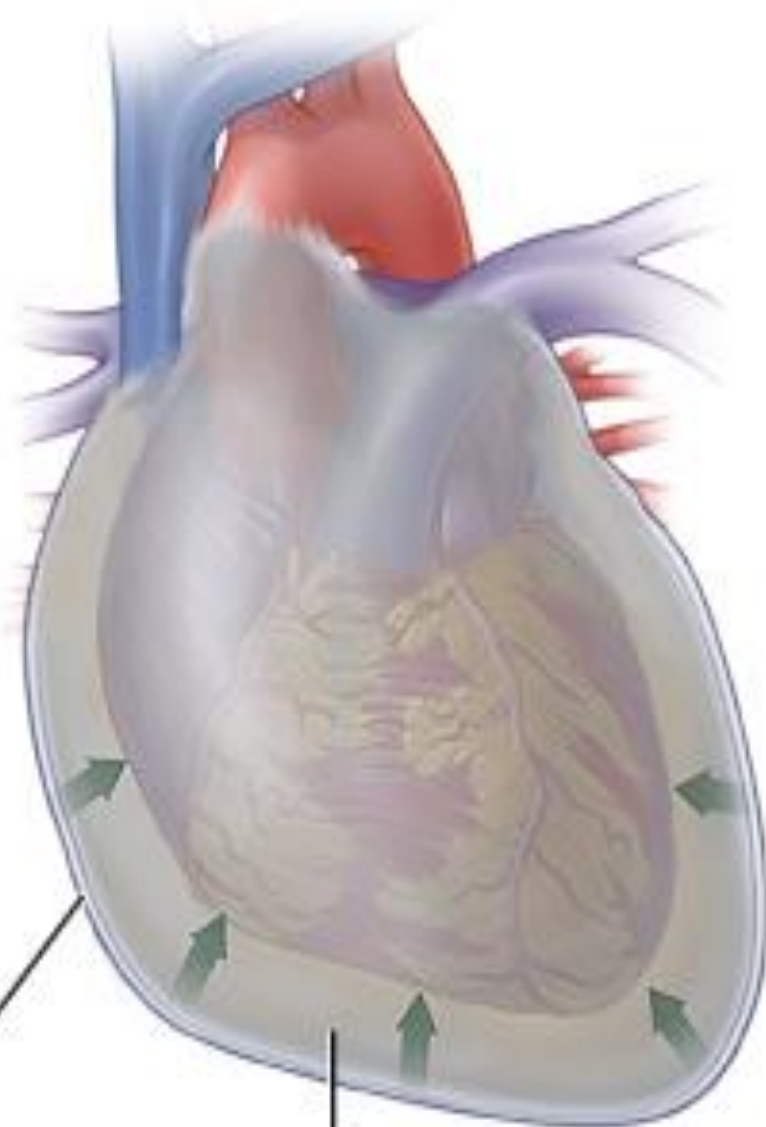


Normal heart



Pericardium

Pericardial effusion

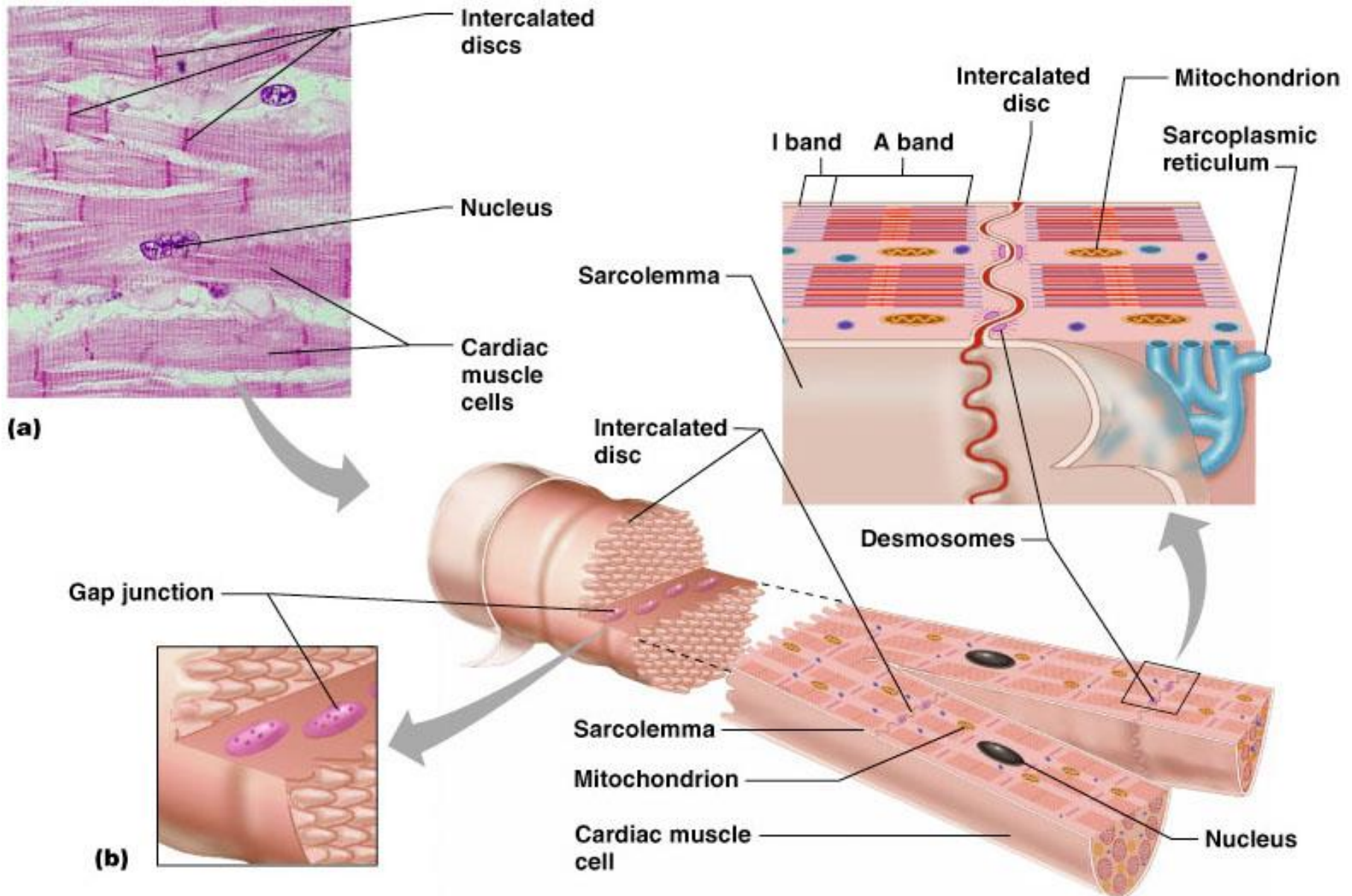


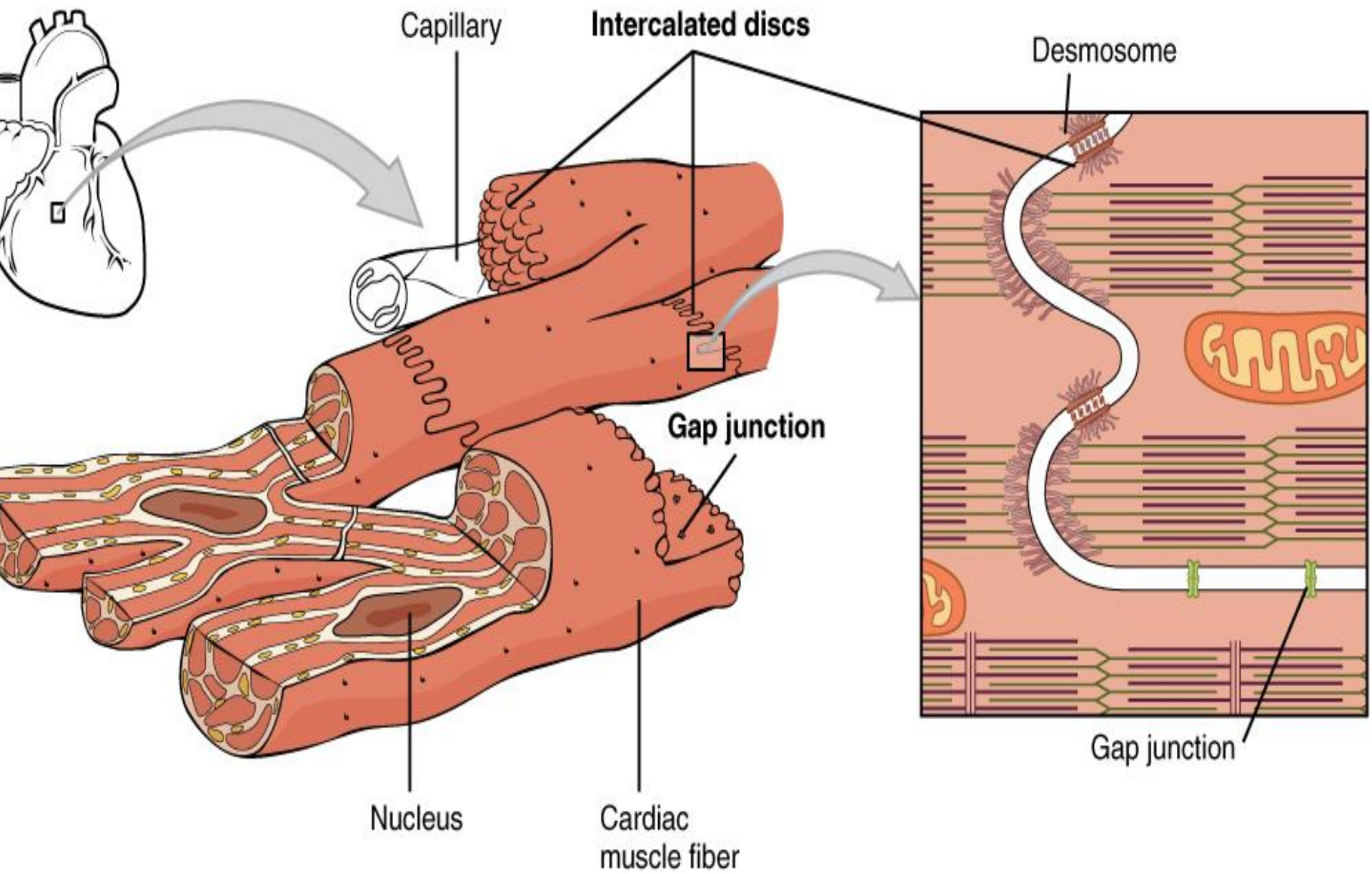
Buildup of fluid

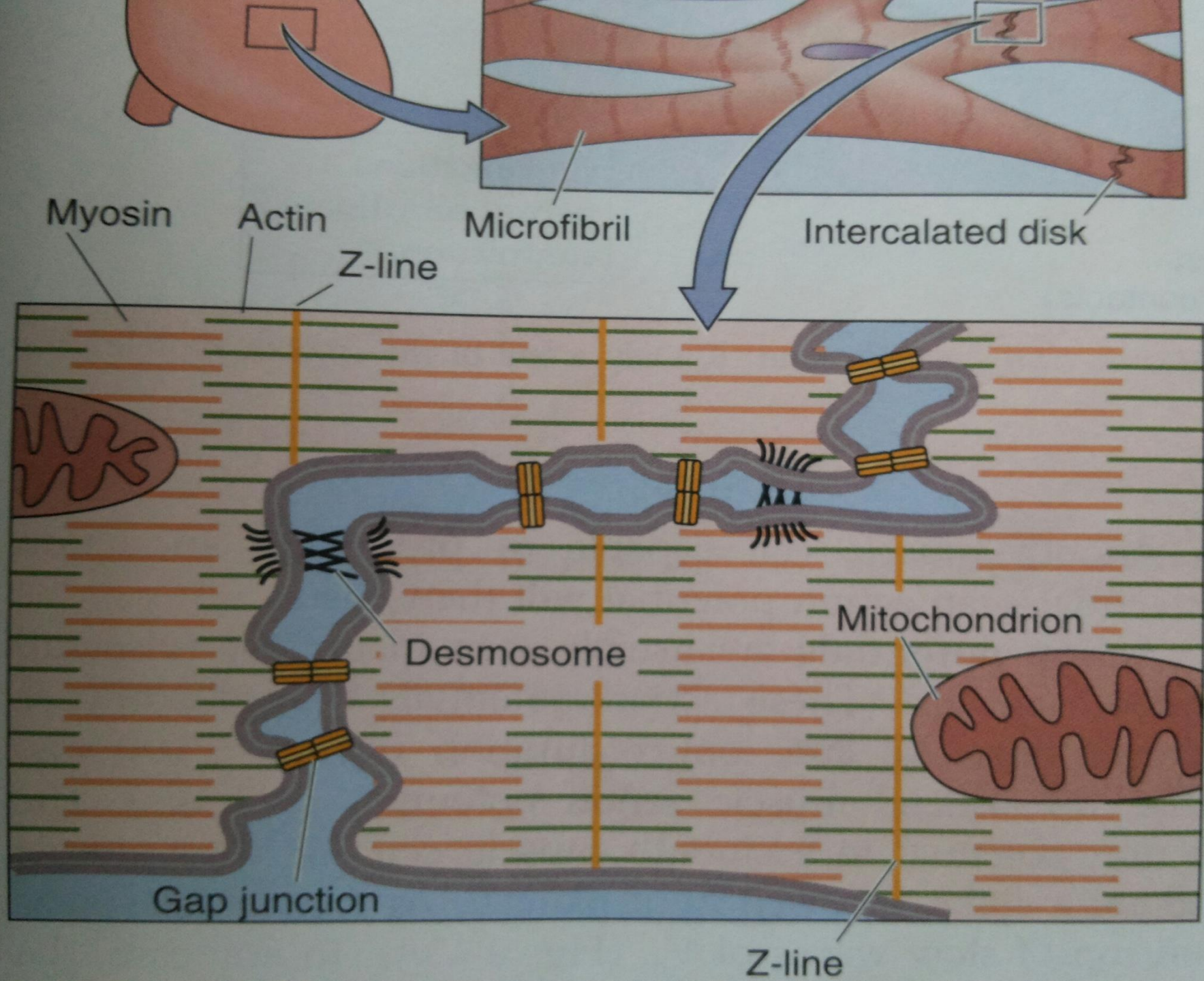
Heart Wall

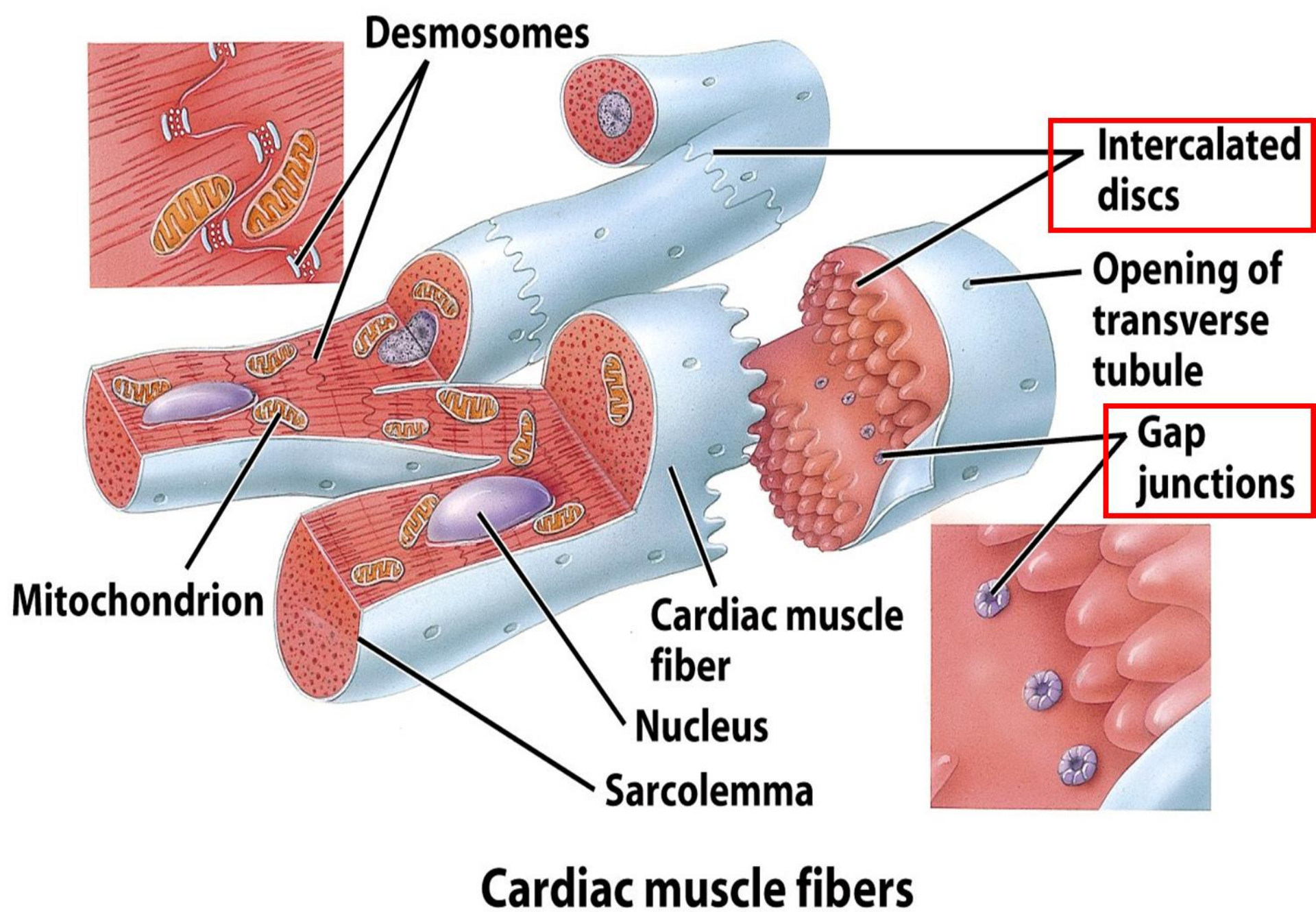
- **Epicardium** – visceral layer of the serous pericardium
- **Myocardium** – cardiac muscle layer forming the bulk of the heart
- **Skeleton** of the heart – crisscrossing, interlacing layer of connective tissue
- **Endocardium** – endothelial layer of the inner myocardial surface

Functional organization of cardiac muscle







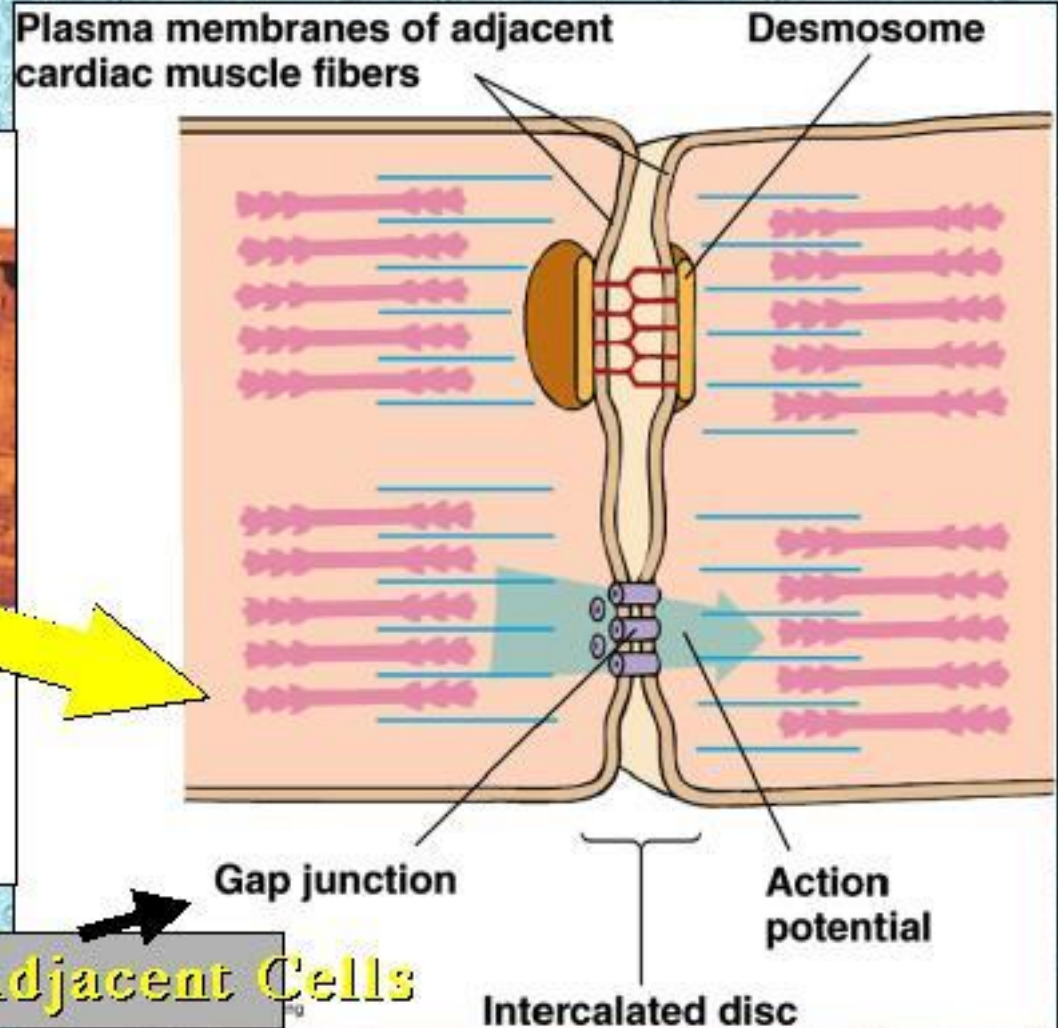


Organization of Cardiac Muscle

Intercalated discs



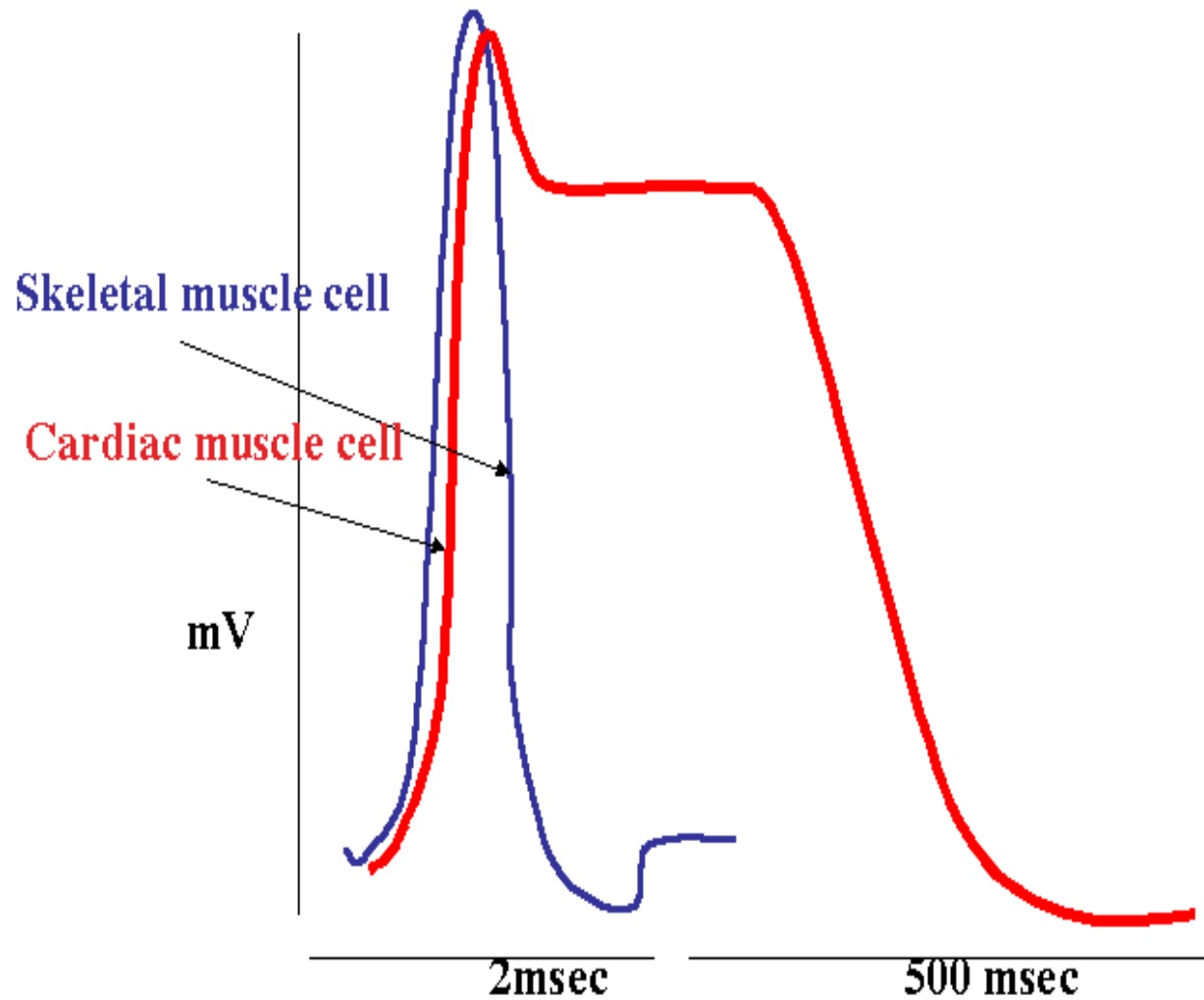
Fig 9-1



Electrically Couples Adjacent Cells

- Cardiac muscle cells are rectangular shaped cells connected by regions called intercalated discs.
- Intercalated discs contain gap junctions and desmosomes.
- The **gap junctions**, which are protein-lined tunnels, **allow** direct transmission of the **depolarizing** current from cell to cell, across the chambers of the heart, so that the cells contract in unison.
- Because of the way these gap junctions function, the cardiac muscle cells are said to be electrically coupled.
- The **desmosomes** hold the cardiac muscle cells **together** during contraction, induced by the sliding of the cardiac myofibrils.
- Sliding is regulated by the intracellular concentration of calcium ions released by the sarcoplasmic reticulum.

Action potential



- **1. Fibrous pericardium**
 - a. Tense connective tissue**
 - i. Protects heart**
 - ii. Anchors heart to surrounding tissues**
 - iii. Prevents over filling**
- 2. Serous pericardium**
 - a. Two layers**
 - i. Parietal layer**
 - ii. Visceral layer**
 - b. Parietal layer**
 - i. Internal surface of fibrous pericardium**
 - c. Visceral layer-epicardium**
 - i. Part of heart wall**
- 3. Pericardial cavity**
 - a. Between the serous layers**
 - b. Fluid filled**
 - i. Reduces friction between serous membranes**

- <https://www.youtube.com/watch?v=IMkHo11reWg>

Thank you all

- <https://www.youtube.com/watch?v=OAWZym8dWcw>