

## Topic 16: Blood Vessels and Heart and Respiratory Study Guide

- Function: Pumps blood through pulmonary & systemic circuit
- Location: Mediastinum (between lungs, posterior to sternum, anterior to vertebral column); Size: ~fist; ~2/3 of heart lies to the \_\_\_\_\_ of midline

### Layers of Heart Wall

- Epicardium (outer, visceral layer of serous pericardium)
  - Reduces \_\_\_\_\_
- Myocardium (cardiac muscle → contraction)
  - Thickest layer
  - Intercalated \_\_\_\_\_
- Endocardium (inner lining)
  - Smooth endothelial lining

### Pericardium (Heart Covering)

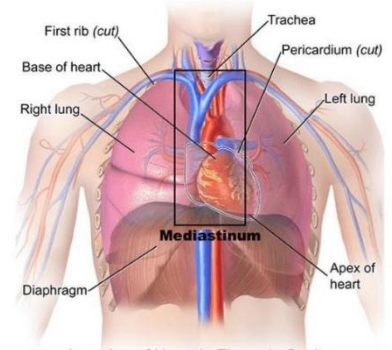
- Fibrous (outer tough layer)
  - Anchors heart to diaphragm and sternum
  - Prevents \_\_\_\_\_
- Serous: double layered membrane
  - Parietal layer
  - Visceral layer (THIS = same physical layer)
- Pericardial cavity
  - Filled with fluid \_\_\_\_\_

### Parts of the Heart

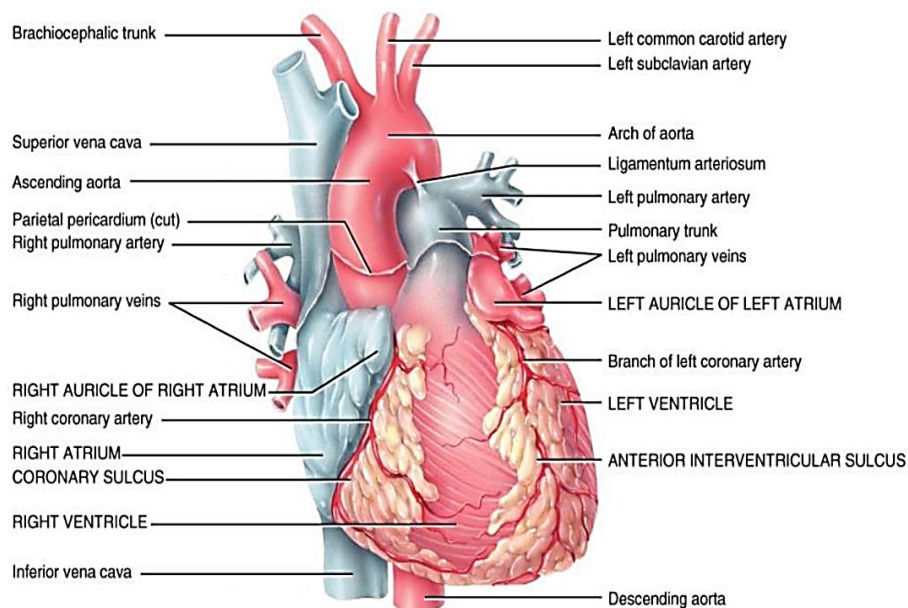
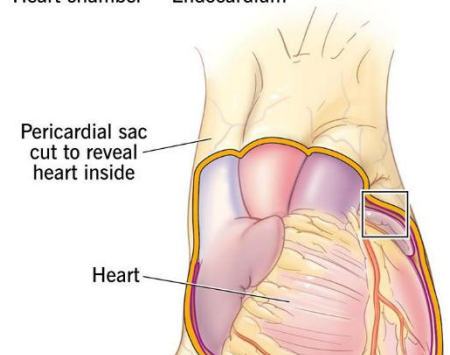
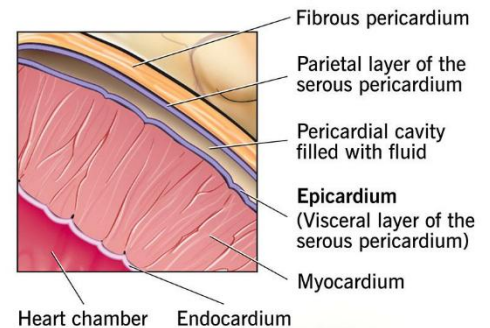
Apex → inferior tip (LEFT, LV) Base → posterior

### Grooves (Sulci)

- Sulci = external grooves on the heart surface
- Coronary sulcus → separates atria vs. ventricles
- Anterior interventricular sulcus → separates \_\_\_\_\_ vs. \_\_\_\_\_ (anterior side)
- Posterior interventricular sulcus → separates \_\_\_\_\_ vs. \_\_\_\_\_ (posterior side)



**Epicardium**  
Visceral pericardium



## Coronary Circulation

### Arteries

- Right coronary artery (RCA)
  - Runs in coronary sulcus (right side)
  - 2 major branches
  - Supplies: RA, RV, SA node (~60%), AV node (~80-90%)
- Left coronary artery (LCA)
  - LAD (anterior interventricular artery)
    - Runs in anterior interventricular sulcus
    - Widowmaker
  - Circumflex artery
    - Runs in coronary sulcus (left side)
    - Supplies: LA, lateral/posterior wall of LV

### Veins

- Great cardiac vein
  - Runs with LAD
  - Drains anterior left ventricle and interventricular septum
- Middle cardiac vein
  - Runs with posterior interventricular artery (PDA)
  - Drains posterior ventricles and septum
- Small cardiac vein
  - Runs along the right margin of the heart
  - Drains: right atrium and ventricles

## Heart Chambers/ Body+Blood Circulation

### Right Atrium (RA)

- Receives deoxygenated blood
- Structures:
  - Fossa ovalis → remnant of fetal foramen ovale
  - Pectinate muscles

### Right Ventricle (RV)

- Pumps blood → pulmonary trunk
- Structures:
  - Trabeculae carneae (muscle ridges)
  - Papillary muscles + chordae tendineae

### Left Atrium (LA)

- Receives oxygenated blood from lungs
- Mostly smooth

### Left Ventricle (LV)

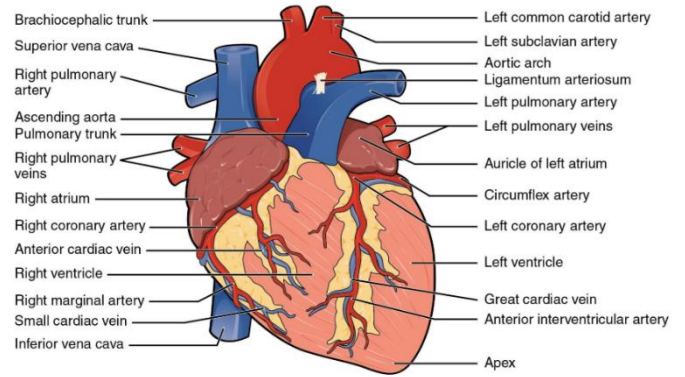
- Pumps blood → aorta (systemic circulation)
- Thickest myocardium (high pressure)

### Atrioventricular (AV) Valves:

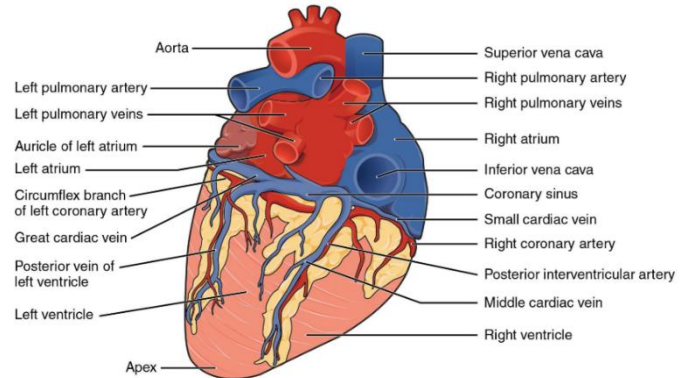
- Prevent backflow into atria during ventricular contraction
- Tricuspid valve (Right AV): AKA right AV valve
- Mitral valve (Left AV): AKA bicuspid valve

### Semilunar Valves:

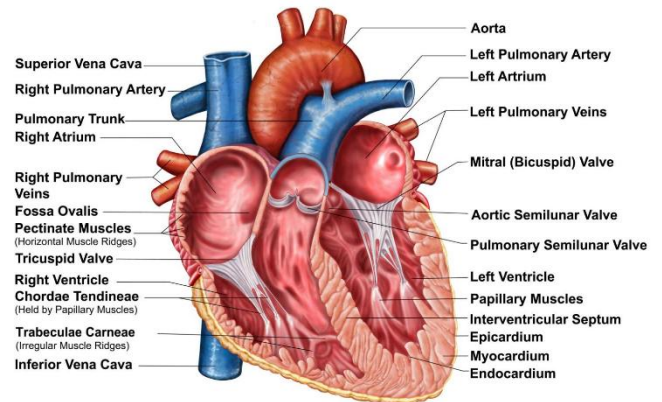
- Prevent backflow into ventricles after ejection
- Pulmonary valve
- Aortic valve



Anterior view



Posterior view



### Septa

- Interatrial septum
- Interventricular septum

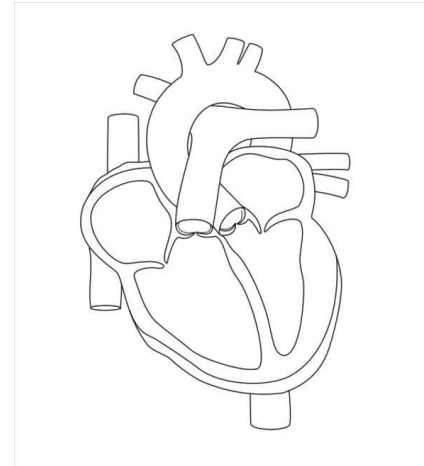
## “Quit playing games with my heart” – Backstreet Boys

- Chordea tendineae- heart strings/chords: prevent valves from flipping backward during contraction
- Heartbreak stress induced cardiomyopathy: Takotsubo cardiomyopathy  
“Broken Heart Syndrome”
  - Not so much a “heart string problem”
  - Sudden catecholamine surge (Epi/NE) that stuns the heart muscles
  - Temporary LV dysfunction; LV looks like a Japanese octopus trap = *takotsubo*



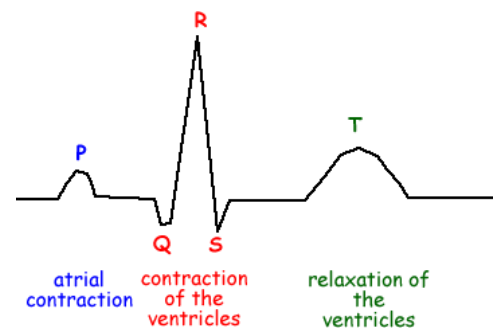
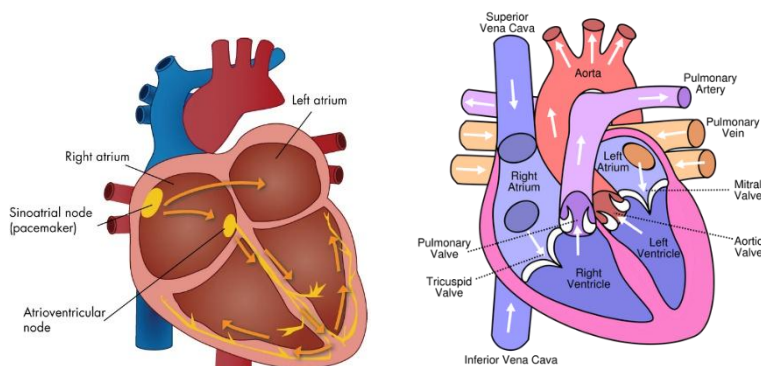
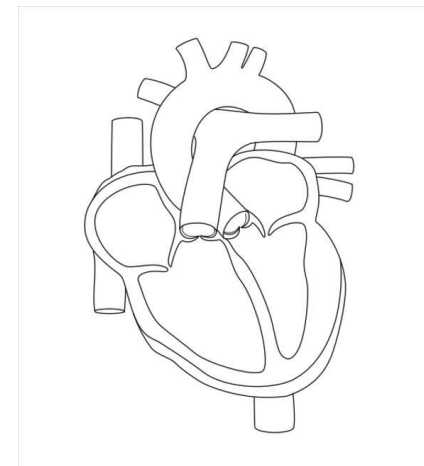
## Flow of Blood Through the Heart

Superior/Inferior vena cava → Right atrium  
 Tricuspid valve (Right AV valve) → Right ventricle  
 Pulmonary valve (Pulmonary semilunar valve) →  
 Pulmonary trunk → pulmonary arteries  
 Lungs (gas exchange)  
 Pulmonary veins → Left atrium  
 Mitral valve (Bicuspid valve / Left AV valve) → Left  
 ventricle  
 Aortic valve (Aortic semilunar valve) → Aorta →  
 systemic circulation

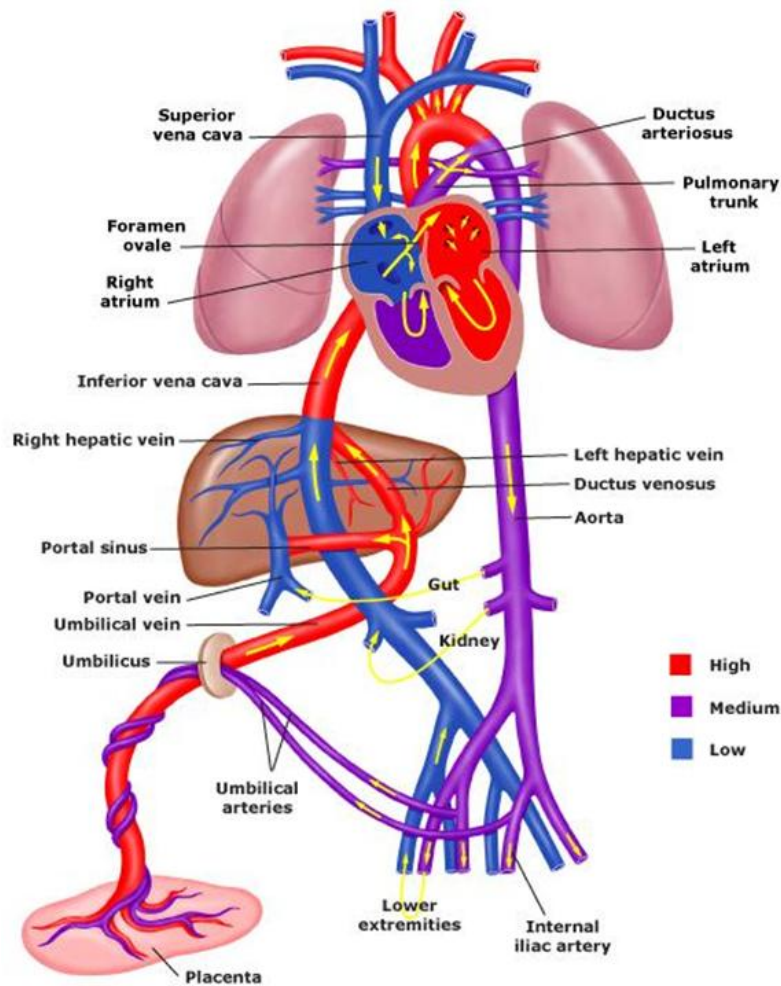
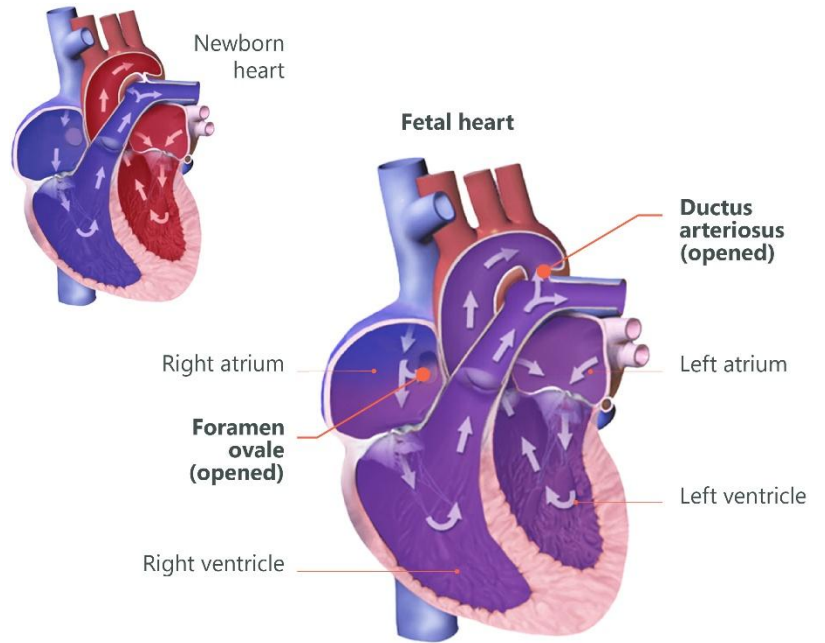
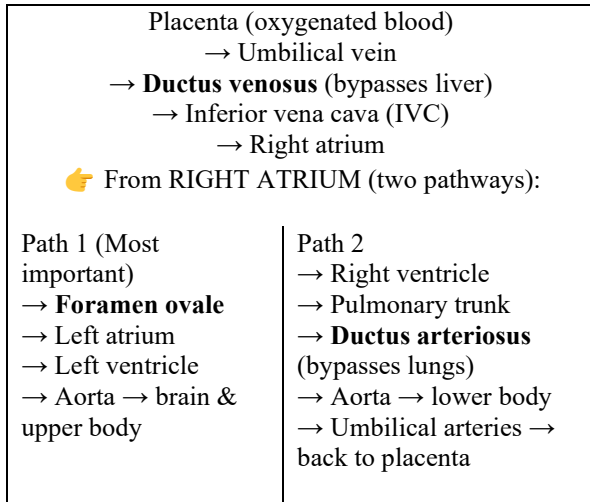


## Conduction System

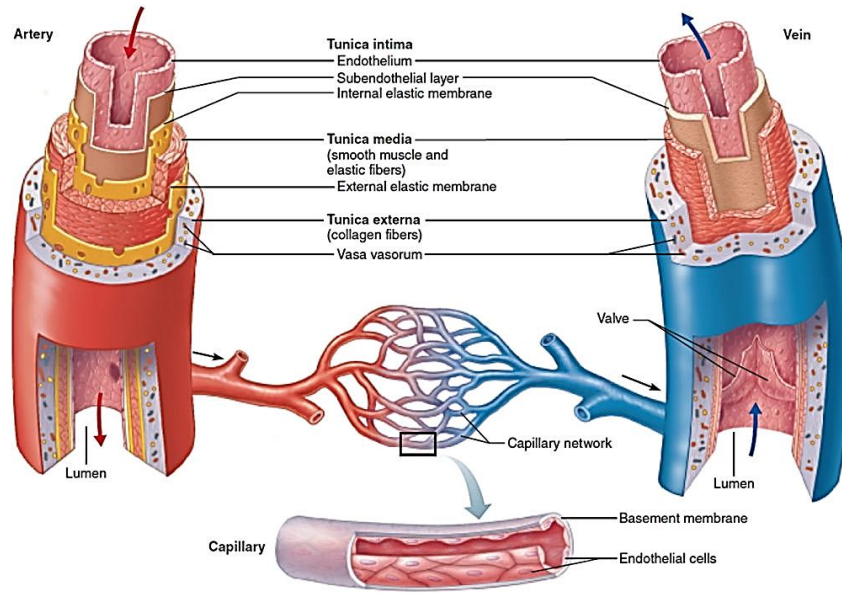
SA node → pacemaker  
 AV node → delay  
 Bundle of His  
 Right/Left bundle branches  
 Purkinje fibers  
 Activation spreads:  
 Endocardium → Epicardium (inside → outside)  
 But pressure builds:  
 Compressing inward to eject blood  
**Activation spreads:**  
 Endocardium → Epicardium (inside → outside)  
**But pressure builds:**  
 Compressing inward to eject blood



## The Fetal Heart



## Structures of Vessels



## Veins and Arteries

### Venous Tree:

Body Tissues

- └ Lower Limb Veins
  - └ Anterior/Posterior Tibial
    - └ Popliteal
      - └ Femoral
        - └ External Iliac
    - └ Internal Iliac
  - └ Common Iliac Veins
    - └ Inferior Vena Cava (IVC)
      - └ Right Atrium

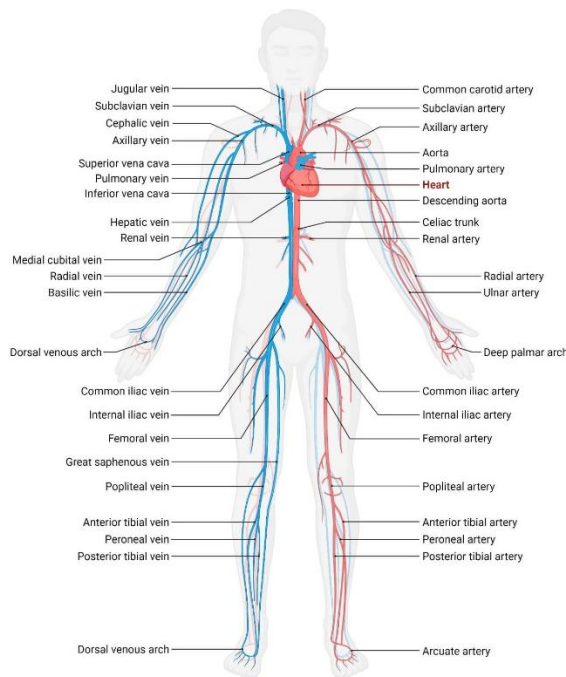
Upper Body

- └ Arm Veins
  - └ Radial/Ulnar
    - └ Brachial
      - └ Axillary
        - └ Subclavian
    - └ Cephalic (superficial)
    - └ Basilic (superficial)
      - └ Median Cubital (connection)
  - └ Jugular Veins (brain)
    - └ Brachiocephalic Veins
      - └ Superior Vena Cava (SVC)
        - └ Right Atrium

### Portal System:

GI Tract

- └ Portal Vein
  - └ Liver (processing!)
    - └ Hepatic Veins
      - └ Inferior Vena Cava
        - └ Right Atrium

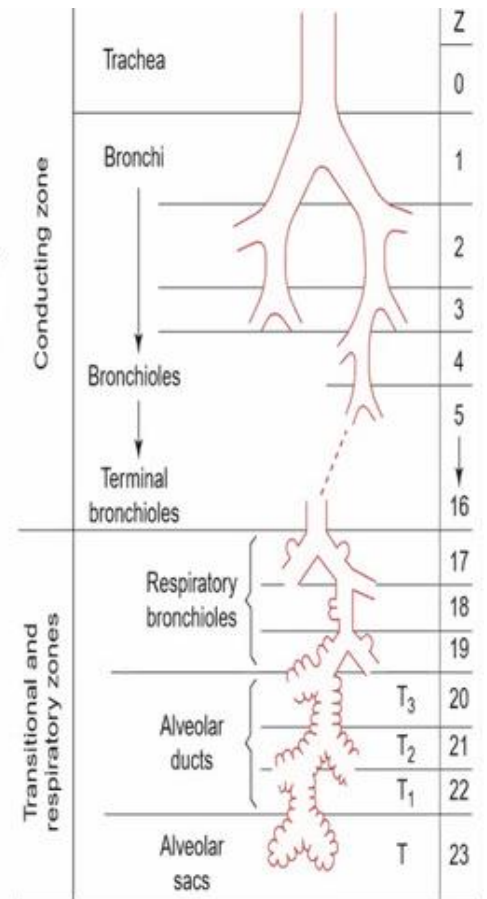
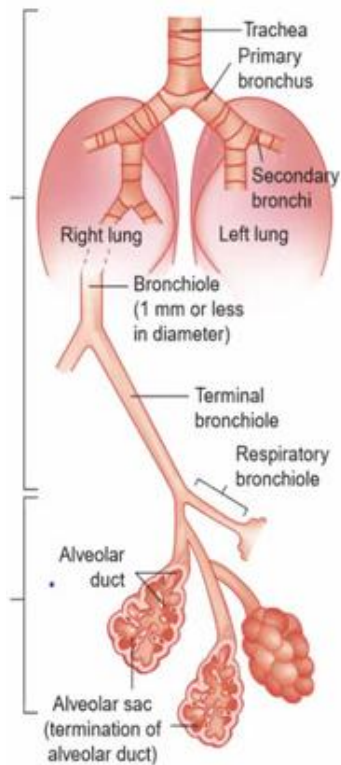
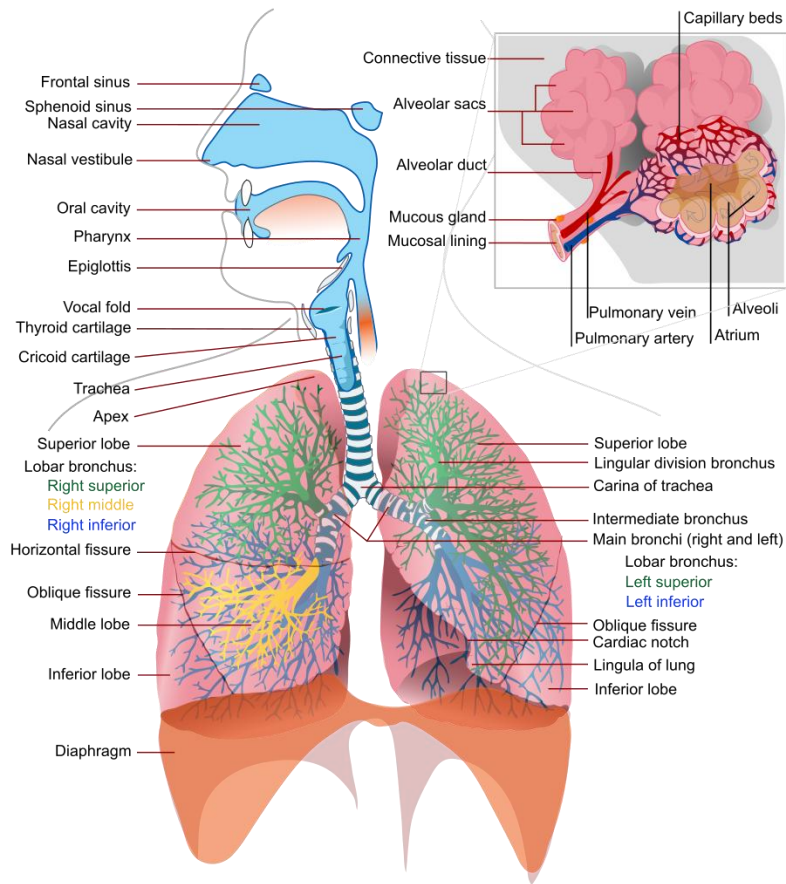


### Arterial Tree:

Left Ventricle

- └ Aorta
  - └ Aortic Arch
    - └ Brachiocephalic Trunk (RIGHT)
      - └ Right Common Carotid → Head/Brain
      - └ Right Subclavian → Arm
        - └ Axillary
          - └ Brachial
            - └ Radial
            - └ Ulnar
              - └ Palmar arches
        - └ Left Common Carotid → Head/Brain
        - └ Left Subclavian → Arm
          - └ Axillary → Brachial → Radial/Ulnar
      - └ Descending Aorta
        - └ Thoracic Aorta
          - └ Abdominal Aorta
            - └ Celiac Trunk → Liver, Stomach, Spleen
            - └ Renal Arteries → Kidneys
            - └ Common Iliac Arteries
              - └ Internal Iliac → Pelvis
                - └ External Iliac
                  - └ Femoral
                    - └ Popliteal
                      - └ Anterior Tibial
                      - └ Posterior Tibial
                        - └ Peroneal

# Respiration/Lungs

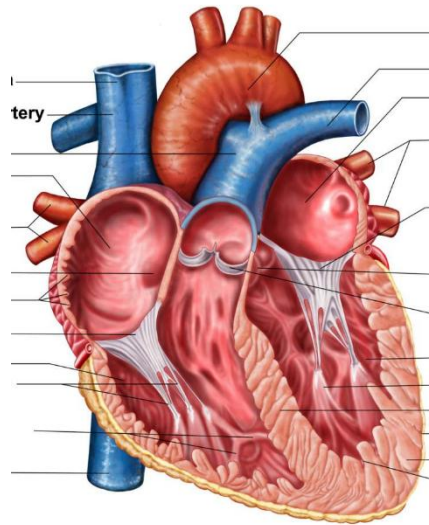


## Topic 16 Study Guide Questions

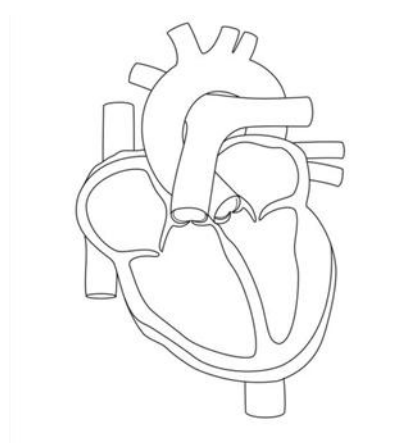
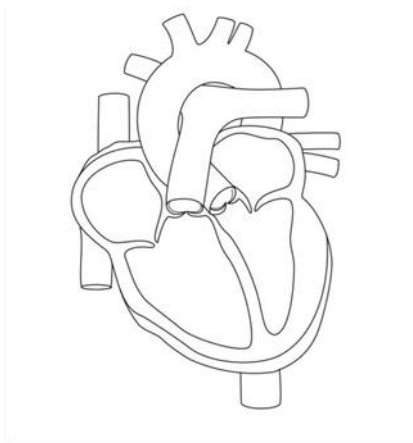
1. Where is the heart located? A. Abdominal cavity B. Mediastinum C. Pleural cavity D. Cranial cavity
2. Which layer of the heart wall is responsible for contraction? A. Epicardium B. Endocardium C. Myocardium D. Pericardium
3. Which layer is the SAME as the visceral pericardium?  
A. Endocardium B. Myocardium C. Epicardium D. Fibrous pericardium
4. The fibrous pericardium primarily functions to:  
A. Pump blood B. Reduce friction C. Prevent overfilling D. Conduct electrical signals
5. The pericardial cavity contains: A. Blood B. Air C. Serous fluid D. Lymph
6. The apex of the heart is formed by which chamber?  
A. Right atrium B. Right ventricle C. Left atrium D. Left ventricle
7. The coronary sulcus separates:  
A. RV vs LV B. Atria vs ventricles C. LA vs LV D. Septum vs myocardium
8. Which artery is known as the “widowmaker”?  
A. Circumflex B. RCA C. LAD D. Pulmonary artery
9. The right coronary artery most commonly supplies which node(s)?  
A. SA only B. AV only C. Both SA and AV D. Neither
10. The great cardiac vein runs with which artery?  
A. Circumflex B. LAD C. PDA D. RCA
11. The middle cardiac vein is located in which sulcus?  
A. Coronary B. Anterior interventricular C. Posterior interventricular D. Atrioventricular
12. Which chamber receives deoxygenated blood from the body? A. LA B. LV C. RA D. RV
13. Which structure prevents AV valve prolapse during ventricular contraction?  
A. Trabeculae carneae B. Chordae tendineae C. Pectinate muscles D. Septa
14. The mitral valve is also known as the: A. Semilunar B. Tricuspid C. Bicuspid D. Pulmonary
15. Which valves prevent backflow into ventricles after ejection?  
A. Tricuspid B. Mitral C. AV valves D. Semilunar valves
16. Which septum separates the ventricles? A. Interatrial B. Interventricular C. Coronary D. Endocardial
17. In fetal circulation, the foramen ovale allows blood to flow from:  
A. LA→RA B. RA→LA C. RV→pulmonary trunk D. LV→aorta
18. The ductus arteriosus connects the:  
A. RA→LA B. Pulmonary trunk→aorta C. IVC→RA D. Umbilical vein→liver
19. Which fetal structure bypasses the liver? A. Foramen ovale B. Ductus arteriosus C. Ductus venosus D. Coronary sinus
20. Which best describes Takotsubo cardiomyopathy?  
A. Chordae rupture B. Permanent blockage C. Temporary LV dysfunction from catecholamines D. Endocarditis
21. Which structure is part of the upper respiratory tract? A. Trachea B. Larynx C. Bronchi D. Alveoli
22. Which structure marks the transition from upper to lower respiratory tract? A. Nasal cavity B. Pharynx C. Larynx D. Trachea
23. Primary function of the upper respiratory tract is: A. Gas exchange B. Air filtration, warming, humidification C. Oxygen transport D. CO<sub>2</sub> removal
24. The primary function of the lower respiratory tract is: A. Filtration B. Gas exchange C. Speech D. Smell
25. Which artery is the FIRST branch off the aortic arch?  
A. Left subclavian B. Left common carotid C. Brachiocephalic trunk D. Coronary artery
26. The brachiocephalic trunk divides into:  
A. Left carotid + left subclavian B. Right carotid + right subclavian  
C. Right carotid + left subclavian D. Left carotid + right subclavian
27. Which artery directly supplies the upper limb? A. Common carotid B. Subclavian C. Celiac trunk D. Renal
28. Correct order of upper limb arteries:  
A. Axillary → Subclavian → Brachial B. Subclavian → Axillary → Brachial  
C. Brachial → Axillary → Subclavian D. Subclavian → Brachial → Axillary
29. The brachial artery divides into:  
A. Femoral + popliteal B. Radial + ulnar C. Carotid + subclavian D. Tibial + peroneal

30. The abdominal aorta divides into:  
 A. Femoral arteries B. Renal arteries C. Common iliac arteries D. Subclavian arteries
31. The femoral artery becomes the popliteal artery:  
 A. In the pelvis B. At the ankle C. Behind the knee D. In the abdomen
32. Which pathway is correct for portal circulation?  
 A. GI → IVC → liver B. GI → portal vein → liver → hepatic veins → IVC  
 C. GI → aorta → liver D. GI → SVC → liver
33. Which veins merge to form the superior vena cava?  
 A. Iliac veins B. Brachiocephalic veins C. Hepatic veins D. Femoral veins
34. The inferior vena cava is formed by the union of:  
 A. Renal veins B. Hepatic veins C. Common iliac veins D. Subclavian veins
35. Which vein is commonly used for blood draws?  
 A. Cephalic B. Basilic C. Median cubital D. Femoral
36. Which vessel has the thickest tunica media? A. Vein B. Capillary C. Artery D. Venule
37. What is the primary function of valves in veins?  
 A. Increase pressure B. Prevent backflow of blood C. Exchange gases D. Contract the vessel
38. Capillaries are best described as:  
 A. Having all three tunics B. Composed only of smooth muscle  
 C. A single layer of endothelial cells D. Containing valves
39. Which layer is composed primarily of endothelial cells?  
 A. Tunica externa B. Tunica media C. Tunica intima D. Vasa vasorum

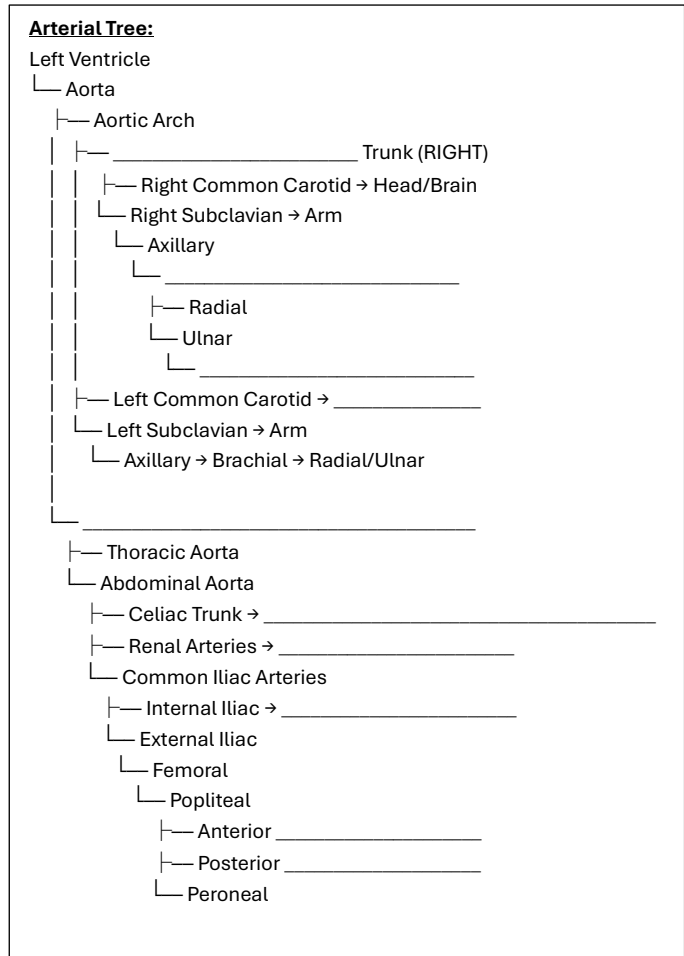
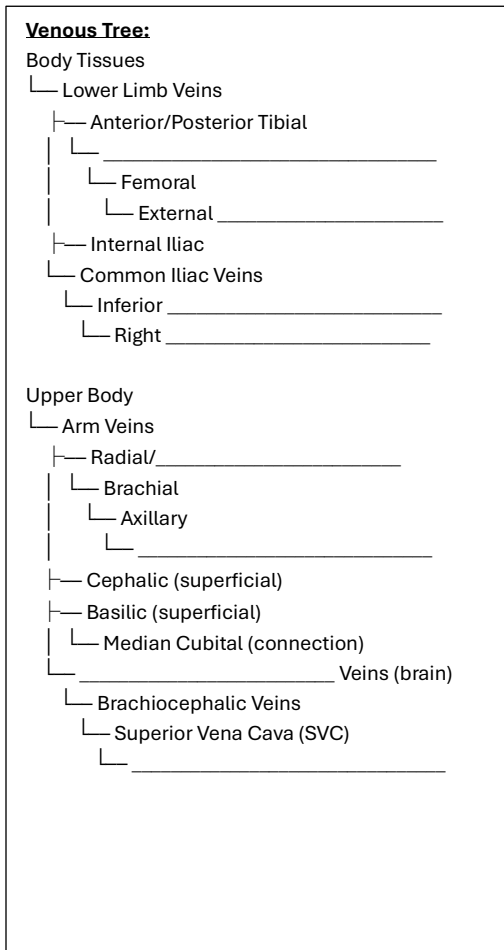
**Identify:**



**Draw the pathway of blood going through the heart and on the other side draw the pathway of electrical conduction:**



Fill in the blanks for each tree of vessels below:



Identify each section and label upper vs. lower respiratory system (note where they separate):

