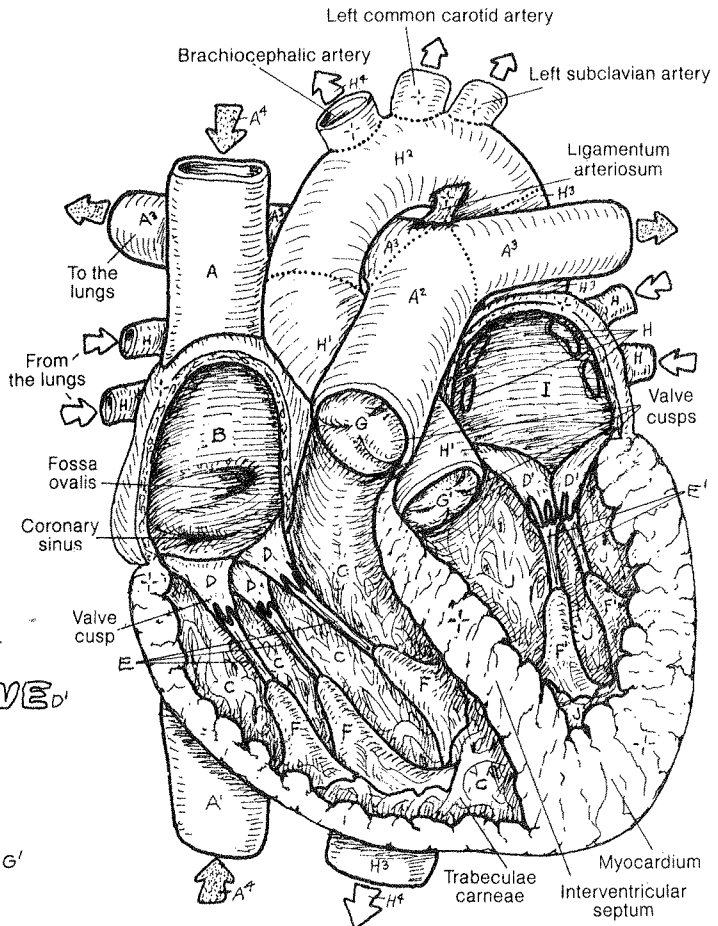


# VI. CARDIOVASCULAR SYSTEM

## CHAMBERS OF THE HEART

CN: Use blue for A, red for H, and your lightest colors for B, C, I, and J.  
 (1) Begin with the four chambers of the heart, and follow the direction of blood flow as you color your way down the list of titles. Also color the directional arrows blue (dotted) and red; their titles are at lower right. (2) Color the circulation chart below, beginning with numeral one (1) in the right atrium. Color the arrows accordingly, along with the four numerals. Do not color the chambers or the vessels.

- SUPERIOR VENA CAVA<sup>A</sup>
- INFERIOR VENA CAVA<sup>A'</sup>
- RIGHT ATRIUM<sup>B</sup>
- RIGHT VENTRICLE<sup>C</sup>
- A-V TRICUSPID VALVE<sup>D</sup>
- CHORDAE TENDINEAE<sup>E</sup>
- PAPILLARY MUSCLE<sup>F</sup>
- PULMONARY TRUNK<sup>A<sup>2</sup></sup>
- PUL. SEMILUNAR VALVE<sup>G</sup>
- PUL. ARTERY<sup>A<sup>3</sup></sup>
- PULMONARY VEIN<sup>H</sup>
- LEFT ATRIUM<sup>I</sup>
- LEFT VENTRICLE<sup>J</sup>
- A-V BICUSPID (MITRAL) VALVE<sup>D'</sup>
- CHORDAE TENDINEAE<sup>E'</sup>
- PAPILLARY MUSCLE<sup>F'</sup>
- ASCENDING AORTA<sup>H'</sup>
- AORTIC SEMILUNAR VALVE<sup>G'</sup>
- AORTIC ARCH<sup>H<sup>2</sup></sup>
- THORACIC AORTA<sup>H<sup>3</sup></sup>

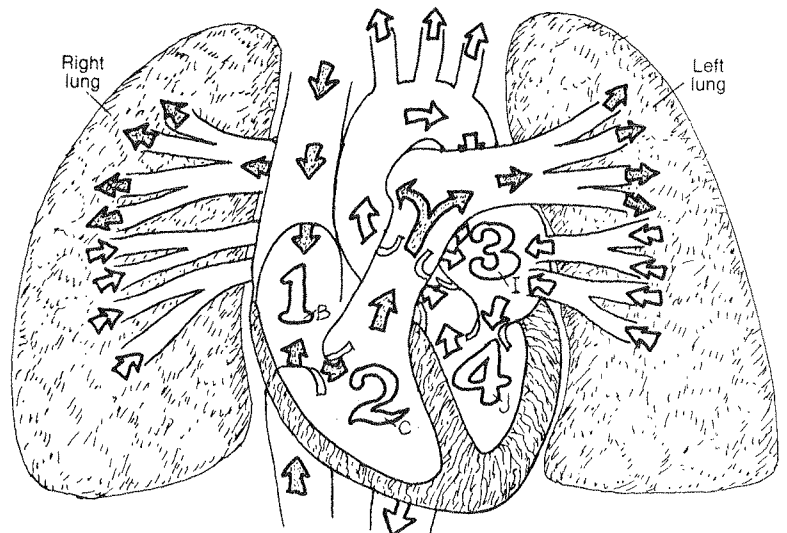


ANTERIOR VIEW OF HEART CAVITIES

The heart is the muscular pump of the blood vascular system. It contains four cavities (chambers): two on the right side (pulmonary heart), two on the left (systemic heart). The pulmonary "heart" includes the right atrium and right ventricle. The thin-walled *right atrium* receives *deoxygenated blood* from the *superior* and the *inferior vena cava*, and from the *coronary sinus* (draining the heart vessels). The thin-walled *left atrium* receives *oxygenated blood* from pulmonary veins. Atrial blood is pumped at a pressure of about 5 mm Hg into the *right and left ventricles* simultaneously through the atrioventricular orifices, guarded by the 3-cusp *tricuspid valve* on the right and the 2-cusp *bicuspid valve* on the left. The cusps are like panels of a parachute, secured to the *papillary muscles* in the ventricles by tendinous *chordae tendineae*. These muscles contract with the ventricular muscles, tensing the cords, and resisting cusp over-flap as ventricular blood bulges into them during ventricular contraction (systole). The ventricles, significantly more muscular than their fellow atria, pump deoxygenated blood to the lungs via the *pulmonary trunk* at a pressure of about 25 mm Hg (right ventricle), and into the *ascending aorta* at a pressure of about 120 mm Hg (left ventricle) simultaneously. This pressure difference is reflected in the thicker walls of the left ventricle compared to the right. The pocket-like *pulmonary and aortic semilunar valves* guard the trunk and aorta, respectively. As blood falls back toward the ventricle from the trunk/aorta during the resting phase (diastole), these pockets fill, closing off their respective orifices, and preventing reflux into the ventricles.

### CIRCULATION THROUGH THE HEART\*

OXYGENATED BLOOD → H<sup>+</sup>  
 DEOXYGENATED BLOOD → A<sup>+</sup>

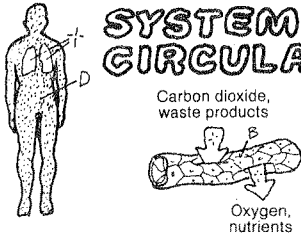


# VI. CARDIOVASCULAR SYSTEM

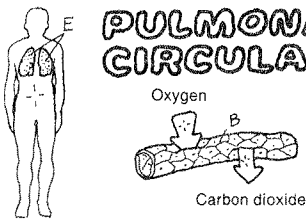
## SCHEME OF BLOOD CIRCULATION

CN: Use blue for A, purple for B, red for C, and very light colors for D and E. (1) Color the titles for systemic and pulmonary circulation; the two figures; and the borders bracketing the large illustration. Also color purple (representing the transitional state between oxygenation and deoxygenation) the two capillaries, demonstrating the difference between capillary function in the lungs versus the body. (2) Begin in the right atrium of the heart and color the flow of deoxygenated blood (A) into the lungs. After coloring the pulmonary capillary network (B), color the oxygenated blood (C) that re-enters the heart and is pumped into and through the systemic circuit.

### SYSTEMIC CIRCULATION<sub>D</sub>



### PULMONARY CIRCULATION<sub>E</sub>



Circulation of blood begins with the heart which pumps blood into arteries and receives blood from veins. *Arteries* conduct blood away from the heart regardless of the amount of oxygen (oxygenation) in that blood. *Veins* conduct blood toward the heart, regardless of the degree of oxygenation of the blood. *Capillaries* are networks of extremely thin-walled vessels throughout the body tissues that permit the exchange of gases and nutrients between the vessel interior (vascular space) and the area external to the vessel (extracellular space). Capillaries receive blood from small arteries and conduct blood to small veins.

There are two circuits of blood flow: (1) the pulmonary circuit, which conveys *deoxygenated blood* from the right side of the heart to the lungs and freshly *oxygenated blood* back to the left side of the heart, and (2) the systemic circuit, which conveys oxygenated blood from the left heart to the body tissues and returns deoxygenated blood to the right heart. The color red is used universally for *oxygenated blood*; the color blue is used for *deoxygenated blood*.

Clearly, not all arterial blood is oxygenated (in the pulmonary circulation, arteries conduct deoxygenated blood to the lungs), and not all venous blood is deoxygenated (pulmonary veins conduct oxygenated blood to the heart).

*Capillary blood* is mixed; it is largely oxygenated on the arterial side of the capillary bed, and it is largely deoxygenated on the venous side, as a consequence of delivering oxygen to and picking up carbon dioxide from the tissues it supplies.

One capillary network generally exists between an artery and a vein; an exception is the portal circulation characterized by two capillary sets between artery and vein. The vein between the two networks is the portal vein. Such can be seen between the gastrointestinal tract and the liver.

### DEOXYGENATED BLOOD<sub>A</sub> CAPILLARY BLOOD<sub>B</sub> OXYGENATED BLOOD<sub>C</sub>

