

THE CARDIOVASCULAR SYSTEM

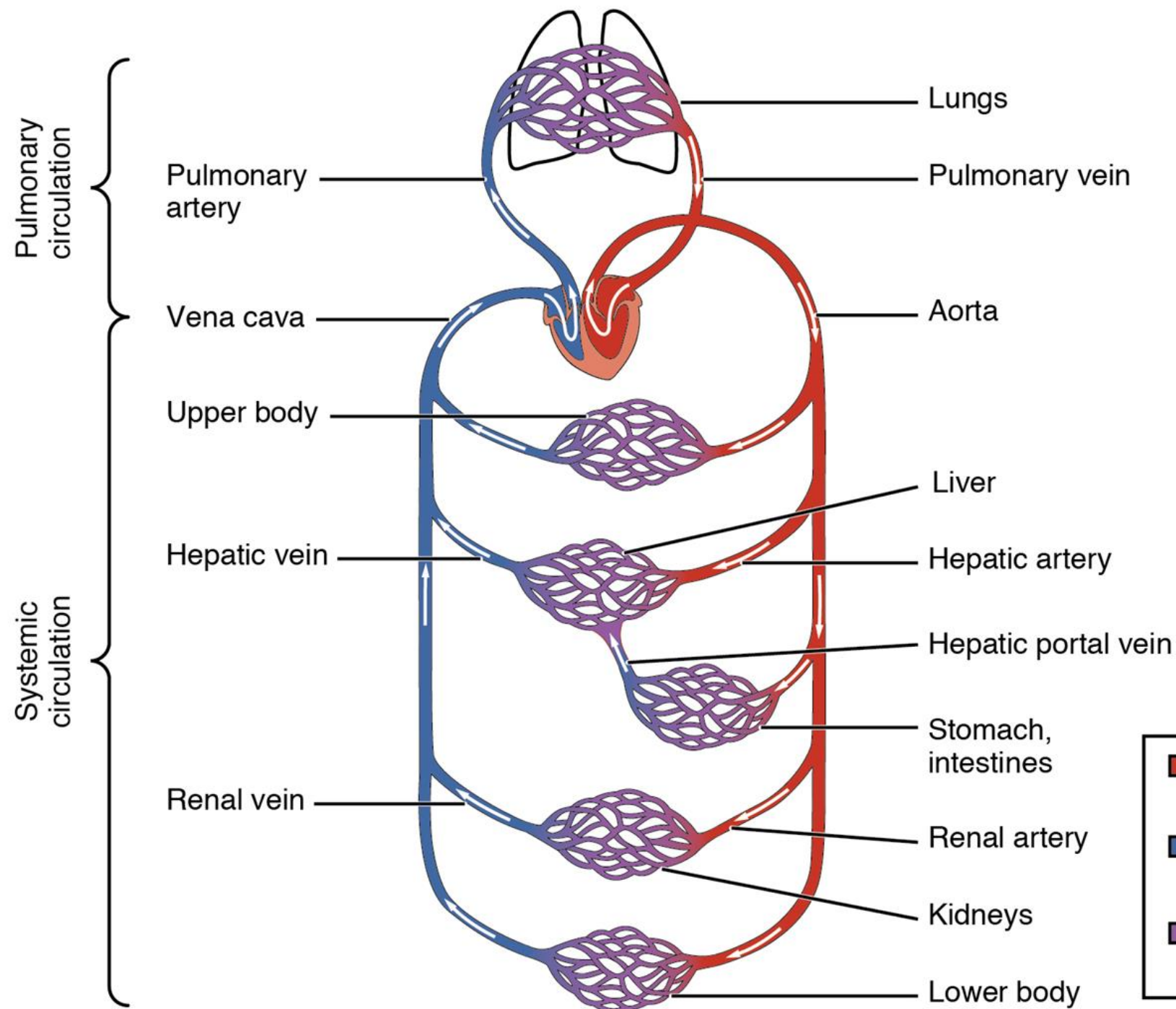


THE HEART

- Composed of the heart, blood vessels, and blood
- Main functions:
 - Deliver oxygen, fuel and other nutrients to the tissues of the body
 - Removal of carbon dioxide and waste products from tissue
 - Maintenance of constant body temperature

The Heart

- Made of specialized muscle tissue called MYOCARDIUM (cardiac muscle)
- Divided into halves- right and left
- *Right half:* pumps deoxygenated blood to the lungs (PULMONARY CIRCULATION)
- *Left half:* pumps oxygenated blood to the rest of the body (SYSTEMIC CIRCULATION)



Pulmonary
circulation

Pulmonary
artery

Vena cava

Upper body

Hepatic vein

Renal vein

Lungs

Pulmonary vein

Aorta

Liver

Hepatic artery

Hepatic portal vein

Stomach,
intestines

Renal artery

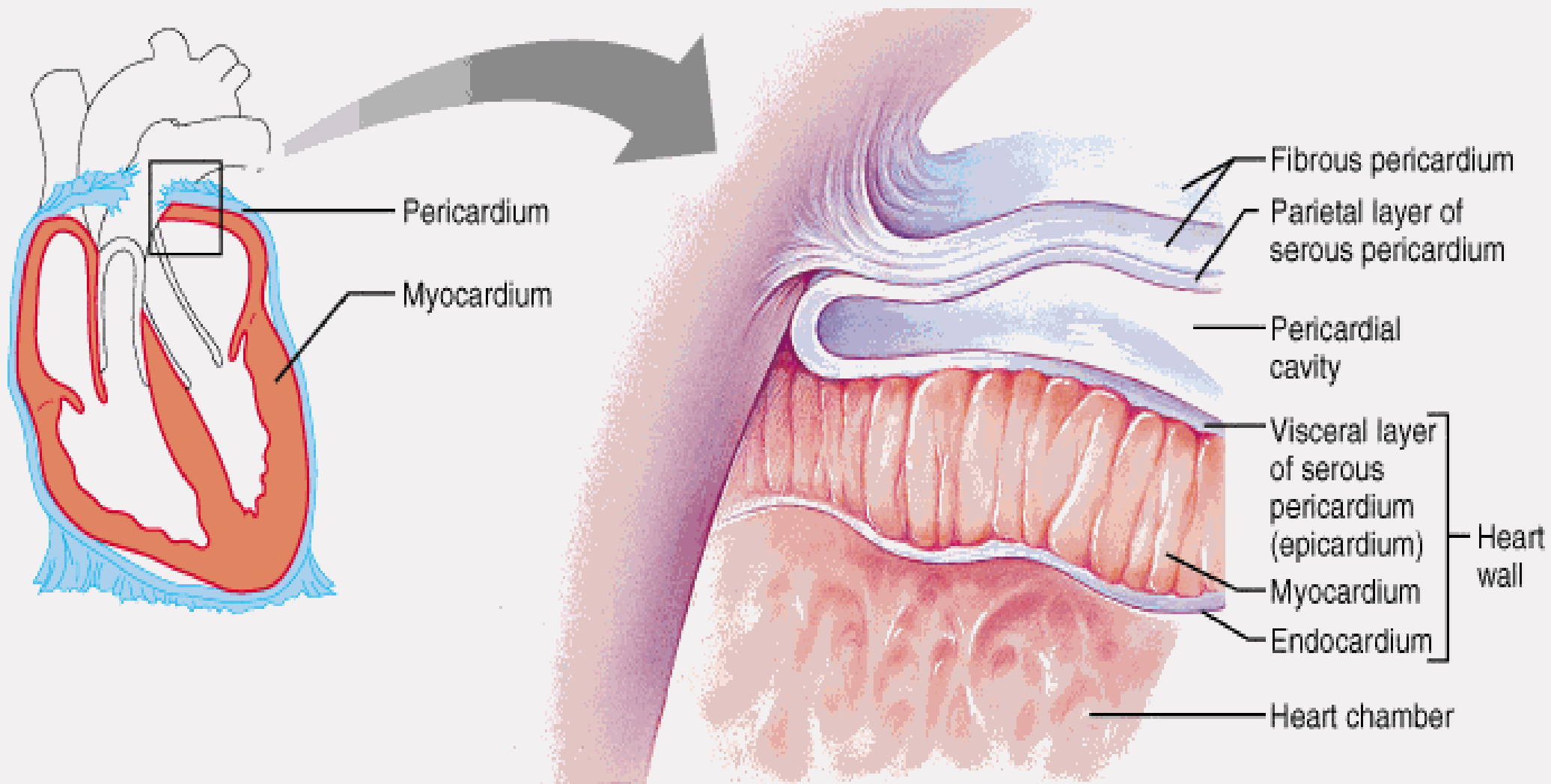
Kidneys

Lower body

- Vessels transporting oxygenated blood
- Vessels transporting deoxygenated blood
- Vessels involved in gas exchange

LAYERS OF THE HEART

- PERICARDIUM – outermost layer, tough protective sac that surrounds the heart
- EPICARDIUM – outer layer that lies against the pericardium
- ENDOCARDIUM – layer that lines the inside of the heart



FOUR CHAMBERS

- Upper chambers are called ATRIA
- Lower chambers are called VENTRICLES
- Atria and ventricles are separated by valves that allow the blood to flow only from the atria into the ventricles
- These valves are called ATRIOVENTRICULAR (AV) VALVES

Right chambers

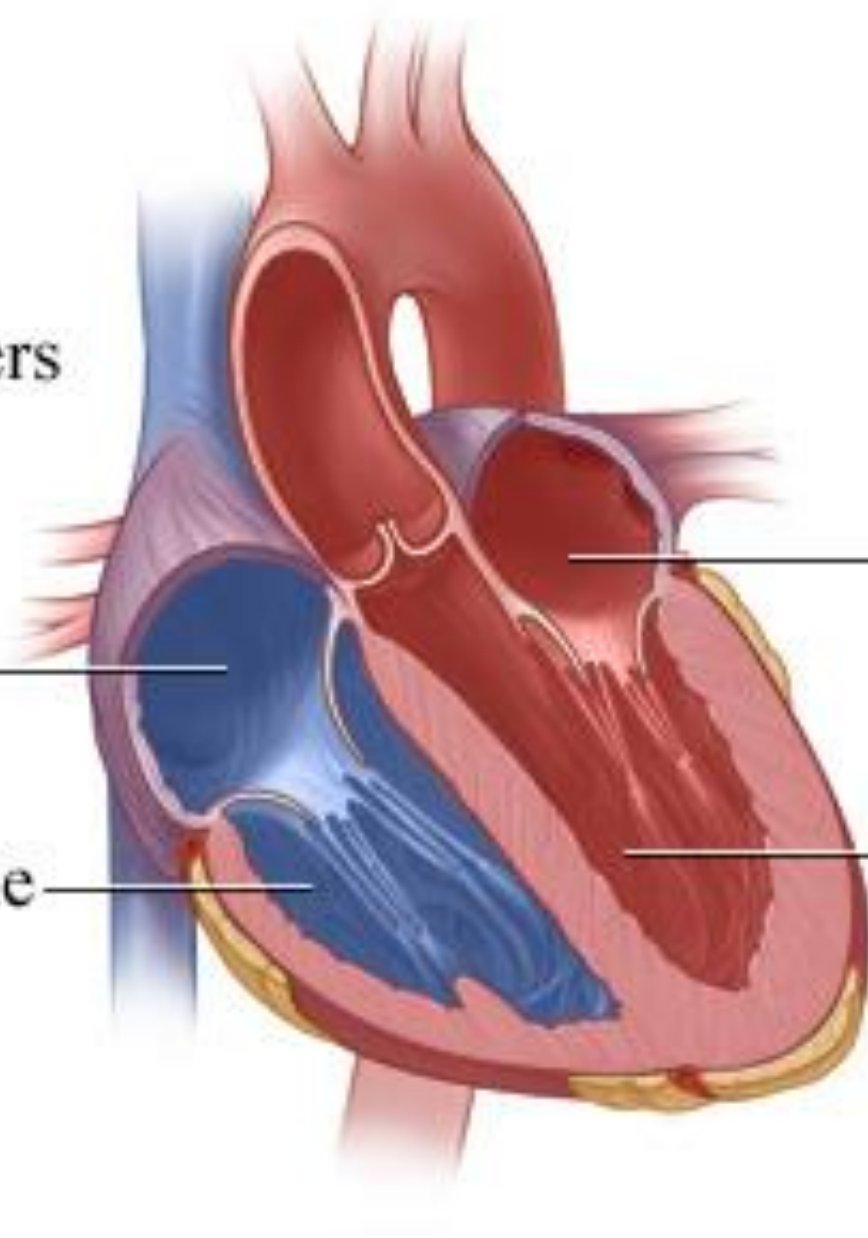
Left chambers

Right atrium

Left atrium

Right ventricle

Left ventricle



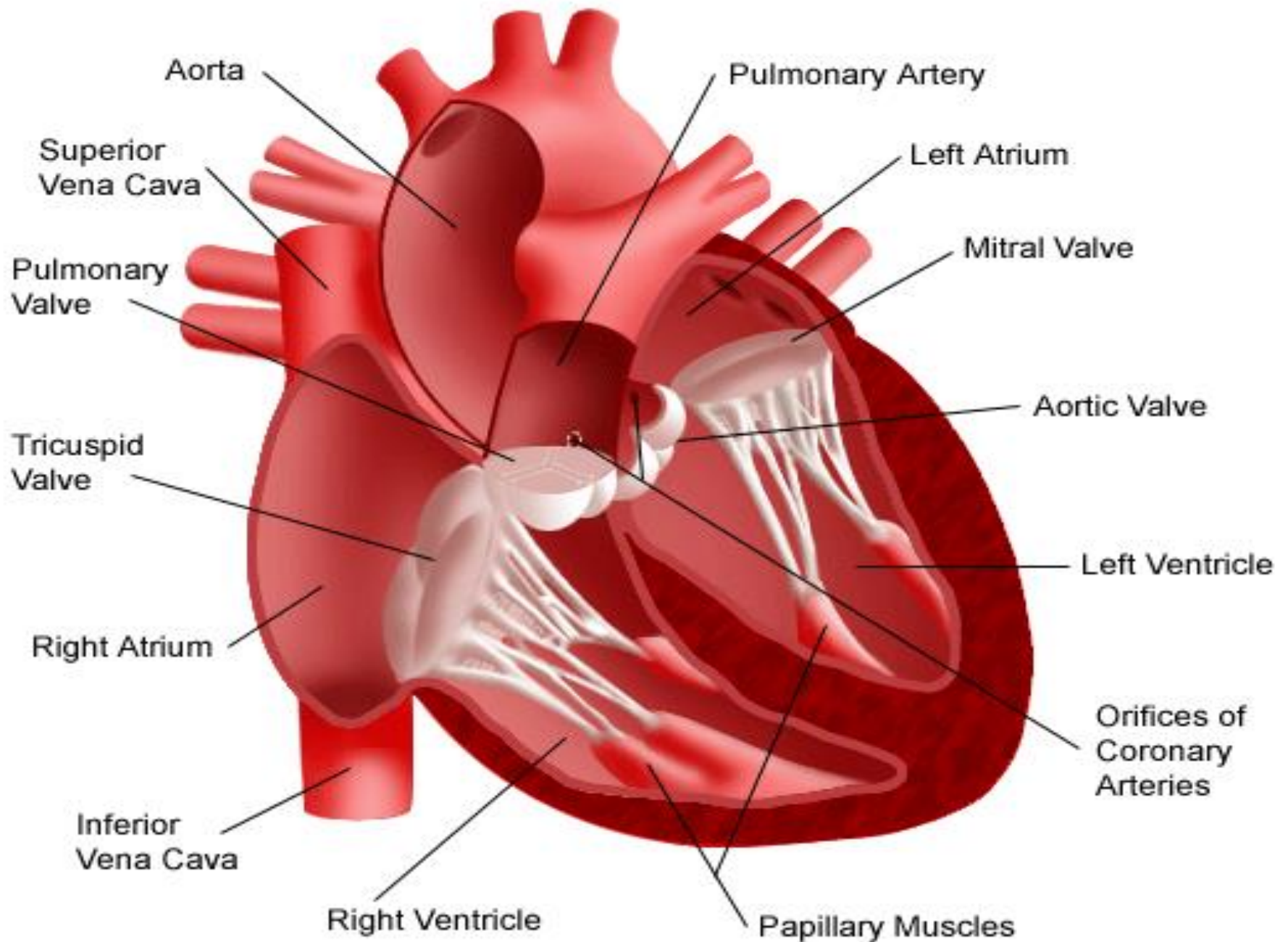
VALVES

- On the right side of the heart, the AV valve is called the **TRICUSPID VALVE** because it is composed of three flaps
- On the left side of the heart, the valve is called the **BICUSPID VALVE** (or mitral valve) because it is composed of two flaps
- These valves are attached to muscular extensions of the ventricle walls (called **PAPILLARY MUSCLES**) by strands of tissue called **CHORDAE TENDINAE**

VALVES CONT...

- Valves are also found where the blood leaves the ventricles
- Right side = PULMONARY SEMILUNAR VALVE
 - Prevents blood from flowing back from the pulmonary arteries into the right ventricle
- Left side = AORTIC SEMILUNAR VALVE
 - Separates the aorta from the left ventricle

Interior View of the Heart



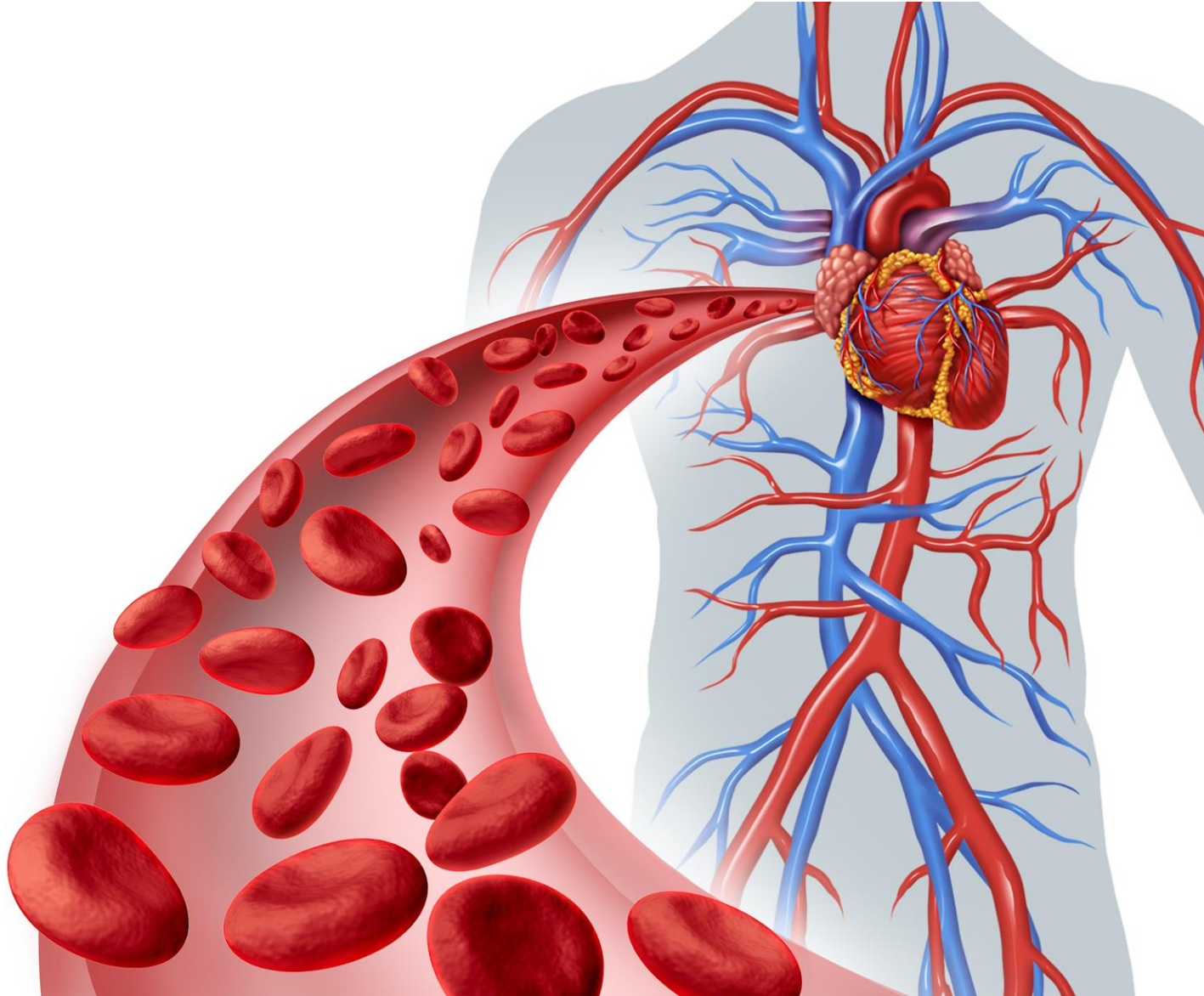
PATH OF BLOOD THROUGH THE HEART

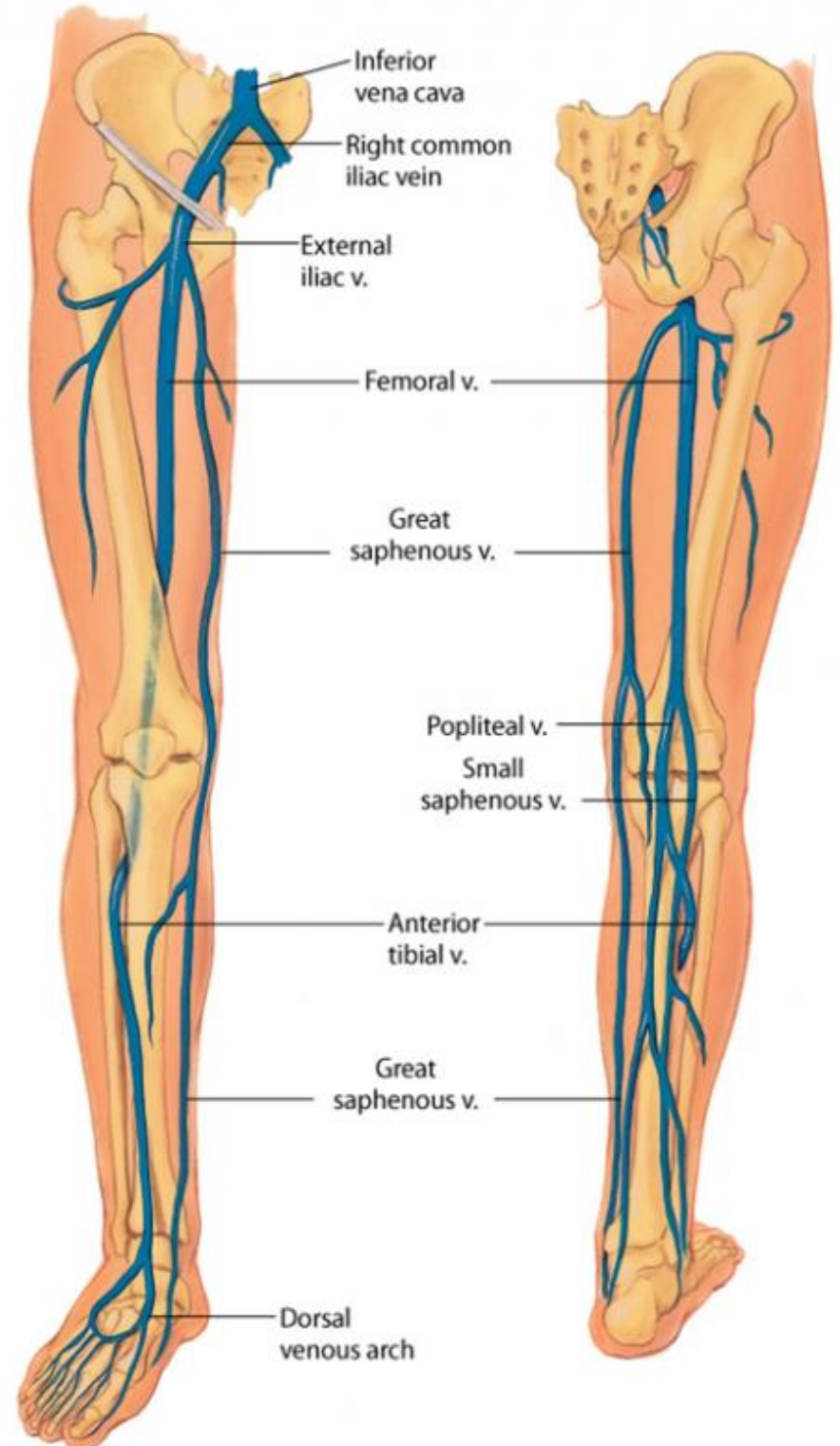
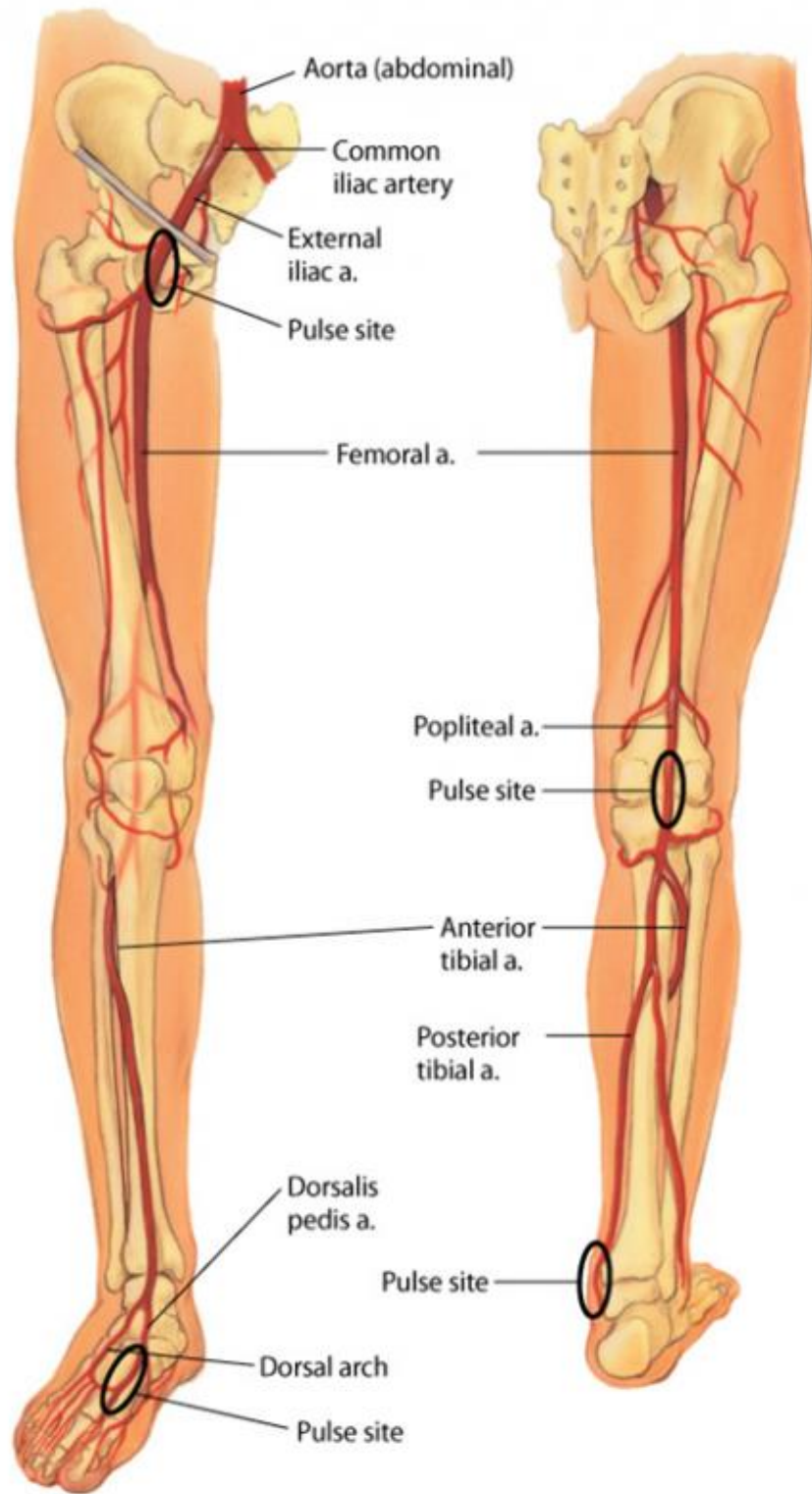
- What happens on the right side:
- Deoxygenated blood is delivered to the RIGHT ATRIUM by the SUPERIOR AND INFERIOR VENA CAVA
- From the RIGHT ATRIUM blood passes through the TRICUSPID VALVE and enters the RIGHT VENTRICLE
- Blood is pumped through the PULMONARY SEMILUNAR VALVE and out the PULMONARY ARTERIES to the lungs to become oxygenated

Back to the heart

- Blood returns from the lungs through the PULMONARY VEINS to the LEFT ATRIUM
- Passes through the BICUSPID VALVE and enters the LEFT VENTRICLE
- Blood is then pumped out through the AORTIC SEMILUNAR VALVE and into the AORTA
- The AORTA pumps blood to the body (systemic circulation) and eventually returns to the heart through in INFERIOR AND SUPERIOR VENA CAVA

The Vascular System and Blood Flow



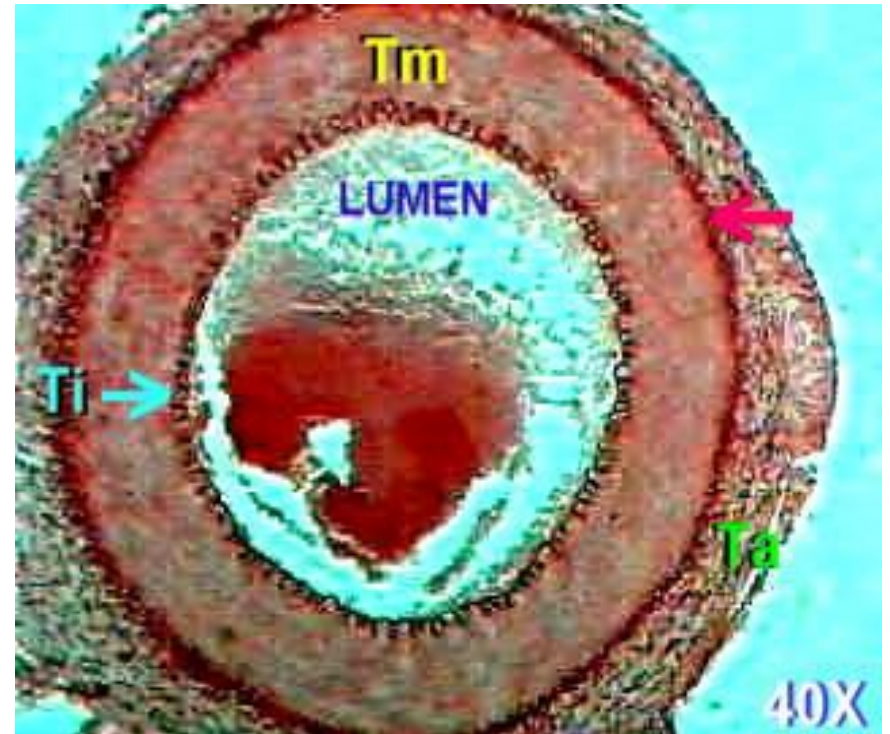


THE VASCULAR SYSTEM AND BLOOD FLOW

- *VASCULAR SYSTEM* is formed by a network of vessels that transport blood throughout the body
- As you follow the path of blood through the body away from the heart, the vessels branch out and get smaller
- Main categories of vessels:
 - Arteries, arterioles, capillaries, venules, and veins

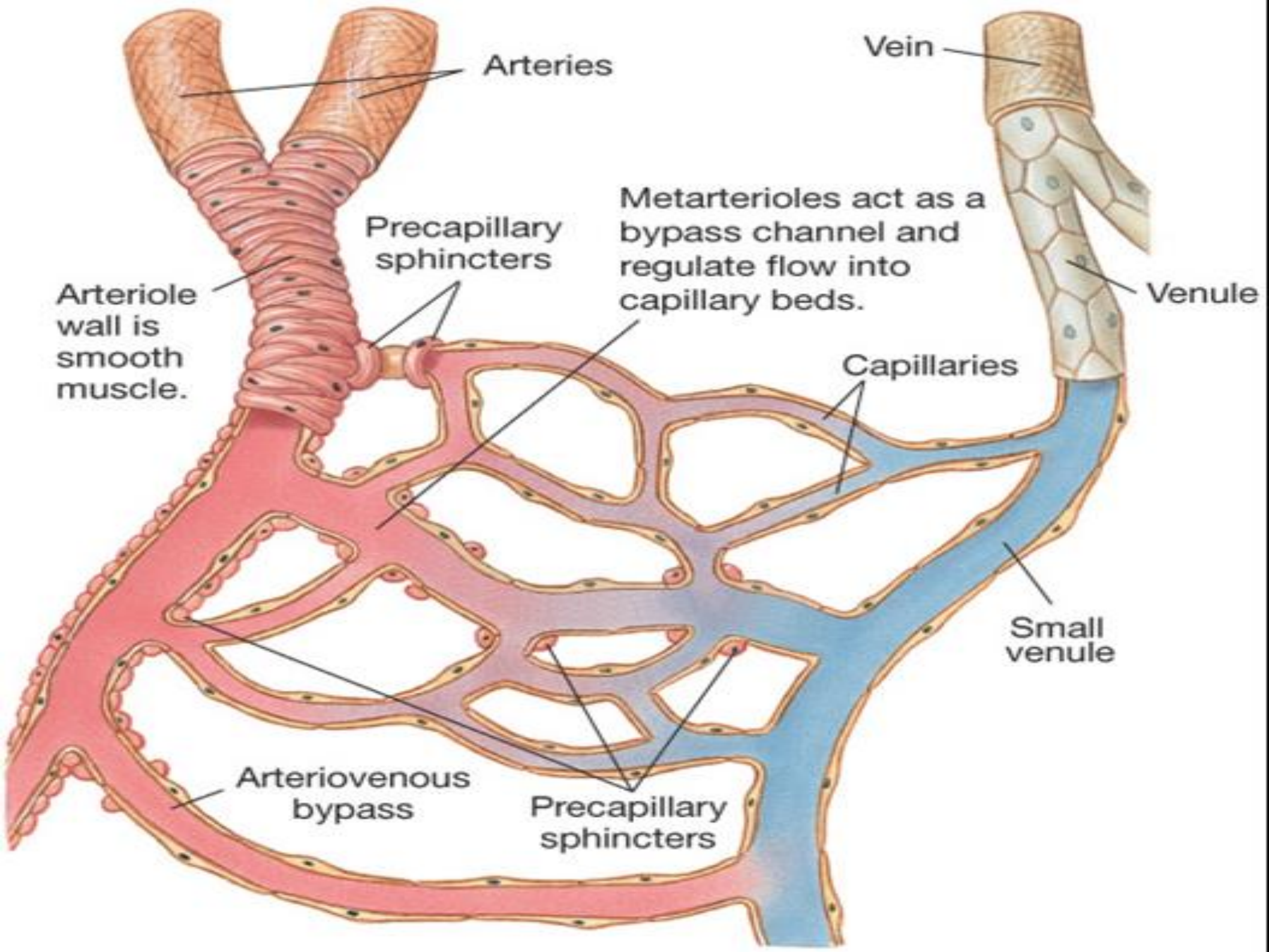
ARTERIES

- Carry blood away from heart
- Thick, muscular walls that are very elastic
- Ability to stretch and recoil is important in assisting the movement of blood during diastole

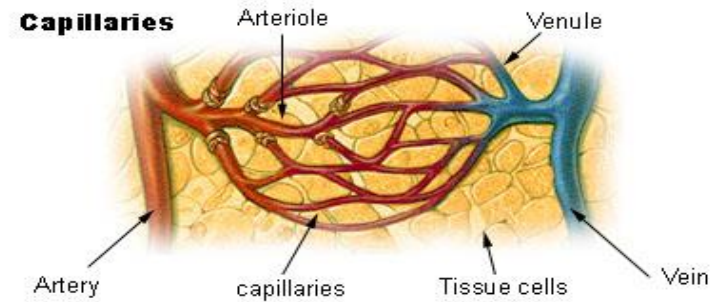


ARTERIOLES

- Smaller than arteries
- Surrounded by rings of smooth muscle that can contract or relax
 - Controlled by the nervous system
- Nervous system can control the distribution of blood flow to different organs using arterioles



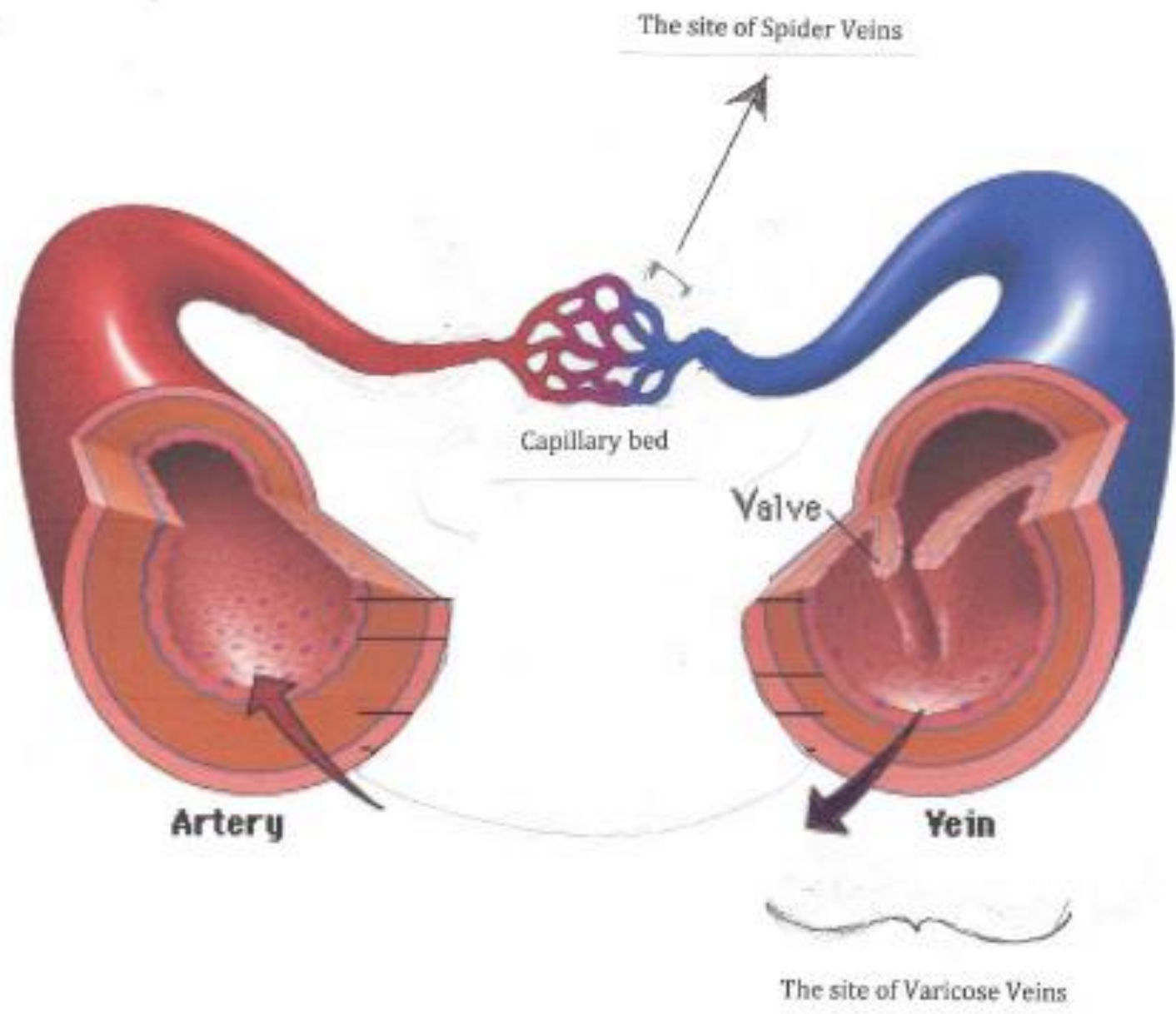
CAPILLARIES



- Smallest vessel
- Walls are very thin – one cell thick
- Location of exchange of gases and nutrients
- Interesting fact: if you were to line up all of the capillaries from one person, they would form a line of more than 40,000 km long.

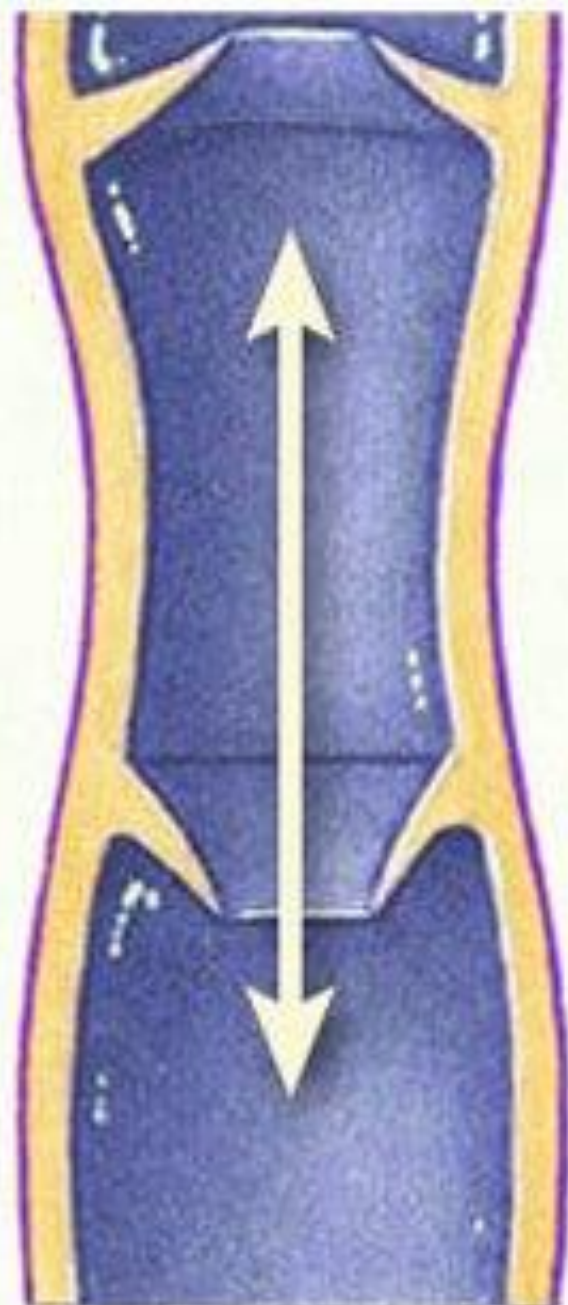
VEIN

- Return blood to the heart
- Become larger as they move away from the capillaries
- Venules --> veins --> vena cava
Carry deoxygenated blood
(except the pulmonary veins)



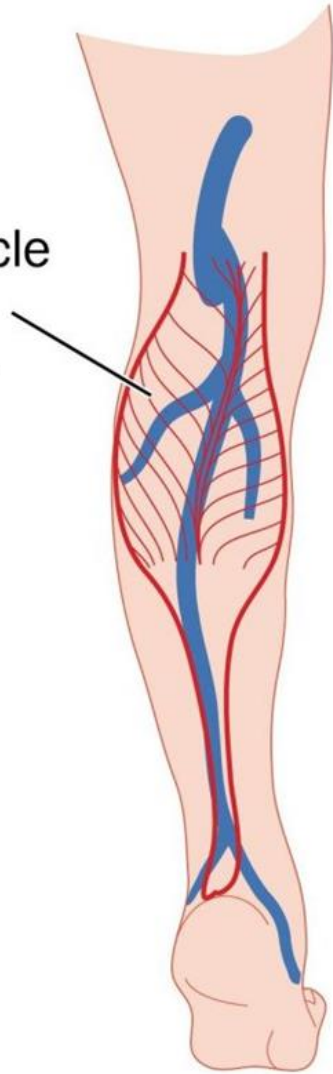


Normal blood flow inside vein

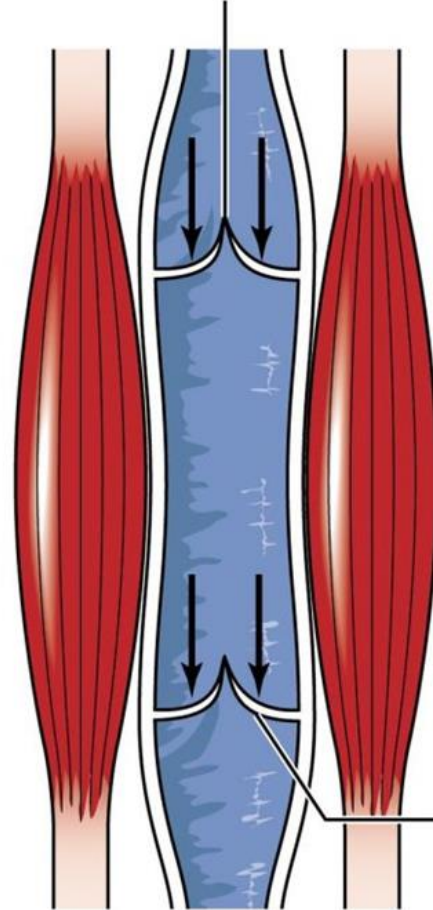


Blood backflows, pools inside vein

Calf muscle acts as pump for deep leg veins

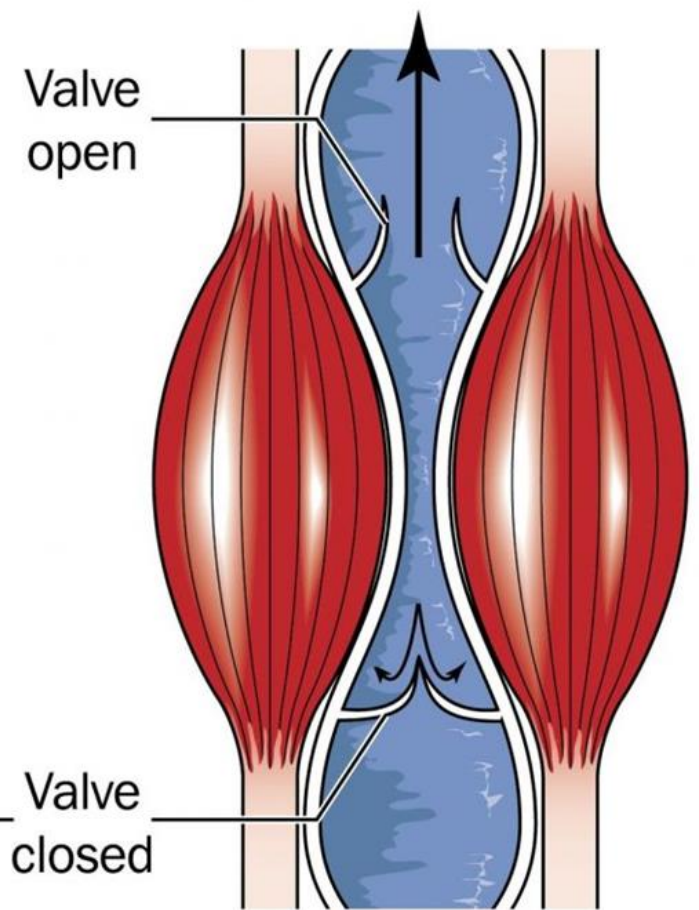


Valves prevent backflow



Calf muscle relaxed

Blood flow caused by muscle contraction



Calf muscle contracted

BLOOD

- Main role is to transport oxygen, carbon dioxide and nutrients
- Two main components: PLASMA and BLOOD CELLS
- PLASMA: fluid component
 - Composed mostly of water
 - Makes up about 55% of blood
 - Within you will find nutrients, proteins, ions, and gases

BLOOD CELLS

- RED BLOOD CELLS – most abundant blood cell
 - Transport O₂ and CO₂
 - Contain a specialized protein called HEMOGLOBIN which can bind O₂ and CO₂
- WHITE BLOOD CELLS – less than 1% of blood
 - Play an important role in protecting the body from disease

PLATELETS

- Incomplete cells
– fragments
- Important in the regulation of blood clotting

