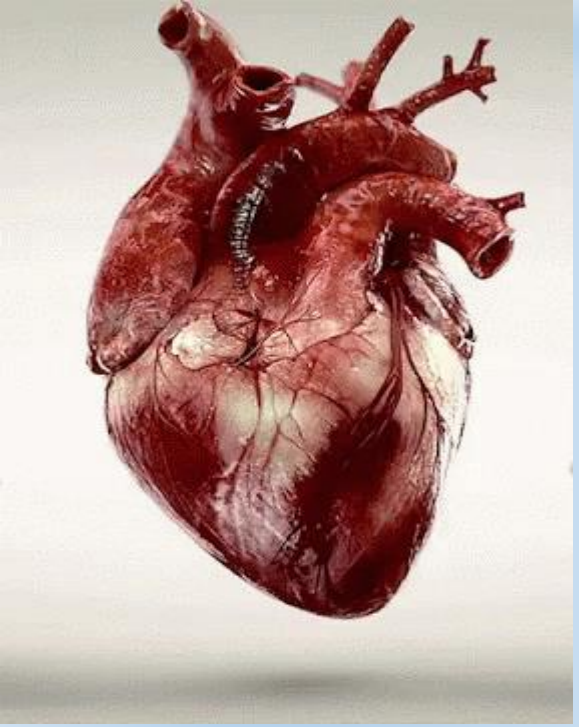


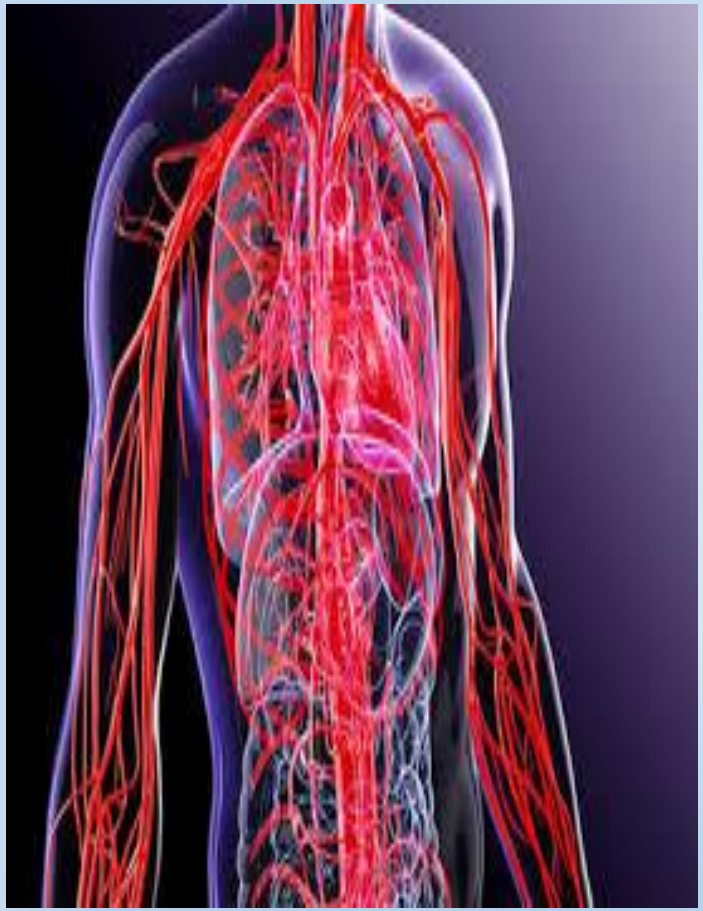
Biology Grade 9

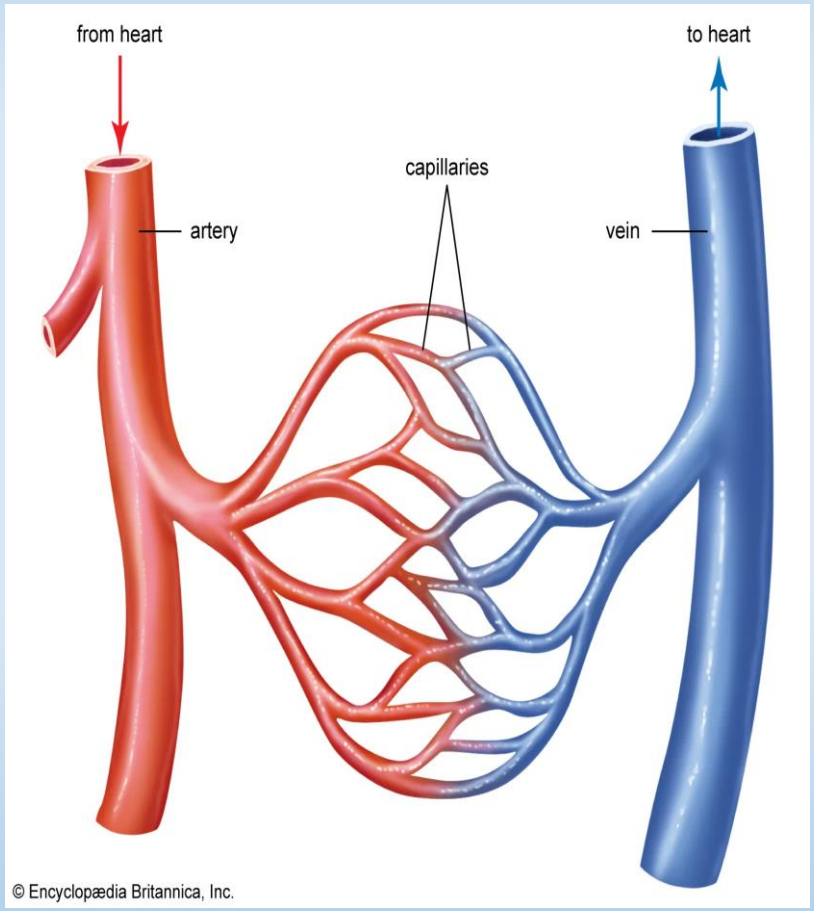
CHAPTER 3: CARDIAC SYSTEM

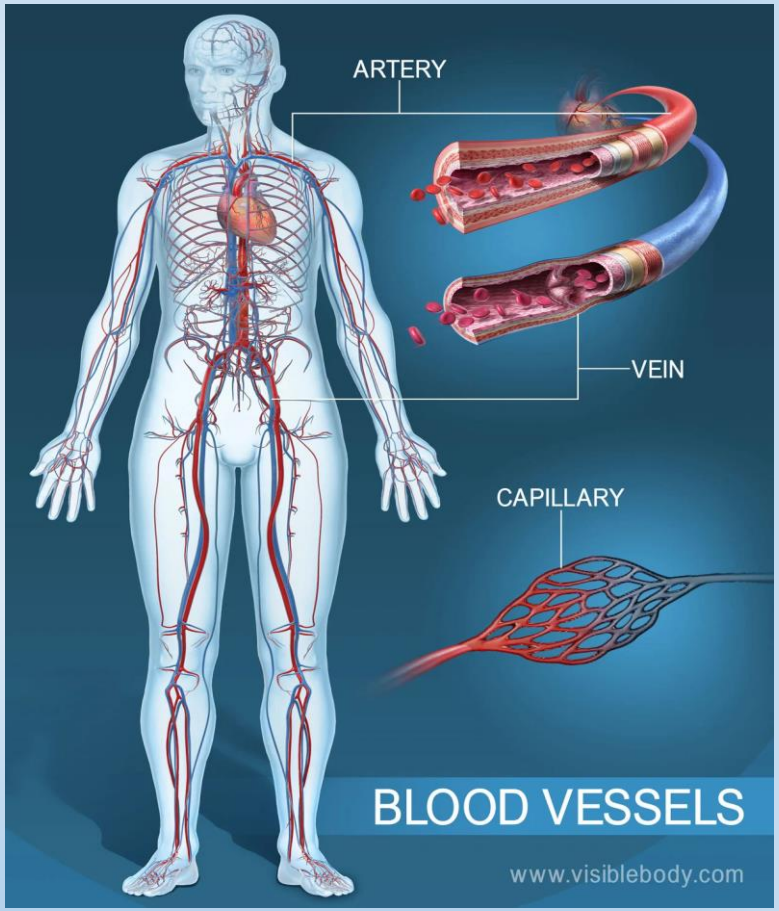
INSTRUCTOR: SUHAIB AUDI

Activity 2: Blood Vessels and the Dynamics of circulation

The distribution of blood should satisfy the needs of organs for oxygen gas and nutrients. To respond to the body needs in these substances, blood circulates in a network of blood vessels with different characteristics.

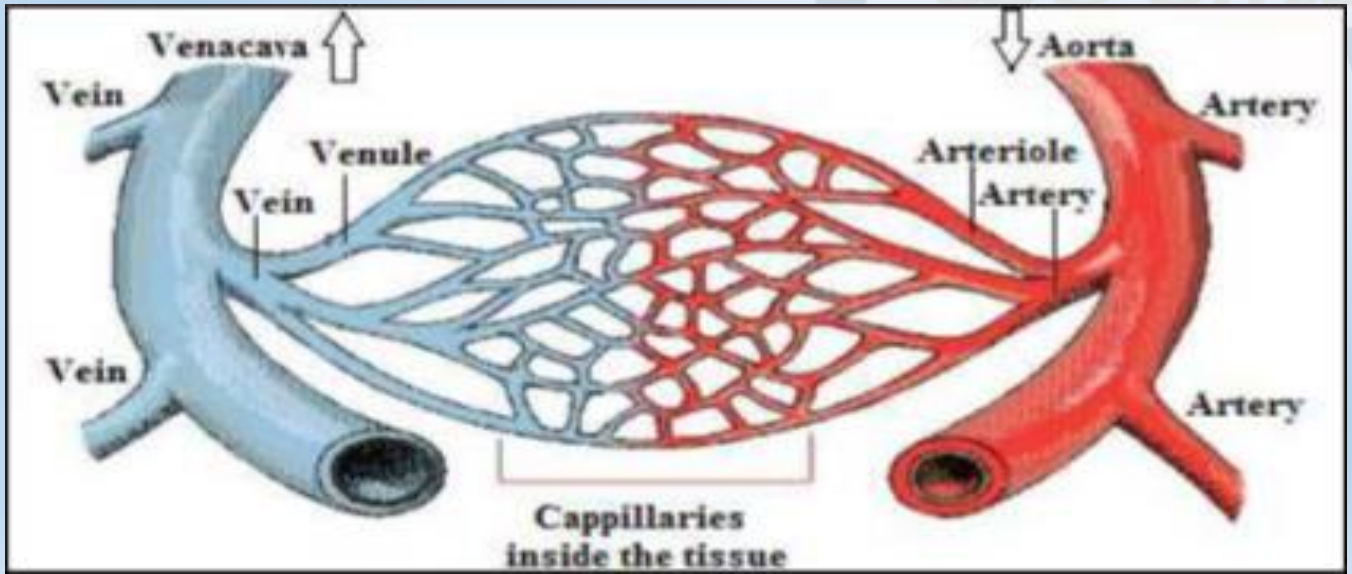


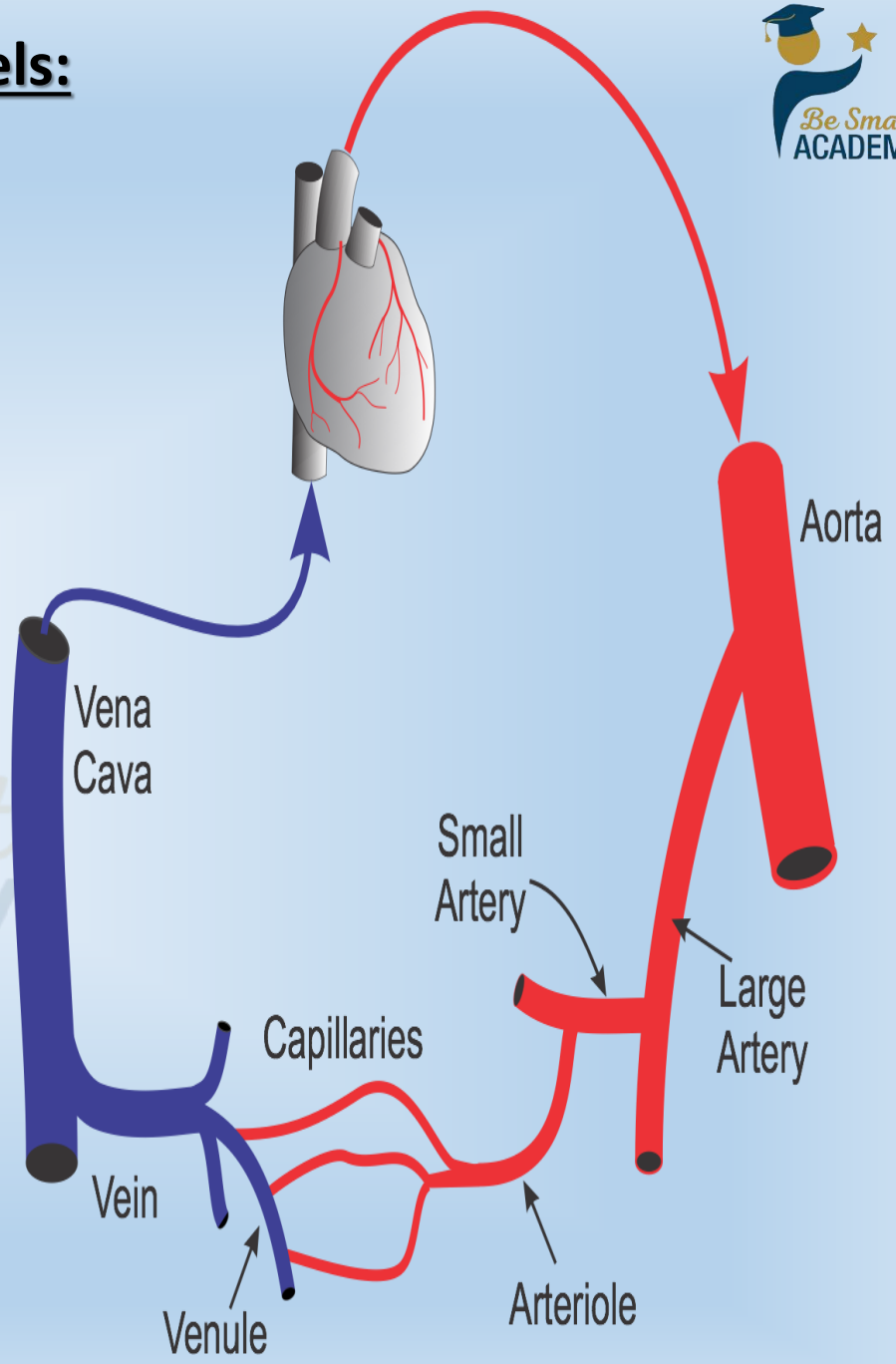




❖ Blood circulates all over the body through blood vessels:

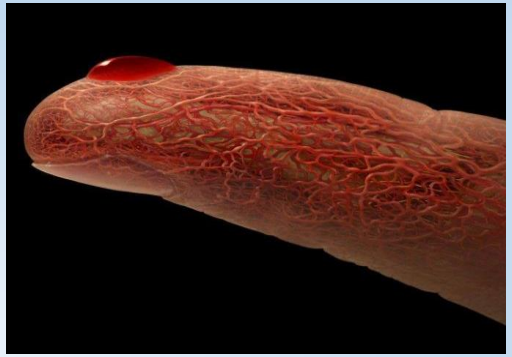
- **Aorta:** carries blood AWAY from the heart.
- **Arteries**
- **Arterioles**
- **Capillaries:** site of exchange.
- **Venules**
- **Veins**
- **Vena cava:** carry blood TO the heart.





1. Name the type of vessels that ensure the continuity between arteries and veins.

The blood capillaries are the blood vessel that insure the continuity between arteries and veins.



2. List the characteristics of vessels that facilitate the exchange between blood and organs.

-Thin wall

-Large surface area

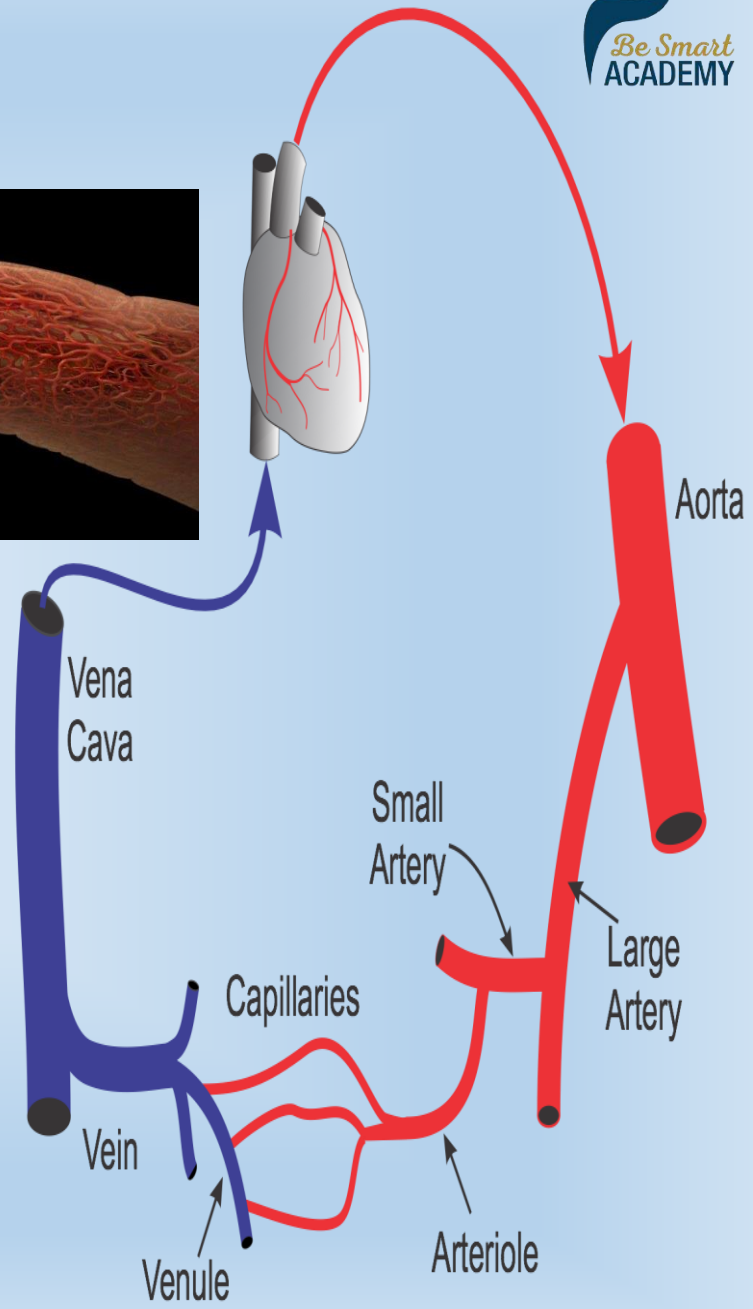
- Narrow diameter

3. Compare the role/function of arteries and veins in the circulatory system.

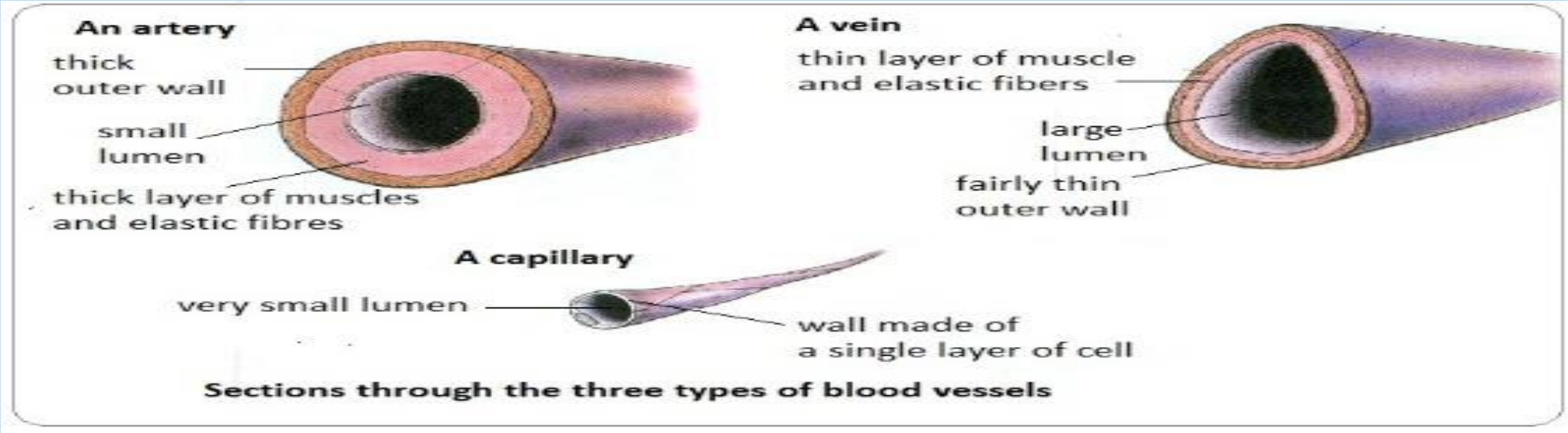
Arteries carry blood away from the heart to other organs whereas veins carry blood from the organs to the heart.

4. Indicate the pathway followed by blood in blood vessels starting from the aorta and ending with vena cava.

Aorta – arteries – arterioles – capillaries – venules – veins – vena cava



❖ Cross section of a vein and an artery observed with naked eye:



Arteries carry blood away from the heart to other organs whereas veins carry blood from the organs to the heart.

1. Distinguish an artery from a vein.

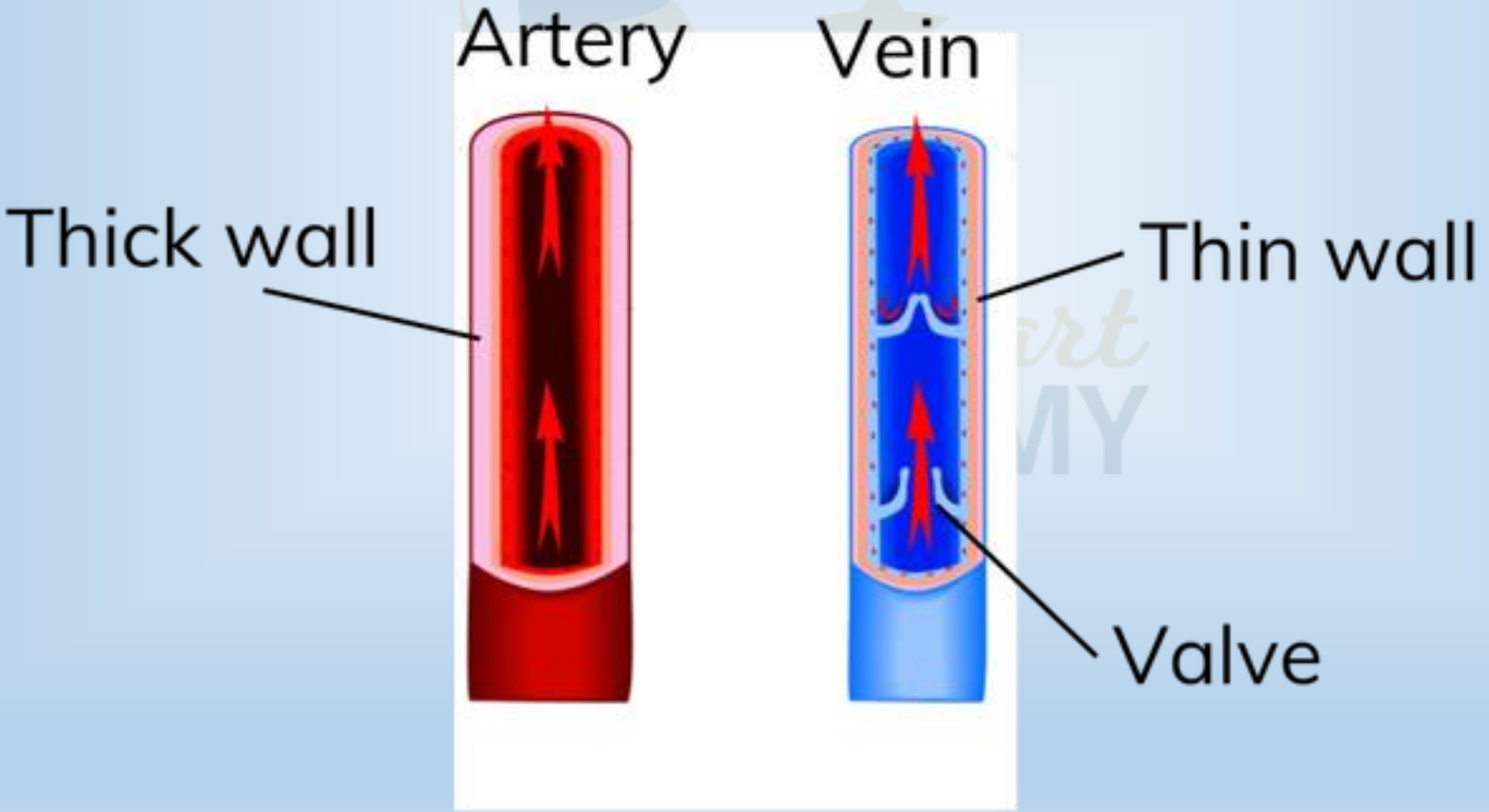
An **artery** has a **thick and elastic wall** because it carries blood under high pressure from the heart. A **vein** has a **thinner and less elastic wall** because it carries blood under low pressure back to the heart.
The **inside (lumen)** of a vein is **wider** than that of an artery.
When cut, an **artery stays open** due to its thick wall, while a **vein appears flaccid (collapsed)** because of its thin wall.

2. Explain why it is important for an artery to have a thick and elastic wall.

An artery has a thick and elastic wall to withstand the high pressure created by the pumping force of the left ventricle.

3- Indicate the largest artery and the largest vein in the human body.

Aorta is the largest artery and vena cava is the largest vein in the human body.



	Artery	Vein	Capillary
Role	• Carries bright (oxygenated) red blood from heart to organs • **Exception: pulmonary artery carries dark red blood (deoxygenated)**	• Carries dark (deoxygenated) red blood from organs to heart • **Exception: pulmonary vein carries bright red blood (oxygenated)**	• Site of exchange between blood and organs
Aspect of wall	Thick	Thin	Very Thin
Diameter of the opening (lumen)	Small	Large	Very small
Pressure	High	Low	Low
Speed	fast	moderate	Very slow
Valves	no	yes	no

❖ Double blood circulation:

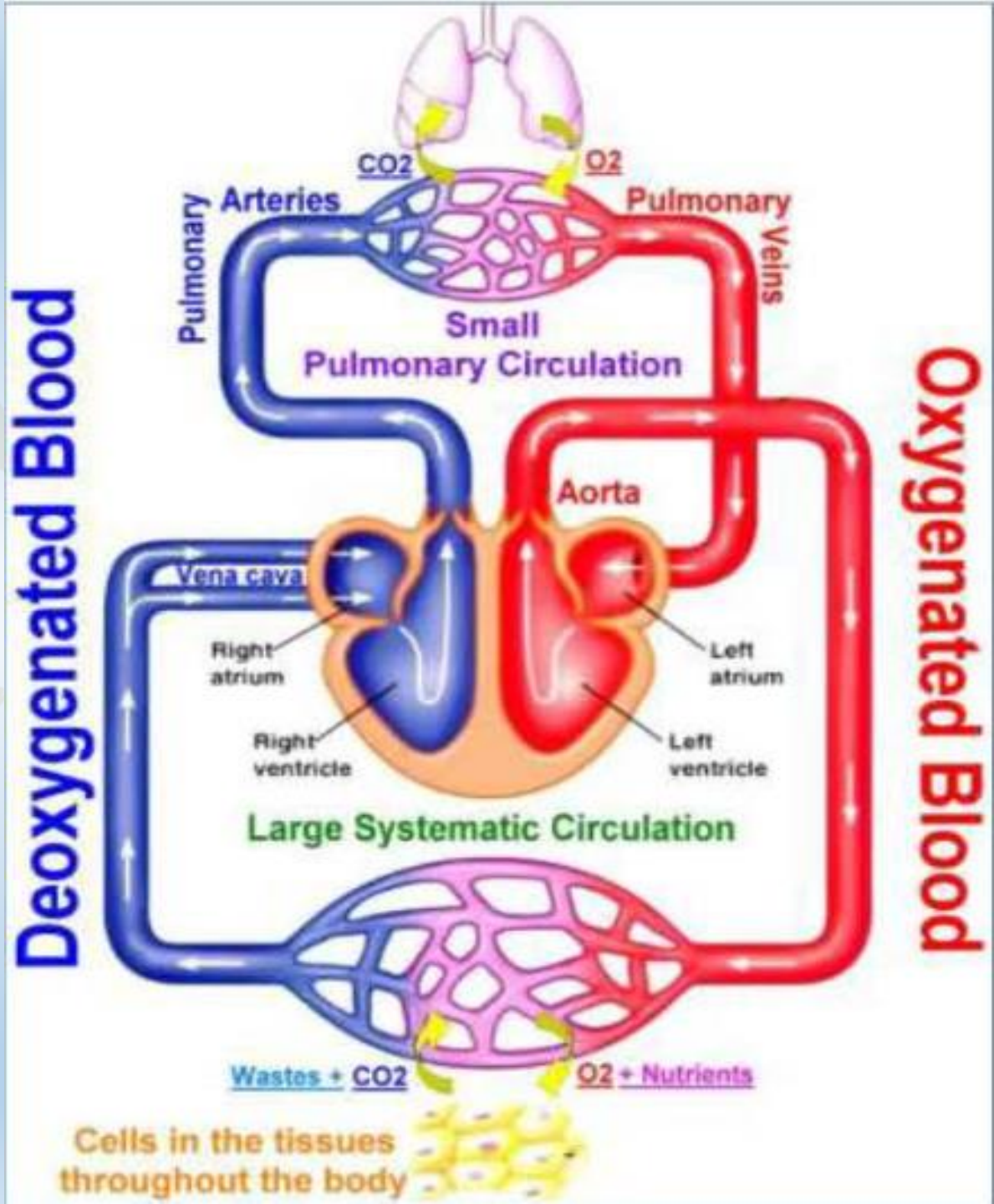
By convention, the red blood corresponds to blood enriched with oxygen gas, and the blue one corresponds to blood enriched with carbon dioxide.

During blood circulation, the heart pumps blood into two closed circuits with each beat.

The two circuits are arranged in series where the output of one becomes the input of the other.

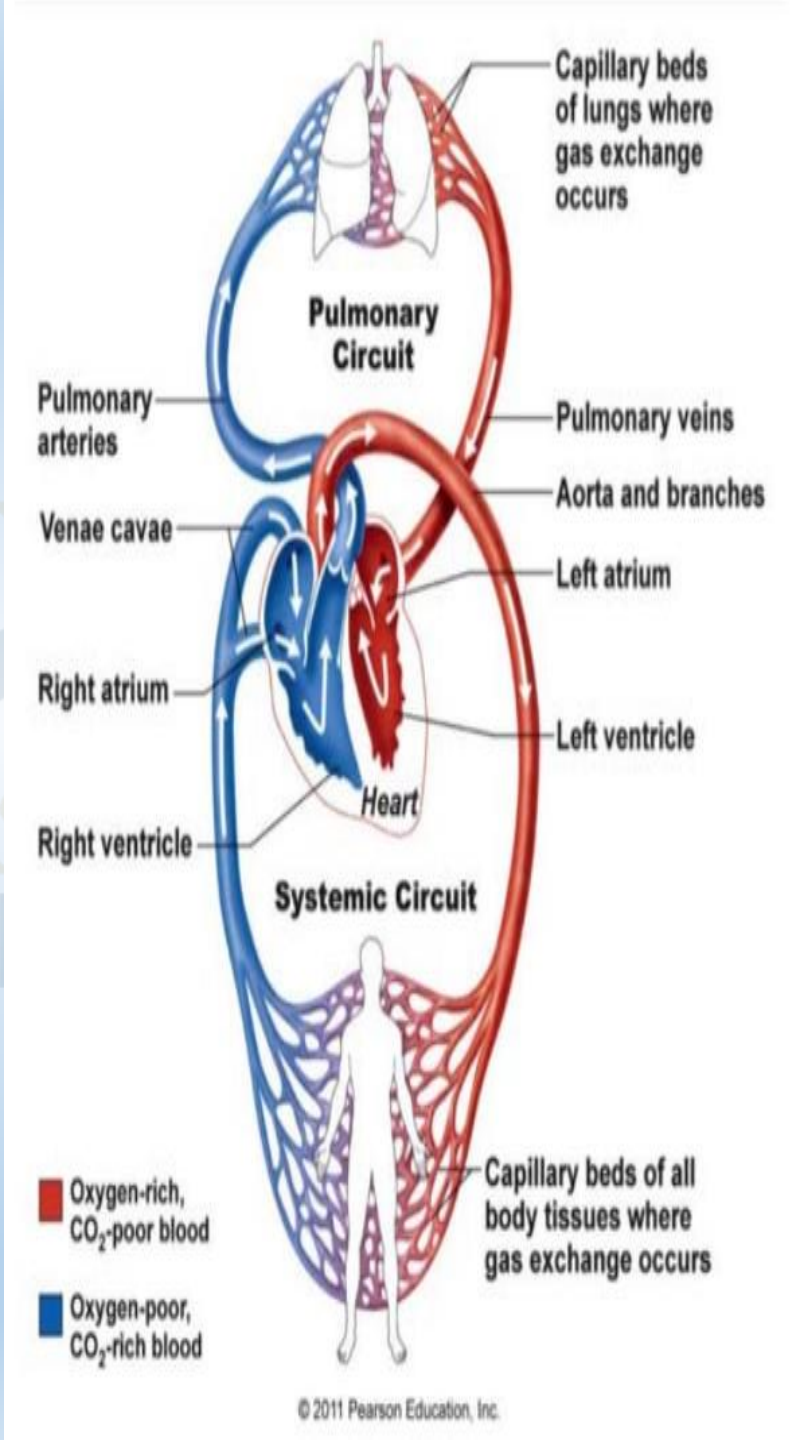
1. Name the two blood circuits.

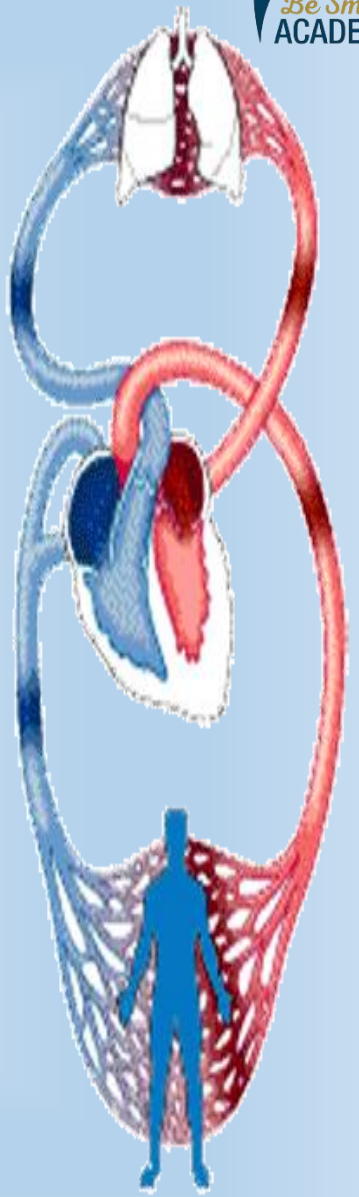
- ✓ **Systemic circulation**
- ✓ **Pulmonary circulation.**



1. Pulmonary circulation (small circulation):

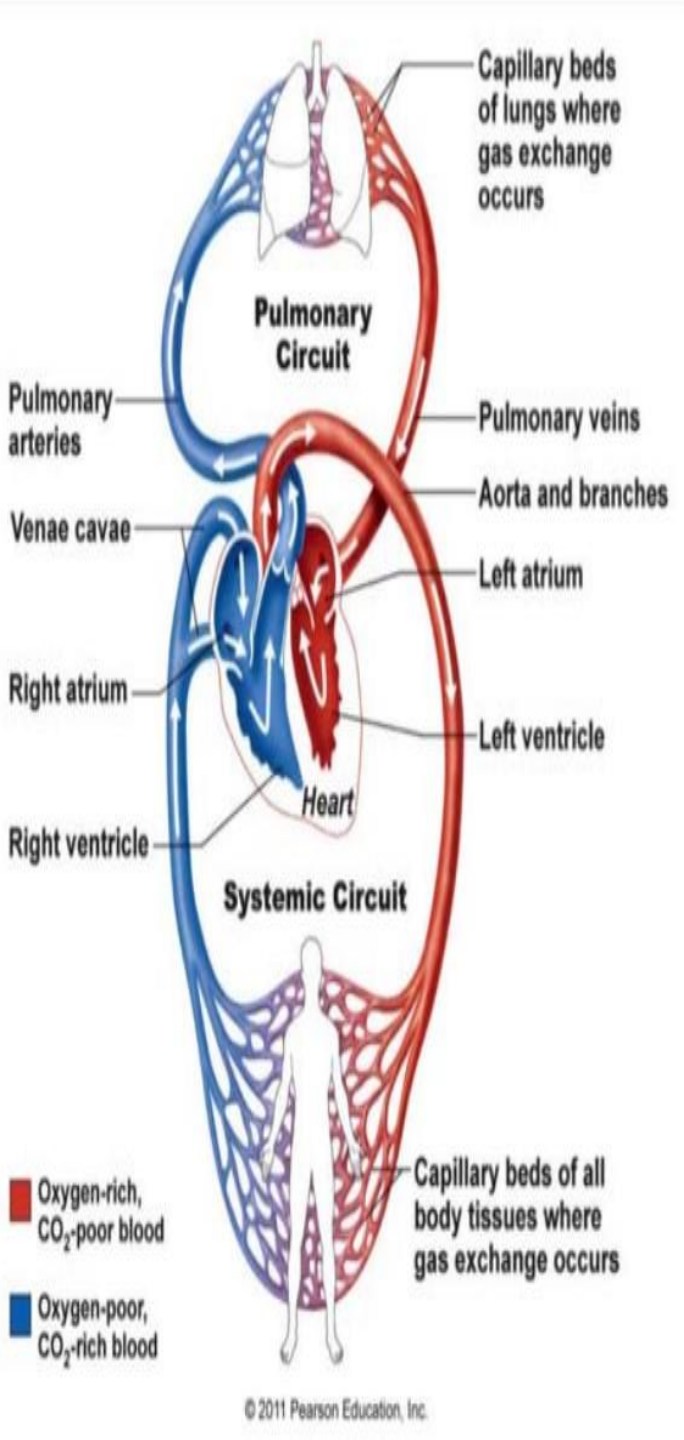
- From the pulmonary artery to the pulmonary veins.
- Function: To oxygenate blood at the level of lungs and to get rid of carbon dioxide.
- Blood rich in CO_2 is pumped from the right ventricle into the pulmonary artery through opened sigmoid valves, the pulmonary artery carries blood to the lungs where the exchange of gases between blood capillaries and alveoli takes place.
- The oxygenated blood goes back to the left auricle (heart) through the 4 pulmonary veins, the left auricle pumps blood to the left ventricle through opened bicuspid valve.

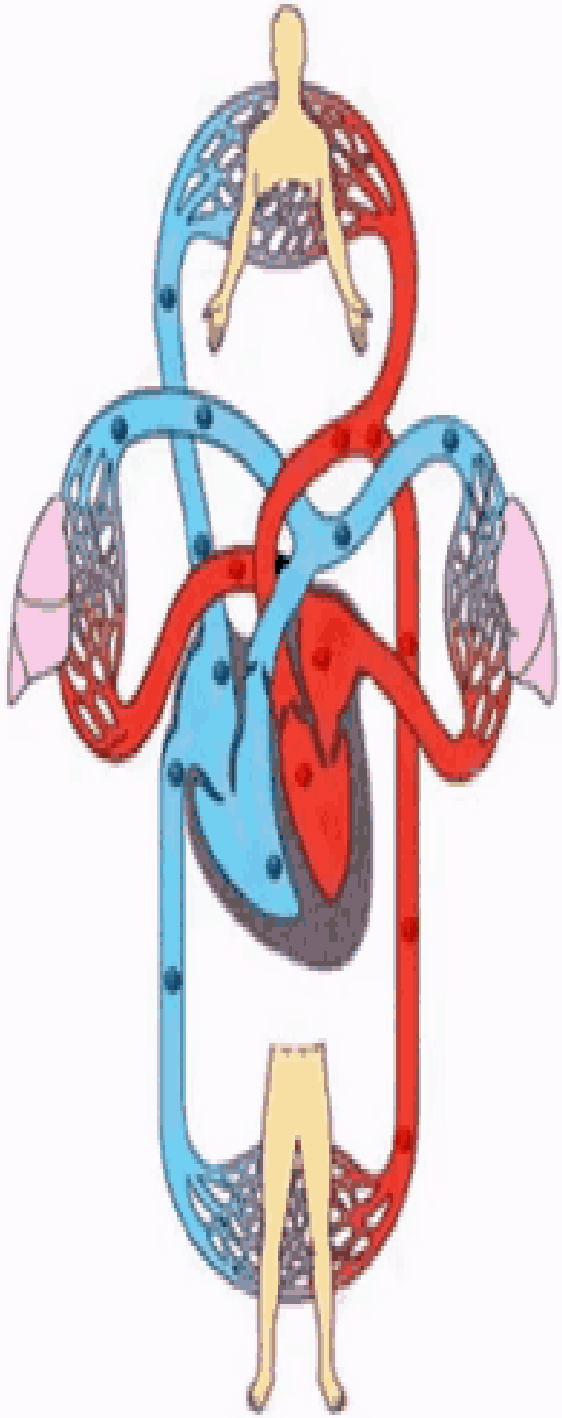




2. Systemic Circulation (big circulation):

- From the aorta to the superior and inferior vena cava.
- Function: To supply body organs with oxygen and nutrients and carries away CO_2 and wastes.
- Blood rich in O2 is pumped from the left ventricle into the aorta through opened sigmoid valve; the aorta carries blood to all the body organs where the exchange of gases between blood capillaries and cells takes place.
- The blood rich in CO2 goes back to the right auricle (heart) through the superior and inferior vena cava, the right auricle pumps blood to the right ventricle through opened tricuspid valve.





- “The heart is often described as a double pump”. Justify this statement.

During systemic circulation, the left side of the heart is the pump of oxygenated blood.

During pulmonary circulation, the right side of the heart is the pump of the deoxygenated blood.