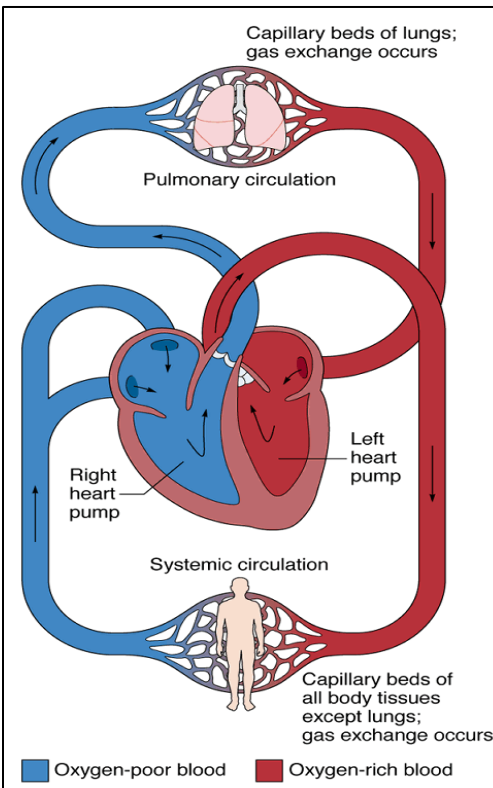


4.3 Review

EQ 1 – What types of muscle help move blood around the body?

The heart is the primary muscle that helps move blood & is made of **cardiac muscle** tissue. It is responsible for the **circulation** of blood & all the materials in it.

EQs 2 & 3 – What is the relationship between the heart and the lungs? What is the pathway of blood in and out of the heart in pulmonary and systemic circulation?



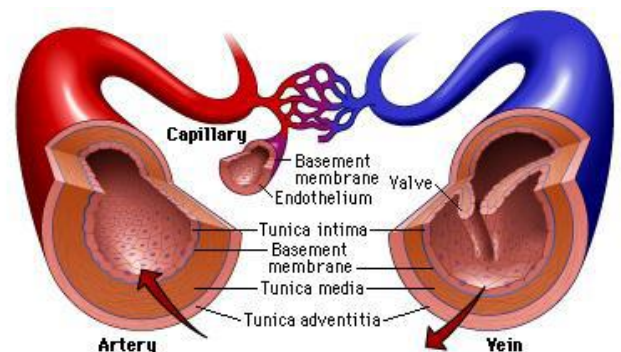
Pulmonary Circulation: The right side of the heart collects deoxygenated blood into its **atrium** & then passes it into the **ventricle**. The right **ventricle** then pushes the blood to the lungs, where the CO_2 is dropped off and O_2 is picked up.

Systemic Circulation: The blood from the lungs comes back to the left side of the heart through the left **atrium**. It then moves into the left **ventricle** and the **ventricle** pushes it out through the **aorta** (biggest **artery**) and into the rest of the **arteries**. The **arteries** carry oxygenated blood to all of the body's tissues. As they reach the tissues, they turn into tiny arteries called **arterioles**, which then become **capillaries**. The **capillaries** are the place where oxygen, nutrients and hormones are dropped off and waste products are picked up. The **capillaries** then turn into **venules**, which turn into **veins**, which come together as the vena cava (biggest **veins**) and carry deoxygenated blood back into the right **atrium** of the heart.

EQs 4 & 5 – How do the structure of arteries, veins, and capillaries relate to their function in the body?

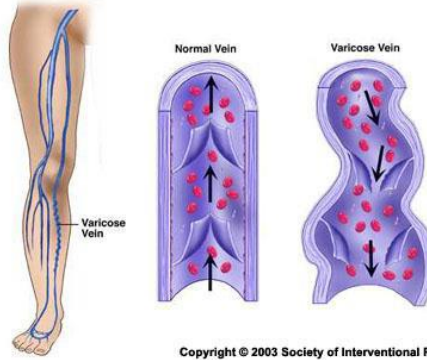
What unique feature of veins help move blood back to the heart?

| Arteries | Capillaries | Veins |
|--|---|---|
| Three layers of thick, fairly rigid walls to allow them to expand/contract & to handle high pressure (blood has greatest pressure as it's leaving the heart)—one layer is smooth muscle . | Thin walled (one cell layer thick) & microscopic in size to allow for the exchange of materials, often have pores to allow movement of materials. | Three layers of elastic/collapsible walls with valves to prevent the backflow of blood as it moves toward the heart— one layer is smooth muscle |



EQs 6 & 7 – What are varicose veins? Why don't we ever hear about varicose arteries?

Varicose veins are big, twisty **veins** near the skin's surface that are caused by weakened **valves**. When the **valves** don't work (keep blood moving), blood collects in the **veins** and the pressure builds up, causing them to become weak, large and twisted. They can run in families, but are also caused by age, being overweight and standing for long periods of time.



Arteries don't do this because they have higher pressure in them & therefore do not need **valves** to keep the blood moving.

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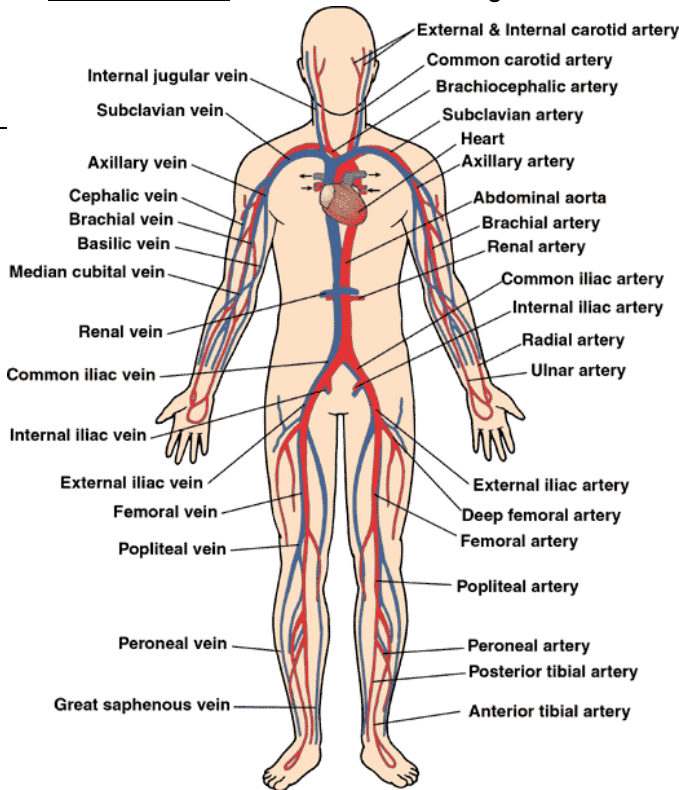
EQ 8 – What are the major arteries and veins in the body and which regions do they serve?

Major Arteries

- **Aorta** – branches to all other arteries in the body
- **Coronary**– runs across the ventral side of the heart; nourishes heart muscle
- **Pulmonary**– transport blood from heart to lungs
- **Subclavian** – leads to all arm arteries
- **Brachial** – nourishes upper arm
- **Radial** – lower arm artery
- **Ulnar** – lower arm artery
- **Palmar** – wrist and hand
- **Digital** – nourishes fingers
- **Renal** – nourishes kidneys
- **Iliac** – leads to all leg arteries
- **Femoral** – nourishes upper leg
- **Popliteal** – nourishes knee region
- **Anterior tibial** – nourishes lower leg

Major Veins

- **Superior Vena Cava** – returns deoxygenated blood from neck and head to heart
- **Inferior Vena Cava** – returns deoxygenated blood from areas below the shoulders to the heart
- **Internal jugular** – returns blood from head/face to superior vena cva
- **Pulmonary** – transport blood from lungs to heart
- **Subclavian** – returns blood from arms to heart
- **Dorsal venous network** – returns blood from the lower arm
- **Cephalic** – returns blood from the lateral side of the arm
- **Basilic** – returns blood from the medial side of the arm
- **Renal** – returns blood from kidneys
- **Common iliac** – returns blood from legs to inferior vena cava
- **Femoral** – returns blood from upper leg
- **Posterior tibial** – returns blood from lower leg

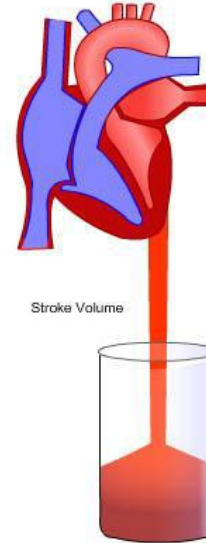


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EQ 9, 10, & 11 – What is cardiac output? How does cardiac output help assess overall heart health? How does an increased or decreased cardiac output impact the body?

Cardiac output is the volume of blood the heart pumps per minute (mL/min) out of the left side. It's calculated by multiplying **heart rate** (beats/min) by **stroke volume** (mL/beat). **Stroke volume** is how much blood is pushed out by the left ventricle with each beat. An average person has a resting heart rate of 70 beats/min and a resting stroke volume of 70 mL/beat, leading to a typical cardiac output of 4,900 mL/min. The total volume of blood in an average person is 5,000 mL (5 L), so the whole volume of blood is pumped through the heart about once each minute. During vigorous exercise, it can increase 4-7 times.

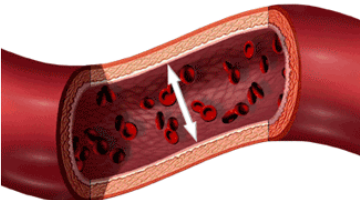
Normal **cardiac output** is needed to move oxygen and nutrients to all the body's tissues. If a person's **cardiac output** is lower than normal, the tissues can suffer or blood pressure can become unhealthy. An increased cardiac output from exercise can help strengthen the heart.



To increase cardiac output
Increase stroke volume
or
Increase heart rate
or
increase both

EQ 12 – What is blood pressure?

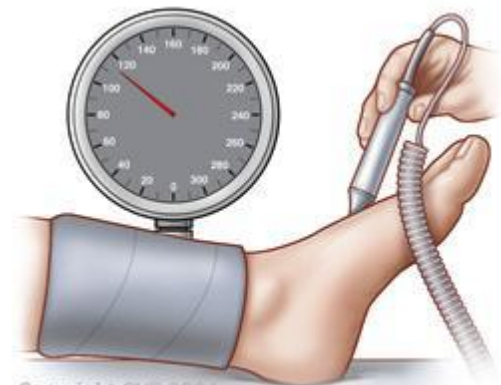
Blood pressure is the measurement of force applied to artery walls



Blood pressure is a measure of how fast the molecules in blood are hitting the walls of the **arteries**. Systolic pressure (top number) is a measure of arterial pressure when the heart contracts while diastolic pressure (bottom number) is a measure of arterial pressure when the heart rests. Blood pressure increases with increased blood volume & with increased **heart rate**. It is an important indicator of cardiac health and should be under 120/80 at rest.

EQ 13 & 14 – How can the measurement of blood pressure in the legs be used to assess circulation? What is peripheral artery disease?

The **blood pressure** in the legs can be taken to measure how well blood is circulating to those limbs. To take the pressure, a person listens to the **pulse** in that region. **Arteriosclerosis** ("abnormal condition of hard arteries") & **atherosclerosis** ("hard arteries due to fat deposits") can both impede blood flow by making the arteries more narrow (that's **atherosclerosis**) and less flexible (that's **arteriosclerosis**). That can lead to **peripheral vascular disease**, in which blood vessels supplying the extremities do not work as well as they should. The most extreme form of **peripheral vascular disease** is **peripheral artery disease (PAD)**, in which there is partial or total blockage of an **artery**, usually one leading to an arm or leg. It causes pain and eventually can even lead to loss of partial or total limbs.



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EQ 15 – Why can smoking lead to peripheral artery disease?



Smoking raises the risk of **atherosclerosis** and therefore the risk of **PAD**. It's thought to do so by:

- Damaging the endothelium (innermost layer of the artery), which allows plaque to build up on the artery walls.
- Reducing the amount of O₂ in the blood

