

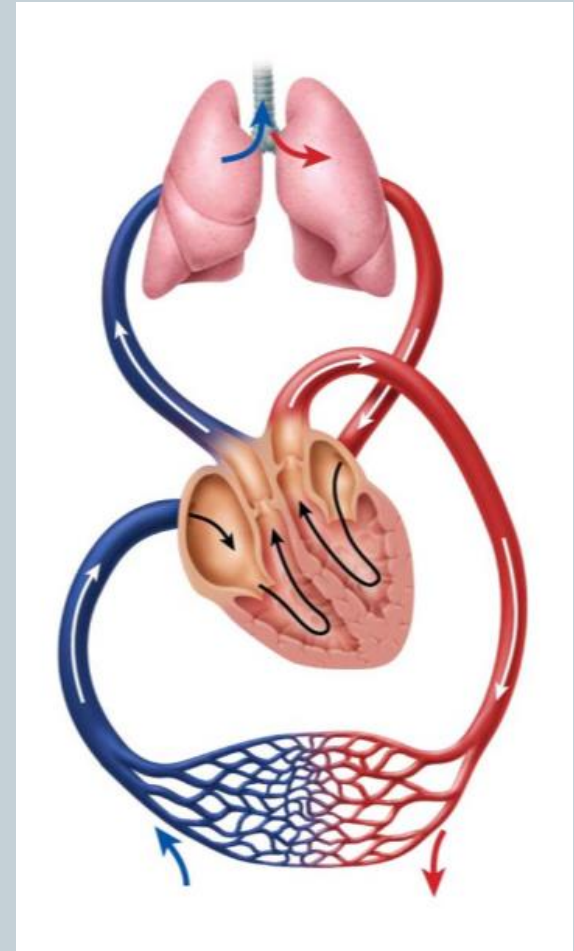
# THE CIRCULATORY SYSTEM



# COMPONENTS



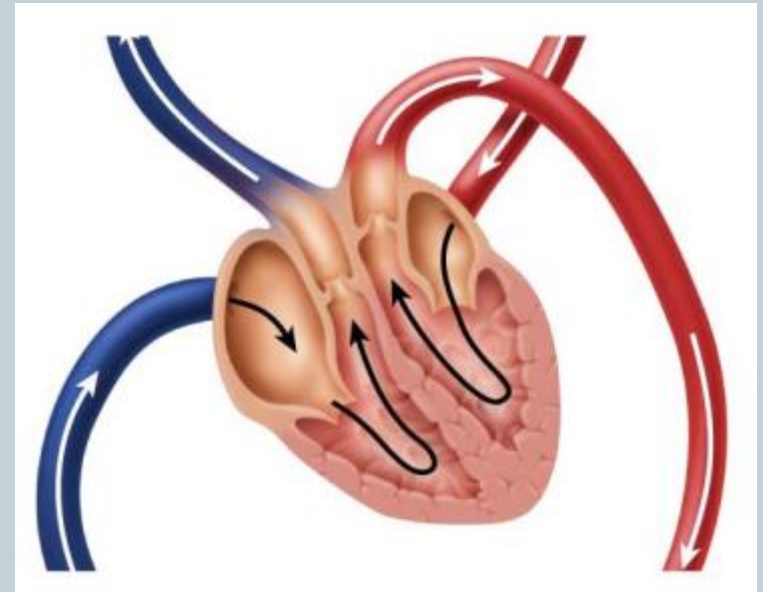
- The human circulatory system is made up of 3 main parts:
  - ✦ The heart
  - ✦ Blood vessels (arteries, veins, capillaries)
  - ✦ Blood



# THE HUMAN HEART



- The human heart is made of 3 types of tissues:
  - ✦ Cardiac muscle tissue
  - ✦ Nerve tissue
  - ✦ Connective tissue
- The cardiac tissue is only found in the heart and contracts to move blood around the heart.

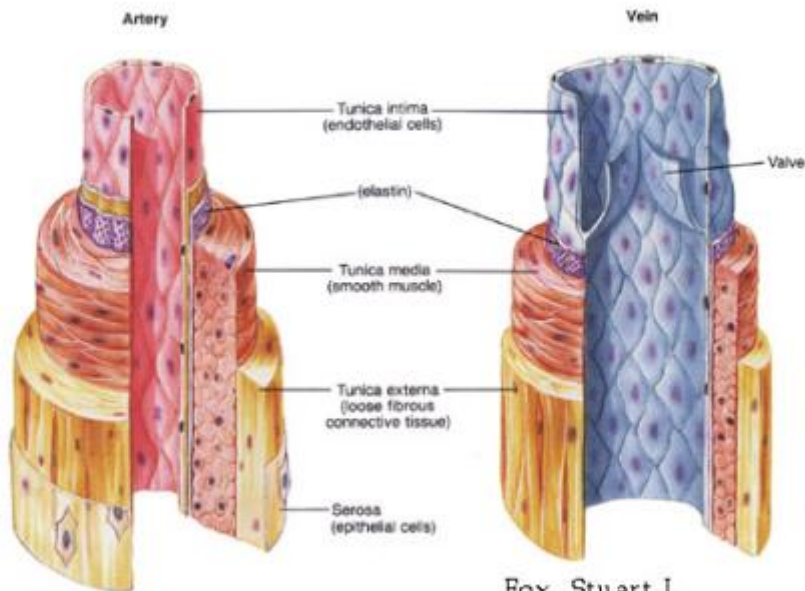


# ANATOMY OF THE HUMAN HEART



- It consists of 2 pumps which move blood through 2 different circuits at the *same time*:
  - ✦ **1. pulmonary - to the lungs**
  - ✦ **2. systemic - to the body**
- Each pump has 2 chambers: an atrium and a ventricle
  - ✦ The **Atrium** is a thin walled chamber that receives blood from the veins and pumps it at low pressure to the ventricle.
  - ✦ The **Ventricle** is a thick walled chamber that receives blood from the atrium and pumps it at high pressure into the arteries.

# BLOOD VESSELS

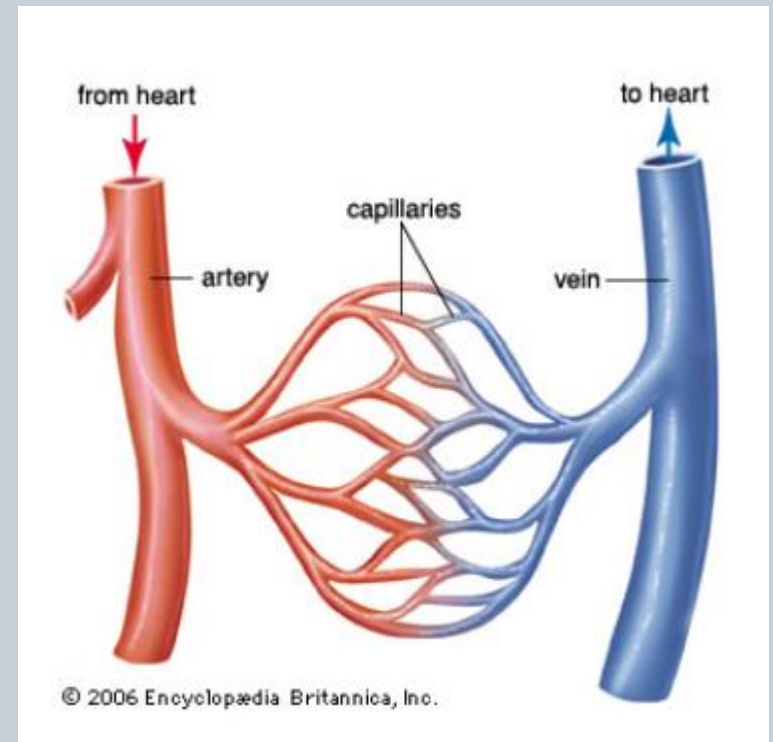


Fox, Stuart I.  
Human Physiology 4th  
Brown Publishers

**Artery**

**Vein**

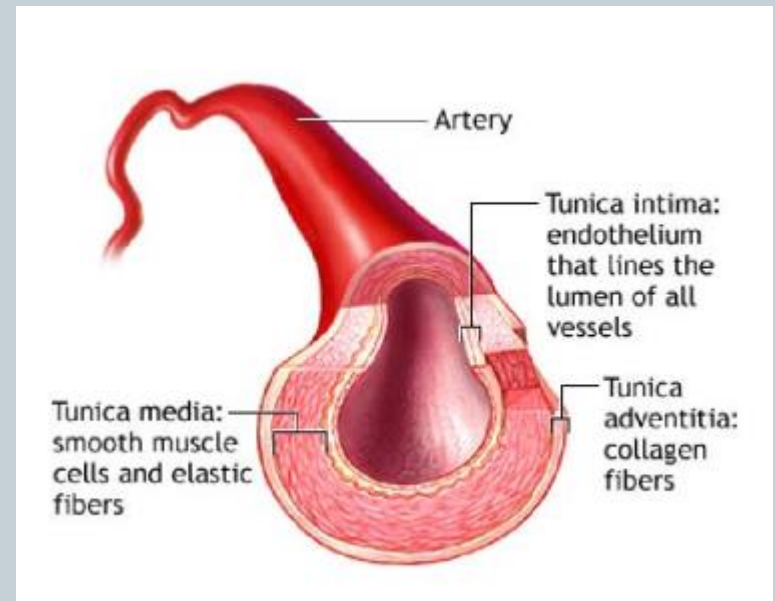
## Capillaries



# ARTERIES



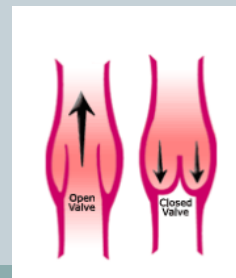
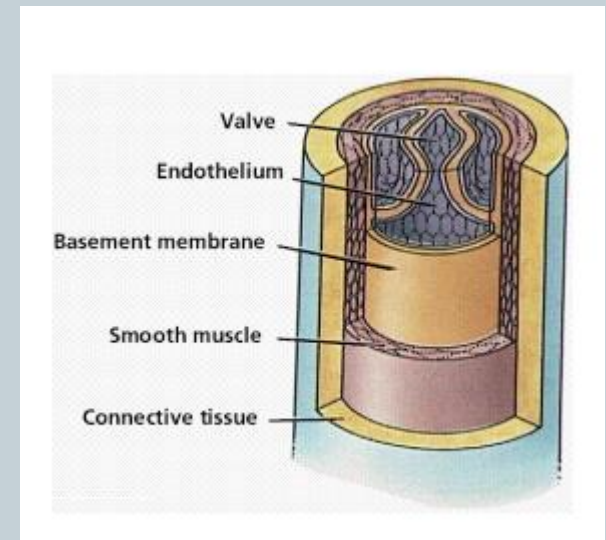
- All arteries take blood **AWAY** from the heart, and most arteries carry oxygenated blood.
- Arteries have a thick layer of smooth muscle and elastic tissue to withstand the large pressure generated by contraction of the heart.



# VEINS



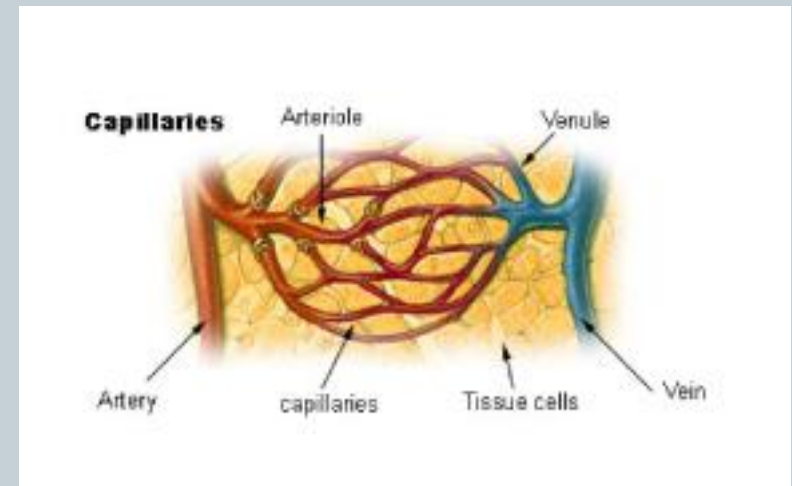
- Veins always move blood **TOWARD** the heart, and most veins carry de-oxygenated blood.
- Veins have relatively thin walls compared to arteries because the blood is under a much lower pressure in the veins. Veins also contain valves to prevent backflow.



# CAPILLARIES



- Capillaries are thin vessels, only one cell thick, and can have a diameter so thin that only one RBC (Red Blood Cell) can pass through at a time.
- Capillaries link arteries with veins.
- Capillaries are where the blood exchanges materials (CO<sub>2</sub>, O<sub>2</sub>, water, ...) with individual cells.





# BLOOD



- **Blood is a specialized bodily fluid containing tissues (blood cells) that deliver necessary substances to the body's cells (such as nutrients and oxygen) and transports waste products away from the body's cells.**
- Blood also helps to regulate body temperature (heat exchange).

## Facts:

- - average human has **5 litres of blood (females have 4.5L, males have 5.6L)**
- - blood contains ***cells and dissolved materials***
- - it carries vital substances to all parts of the body
- - There are four main Blood types: A, B, AB and O (as well as Rh+ and Rh-).

# COMPONENTS OF BLOOD



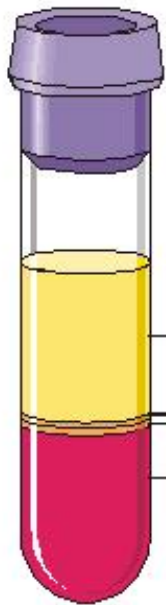
- **Plasma** is the liquid part of blood which comprises 54% of blood by volume
- **Red Blood Cells** (RBC) / erythrocytes transport oxygen and make up 45% of blood
- **White Blood Cells** (WBC) / leukocytes make up the immune system and make up < 1% of blood
- **Platelets** are used for blood clotting and make up < 1% of blood

# WHERE DO BLOOD CELLS COME FROM?



- Blood cells are **made in the bone marrow from stem cells and then specialize to become the different types of blood cells.**
- \* bone marrow is the soft, spongy material in the center of the bones.
- (bone marrow actually produces 95 percent of the body's blood cells)

# CENTRIFUGED BLOOD



**Plasma**- liquid part of blood. A dilute solution of salts, glucose, amino acids, vitamins, urea, proteins and fats.

**White blood cells**- involved in immune system.

**Platelets**- involved in blood clotting.

**Red blood cells**- involved in carrying oxygen.



# DISEASES AND DISORDERS OF THE CIRCULATORY SYSTEM



- Many conditions affect the function of the circulatory system. The most common heart problem is coronary artery disease, which can lead to a heart attack.
- Coronary arteries are the blood vessels that carry blood to the heart muscle. When coronary arteries become completely blocked, the heart muscle no longer receives the oxygen it needs to function. The heart then stops and the tissue begins to die. Medical attention is needed immediately.

# HEART ATTACK

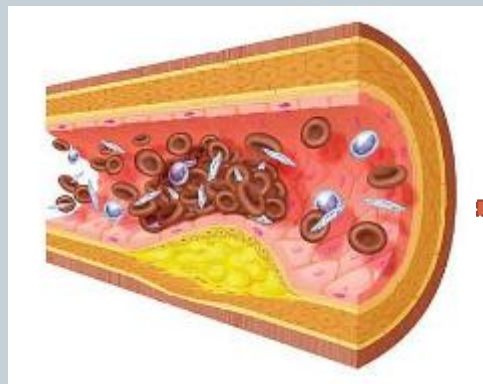


- When coronary arteries become completely blocked and heart muscle cells no longer receive the oxygen and nutrients it needs. The heart stops beating and the heart tissue begins dying.
- Symptoms of heart attack include the following:
  - Chest pain or pressure
  - Shortness of breath
  - Nausea
  - Anxiety
  - Upper body pain
  - Abdominal or stomach pain
  - Sweating
  - Dizziness
  - Unusual fatigue
- Actual symptoms vary between individuals and even men and women!

# ARTERIOSCLEROSIS



- A general term for several conditions in which the walls of the arteries thicken and lose their elasticity. The most common type is called atherosclerosis in which plaque (fatty deposits, calcium, and fibrous tissues) builds up on the inside of the walls.



# PREVENTION



- **Atherosclerosis may lead to angina (chest pain), blood clots, shortness of breath, heart attack, or heart failure.**
- Healthy lifestyle choices such as:
  - exercise (increases HDL, the good cholesterol)
  - not smoking (smoking increases the bad cholesterol
  - LDL, constricts the walls of the artery, makes blood clot
  - and the carbon monoxide inhaled may also damage the
  - walls of the artery)
  - eating a diet low in unhealthy fats (trans fats)
  - eating a diet high in vegetables and fruit
- ...can help reduce the risk of developing this condition