ملخص وشرح الدرس الأول System Circulatory الجهاز الدوري

موقع المناهج ⇦ المناهج الإماراتية ⇦ الصف العاشر المتقدم ⇦ علوم ⇦ الفصل الأول ⇦ الملف

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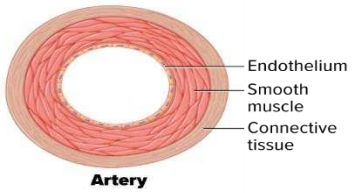
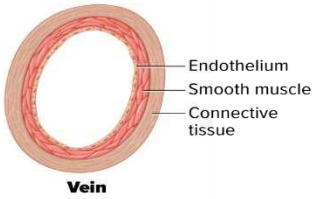
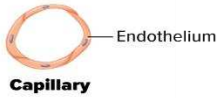
- Blood vessels circulate blood throughout the body and help keep the blood flowing to and from the heart.
- The three major blood vessels are:
  1. Arteries
  2. Capillaries
  3. Veins







Arteries

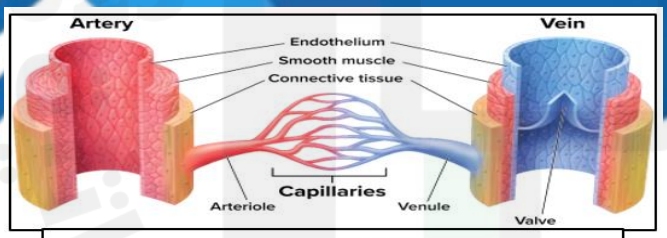
- Oxygen-rich blood (oxygenated) is carried away from the heart in large blood vessels called arteries. They have three layers:
  - Outer layer of connective tissue
  - Middle layer of smooth muscle
  - Inner layer of endothelial tissue
  - The endothelial layer of arteries needs to be thicker because blood is under higher pressure when it is pumped from the heart into the arteries.

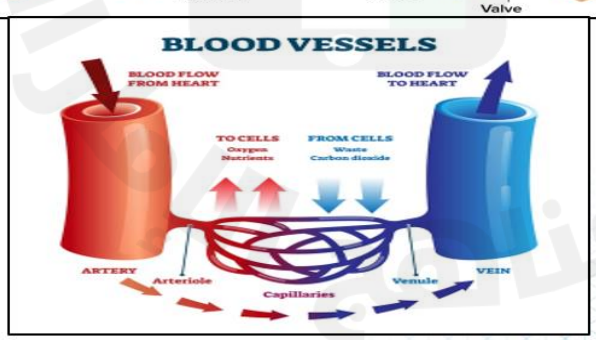
Capillaries

- Capillaries are microscopic vessels in which exchange of substances and wastes occurs.
- The walls are only one cell thick. This permits the easy exchange of materials between the blood and body cells through the process of diffusion.

Veins

- The largest vessels are veins.
- They carry oxygen-poor blood (deoxygenated) back to the heart.
- The endothelial walls of veins are much thinner than the walls of arteries as the pressure of the blood decreases before it enters the veins.
- Skeletal muscle contraction keeps blood moving.
- Larger veins in the body have valves. Valves are tissue flaps that prevent backward flow.
- Breathing movements exert a squeezing pressure against veins in the chest, forcing blood back to the heart.

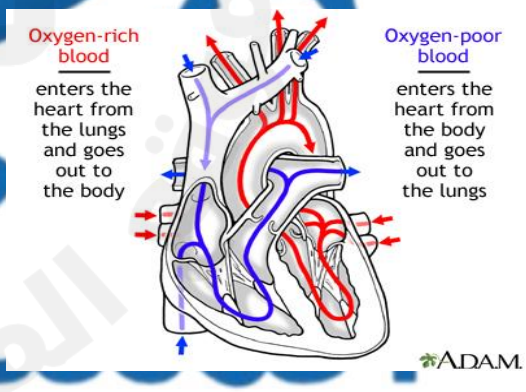




Aspect	Artery	Vein	Capillary
Cross section	 Lumen	 Lumen	 Lumen
Function	To carry blood away from the heart to other parts of the body	To carry blood to the heart	To connect the artery and the vein
Size of lumen	Small	Large	Very small
Wall thickness	Thick, elastic and muscular	Thinner and less elastic	Very thin (one - cell thick)
Blood flow	Very fast, high pressure	Slow, low pressure	Very slow, very low pressure
Type of blood carried	Oxygenated blood (except pulmonary artery)	Deoxygenated blood (expect pulmonary vein)	Carries oxygenated blood to cell body; bring deoxygenated blood out of the cell body
Presence of valve	✕ (except pulmonary artery)	✓ (except pulmonary vein)	✕

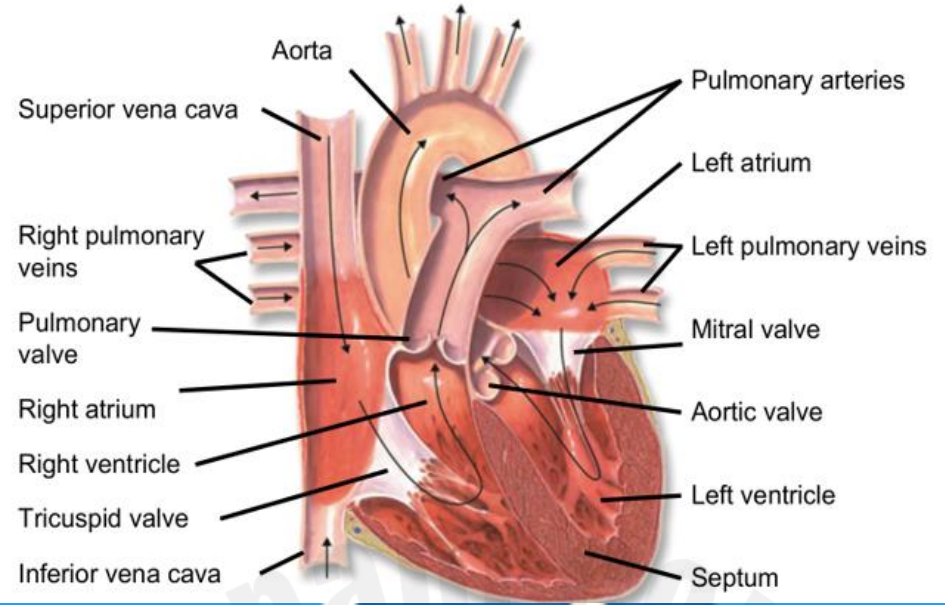
The Heart

- **The heart is a hollow, muscular organ that pumps blood throughout the body.**
  - **It pumps oxygenated blood to the body.**
  - **It pumps deoxygenated blood to the lungs.**



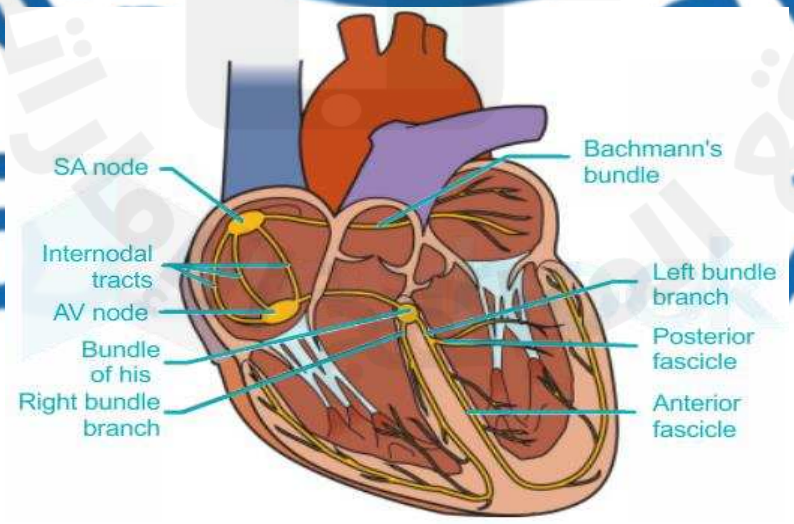
Structure of the Heart

- The heart is made of **cardiac muscle**. It is capable of conducting electrical impulses for muscular contractions.
- **It is divided into four sections called chambers.**
- **The right and left atrium receive blood returning to the heart.**
- **The right and left ventricles pump blood away from the heart.**
- A strong muscular wall (septum) separates the left side of the heart from the right side of the heart.
- **Valves** separate the atria from the ventricles and keep blood flowing in one direction.
- There are valves located between each ventricle and the large blood vessels that carry blood away from the heart.



How the Heart Beats?

- **In the first phase, the atria fill with blood. Then the atria contract, filling the ventricles with blood.**
- **In the second phase, the ventricles contract to pump blood out of the heart.**
- A group of cells in the right atrium, called the **pacemaker,** or **sinoatrial (SA) node**, **sends out signals that cause both atria to contract.**
- **The signal travels to another area in the heart called the atrioventricular node (AV), causing both ventricles to contract.**
- This two-step contraction makes up one complete heartbeat.



Pulse

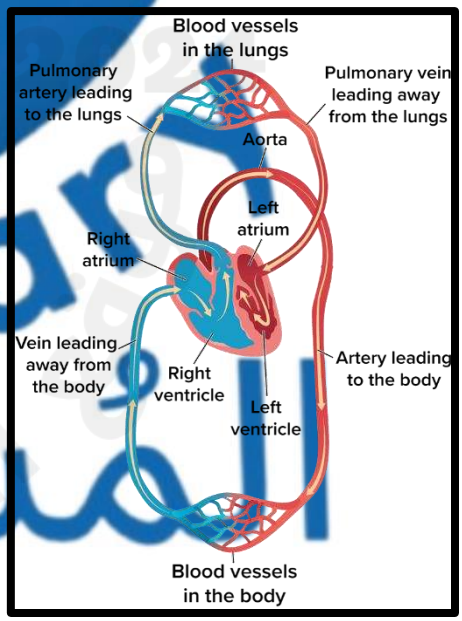
- **The pulse is the alternating expansion and relaxation of the artery wall caused by contraction of the left ventricle.**
- The heart pulses about **70 times each minute**. The number of times the artery in your wrist pulses is the number of times your heart beats.

Blood Pressure

- **Blood pressure is a measure of how much pressure is exerted against the vessel walls by the blood.**
- Blood-pressure readings can provide information about the condition of arteries.
- The contraction of the heart **(systole)** causes blood pressure to rise to its highest point, and the relaxation of the heart **(diastole)** brings blood pressure down to its lowest point
- **The ideal normal blood-pressure reading for a healthy adult is 120 (systolic pressure)/80 (diastolic pressure).**
- Blood pressure is measured using an instrument called a **sphygmomanometer.** When reading the results, the top number is the systolic pressure and the number underneath that is the diastolic pressure.

The Blood Flow

- **Blood flow through the body consists of two different circulatory loops.**
- First loop: the blood travels from the heart to the lungs and back to the heart.
- Second loop: the blood is pumped in another loop from the heart through the body and back.

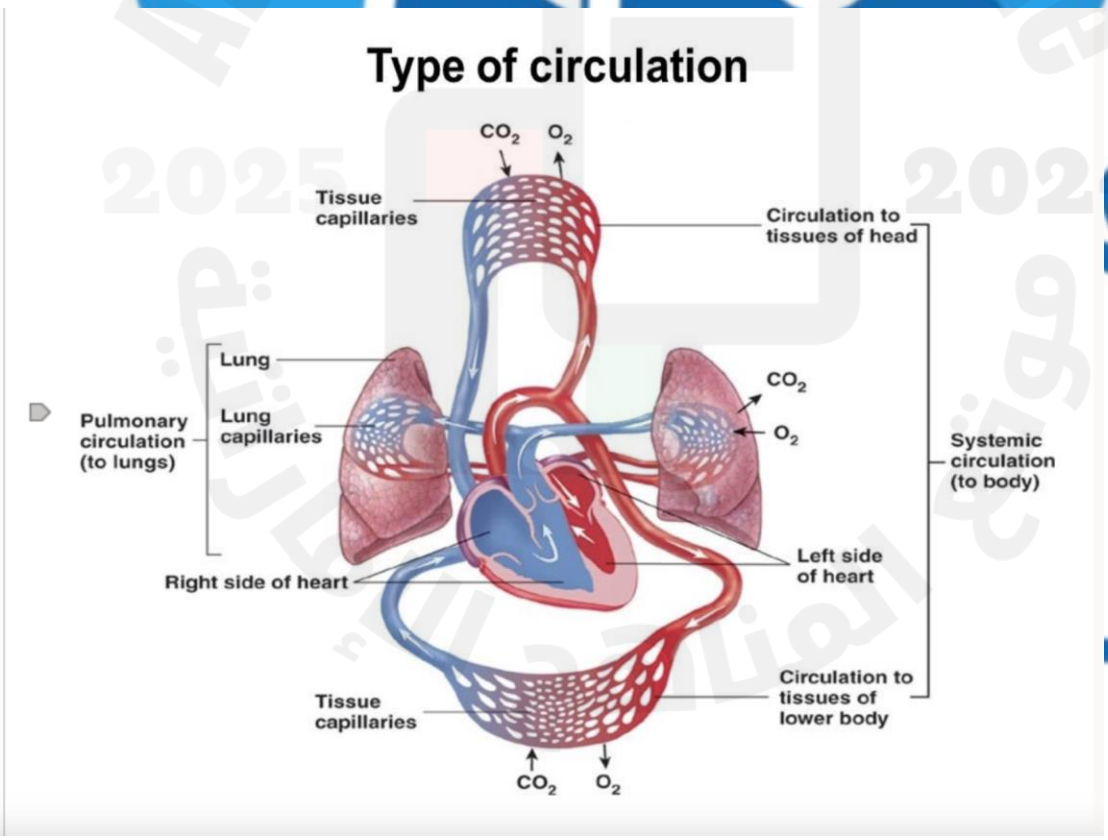


1. To the lungs and back

- Deoxygenated blood flows from the right atrium into the right ventricle and is pumped into the pulmonary arteries that lead to the lungs.
- Blood flows into capillaries in the lungs that are in close contact with the air that enters the lungs. Oxygen diffuses from the lungs into the blood. At the same time, carbon dioxide diffuses in the opposite direction—from the blood into lungs, this is a **gas exchange process.**
- Oxygenated blood flows from the lungs to the left atrium of the heart.

2. To the body and back

- Blood moves from the left atrium into the left ventricle
- The left ventricle pumps the blood into the aorta (the largest artery).
- Blood flows into the capillaries that branch throughout the body. Oxygen is released from the blood into the body cells by diffusion. Carbon dioxide moves from the cells to the blood by diffusion.
- The deoxygenated blood then flows back to the right atrium through veins.



Functions of the Circulatory System

- **The circulatory system is the body's transport system.**
- **Blood carries important substances, such as oxygen and nutrients, to all parts of the body.**
- **It carries waste products, such as carbon dioxide, away from body cells.**
- It also carries disease-fighting materials produced by immune system.
- Blood contains cell fragments and proteins for clotting.
- **It also distributes heat throughout the body to help regulate body temperature.**

Blood Components

- **Blood is made up of a liquid medium called plasma, red blood cells, platelets, and white blood cells.**

Plasma

- **Plasma is the clear, yellowish portion of the blood.**
- **It carries glucose, fats, vitamins, minerals, hormones, and waste products from the cells.**
- More than 50 percent of blood is plasma. 90% of plasma is water, and nearly 10 % is dissolved materials.

Red Blood Cells

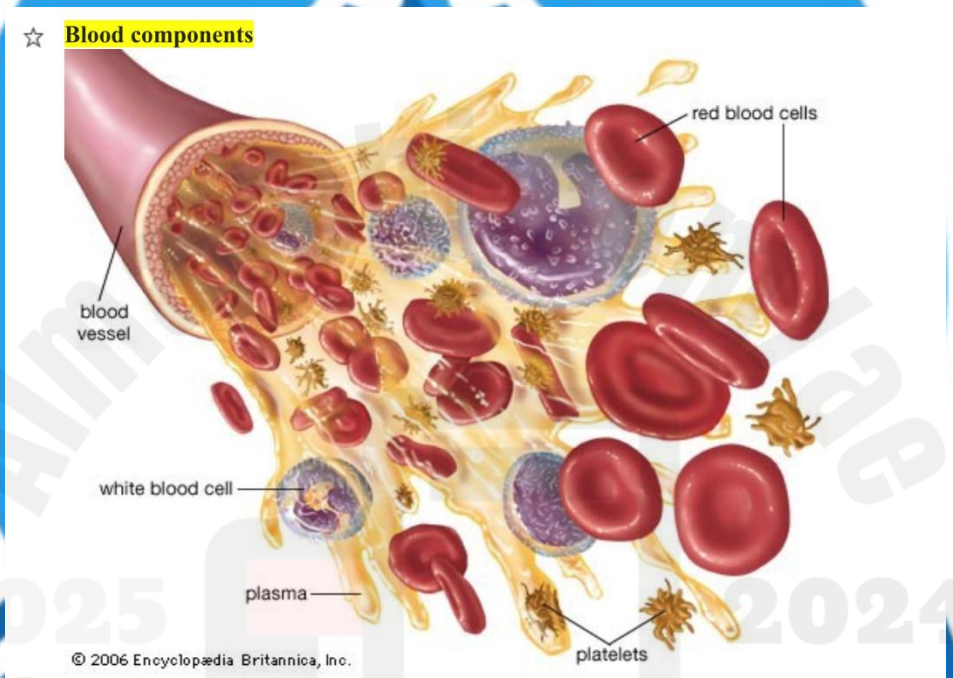
- **Red blood cells carry oxygen to all body cells.**
- Red blood cells resemble discs with pinched-in centers, with no nuclei and develop in the bone marrow. Life span is 120 days.
- **They consist of an iron-containing protein called hemoglobin.**
- **Hemoglobin** binds with oxygen molecules and carries oxygen to the body's cells.

Platelets

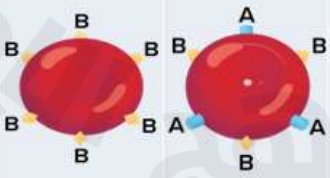
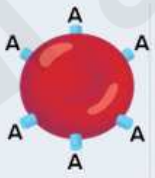
- **Platelets are cell fragments that are important in forming blood clots.**
- They collect and stick to the vessel at the site of a wound.
- Platelets release chemicals that produce a protein called fibrin.
- **Fibrin** is a protein that weaves a network of fibers across the cut that traps blood platelets and red blood cells as shown in the figure.

White Blood Cells

- **The body's disease fighters are white blood cells, which are produced in bone marrow.**
- Some white blood cells recognize disease-causing organisms.
- Others produce chemicals to fight invaders or to surround and kill the invaders.
- Many white blood cells move from bone marrow to other sites in the body to mature.
- White blood cells have nuclei, and most live for months or years and they are fewer than red blood cells.

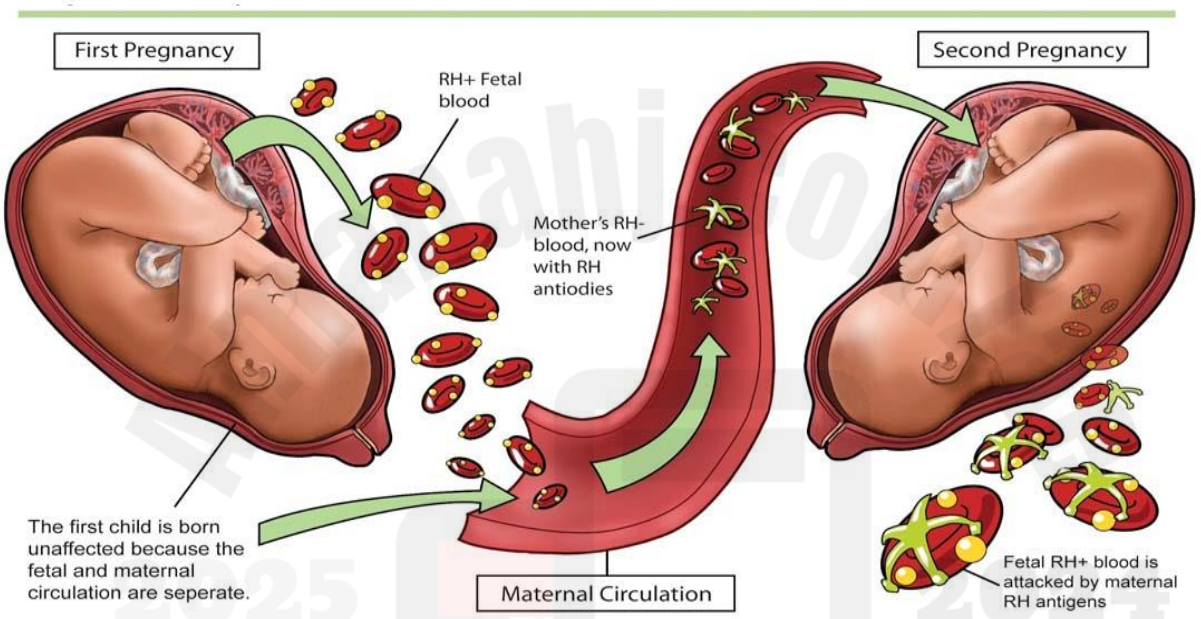


Blood Groups

Blood Type	A	B	AB	O
Marker molecule and antibody	Marker molecule: A Antibody: B	Marker molecules: B Antibody: anti-A	Marker molecules: AB Antibody: none	Marker molecules: none Antibodies: anti-A, anti-B
Example				
Can donate blood to:	A or AB	B or AB	AB	A, B, AB, or O
Can receive blood from:	A or O	B or O	A, B, AB, or O	O

Rh Blood Group

- **The Rh factor is another marker on red blood cells.**
- **It can cause complications during pregnancy.**
- If a fetus's Rh-positive blood mixes with the mother's Rh-negative blood, the mother will make anti-Rh antibodies.
- During another pregnancy, these antibodies can cross the placenta and destroy red blood cells if the fetus has Rh-positive blood.



Circulatory System Disorders

- Blood clots and other matter (fat deposits) can reduce the flow of blood travelling through the arteries.

1- **Atherosclerosis is the condition of blocked arteries.**

- When blood flow is reduced or blocked, the heart must work even harder to pump blood, and vessels may burst.
- **Atherosclerosis can lead to a heart attack or stroke.**

2- **Heart attack occurs when blood does not reach the heart muscle, can result in damage to the heart, and can even result in death if not treated.**

3- **Stroke occurs when clots form in the blood vessels that supply oxygen to the brain. This can lead to ruptured blood vessels and internal bleeding. The brain die because brain cells are deprived of oxygen.**

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