Department of biology

Department of Biology

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animal physiology

Stage (-3-)

LEC ((5))

Circulatory system

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Cardiovascular System

The cardiovascular system (CVS) is the transport system of the body.

CVS supplies nutrients to and removes waste products from various tissues of the body.

Components :

- **Heart**
- **Blood Vessels**
- **Blood (flows in a close tubular system)**

Function of the Cardiovascular System

Transport nutrients, hormones

- **Remove waste products**
- **Gaseous exchange**
- **Immunity**
- **Blood vessels transport blood, carry oxygen and carbon dioxide also carry nutrients and wastes**
- **Heart pumps blood through blood vessels**

Heart

•The heart is a cone-shaped, muscular organ located in the thoracic cavity between the lungs behind the sternum.

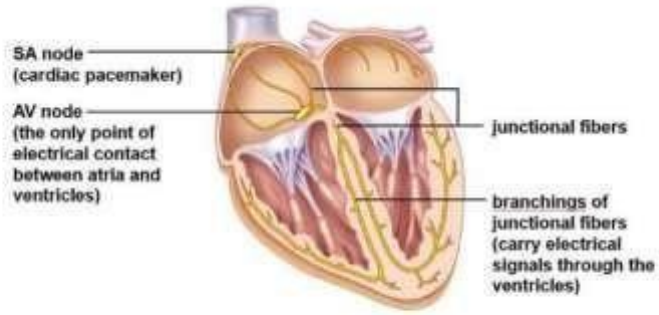
•The pericardium is the outer membranous sac with lubricating fluid.

•The heart has four chambers: two upper, thin-walled atria, and two lower, thick-walled ventricles.

The septum is a wall dividing the right and left sides.

•Atrioventricular valves occur between the atria and ventricles; the tricuspid valve on the right and the bicuspid (mitral) valve on the left.

•The valve between the right ventricle and pulmonary trunk is the pulmonary semilunar valve. The valve between the left ventricle and the aorta is the aortic semilunar valve



Heart Conduction System

The Cardiac Cycle

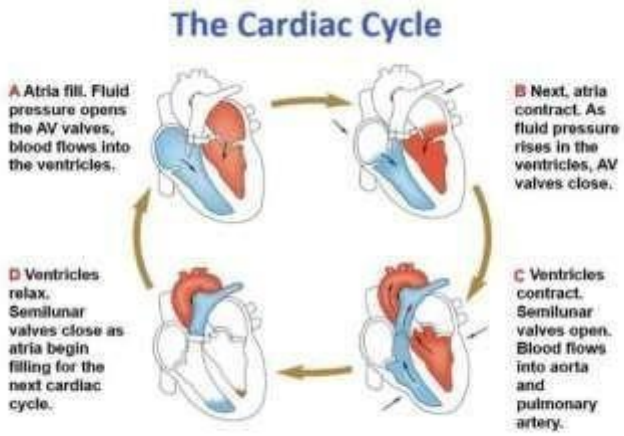
•Cardiac cycle: Heart muscle alternates between diastole (relaxation) and systole (contraction)

–Blood collects in the atria

–AV valves open, blood flows into ventricles

–Contraction of the ventricles drives blood circulation

–Ventricles contract with a wringing motion from bottom to top



How the Heart Beats (intrinsic control of the heartbeat)

•Cardiac pacemaker **(Sinoatrial node, SA node)**

–A clump of noncontracting cells in the right atrium's wall spontaneously fires action potentials.

Cardiac conduction system

–Signal spreads from SA node to the AV node **(atrioventricular node)** and junctional fibers in the septum, so the heart contracts in a coordinated fashion.

✓A normal resting heart rate for adults ranges from **60 to 100** beats per minute.

✓**Bradycardia:** This is an irregularly slow heart rate below 60 beats per minute.

✓**Tachycardia:** This is an irregularly fast heart rate of more than 100 beats per minute.

Heart Conduction System

Extrinsic Control of Heartbeat

•A cardiac control center in the medulla oblongata speeds up or slows down the heart rate by the way of the autonomic nervous system branches: the parasympathetic system (slows down heart rate) and the sympathetic system (increases heart rate) .

•Hormones epinephrine and norepinephrine from the adrenal medulla also stimulate a faster heart rate.

Blood Vessels

Blood Vessels -A closed network of tubes

These includes arteries, capillaries, and veins

Arteries

–Blood vessels that carry blood away from the heart are called arteries. –

Pumping of the heart sends out blood under pressure to the arteries.

–They are the thickest blood vessels, and they carry blood high in oxygen, known as oxygenated blood (oxygen-rich blood).

Veins

•Blood vessels that carry blood back to the heart are called veins.

•They have one-way valves, which prevent blood from flowing backward

•They carry blood that is high in carbon dioxide, known as deoxygenated blood (oxygen-poor blood). Capillaries

•The smallest blood vessels are capillaries, and they connect the arteries and veins.

This is where the exchange of nutrients and gases occurs .

Pressure, Transport, and Flow Distribution

- Contracting ventricles put pressure on the blood, forcing it through a series of vessels
- Arteries carry blood from the ventricles to the arterioles
- Arterioles control blood distribution to capillaries
- Capillaries exchange substances
- Venules collect blood from capillaries
- Veins deliver blood back to the heart

Blood Circulation

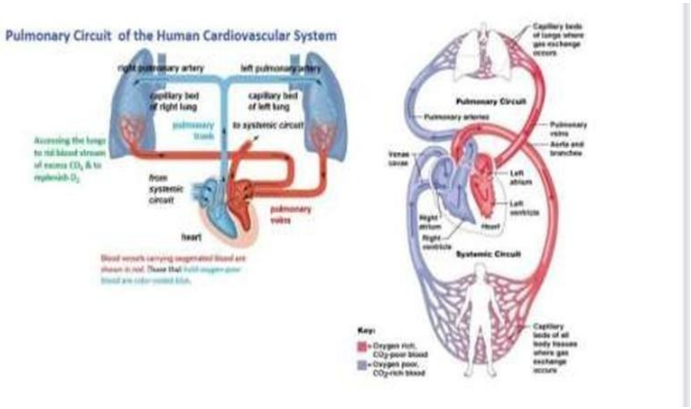
Coronary Circulation:

Coronary circulation is the circulation of blood supply to the heart muscle (myocardium). Coronary arteries supply oxygenated blood to the heart muscle.

Cardiac veins then drain away the blood after it has been deoxygenated.

Pulmonary Circulation

The flow of blood between the heart and lungs. Oxygen-poor blood flows from the heart, through a pair of lungs, then back to the heart. Then, Blood takes up oxygen in the lungs.



Systemic Circulation

Systemic circulation the flow of blood between the heart and the cells of the body. Oxygenated blood flows from the heart (through the aorta) into capillary beds where it gives up O2 and takes up CO2, then flows back to the heart .

Portal Circulation

Portal circulation - returns blood from the digestive tract and spleen to the liver (where raw nutrients in blood are processed before the blood returns to the heart). Transmits deoxygenated blood from most of the gastrointestinal tract and gastrointestinal organs to the liver.