

Examrace

Competitive Exams: Heart

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The heart is a 4 chambered double pump, responsible of circulating oxygenated blood around the body and deoxygenated blood to the lungs. An adult heart pumps about 5 litres of blood per minute. The heart, has 2 upper chambers called atria (singular: Atrium) and 2 lower chambers called ventricles. The heart has 2 pumps and circulates oxygenated and de-oxygenated blood. This is known as double circulation.

Aorta: The largest artery found in the body. It receives oxygenated blood from the heart and then divides into many arteries all around the body.

Vena Cava: The largest vein found in the body. It transports de-oxygenated blood to the heart from the rest of the body. De-oxygenated blood is then transported to the lungs to be oxygenated.

Atrium: One of the upper chambers of the heart.

Tricuspid valve: A valve that lets blood to pass from the right atrium to the right ventricle.

Ventricle: One of the lower chambers of the heart.

Bicuspid valve: The valve that lets blood to pass from the left atrium to the left ventricle.

Pulmonary Vein: The vein that carries oxygenated blood to the left atrium.

Semi-lunar valves: The 2 valves which let blood pass from the lower ventricle to the aorta and the pulmonary artery.

Pulmonary Artery: The artery that carries deoxygenated blood from the heart to the lungs.

Tendon: Special fibres in the heart muscle.

A Double Circulation

This diagram shows the double circulation of the blood. The arteries are on the right hand side of the diagram while the veins are on the left hand side.

The following table shows the various blood vessels of the body, their route and function.

Difference between Arteries and Veins

The main difference between arties and veins is that arteries carry blood from the heat to all the other tissues in the body while veins carry blood from the body to the heart.

Usually, veins carry deoxygenated blood and arteries carry oxygenated blood. One exception is that the pulmonary artery carries deoxygenated blood from the body to the heart and the pulmonary vein carry oxygenated blood from the heart to the lungs.

Veins have valves so that blood goes in the right direction; arteries don't have valves because blood flows with a lot of pressure inside the arteries and backflow of blood is impossible. Arteries have a thin lumen (inner structure of the blood vessel, where blood passes) because blood flows with a high pressure and the walls have to be wide, while veins have a wide lumen.

Arteries have an elastic wall, but veins don't have an elastic wall.

Blood

Blood is the main fluid found in the body. The functions of blood are the following:

- The fluid that carries all the nutrients and oxygen around the body to all cells
- Transports heat around the body
- Transports hormones
- Transports antibodies
- Important for excretion of urea, excess water and salts
- Blood clotting
- Controls the amount of water and chemicals in the body tissues
- The body has about 6 litres of blood (9% body mass). There are 4 blood groups in humans, namely A, B, O and AB (rarest) Blood is made up of Erythrocytes (Red Blood Cells), Leucocytes (white blood cells), and Plasma.

Erythrocytes (Red-Blood Cells)

- Erythrocytes are numerous, have no nucleus and have a bi-concave shape (for a larger surface area) to carry oxygen (O₂) more efficiently.
- Red-blood cells are made in the bone marrow and their life span is about 4 months.
- Deamination (taking away iron from the red-blood cells, hence, destroying them to be replaced by new ones) takes place in the liver.
- Erythrocytes contain haemoglobin that when it is oxygenated, haemoglobin becomes oxyhaemoglobin. Carbon dioxide travels in the plasma as (hydrogen carbonate ions) HCO₃⁻ ions. This also helps erythrocytes to carry O₂.
- Carbon monoxide (CO) combines with the haemoglobin 300 times faster than O₂, thus it is very harmful. This gas is produced by cigarettes and burning of fuels such as in cars.

- People living in high altitudes have a greater number of Erythrocytes since less oxygen is present in the air. Their body has adapted to the environment. This is known as acclimatization.

Leucocytes

Leucocytes are larger than Erythrocytes. They're colourless, and are made in the red bone marrow and the lymph glands. There are various types of leucocytes. Phagocytes and Lymphocytes are two of these types.

- Phagocytes engulf the germs, which leaves remains of dead germs and leucocytes called pus. The process by which phagocytes engulf germs is similar to the way amoebas feed and is known as phagocytosis.
- Lymphocytes produce antibodies, detect the germ's antigen and it can either make the germ burst, or clump together, or make them harmless.

Platelets are Fragments of cells also found in the blood.

Plasma

Plasma is a sticky fluid, containing water, salts, food substances, urea, hormones, platelets, prothrombin, blood proteins, fibrinogen (for blood clotting), globulin (helps to destroy germs), albumin (makes blood thick and viscous).

When a blood vessel is damaged, platelets enter the wound. Platelets activate prothrombin into thrombin. Then thrombin activates fibrinogen into fibrin, which is insoluble and forms solid threads that forms the cloth.

Hemophilia is a genetic disease where blood fails to clot.

Tissue Fluid

Tissue fluid is a liquid found around cells. This watery liquid keeps the cells in the right condition, providing them with oxygen and all the necessary nutrients. Tissue fluid is drained from blood capillaries. It is a yellowish in colour because it contains urea when it is full of waste.

Useful substances pass from the tissue fluid to the cells and urea, excess water and waste substances pass from the cells to the tissue fluid.

Tissue fluid drains in the lymph vessels. Lymph vessels transport the fluid called lymph. Lymph vessels also have valves like veins do.

Along these lymph vessels, there are lymph nodes. Lymph nodes are structures that produce cells similar to white blood cells that fight germs. When there is an infection, these lymph nodes become swollen and painful. Inside them, bacteria and germs are being trapped and killed by these cells.

