

CAIE Biology A-level

Topic 8 - Transport in Mammals

Definitions and Concepts

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Affinity - The tendency of one substance to bind with another substance.

Aorta - The artery that takes oxygenated blood away from the heart to the body.

Arteriole - A type of blood vessel that connects the arteries and capillaries. The walls of the arterioles contain large amounts of smooth muscle, some elastic fibres and some collagen.

Artery - A type of blood vessel that carries blood away from the heart to the tissues under high pressure. The walls of the arteries contain collagen, smooth muscle and elastic fibres.

Atrial systole - The stage of the cardiac cycle in which the atria contract, pushing blood into the ventricles. The AV valves are pushed open fully and the atria are emptied of blood.

Atrioventricular node (AVN) - A group of cells located between the atria that slow down the wave of excitation and pass it between the ventricles along the bundle of His.

Atrioventricular valves (AV valves) - The valves found between the atria and ventricles. They prevent the backflow of blood from the ventricles into the atria. There are two types of atrioventricular valves: bicuspid and tricuspid.

Atrium - Chamber of the heart that receives blood from the veins.

Bicuspid valves - The atrioventricular valves found between the left atrium and left ventricle.

Blood - The transport medium in the mammalian circulatory system. It consists of plasma, red blood cells, white blood cells and platelets.

Bohr shift - The loss of affinity of haemoglobin for oxygen as the partial pressure of carbon dioxide increases.

Bundle of His - A collection of Purkyne fibres which run from the AVN down to the apex of the ventricles.

Capillaries - Microscopic blood vessels that form a large network through the tissues of the body and connect the arterioles to the venules. They are the site of exchange of substances between the blood and the tissues.

Carbaminohaemoglobin - A compound formed when carbon dioxide reversibly binds to amine groups in haemoglobin.

Carbonic anhydrase - An enzyme that catalyses the reversible reaction between water and carbon dioxide to produce carbonic acid.

Cardiac cycle - Describes the sequence of events involved in one complete contraction and relaxation of the heart. There are three stages: atrial systole, ventricular systole and diastole.

Chloride shift - The process by which chloride ions move into the erythrocytes in exchange for hydrogen carbonate ions which diffuse out of the erythrocytes. This is a one-to-one exchange and it maintains the electrochemical equilibrium of the cell.



Circulatory system - The transport system in animals.

Closed circulatory system - A circulatory system in which the blood pumped by the heart is contained within blood vessels. The blood does not come into direct contact with the cells. Closed circulatory systems are found in animals, e.g. vertebrates.

Diastole - The stage of the cardiac cycle in which the heart muscle relaxes. The atria and ventricles fill with blood. The AV valves are open.

Double circulatory system - A circulatory system in which the blood flows through the heart twice in two circuits. Blood is pumped from the heart to the lungs before returning to the heart. It is then pumped around the body, after which it returns to the heart again. Double circulatory systems are found in mammals.

Elastic arteries - Large vessels that receive blood directly from the heart at high pressure. They contain large numbers of collagen and elastic fibres.

Haemoglobin - The red pigment found in erythrocytes that binds reversibly with four oxygen molecules to form oxyhaemoglobin. It is a globular protein that consists of four polypeptide chains, each with a prosthetic haem group.

Haemoglobinic acid - The product formed when haemoglobin accepts free hydrogen ions. This enables haemoglobin to act as a buffer which reduces changes in blood pH.

Hydrostatic pressure - The pressure exerted on the sides of a vessel by a fluid.

Inferior vena cava - The vein that returns deoxygenated blood to the heart from the lower body.

Left ventricle - The chamber of the heart that receives oxygenated blood from the left atrium and pumps it through the aorta around the body. The left ventricle is thicker than the right ventricle as it must pump blood further at a higher pressure.

Lymphocytes - White blood cells that contribute to the specific immune response e.g. B lymphocytes can differentiate to produce antibodies.

Monocytes - White blood cells that become tissue macrophages and perform phagocytosis.

Muscular artery - A medium-sized vessel that takes blood from an elastic artery and branches into smaller arteries and arterioles. Muscular arteries contain large amounts of smooth muscle.

Neutrophils - White blood cells with a multi-lobed nucleus that perform phagocytosis and release chemicals which contribute to fever and inflammation.

Oncotic pressure - The movement of water into the blood by osmosis due to the tendency of plasma proteins to lower the water potential of the blood.

Oxygen dissociation curve - A graph that describes the relationship between the partial pressure of oxygen and the percentage saturation of haemoglobin in the blood.



Plasma - The main component of the blood that carries red blood cells. It is a yellow liquid that contains proteins, nutrients, mineral ions, hormones, dissolved gases and waste.

Pulmonary arteries - The arteries that carry deoxygenated blood away from the heart to the lungs.

Pulmonary veins - The veins that carry oxygenated blood from the lungs to the heart.

Purkyne tissue - Specialised cardiac muscle fibres which make up the bundle of His and conduct the wave of excitation through the septum from the AVN down to the apex of the ventricles.

Red blood cells (erythrocytes) - A type of blood cell that is anucleate and biconcave. It contains haemoglobin which enables the transport of oxygen and carbon dioxide to and from the tissues.

Right ventricle - The chamber of the heart that receives deoxygenated blood from the right ventricle and pumps it through the pulmonary vein to the lungs. The right ventricle is thinner than the left ventricle as it pumps blood a shorter distance at a lower pressure.

Semilunar valves - A pair of valves found between the ventricles and arteries. They prevent the backflow of blood from the arteries into the ventricles.

Septum - The wall of muscle which separates the left side of the heart from the right side of the heart, preventing oxygenated and deoxygenated blood from mixing.

Sinoatrial node (SAN) - A group of cells in the wall of the right atrium that generate electrical activity, causing the atria to contract. The SAN is often referred to as the heart's pacemaker.

Solvent - A substance which other solutes are dissolved in.

Specific heat capacity - The amount of energy needed to raise the temperature of a substance by a specific amount.

Superior vena cava - The vein that returns deoxygenated blood to the heart from the head and upper body.

Tissue fluid - The fluid that surrounds the cells of animals. It has the same composition as plasma but does not contain red blood cells or plasma proteins.

Tricuspid valves - The atrioventricular valves found between the right atrium and right ventricle.

Vein - A type of blood vessel that carries blood towards the heart under low pressure. It has a wide lumen, a smooth inner lining and valves. The walls of the veins contain smooth muscle, large amounts of collagen and little elastic fibre.

Ventricle - Chamber of the heart which receives blood from the atria.



Ventricular systole - The stage of the cardiac cycle in which the ventricles contract, pushing blood into the arteries. The semilunar valves are pushed open fully.

Venule - A type of blood vessel that connects the capillaries and veins. The walls of the venules contain small amounts of collagen and smooth muscle.

