DOUBLE CIRCULATION

Blood passes through the heart twice in one complete circuit.

CIRCULATORY SYSTEM

Oxygenated blood (Oxygen & nutrients) is transported from the heart to all the body parts.

Deoxygenated blood (CO_2 & urea) is transported from all the body parts to the heart.

1) Systemic circulation: *The heart pumps blood to all the body parts under a high pressure.*

2) Pulmonary circulation: *The heart pumps deoxygenated blood to the lungs under a low pressure (small distance).*

BLOOD

Blood plasma

@ The liquid part of the blood.
@ Transport hormones, CO_2.
@ Contains dissolved substances *e.g. Glucose, Amino acids and mineral ions.*

Red blood cells

@ Contains haemoglobin.
@ Haemoglobin binds with the oxygen, forming oxyhaemoglobin.
@ Transports oxyhaemoglobin from the lungs to the respiring tissues.
@ Biconcave --> large surface area --> rapid rate of diffusion of oxygen in & out of the cell.
@ No organelles --> more room for haemoglobin to carry more oxygen.

BLOOD (cont)

@ Very small -->haemoglobin comes close to every cell --> rapid exchange of oxygen with tissue fluid then the body cells.
@ Flexible --> squeeze through narrow capillaries.

White blood cells

@ Part of the immune system.
@ Kill bacteria.
@ Lymphocytes & phagocytes.

Platelets

@ Prevent the bleeding & entry of pathogens when the skin's cut.
@ "Injured sites activate platelets so it release Thrombokinase which converts inactive prothrombin to active thrombin. Thrombin converts soluble fibrinogen to insoluble fibrin that forms a mesh/network that dries to be a scab."

TISSUE FLUID

@ Site of exchange of substances.
@ Supplies the cells with nutrients & oxygen.
@ Takes waste products *e.g. CO_2 & urea.*
@ Plasma moves through the pores between the cells & become a tissue fluid.
@ The old tissue fluid diffused through the lymphatic vessel, called lymph.

LYMPH

@ A milky liquid.
@ Carried by the lymph vessels.
@ Made up of substances from 3 sources:
_Tissue fluid that hasn't been absorbed at the venous end of the capillary (10% of tissue fluid).
_Fatty acids absorbed in ileum through lacteal.
_Lymphocytes from lymph nodes found along the lymph vessels.
@ Lymph is then returned back to the blood before getting into the heart through the lymph vessels.
@ Lymph vessels: Tiny blind ended vessels that allow the tissue fluid to flow in but not out through valves in their walls.

STRUCTURE OF BLOOD VESSELS

Arteries

@ Transport blood **A**way from the heart.
@ High pressure.
@ Thick walls --> withstand the high pressure.
@ Narrow lumen --> to maintain the pressure.
@ Walls --> elastic & stretchable (contains elastic fibres).

Veins

@ Transport blood from the body to the heart.
@ Low pressure.
@ Wide lumens & thin walls --> minimize the resistance of the blood.
@ Contain valves --> unidirect the blood & prevent its backflow.

Capillaries

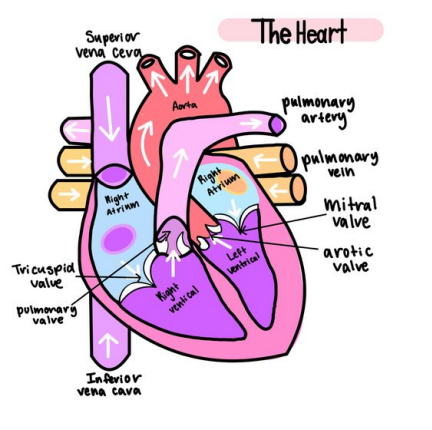
STRUCTURE OF BLOOD VESSELS (cont)

@ The smallest blood vessels.
@ Get blood from the arteries as close as possible to the tissues, to exchange materials with the cells & to link between the arteries and veins.
@ One cell thick --> to shorten the diffusion distance.
@ Have pores --> to allow plasma out, for easier exchange.

The blood in leg veins ascend their way against gravity by:

= The negative pressure in the heart/right atrium/thorax/chest.
= The valves' mechanism of preventing the backflow of blood.
= The muscles in the leg squeeze the veins.

THE HEART



- The left side --> Oxygenated.
- The right side --> Deoxygenated.

(LORD)

THE HEART'S MECHANISM

Atrial systole

@ The cardiac muscles in the atrial walls contract / Muscles in ventricle walls remain relaxed.
@ Atria contract, developing a high pressure that exceeds the pressure in ventricles, forcing the blood in the atria to open the atrioventricular valves and pass to the ventricles.

Ventricular systole

@ Ventricles contract & atria relax, increasing the blood pressure and pushing it out of the heart.
@ As soon as the pressure in the ventricles becomes greater than the pressure in the atria, this difference in pressure pushes the atrioventricular valves shut, preventing the blood from going back into the atria.
@ The pressure inside the ventricles exceeds the pressure of aorta & pulmonary artery, causing the semilunar valves to open. Blood then gets transported from the right ventricle to the lungs, through the pulmonary artery & from the left ventricle to all the body parts, through aorta.

Systole = contraction.
Diastole = relaxation.

CORONARY HEART DISEASE

@ The coronary artery is the artery that supplies the heart with oxygen & nutrients.
@ If it gets blocked, it will stop beating (it needs oxygen and nutrients to obtain energy to pump the blood.
@ It can get blocked by 2 ways:

CORONARY HEART DISEASE (cont)

1) Fatty deposits *on the long run --> narrows the lumen of the artery till it gets blocked.*
2) High blood pressure.

Fast blood flow causes scratches in the artery wall, causing the platelets to be activated and form a mesh/network that blocks the artery. AKA **Atheroma**.

Causes

@ Fatty diet *(increases the fat level).*
@ Lack of exercise *(regular exercise improves the blood flow, wearing layers of fats & salts deposited on the walls of arteries away).*
@ Smoking *(nicotine increases the blood pressure).*
@ Stress.
@ Salts.
@ Hypertension.
@ Genetics.

Treatment

@ Changing the lifestyle *(more exercise, avoiding diet with saturated salts, avoiding food that's rich in fats and quit smoking).*
@ Aspirin.
@ Coronary bypass *(a blocked artery is replaced with a healthy vessel that's taken from another body part).*
@ Angioplasty *(using stents to keep the coronary artery open).*
@ Heart transplant.