**Bio samenvatting**

**Section 1. Blood composition**

An adult has approximately 5 à 6 litres of blood in his body. Blood consists of a liquid called ***blood plasm***. In the blood plasm there are ***blood cells*** and ***platelets***. There are 2 types of blood cells: ***red blood cells*** and ***white blood cells***.

When blood is in a tube for a while the blood cells and platelets lower and the blood plasm remains above.

Blood exists of 55% of blood plasm and 45% of red blood cells, white blood cells and platelets.

***Blood plasm***

Blood plasm exists of proteins (plasma proteins) for 7%. 91% is water and the other 2% exists of parts which are solved in water.

One of the plasma proteins is fibrinogen, fibrinogen is used for the blood clotting.

Blood plasm transports a lot of things like; oxygen, nutrients, carbon dioxide and other waste products.

***Red blood cells***

Red blood cells look like small rounded discs. Red blood cells do not have a nucleus. Red blood cells transport oxygen. They contain a red pigment called: Haemoglobin. Due haemoglobin red blood cells can pick up and give oxygen easily.

***White blood cells***

White blood cells do have a nucleus. White blood cells do not have a fixed shape either. Due to that white blood cells can go through the smallest places. White blood cells make pathogens.

When bacteria enter your body white blood cells can enclose these bacteria and kill them. The white blood cells usually die too. This usually happens when the wound is ignited. The pus from a wound exists of dead white blood cells and dead bacteria.

***Platelets***

Platelets are not real cells but particles of disintegrated cells. They do not have a nucleus. Platelets are used for the blood clotting. They contain fabrics which make the blood clot outside the blood cells.

When blood clots inside the blood vessels there arises a thrombosis.

**Section 2. Blood circulation**

***Pulmonary circulation***

The heart is a double pump. The right-half pumps the blood through the right lung and the left lung. From both lungs the blood flows back to the heart.

In the pulmonary circulation oxygen is picked up in the blood and carbon dioxide is given to the air. This happens in the lungs.

***System circulation***

From the system circulation the blood goes into the left half of the heart. This left half of the heart pumps the blood through the entire body. A part of the blood flows to the head and the arms. Another part of the blood flows to the abdomen and legs. The blood flows through all organs. From the organs the blood flows back to the right half of the heart.
In the systemic circulation oxygen and nutrients are given to the cells and carbon dioxide and other waste products are picked up in the blood.

**Section 3. The heart**

The heart is located within the rib cage, beneath and slightly to the left of the breastbone. The heart is made of cardiac muscle that surrounds a cavity. Its function is to pump the blood around the body. This beating cost a lot of energy, so the cardiac muscles need to be supplied with food and oxygen. Carbon dioxide and other waste products are released. The heart is supplied by blood by the ***coronary arteries*** and ***coronary veins***. The coronary arteries supply the heart with oxygen and nutrients. The coronary veins carry blood that contains carbon dioxide and other waste products away.

The heart beats in 3 stages: contraction of atria 🡪 contraction of ventricles 🡪 diastole

**LEARN IN THE BOOK ALL THE FIGURES AND HOW THE HEART PUMPS ITS BLOOD AROUND!!**

**Section 4. Blood vessels**

There are 3 types of vessels: ***arteries*** (slagaders), ***veins*** (aders) and ***capillaries*** (haarvaten).

Arteries carry blood away from te heart to the limbs and organs of the body. When the heart contracts, blood is pushed under high ***pressure*** into the arteries. The arteries are thick-walled and very elastic, so when they receive blood the walls can stretch. This they contract and bounce back which forces the blood along. This bouncing back can be felt as a *pulse* as the blood flows through the arteries. Most arteries are found deep in the body where there is little risk of them becoming damaged.

The arteries divide up into branches that become increasingly narrow. Tiny branches that have walls only one cell thick are known as ***capillaries***. The capillaries that supply an organ with blood form a ***capillary network***. In these capillaries oxygen, nutrients, carbon dioxide and other substances can easily pass the vessel walls. The capillary network is so dense that no cell in an organ is far away from these capillaries. In this way all the cells can easily be supplied.

These small branches eventually join up to form larger vessels called ***veins***.

Veins carry blood back to the heart. These vessels are wider than arteries and have thinner walls. The blood flows more slowly through them because the blood pressure is lower. No pulse can be felt in the veins. Most veins are found less deep in the body.

The heart sucks blood back from the veins. Many veins have ***valves*** (kleppen) to prevent the blood flowing backwards. These valves help to push the blood back to the heart and prevent blood from returning to the organs. Contractions of skeletal muscles also act as a pump to force the blood along in the direction of the heart. Arteries do not have valves, except for the semi-lunar valves (halvemaanvormige kleppen) of the aorta and the pulmonary artery.

The heart and all the blood vessels together form the circulatory system. The ***hepatic portal vein*** (poortader) carries blood rich in nutrients from the intestines to the liver where it is assessed. From the liver blood travels back to the heart via the ***hepatic vein*** (leverader). The ***hepatic artery*** (leverslagader) supplies the liver with oxygen.

**Section 5. Cardiovascular diseases**

Cardiovascular diseases are a major cause of death in the Netherlands. People with ***low blood pressure*** can get headaches. Low blood pressure is less common that ***high blood pressure*** and is normally harmless.

Healthy vessels have smooth inner linings. When these inner linings are damaged the body makes repairs. During the reparation process white blood cells and platelets collect at these damaged areas. Other substances in the blood can then stick to these cells. Atherosclerosis (slagaderverkalking) is the name of the process in which deposits of fatty substances build up in the inner ling of an artery. This build-up is called plaque and it hardens the arteries. The main substance that causes atherosclerosis is cholesterol.

Cholesterol is a natural substance produced mainly in the liver. Your body produces enough cholesterol to maintain health, but since it is also found in certain foods there is a risk of ingesting too much cholesterol. When cholesterol levels are high it is deposited on the walls of arteries. As a consequence, certain organs and tissues are supplied with less oxygen and nutrients and they may therefore stop functioning. AS the arteries become narrower and less flexible the blood pressure increases. The heart needs to work harder to pump the blood through the narrow vessels.

Atherosclerosis may block blood flow to the cells of the heart muscle. When the heart muscle cells are no longer supplied with oxygen and nutrients, that part of the tissue will die. This is known as a ***heart attack***)

**Section 6. Tissue fluid and lymph**

When blood enters the capillaries, liquid containing oxygen, dissolved food and other useful substances, is forced out of the blood so that it can reach the body cells. Now it is called **tissue fluid** (weefselvloeistof).

Cells pick out the things they need, such as oxygen and nutrients. Waste products are absorbed into the tissue fluid. Part of this tissue fluid then passes back into the capillaries.

Some fluid does not return immediately to the blood system, but to the **lymphatic vessels** (lymfevaten). The fluid inside the lymphatic vessels is called **lymph**. Lymph is a watery liquid that contains dissolved substances and white blood cells. Carbon dioxide and other waste products are transported in lymph. Lymph contains oxygen and nutrients that have not been picked up by the cells. Lymphatic vessels transport lymph away from the organs. Valves inside lymphatic vessels prevent lymph from flowing back.

The ***lymphatic capillaries*** join up to make larger vessels. These vessels unite into 2 main ducts: the ***right lymphatic duct*** and the ***thoracic duct***. These ducts join the blood circulation through 2 veins which are located just below the collarbones. Through these veins the lymph enters the superior vena cava. All lymphatic vessels form the lymphatic system.

At different points along the lymphatic vessels there are ***lymph nodes*** (lymfeknopen). Here the lymph is purified of germs and dead cells.

**Section 7. Excretory system**

Blood that flows away from the organs is carbon dioxide-rich and contains a lot of other waste products. These waste products must be removed from the blood and eventually from the body. This process is called excretion (uitscheiding).

There are 2 kidneys one of each side of the spine near the middle of the back and just beneath the diaphragm. The***renal arteries*** (nierslagaderen) carry oxygenated blood to the kidneys. The ***renal veins*** (nieraders) carry clean blood away from the kidneys.

A kidney is made up of the cortex, the medulla and the renal pelvis. The medulla and the cortex remove harmful substances. All these substances together are called urine.

**Section 8. Antibodies**

Any substance that the body regards as foreign is known as an ***antigen***. When such substances invade the body, the body will fight them. This occurs in people who receive blood transfusions or in people who have an infection.

***Infectious diseases*** are caused by micro-organisms that invade the body and multiply.

A micro-organism that causes disease is called a ***pathogen***.

**Section 9. Blood clotting**

When blood leaves the blood vessels and comes in contact with air it clots. When a blood vessel is damaged the loss of blood may be stopped in several ways. As muscles in the blood vessels lining contract, the blood vessels become narrower. This decreases blood flow through the damaged vessel.

When bleeding occurs, the surface of the platelets becomes sticky. These sticky platelets begin adhering to the wall of the blood vessel. The clot of platelets releases substances that turn fibrinogen into fibrin.

Then fibrin produces tiny fibres which trap blood cells. Then the fibres form a thick red jelly that stops the bleeding. This clot hardens to make a scab that keeps the wound clean. After some time when the skin has healed the scab will fall off, because the fibrin fibres are slowly broken down.