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Question 1

Outline the components of blood, stating the function of all component parts

What is blood

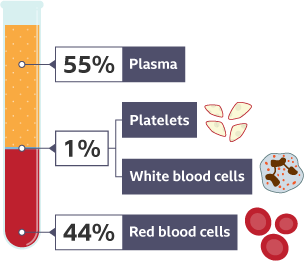
Blood is the unique fluid in circulatory system of humans and other vertebrates that distributes essential nutrients, minerals and oxygen to the cells and remove waste products of metabolism. It has four components: Plasma, red blood cells [RBC], Platelets and white blood cells [WBC}.

Plasma: Plasma is the yellowish liquid potion of blood when separated making up to 55% of the blood structure [see figure 1] that facilitates the movement of red blood cells and white blood cells which contains nutrients, hormones, and proteins. It also facilitates the maintenance of blood pressure and volume, involved in the movement of antibodies for immune defence and carries waste product e.g. carbon dioxide and urea to organs for excretion. Plasma also contains different proteins like albumin, that assist in the maintenance of blood volume and pressure through the prevention of fluid leakage from the blood vessels helping the body to maintain homeostasis.

RBC: Also referred to as erythrocytes are biconcave in structure and carries oxygen from the lungs to the rest of the body tissues and returns carbon-dioxide which is acidic from those tissues back to the lungs, so the body pH balance is maintained making them the most abundant cells in the blood. They embody haemoglobin, a protein that binds to oxygen which help in energising the body and forms 45% of the blood structure [see figure 1]. Their disc-like nature allows them to easily pass through narrow blood vessels called capillaries where oxygen exchange happens, and RBCs are produced in the red bone marrow.

WBC: Also referred to as leukocytes forms part of the body immune system that helps fights germs like bacteria, viruses and foreign invaders to keep the body healthy. It forms 1% of blood structure [see figure 1]. Unlike RBCS, WBCs have a nucleus and there are various types, each performing specified role, like neutrophils which attack and destroy pathogens directly and lymphocytes that is responsible for the production of antibodies to fight infections. They are made in the bone marrow and flow through the bloodstream, regularly patrolling to capture dangerous substances. Anytime the body contacts an infection, the WBC multiplies to fight off the attack effectively.

Platelets: Also referred to as thrombocytes are tiny, disc–shaped cells in the blood that aids the stoppage of bleeding by forming clot to heal wounds and they form 1% of the blood structure [see figure 1]. Thrombocytes are produced in the bone marrow and let out into the blood stream, so when the blood vessel is injured, they quickly assemble at the sight of the wound to form a short-term plug to stop further bleeding by releasing chemicals which activates clotting agent to seal the wound making it possible for the body to maintain normal blood circulation.

Figure 1 [The four components of blood] (BBC, 2025)

2. Describe in detail the lymphatic system.

The lymphatic system is a vital component of the human circulatory system which contributes to maintaining the fluid balance of the body by filtering dangerous substances. It is made up of a broad network of vessels, nodes, organs and tissues to convey lymph [a clear fluid that embodies WBCs], especially lymphocytes which are crucial for immune response, it also assists in the intake of fatty acids and fat-soluble vitamins from the digestive system.

Everyday, almost 20 litres of plasma flows out of tiny pores in the delicate walls of capillaries, like water seeping through a sponge. Where does this water go? It supplies oxygen and nutrients to the tissues enclosing each capillary. The tissues hungrily soak up all the nutrients leaving behind waste [like a child who finishes their food but leaves behind a pile of sticky napkins]. The plasma picks up this waste and return them to the blood stream through the same path it came, by flowing back via the pores in capillary walls. Each day, almost 17 litres of plasma returns to the blood stream through this process. Since 20 litres of plasma initially flowed out of capillary walls, meaning 3 litres are still wandering around in the body tissues. This is where the lymphatic system steps in, small lymphatic capillaries pick up this remaining fluid from tissues, making the fluid to change its name from plasma to lymph. The “lymphatic capillaries transport the lymph into bigger tubes called lymphatic vessels, these vessels keep moving the lymph until it reaches one of the two main ducts in the upper chest. These are called right lymphatic duct and thoracic duct, and they look like highway on ramps, merging into larger vein called the subclavian veins and the lymph empties into them for an onward journey to re-enter the bloodstream” (clinic, 2023) and continue the cycle.

The structure of the lymphatic system is a composition of different vital components, each having a specified function that contributes to its general purpose in the body:

Lymph.

Lymph is a colourless liquid that is almost identical to blood plasma but with less proteins