CHAPTER 9: CIRCULATORY SYSTEM

This chapter focuses on the circulatory system – that is, the heart and vessels that pump our blood around the body. We will look at the composition of blood, study the heart muscle, and trace the flow of blood through the heart and the vascular system. We will also look at the relationship between circulation, blood pressure and pulse.

Blood composition

Task

Read pages 281-285 in Chapter 11 of your text (Thibodeau, G.A. & Patton, K.T. (2004) Structure & Function of the Body, Mosby: St Louis)

The body contains between four and six litres of blood, which accounts for around 7-9% of body weight.

Blood is made up of two parts – *plasma* and *formed elements*. If you filled a glass container (test tube) with blood and let it stand for a few hours, the 'solid' and the fluid components would separate. In fact, the formed elements, which are essentially blood cells, would settle on the bottom, have a reddish colour and make up about 40-45% of the volume. The upper 55% or so would be a straw coloured, syrupy liquid – plasma. See Figure 11-1 on page 282 of your text.

Blood plasma

This is the fluid portion of blood. It accounts for approximately 55% of blood volume.

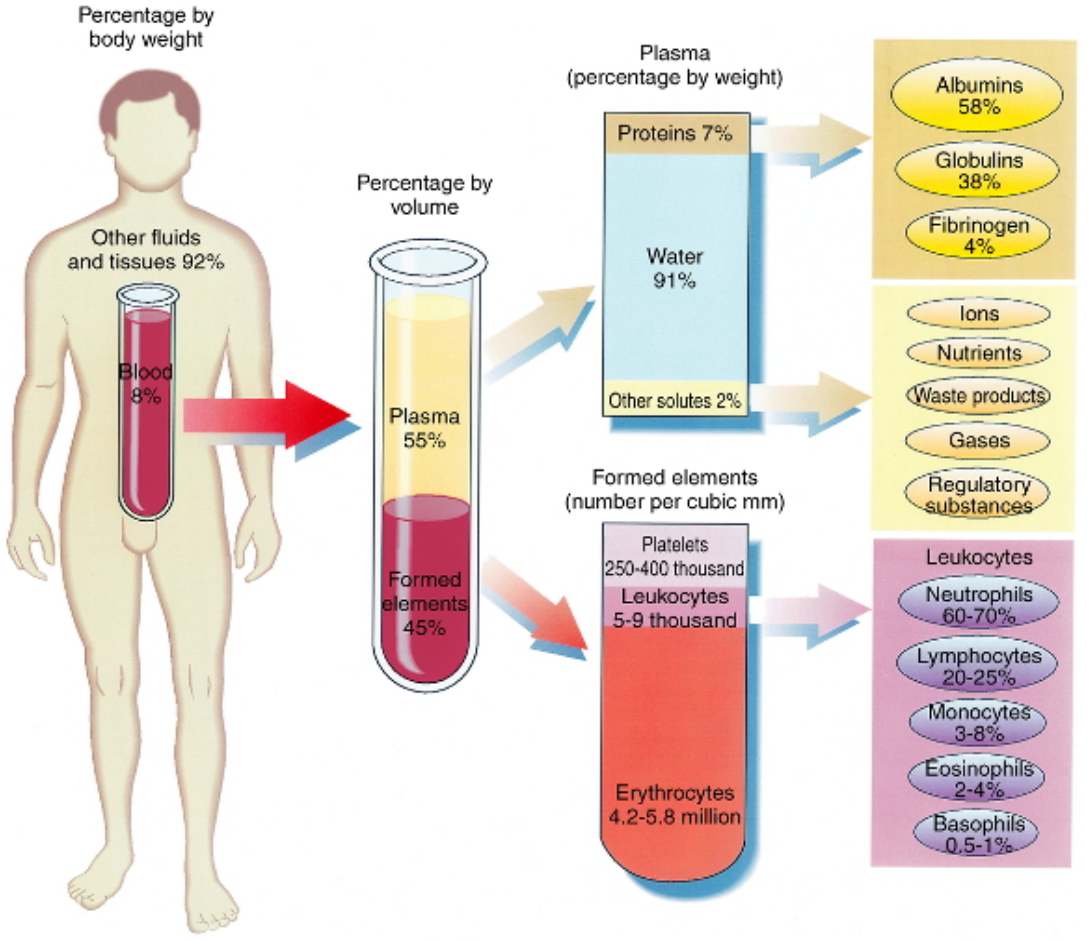
Plasma is primarily water containing many dissolved substances (for example, protein, foods, tissue salts or ions, gases like oxygen and carbon dioxide, and hormones).

Formed elements

These are the blood cells that are suspended in plasma. They make up approximately 45% of blood volume and include:

- Red Blood Cells (RBCs, also known as erythrocytes)
- White Blood Cells (WBCs, also known as leukocytes)
- Platelets (also known as thrombocytes)

The process of formation of new blood cells is called 'hematopoiesis'. This process occurs mainly in red bone marrow, except for some leukocytes which are formed by lymphatic tissue in the lymph nodes, thymus, and spleen. In adults, the main sites of red bone marrow involved in hematopoiesis are located in the sternum, ribs and hipbones, with some sites also in the vertebrae, clavicles and cranium.



Red blood cells (RBCs)

Task

Read pages 284-287 in Chapter 11 of your text (Thibodeau, G.A. & Patton, K.T. (2004) Structure & Function of the Body, Mosby:St Louis).

A red blood cell is disc-shaped and looks like a disc that has been 'pinched' in the middle. It has no nucleus.

RBCs function to transport oxygen and carbon dioxide.

The hematocrit is a measure of the total blood volume made up by red blood cells, and is normally about 45%. The hematocrit test is a medical test in which a centrifuge (a machine which rapidly spins test tubes full of blood to separate the liquid from solid portions) is used to separate whole blood into formed elements and liquid fraction. See pages 286-287 and Figure 11-3 in your text.

White blood cells (WBCs)

Task

Read pages 287-287 in Chapter 11 of your text (Thibodeau, G.A. & Patton, K.T. (2004) Structure & Function of the Body, Mosby: St Louis).

Their general function is defence and they make up an important part of the immune system. They vary in size with some types the largest of the blood cells. There are several types of WBCs, and they have different functions.

Two types of WBCs called *neutrophils* and *monocytes* carry out phagocytosis, a process where the WBC engulfs and digests harmful substances like bacteria and cancer cells.

Task

See Figure 11-5 on page 288 of your text.

LYMPHOCYTES produce antibodies (B lymphocytes) or directly attack foreign cells (T lymphocytes).

EOSINOPHILS protect against irritants that cause allergies

BASOPHILS produce heparin, which inhibits clotting

Below are some clinical conditions related to white blood cells:

Leukopenia where there is an abnormally low WBC count

Leukocytosis which is an abnormally high WBC count

Leukaemia is a cancer of the blood affecting WBCs where there is an elevated WBC count, however, the cells are mutated and do not function properly.

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