Blood Components

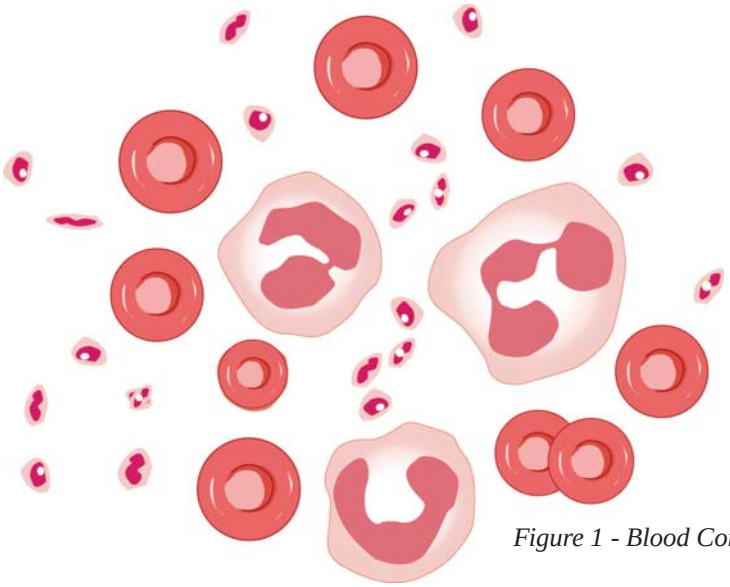

Figure 1 - Blood Components

Blood consists of three types of cells; red blood cells, white blood cells, and platelets, all suspended in the blood plasma.

The Functions of the Blood Include:

- Being a medium for transport;
- Transporting oxygen from the lungs to the organs and carbon dioxide away from the organs to the lungs
- Transporting the soluble products of digestion from the small intestine to other organs
- Transporting urea from the liver to the kidneys
- As a defence against disease
- Homeostasis and maintaining body temperature.

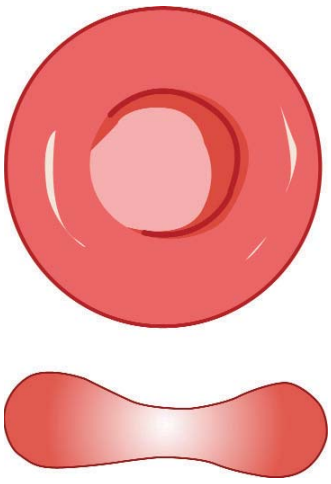

Figure 2 - Red Blood Cell

Red Blood Cells

Red blood cells (Eurythrocytes) are biconcave discs which have no nucleus. There are 5,000,000,000 red blood cells per litre of blood. They contain a red pigment called haemoglobin which enables them to transport oxygen from the lungs to the organs. Red blood cells are ideal for transporting oxygen to the tissues and taking carbon dioxide away from them.

Key Features Include:

- Shape designed to maximise surface area for gaseous diffusion
- Thin outer membrane to let gases diffuse through quickly
- No nucleus to allow more space for haemoglobin
- Small in size to allow them to travel through the smallest blood vessels to transport gases to all of the tissues.

White Blood Cells

White blood cells (Leukocytes) are a very important part of the immune system of the body. They are much less numerous than red blood cells but are considerably larger and increase in quantity when they are fighting an infection.

Figure 3 - White Blood Cell

Main Types of White Blood Cells:

- **Phagocytes**
  Ingest pathogens or destroy pathogens by releasing enzymes
- **Lymphocytes**
  Produce antibodies (specialised proteins) which destroy pathogens, they can also produce antitoxins which can neutralise the toxins released by pathogens.

Platelets

Platelets (Thrombocytes) are responsible for blood clotting. Upon contact with a foreign surface; such as the surface of a cut or fatty deposits at an atheroma (*an atheroma is a swelling in an artery wall, made up of accumulated cells and cell debris)*, these release enzymes which initiate a chain reaction which causes the protein fibrinogen in the blood to turn into fibrin. This fibrin forms in a mesh over the cut which traps other blood cells to form a blood clot.

Figure 4 - Platelets

Plasma

Blood plasma makes up 55% of the blood volume, is a straw coloured liquid and can be separated from the blood cells using centrifugation.

Plasma Contains:

- Water
- Salts
- Digested foods; glucose, fatty acids, glycerol, amino acids
- Waste products; carbon dioxide, urea
- Hormones, including testosterone, oestrogen
- Blood proteins: fibrinogen antibodies

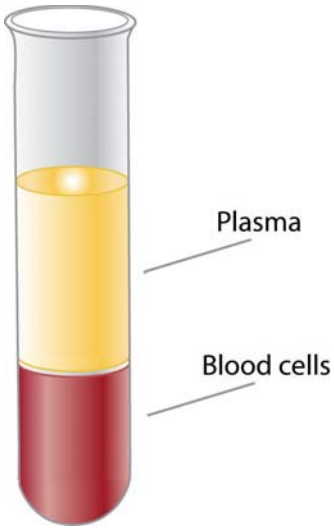

Figure 5 - Centrifuged Blood

Haemoglobin

Red Blood cells are specially designed with a shape that maximises the surface area for gaseous diffusion and also the amount of haemoglobin that the cell can contain. Each red blood cell contains about 300,000,000 haemoglobin molecules; these allow the blood to carry twenty times more oxygen (O_2) than water.

The haemoglobin molecule is a complex protein that contains four haem groups consisting of a polypeptide chain with one iron ion at the centre.

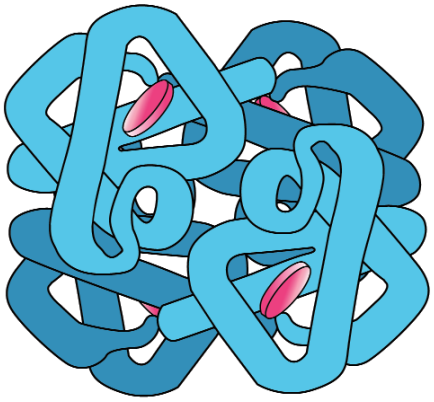

Figure 6 - Haemoglobin Structure

One molecule of oxygen can bind to each iron group in the lungs, when haemoglobin combines with oxygen it forms oxyhaemoglobin.

Haemoglobin + oxygen ➡ Oxyhaemoglobin

This is called oxygenated blood and is red in colour. In the other organs oxyhaemoglobin splits up into haemoglobin and oxygen, after the haemoglobin has released this oxygen at the tissues it is called deoxygenated blood and is blue in colour.

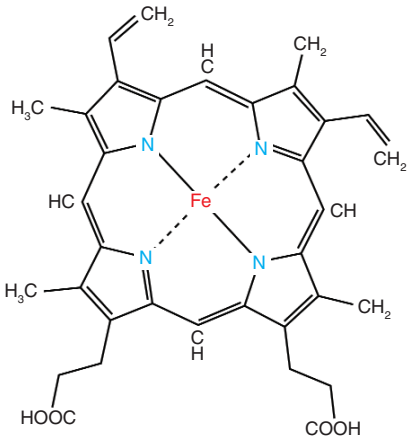

Figure 7 - Haem Group Structure