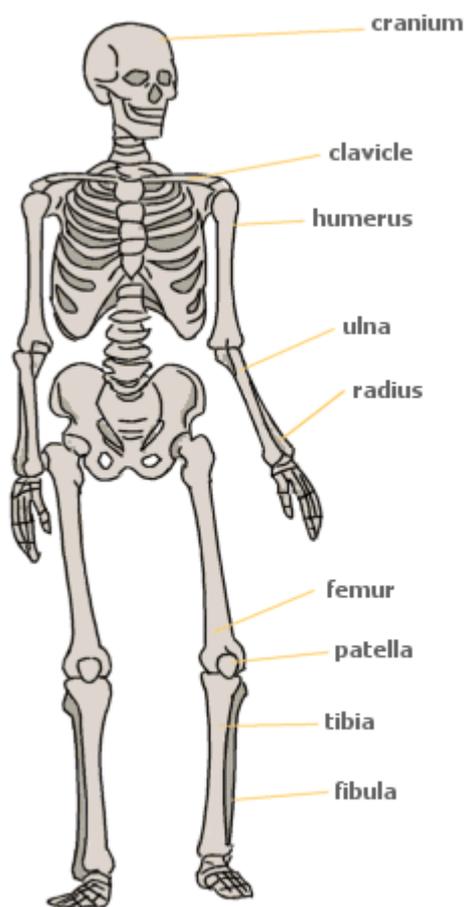


INTRODUCTION TO THE HUMAN BODY

THE SKELETON

The human skeleton is mostly made of bone. In fact, it is made up of 206 bones to be precise, almost half of these in the hands and feet! Bone is a living tissue and is very hard because it contains minerals such as calcium. Our skeleton protects our organs, gives shape and support to our body, and enables us to move.



Human Skeleton

Bones also manufacture blood cells and store useful minerals.

Bones are held together by ligaments. Ligaments are very tough, but they're elastic so they will stretch when they are pulled.

Tendons also connect to bones. Each end of a muscle attaches to the skeleton by a tendon. Tendons are tough and not very elastic so they don't stretch.

MOVEMENT AND JOINTS

Nerves, muscles and the skeleton are needed for movement. The nerves carry messages or nerve impulses to the muscles. These respond by shortening and the shortening of a muscle is called a contraction. Our muscles are attached to the skeleton. Contraction of the muscles causes the bones to move. When a muscle contracts it pulls one part of the skeleton towards another.

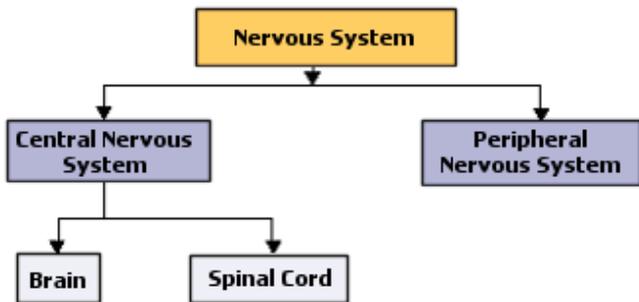
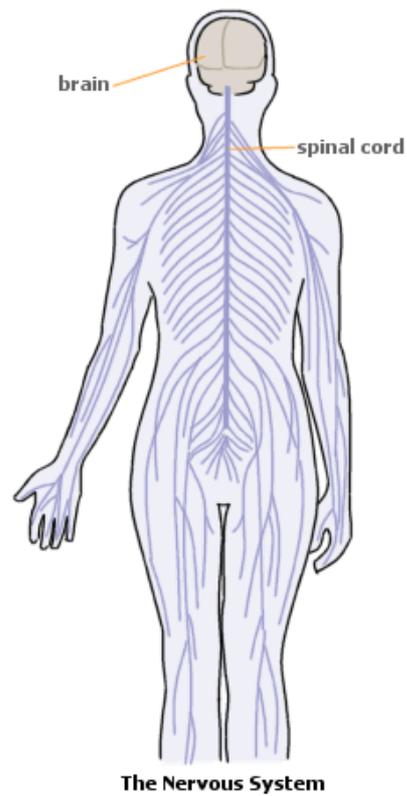
If bones are to move around each other they need to have joints. Joints allow movement with minimum friction. There are almost 100 joints in the human body.

A fluid called synovial fluid separates bones in a joint. The synovial fluid is like oil between the moving parts of a machine. It lubricates the joint.

The ends of the two bones are made of cartilage. It's softer than bone and slightly springy. It helps to prevent jarring when the two bones move against each other. Different types of joints allow for different types of movement. The hip joint is called a ball and socket joint. This allows movement in any direction. The knee has a hinge joint. This only allows movement in one direction. The bones in our skull are held together by fused joints.

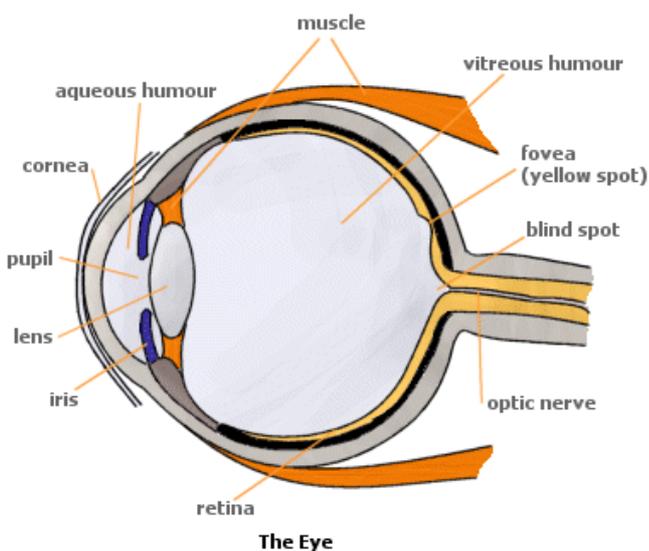
NERVOUS SYSTEM

The nervous system is organised into two main parts: the brain and the spinal cord. The brain is housed inside the skull and the spinal cord runs down the centre of the backbone. The brain and spinal cord together make up the central nervous system.



The central nervous system is connected to the various parts of the body by nerves. Some of the nerves come out of the brain, others out of the spinal cord. Messages from the nervous system are tiny little pulses of electricity called nerve impulses. These nerve impulses travel in bundles of nerve cells called neurons.

The nerves that come out of the brain go mainly to structures in the head like the eyes and the jaws, and those that come out of the spinal cord go to the rest of the body.



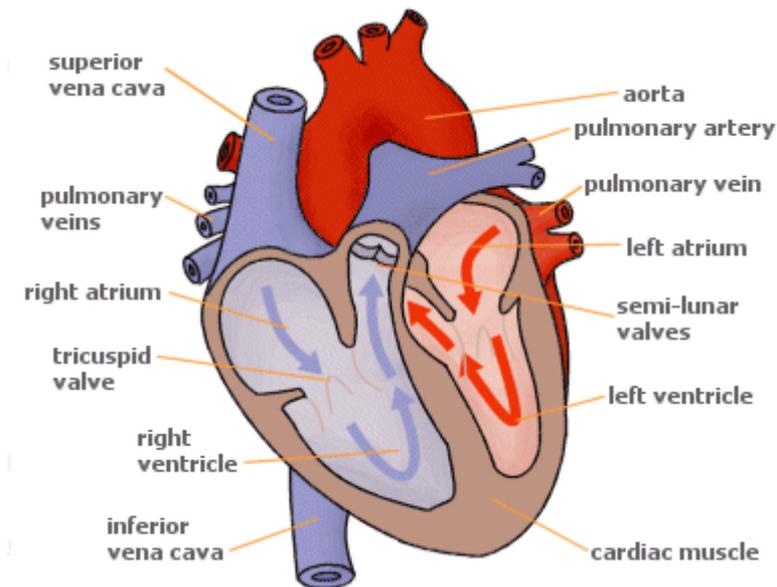
Sense organs such as the eye, the ear, the nose, the tongue and the skin receive a stimulus, such as light in the eye or sound in the ear. The message passes along a sensory nerve to the brain and the brain decides what action it needs to take and sends the response back through another set of neurons called motor neurons.

The retina is a screen at the back of the eye containing light sensitive cells. When light is focused here an image is formed. The optic nerve carries information about the image to the brain where it can be processed. The brain can then decide what action you need to take.

CIRCULATION AND THE HEART

Large organisms need transport systems to carry useful substances to where they are needed and to carry waste away. In the human body, the main organ of the circulatory system is the heart. The heart's job is to pump the blood around the body.

The heart is divided into a left side and a right side. The right side of the heart is responsible for circulating blood to the lungs; the left side of the heart is responsible for circulating blood around the body. The blood is oxygenated in the lungs and pumped round the body by the heart.



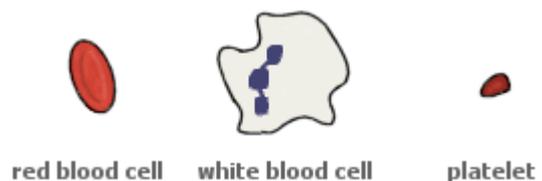
There are four chambers in the heart: two ventricles and two atria. The walls of the ventricles are much more muscular than the walls of the atria. This is because the ventricles have to pump the blood out to the lungs or the body, whereas the atria receive blood from the lungs or the body.

The rest of the circulatory system consists of tubes called blood vessels.

BLOOD AND BLOOD VESSELS

Blood is a living tissue. It contains several things including:

- red blood cells which transport oxygen
- white blood cells which fight disease
- platelets which help the blood to clot
- plasma, a pale fluid that bathes the cells



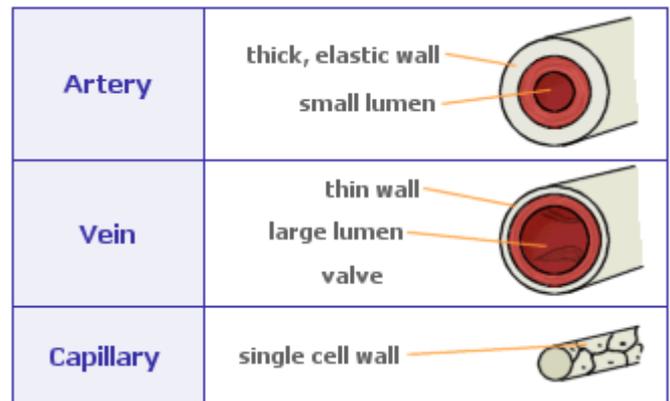
Besides water, plasma contains dissolved salts and minerals as well as microbe-fighting antibodies. It is a complex fluid and is responsible for carrying food and waste to and from all the cells. CO₂ that is being taken away from cells back to the lungs is dissolved in the plasma.

Blood travels around the body in different blood vessels. These are:

(1) **Arteries** carry blood away from the heart to the various organs. They deliver the oxygen-rich blood to the capillaries where exchange of oxygen and carbon dioxide occurs. The capillaries then deliver the waste-rich blood to the veins for transport back to the lungs and heart.

(2) **Veins** receive blood from the capillaries after the exchange of oxygen and carbon dioxide has taken place. The veins transport blood back to the lungs and heart from the body. Veins have valves in them; these are like 'gates' that only allow blood to move in one direction.

(3) Within each organ many tiny blood vessels called **capillaries** connect the arteries and veins. Unlike the arteries and veins, capillaries are very thin and fragile. In fact, they are only one cell thick. They are so thin that blood cells can only pass through them in single file.

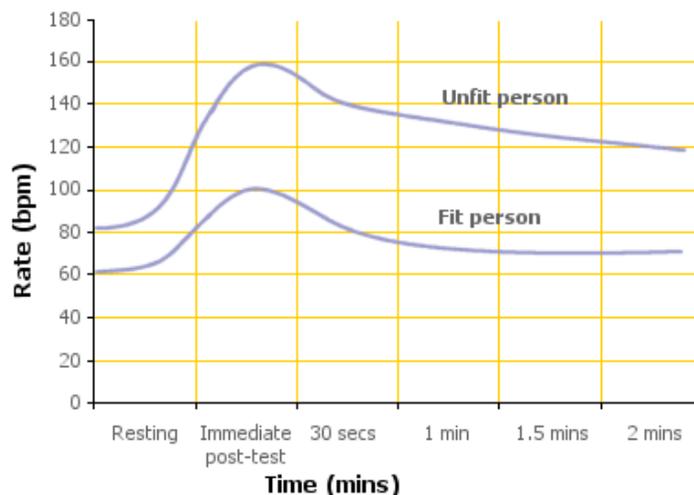


In a capillary bed, red blood cells give up oxygen and food to the surrounding cells for respiration and any unwanted products are passed back from the surrounding cells into the blood. The capillaries coming away from an organ have exchanged their oxygen and food for CO₂ and waste. This blood is pumped around the body back into the heart so that it can be re-oxygenated in the lungs.

CARDIOVASCULAR FITNESS

If more oxygen is required by certain parts of our body our heart rate and our breathing rate increases. The heart rate goes up to increase the supply of blood; our breathing rate goes up to increase the supply of oxygen to the blood. This happens when we exercise. When you start to run, your breathing starts to get much heavier. This is an involuntary action and is caused by the brain sensing that there is more carbon dioxide in the blood and asking your heart to pump harder.

One way of measuring your fitness is to find out how quickly your pulse rate returns to normal after a standard amount of exercise. When you take exercise, your pulse rate increases and when you stop and rest your pulse gradually returns to its resting rate. The quicker your pulse rate returns to the resting rate, the fitter you are.



Our tissues are continually using up glucose and oxygen to obtain the energy required for growth, repair, movement and so on. When you take exercise the rate of tissue respiration increases so cardiac output must also increase. If you are physically fit, your heart will beat faster and pump a larger volume of blood with each beat.

It is important to keep fit for many reasons. It keeps our body mass down. Being fit also increases our resistance to disease; it helps prevent circulatory problems such as heart disease and varicose veins.



Football



Cycling



Running

Exercise helps us to cope better with everyday tasks such as climbing stairs and walking uphill. It makes us feel better, physically and mentally and it also helps us to withstand stress. Exercise and diet are both very important aspects of keeping fit.