Blood

❖ The main functions of blood are to transport oxygen, carbon dioxide, water, nutrients, hormones and waste around the body. Blood also fights infection and regulates temperature.

❖ Composition of blood:

1. **Plasma** constitutes for about 54% of our blood. 92% of it is water.
2. **White blood cells and platelets** constitute for about 1% of our blood.
3. **Red blood cells** constitute for about 45% of our blood.

❖ **Red blood cells** have a biconcave shape and are involved in the transportation of oxygen by **haemoglobin** (haem=iron-containing), they are made in the **bone marrow**, they have no nucleus, they last for approximately 120 days and are then broken down into pigments called **bilirubin** and **biliverdin** in the liver. (N.B. **oxyhaemoglobin** = oxygen rich haemoglobin, **deoxyhaemoglobin** = low oxygen haemoglobin)

❖ **White blood cells** are divided into 2 types: **monocytes** are involved in recognising anything that is foreign and ingesting the foreign particle by **phagocytosis** whereas **lymphocytes** are involved in the **production of antibodies which inactivate and immobilise pathogens**. (White blood cells have nuclei and are also made in the bone marrow.

❖ **Platelets** are small fragments without nuclei and last just 7 days. They are essential in **clotting** blood.

❖ **Blood groups** consist of A, B, AB and O groups. **People in the AB blood group are known as universal recipients** because they can receive blood from any group. **People in the O group are known as universal donors** because they can give blood to anybody, although the most common blood group they can only receive blood from their own group.

❖ **Deep vein thrombosis(DVT)** are swollen areas caused by unwanted clotting in veins due to a lack of movement on long journeys’. (flight socks may prevent DVT)
Circulatory System

**Open circulatory systems** allow the blood flow out of the vessels before returning to the heart via *ostia*. (no veins involved) E.g. insects.

- **Closed circulatory** systems don’t allow the blood to leave the blood vessels E.g. humans advantages include **faster and controlled delivery of oxygen and nutrients** which allow for longer periods of activity.

- **Arteries** are blood vessels that carry blood away from the heart in powerful pulses. They have thick walls small lumens and no valves.

- **Endothelium** is the innermost layer of blood vessels that consists of just a single layer of cells.

- **Veins** are blood vessels that carry blood to the heart in an even flow. They have thin walls large lumens and valves.

- **Capillaries** are tiny blood vessels with walls just one cell thick, they carry blood from arterioles to venules through tissues releasing nutrients and removing wastes.

- The human circulatory system consists of two circuits **systemic and pulmonary**.

- The **coronary artery** carries blood to the heart muscle from the aorta. (coronary vein)

- The **hepatic artery** carries blood to the liver. (**hepatic vein**)

- The **renal arteries** carry blood to the kidneys. (**renal veins**)

- The **mesenteric arteries** carry blood to the small and large intestines.

- The **carotid arteries** supply blood to the head. (**jugular veins**)

- The **subclavian arteries** supply blood to the arms. (**subclavian veins**)

- The **iliac arteries** carry blood to the legs. (**iliac veins**)

- A **portal system** is a network of capillaries in one organ or tissue joined to another network of capillaries in another organ or tissue via a vein or veins.

- A **pulse** is the alternate contraction and relaxation of an artery as blood passes through it.

- **Blood pressure** is the force blood exerts on the walls of blood vessels.

- A **sphygmomanometer** is used for measuring blood pressure(normally 120/80 mmHg)

- **Atherosclerosis** is the hardening of artery walls due to a build-up of fatty deposits.

- **Smoking** causes heart rate and blood pressure to increase. **Diet** high in saturated fats increase blood pressure and atherosclerosis. **Exercise** helps lower blood pressure.
Lymphatic System

- The lymphatic system returns extracellular fluid (ECF) or interstitial fluid caused by plasma leaking from capillaries to the bloodstream.

- Lymph is a clear liquid that is collected around cells and is transported by the lymphatic system back to the bloodstream.

- Lymph vessels are narrow, dead ending tubes that transport lymph and are present in every tissue and organ throughout the body.

- Lymph nodes are small spherical-shaped organs of the lymphatic system that contain many white blood cells.

- Functions of the lymphatic system:
  1. Filters lymph: white blood cells in lymph nodes remove bacteria and viruses.
  2. Absorb fat from small intestine: lymph vessels throughout the wall of the digestive system absorb lipids.
  3. Maturation of certain white blood cells: lymphocytes mature and become fully active in the thymus.
  4. Fighting infection: white blood cells produce antibodies to kill bacteria and viruses.