

Cells, Tissues and Organs

Multicellular organisms are organisms that are made up of more than one cell- e.g. humans, plants

Unicellular organisms are organisms that are made up of just one cell- e.g. amoeba, paramecium

- Cells are the basic unit of life
- Tissues are a group of cells specialised to perform a particular function e.g. muscle tissue, nerve tissue
- Organs consist of a group of tissue working together to bring about specific functions- e.g. brain, heart, lungs
- A system is a group of related tissues and organs –e.g. blood, heart, arteries, capillaries and veins, all make up the circulatory system

Cells – Tissues- organs- systems

Specialisation means that animal cells have a special shape or structure that allows them to carry out their function.

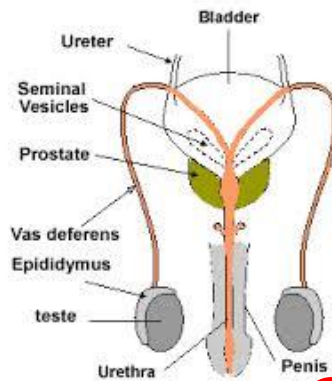
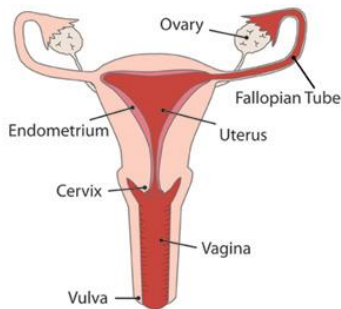
Cell	Function	Specialisation
Skeletal muscle cell	Contracts to allow movement of body parts	Contains long protein filaments that can slide past each other to shorten the cell
Neuron (nerve cell)	Transmits electrical impulses from one part of the body to another	Contains membrane proteins that carry out active transport of sodium and potassium ions to help “recharge” the cell
Red blood cell	Carries oxygen to body tissues that require it	Has no nucleus so that there is more space available to carry oxygen
Sperm cell	Transfers genes from the male body to the female gamete during sexual reproduction	Has a tail that enables it to swim to egg cell and has several mitochondria to supply ATP for energy
Phloem cell (found in plants)	The building block of the transport system for sugars	Cells have holes in their cell walls at each end to allow sugars to move from one cell to the next
Xylem cell (found in plants)	The building block of the transport system for water and mineral salts	Cells are strengthened with a hard substance called lignin to withstand changes in pressure of water

Reproduction

In sexual reproduction, new organisms are produced from the joining of the male sex cell and the female sex cell. This is called fertilisation.

Sex cells are also known as **gametes**. The **male** gamete is the **sperm** cell and the **female** gamete is the **egg** cell.

Sperm cells are **continuously** in the **testes** of adult male mammals. During sexual intercourse sperm cells travel through the **sperm duct**, into the **urethra** and are released at the end of the **penis**. They reach the oviducts by swimming up through the vagina and the uterus.



The **egg** cells are produced in the **ovaries** of a female mammal. The eggs are **released** from the ovaries into the **oviducts**.

If an egg cell is **fertilised** by a **sperm** in the oviduct then it **divides** several times and implants itself into the wall of the **uterus** where it grows and develops into a new individual.

Fertilisation

Fertilisation is the joining of a male gamete to female gamete to create the first cell of a new individual.

- The first cell is called a **zygote**
- The zygote has a chromosome complement of 46 (**diploid**) because it gets 23 chromosomes from each of the gametes.
- Several rounds of mitotic cell division then take place
- Many of the new cells produced then become specialised to perform particular functions and form all the body tissues of the new individual

Blood

In mammals, nutrients (e.g. glucose and amino acids) , oxygen and carbon dioxide are transported around the body in the blood.

Red blood cells are specialised to carry oxygen because:

- They contain large quantities of a protein called haemoglobin which can bind oxygen
- They have a bio-concave disc shape , which maximises the surface area of the cell membrane for oxygen to diffuse across
- They don't have a nucleus so there is more room for haemoglobin
- They are tiny and flexible so can squeeze through the narrowest of blood capillaries to deliver oxygen

Blood is made up from red blood cells, white blood cells, platelets , all floating in plasma. Plasma contains blood cells and dissolved substances.

Haemoglobin binds with oxygen in body locations where the oxygen concentration is high (in the lungs) and forms oxyhaemoglobin.

In locations where the oxygen concentration is low (body tissues), the haemoglobin releases oxygen.

- Blood that has a low oxygen concentration is a dark red colour and is described as deoxygenated

Capillaries

- Tiny blood vessels with walls one cell thick where exchange of materials occurs
- Form networks to allow exchange of materials
- Carbon dioxide moves into the blood from the cells
- Oxygen moves into the cells from the blood
- The blood pressure in the capillaries is high

Veins

- A blood vessel with valves that transports blood to the heart
- Contain deoxygenated blood
- Have a thin wall thickness
- The blood pressure in the veins is low

Arteries

- A blood vessel that doesn't contain valves and transports blood away from the heart

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Pathway of Blood