

Cells & Reproduction Key Notes

Organs

A group of similar cells is called a **tissue**

A group of **different tissues** is called an **organ**

An organ is made from a group of different tissues, which all work together to do a particular job

Both animals and plants have organs: -

Animals: -

- Heart
- Lung
- Stomach
- Brain
- Kidney
- Liver

Plants: -

- Leaf
- Root
- Stem
- Flower

Organs can work together do perform specific jobs – these are called organ systems

The skeleton has three main functions: -

- Supporting the body
- Protecting some of the vital organs
- Helping the body move

Cells

A cell is the basic building block for both animals and plants

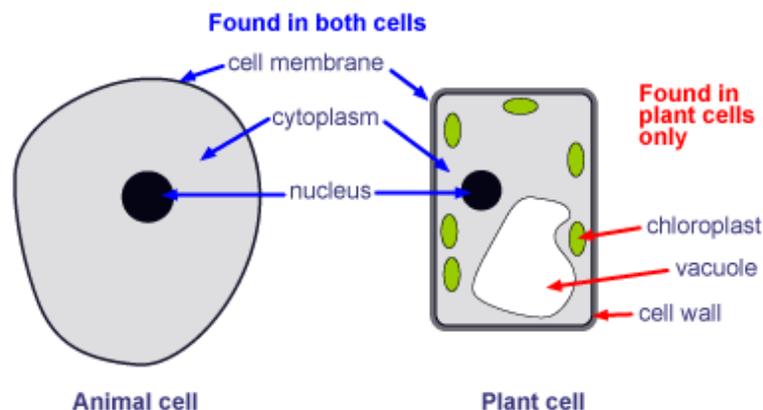
Cells are extremely small (we need a microscope to see them)

Animal cells contain: -

| Part | Function |
|---------------|---|
| Nucleus | Controls what happens in the cell (but it is <i>not</i> a 'brain')! |
| Cell Membrane | Controls what substances can enter and exit the cell |
| Cytoplasm | Where chemical reactions take place (jelly-like substance) |

Plant cells contain (as well as the parts found in an animal cell): -

| Part | Function |
|--------------|---|
| Chloroplasts | Where <i>photosynthesis</i> occurs (contain chlorophyll (which is green)) |
| Vacuole | Contains cell sap (a solution of sugar and salt) helping with rigidity |
| Cell wall | Made of cellulose, which gives support to the cell |



Many organisms are multi-cellular - they are made up of lots of cells, not just one!

Many of these cells are specialised, sharing out the *life processes* (they work together as a team, supporting the organism)

Animal specialisation – red blood cell (large surface area to carry oxygen); nerve cell (long and can carry electrical signals); male sex cell (sperm with long tail for movement); female sex cell (large cytoplasm as energy store)

Plant specialisation – root hair cell (large surface area to absorb water and minerals); leaf cell (lots of chloroplasts to aid photosynthesis)

Specialised animal cells (red blood cell; nerve cell; egg cell; sperm cell): -



Specialised plant cells (root hair cell; leaf cell): -



Fertilisation

The sperm cell is extremely streamlined, with a powerful tail for swimming. It also has special chemicals in its head to help it penetrate the egg cell.

The egg cell is full of cytoplasm, used as an energy store for when fertilisation occurs. It also has a special barrier, which only allows one sperm to penetrate and fertilise it.

Living organisms must reproduce to survive. Most animals do this via sexual reproduction, involving a male and a female

Males produce sperm cells, whilst females produce egg cells - these can fuse to produce offspring, in the process known as fertilisation

Fertilisation occurs when a sperm cell and egg cell meet, and join together. This occurs after sexual intercourse, when sperm from the male travels towards the egg tubes (oviducts) within the female. If a sperm cell meets an egg cell there, fertilisation can occur

The nucleus of the sperm cell and egg cell contain only half the genetic information needed for a new human, so when they fuse there is enough information for life to begin

Because fertilisation requires information (genes) from both the male and female, the offspring (baby) will have features from both its mum and dad

1. Sperm cells from the male enter the female during sexual intercourse
2. Sperm and egg cells meet within the oviducts
3. 1 sperm cell can burrow into the egg cell, and fertilise it
4. At this point no more sperm cells can enter the egg cell
5. Genetic information is shared between the nucleus of the sperm and egg cell
6. The fertilised egg now divides into two, and then into four, then eight etc... becoming a ball of cells - an embryo

External fertilisation occurs outside the female - the male releases sperm cells onto the egg cells as the female lays them

External fertilisation occurs in fish and most water dwelling animals (e.g. amphibians). These organisms usually produce a large number of sex cells which are released into the water.

There are usually courtship rituals which make sure the male and female sex cells are released near each other.

However, the chances of fertilisation are very low, so huge numbers of eggs and sperm are needed to ensure enough offspring are produced

Internal fertilisation occurs inside the female

Internal fertilisation occurs in most land dwelling organisms (such as mammals) - this is necessary as sperm need fluid in order to be able to swim to the egg (the fluid comes from semen, ejaculated along with the sperm from the male).

These organisms produce far fewer sex cells, as the chances of successful fertilisation are much higher (the sex cells are much closer together when they are released)

Reproductive systems

The reproductive system contains the organs needed for reproduction - this includes both male and female systems

The male system contains the following: -

- ⊕ Testes
- ⊕ Glands
- ⊕ Sperm ducts
- ⊕ Urethra
- ⊕ Penis

Testes

The testes (individually called a testis) are contained in a sac of skin called the scrotum. Their function is to produce millions of male sex cells (sperm) and to make the male sex hormone (testosterone) which affects the way a male's body develops. They are located outside of the body keeping sperm at a temperature slightly lower than the body, essential for healthy sperm production

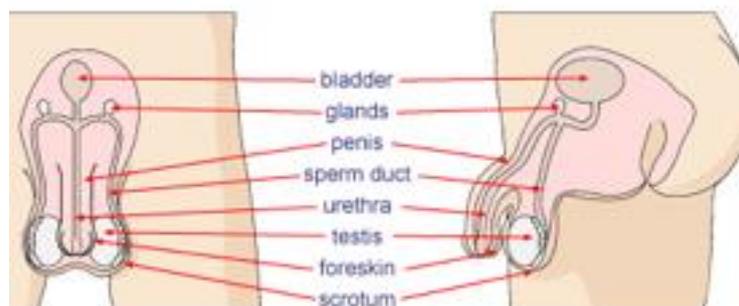
Sperm duct and glands

The sperm can pass through the sperm ducts, where it mixes with fluids produced by the glands. The fluids provide the sperm cells with nutrients - this mixture of sperm and fluid is known as semen

Penis and urethra

The penis passes urine out of the male's body, and passes semen into the vagina of the female during sexual intercourse

The urethra is the tube inside the penis that can carry urine or semen. A ring of muscle makes sure that there is no chance of urine and semen getting mixed up



The female system contains the following: -

- ⊕ Ovaries
- ⊕ Oviducts (egg tubes / Fallopian tubes)
- ⊕ Uterus

- ⊕ Cervix
- ⊕ Vagina

Ovaries

The two ovaries contain hundreds of undeveloped female sex cells (egg cells or ova). Females have these cells in their body from birth (whereas males produce new sperm continually). These are make the female sex hormones (oestrogen and progesterone)

Oviducts (egg tubes / Fallopian tubes)

Each ovary is connected to the uterus by an oviduct (Fallopian tube). The oviduct is lined with cilia which are tiny hairs on every cell. Every month (in humans) an egg develops and becomes mature, and is released from an ovary. The cilia waft the egg along the oviduct and into the uterus.

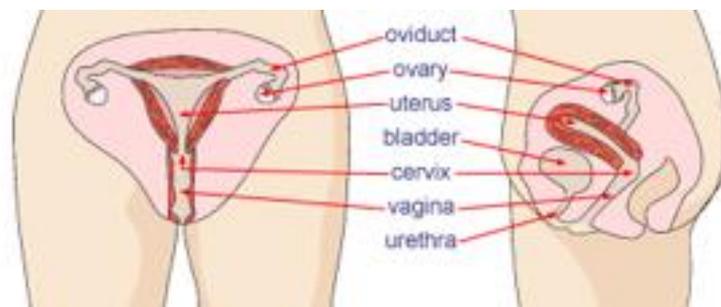
Uterus and cervix

The uterus (womb) is a muscular bag with a soft lining where the foetus develops until birth.

The cervix is a ring of muscle at the lower end of the uterus, which keeps the foetus in place during pregnancy.

Vagina

The vagina is a muscular tube that leads from the cervix to the outside of the female body. During sexual intercourse, the male's penis enters the vagina. The opening to the vagina has folds of skin called labia that meet to form a vulva. The urethra also opens into the vulva, but it is separate from the vagina and is used for passing urine from the body



Menstrual cycle

The female reproductive system includes a cycle of events called the menstrual cycle

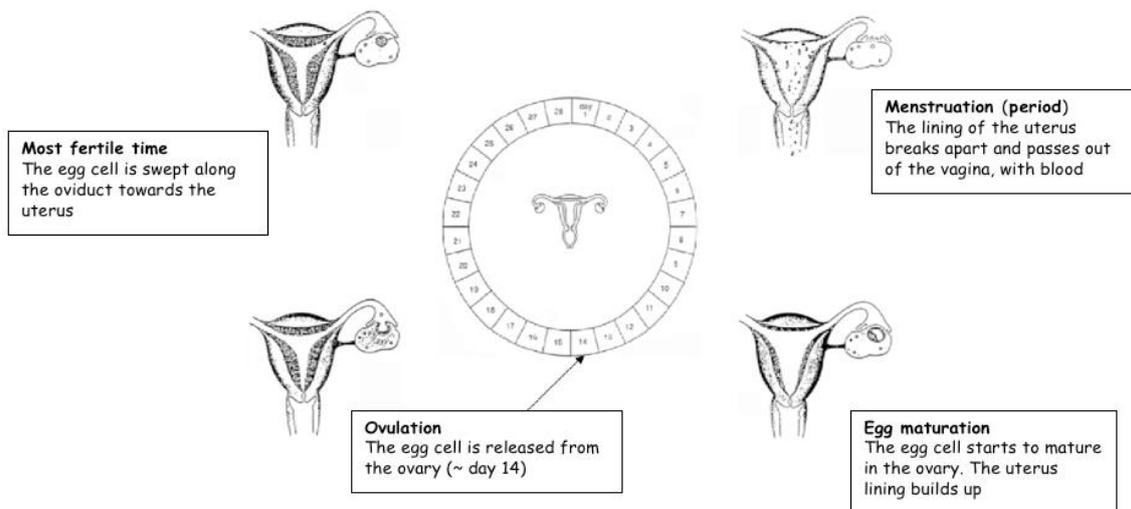
It lasts about 28 days (but it can be slightly more or less than this)

It is controlled by a series of sex hormones (produced in the brain and ovaries)

A female must have a menstrual cycle - for fertilisation to occur she needs to release her sex cells (eggs) and be prepared for pregnancy - this occurs during the menstrual cycle

Egg cells are released from the ovaries. The time when they are released is called ovulation. If the egg cell meets a sperm cell it will be fertilised. If it does not, it will die.

The time when the uterus lining breaks apart is called menstruation. Another term for this is 'having a period'. During this time the uterus lining and a little blood passes out of the vagina.



If an egg cell and sperm cell meet, and there is successful fertilisation, the body will detect this, and the soft lining of the uterus not break down (the female will have no more menstruations / periods)

The embryo will then attach to the uterus lining, where it will develop into a foetus (and in a human, this development will last for around nine months until birth)

During pregnancy, the uterus lining becomes much thicker as it supplies the embryo with the materials it needs to develop and grow. It will not break down during pregnancy (if this were to happen the foetus would not be able to develop and grow, and would die)

Birth & Adolescence

The foetus relies upon its mother as it develops. It needs: protection; oxygen; nutrients (food and water). It also needs its waste substances being removed

The foetus is protected by the uterus and a protective bag called the amnion

This protective bag (amnion) contains a special liquid - amniotic fluid Oxygen; nutrients (food and water); and waste products are all taken care of by the placenta

The placenta grows into the wall of the uterus and is joined to the foetus by the umbilical cord

The mother's blood does not mix with the foetus's blood, but the placenta lets substances pass between the two blood supplies.

It is vital the baby receives a great deal of care, as it is completely reliant on the mother to survive

For the first few months the baby needs to be fed on milk from the breasts (mammary glands) - this contains nutrients allowing the baby to grow. Just as importantly this milk contains antibodies, which help protect the baby from diseases (artificial milk does not contain this)

Reproductive systems of a child are not mature, and need to change as a boy or girl develops into an adult, so that the system is fully working

The changes are both physical and emotional – the time when these physical and emotional changes take place is known as adolescence

Changes which occur in boys and girls include: -

- Underarm and public hair growth
- Height change
- Body smells begin to get stronger

Changes in boys: -

- Voice breaks (gets deeper)
- Testes and penis get bigger
- Testes start to produce sperm cells
- Shoulders get wider
- Hair grows on face and chest

Changes in girls: -

- Breasts develop
- Ovaries start to release egg cells (periods start)
- Hips get wider