Knowledge Organiser: Animal Reproduction

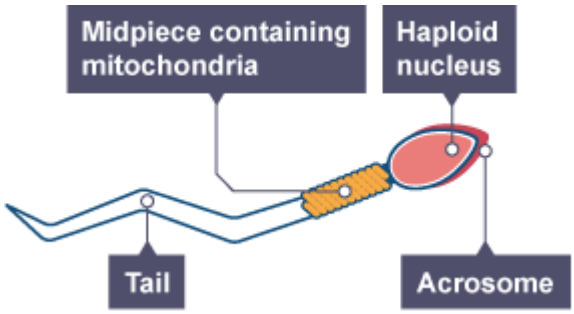
Sexual reproduction

Sexual reproduction involves the joining of two sex cells,
or gametes during fertilisation. Organisms produced by sexual reproduction have two parents and are genetically similar to both but not identical to either.

Fertilisation is the fusion of the nucleus of a male gamete (sperm cell) with the nucleus of a female gamete (egg cell), producing a new cell called a zygote. This then matures into an embryo. In humans, fertilisation happens inside the woman's body. This is a process called **internal fertilisation**.

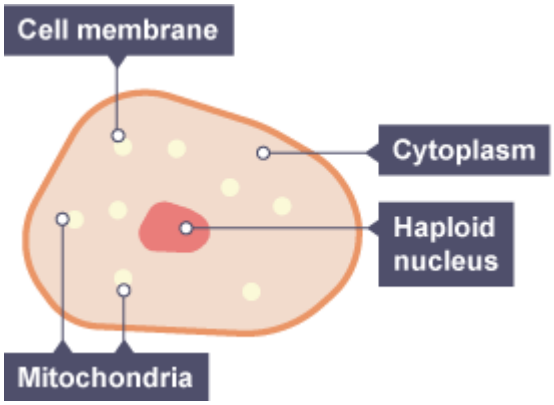
Sperm Cells

- The head contains the genetic material for fertilisation in the nucleus.
- The acrosome in the head contains enzymes so that a sperm can penetrate an egg.
- The middle piece is packed with mitochondria to release energy needed to swim and fertilise the egg.
- The tail enables the sperm to swim.
- Sperm are the smallest cells in the body and millions of them are made.

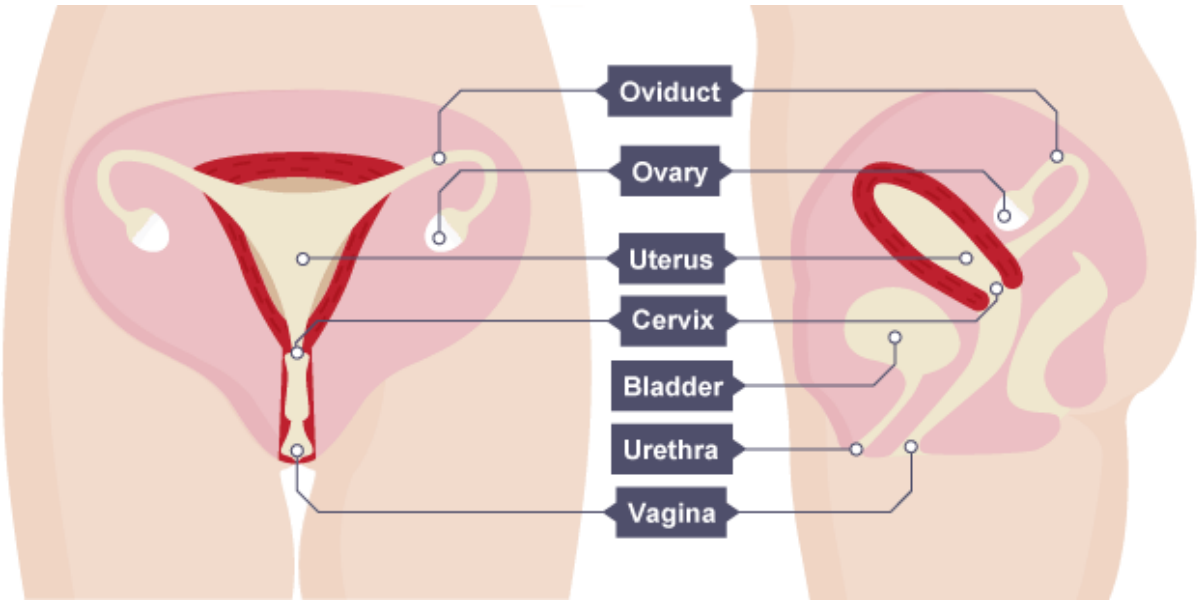


Egg Cells

- The cytoplasm contains nutrients for the growth of the early embryo.
- The nucleus contains the genetic material for fertilisation.
- The cell membrane changes after fertilisation by a single sperm so that no more sperm can enter.
- Eggs are one of the biggest cells in the body and only a few are made.

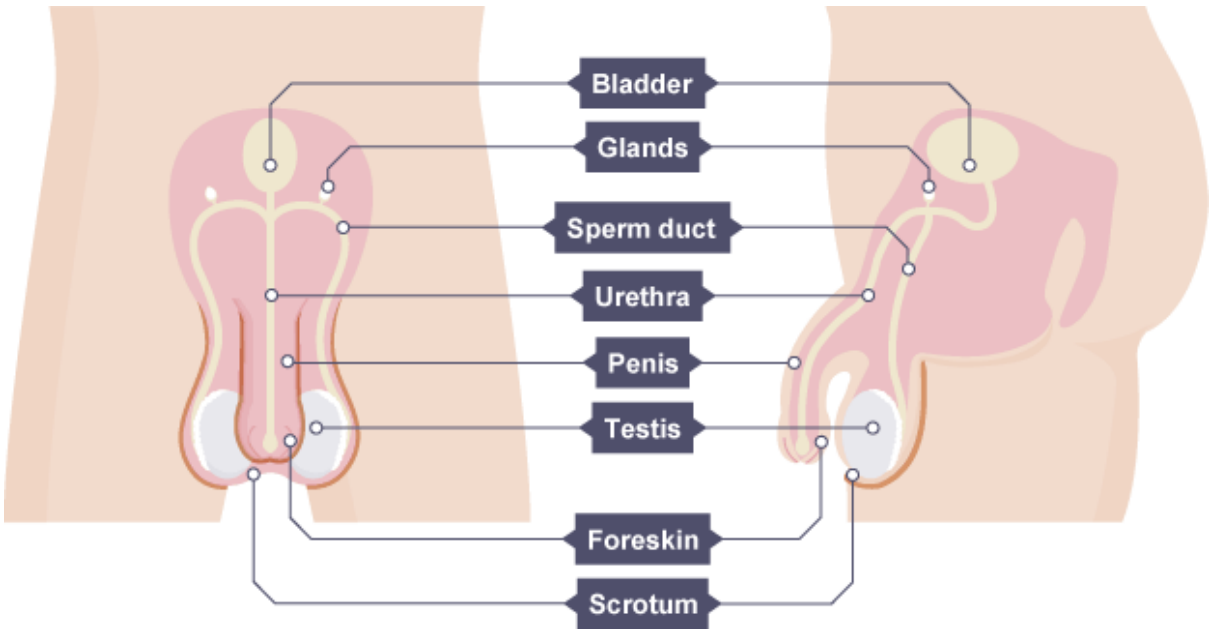


The **human female reproductive system** contains these parts:



Structure	**Function**
Ovaries	Contain hundreds of undeveloped female gametes (sex cells). These are called ova (one of them is called an ovum) or egg cells. Women have these cells in their bodies from birth, whereas men produce new sperm continually.
Oviduct	Each ovary is connected to the uterus by an oviduct. This is sometimes called a Fallopian tube or egg tube. The oviduct is lined with cilia, which are tiny hairs on cells. Every month, an egg develops, becomes mature and is released from an ovary. The cilia waft the egg along inside the oviduct and into the uterus.
Uterus	The uterus, also called the womb, is a muscular bag with a soft lining. The uterus is where a baby develops until its birth.
Cervix	The cervix is a ring of muscle at the lower end of the uterus. It keeps the baby in place while the woman is pregnant.
Vagina	The vagina is a muscular tube that leads from the cervix to the outside of the woman's body. A man's penis goes into the woman's vagina during sexual intercourse.

The **human male reproductive system** contains these parts:



Structure	**Function**
Testes	To produce millions of male gametes (sex cells) called sperm. To make male sex hormones, which affect the way a man's body develops.
Scrotum	Bag of skin surrounding the testes.
Glands	Produce fluids that provide the sperm cells with nutrients. The mixture of sperm and fluids is called semen.
Sperm duct	The sperm pass through the sperm ducts, and mix with fluids produced by the glands.
Penis	To pass urine out of the man's body. To pass semen out of the man's body.
Urethra	A 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.

Puberty

The reproductive system of a child is not mature. It needs to change as a boy or girl develops into an adult, so that the system is fully working. The time when the changes happen is called puberty.

The changes happen because of sex hormones produced by the testes in boys and by the ovaries in girls. Some changes happen in boys and girls, while others just happen in boys or girls.

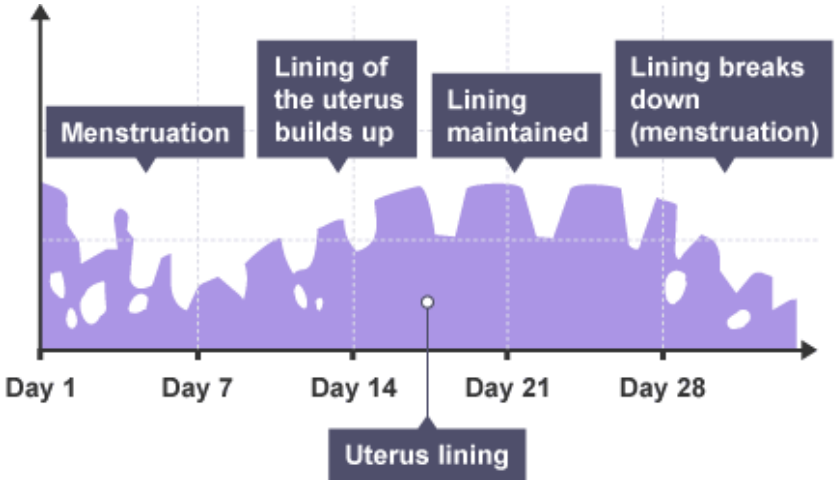
Both	**Boys**	**Girls**
Underarm hair grows	Voice breaks (gets deeper)	Breasts develop
Pubic hair grows	Testes and penis get bigger	Ovaries start to release egg cells (the menstrual cycle starts)
Body smell gets stronger	Testes start to produce sperm cells	Hips get wider
Emotional changes	Shoulders get wider	
Growth rate increases	Hair grows on face and chest	

The time between puberty and adulthood is called **adolescence**.

The 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 less or more than this. The cycle stops while a woman is pregnant. These are the main features of the menstrual cycle:

- The start of the cycle, day 1, is when bleeding from the vagina begins. This is caused by the loss of the lining of the uterus, with a little blood. This is called menstruation or having a period.



- By the end of about day 5, the loss of blood stops. The lining of the uterus begins to re-grow and an egg cell starts to mature in one of the ovaries.
- At about day 14, the mature egg cell is released from the ovary. This is called ovulation. The egg cell travels through the oviduct towards the uterus.
- If the egg cell does not meet with a sperm cell in the oviduct, the lining of the uterus begins to break down and the cycle repeats.

Fertilisation happens if the egg cell meets and joins with a sperm cell in the oviduct. The fertilised egg attaches to the **lining of the uterus**. The woman becomes pregnant, the lining of the uterus does not break down and menstruation does not happen.

The fertilised egg divides to form a ball of cells called an **embryo**. The embryo attaches to the lining of the uterus. It begins to develop into a fetus and finally into a baby.

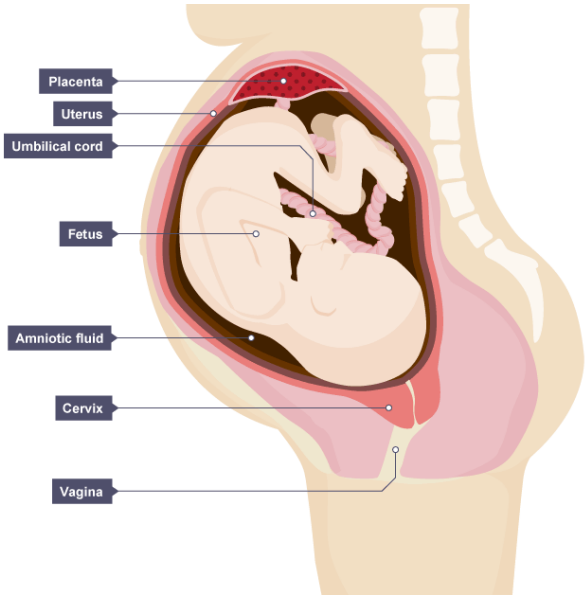
Development of the fetus

The fetus relies upon its mother as it develops. These are some of the things it needs:

- protection against knock and bumps, and temperature changes
- oxygen for respiration
- nutrients (food and water)

The developing fetus also needs its waste substances removing.

The fetus is protected by the uterus and the amniotic fluid, a liquid contained in a bag called the amnion.

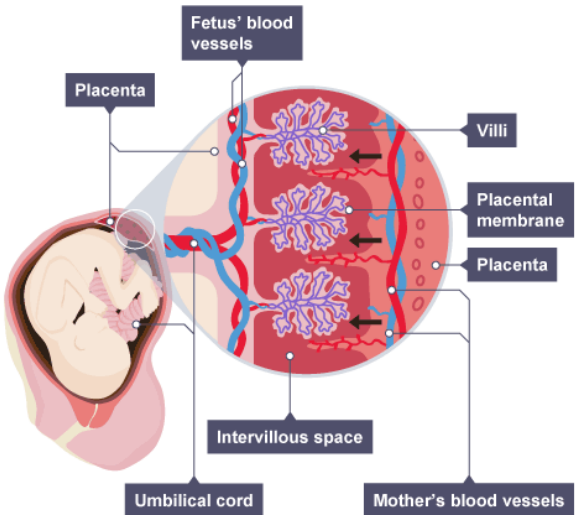


The placenta

The placenta is an organ responsible for providing **oxygen and nutrients**, and removing waste substances. It grows into the wall of the uterus and is joined to the fetus by the **umbilical cord**.

The mother's blood does not mix with the blood of the fetus, but the placenta lets substances pass between the two blood supplies:

- oxygen and nutrients diffuse across the placenta from the mother to the fetus
- carbon dioxide and other waste substances diffuse across the placenta from the fetus to the mother



The mother's lifestyle can affect the developing fetus. For example, **smoking** reduces the amount of oxygen in the bloodstream. This can lead to low birth weight and premature birth (when a baby is born too soon). Drinking alcohol during pregnancy can harm the developing baby's nervous system, especially its brain.

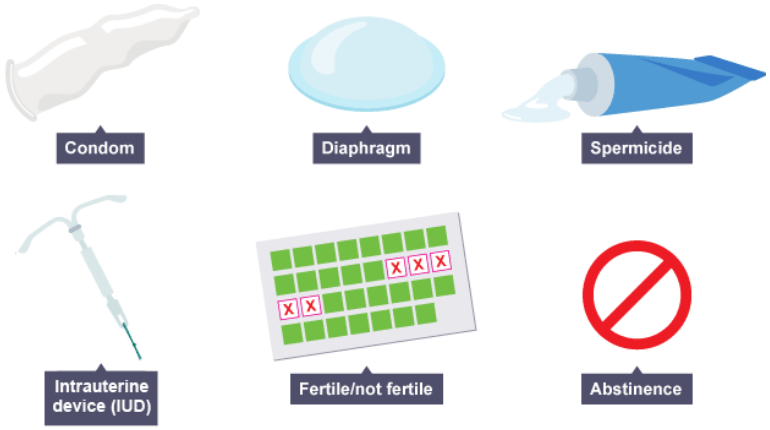
Birth

It takes about **40 weeks** for a baby to develop in the uterus. This time is called gestation. After this, the baby is ready to be born. The **cervix relaxes** and muscles in the wall of the uterus contract. Waves of muscle contraction push the baby out of the mother's body through the vagina.

Contraception

Hormonal contraception

Human fertility is controlled by hormones, so fertility can be controlled using hormonal forms of contraception.



The oral contraceptive, which is known as the pill, contains oestrogen or progesterone. These hormones stop the eggs from maturing.

Benefits and risks of hormonal contraception

Oral contraceptives are more than 99% effective if taken correctly and can reduce the risk of certain cancers.

However, there are possible side effects, such as changes in weight, mood and blood pressure due to high levels of oestrogen. Modern pills contain much less oestrogen.

Contraceptive injections, implants or skin patches contain slow release progesterone to prevent the maturation and release of eggs.

Non-hormonal contraception

Fertility can be controlled without hormones.

These methods include:

- physical barrier methods such as condoms and diaphragms, which prevent the sperm reaching an egg
- intrauterine devices (IUD) also known as a coil, prevent the implantation of an embryo or release of a hormone
- spermicidal agents which kill or disable sperm
- abstaining from intercourse when an egg may be in the oviduct
- surgical methods of male and female sterilisation, eg a vasectomy, where the sperm ducts are cut and tied

Benefits and risks of non-hormonal contraception

- Condoms are easy and quick to use, but sometimes they can tear or rip.
- Diaphragms need to be put in just before sex and left in several hours afterwards.
- IUDs need to be fitted by a health professional. IUDs can remain in position for up to 10 years. However, there is a small risk of causing an ectopic pregnancy, which leads to complications for both the mother and the foetus.
- Spermicidal agents can be added to other physical barriers such as condoms, but some people can have allergic reactions to these.
- Abstaining can be used successfully, but if the timings are not accurate, the chance of pregnancy is high.
- Surgical methods cannot be reversed, and is considered permanent.