



What should I already know?

Variation and classification

Living things are classified into broad groups according to observable characteristics, similarities and differences

Adaptations

Animals and plants are adapted to the conditions of the habitats in which they live.

An adaptation is a way an animal's body helps it survive in its environment – for example meerkats have dark circles around their eyes, which act like sunglasses, helping them see even when the Sun is shining very brightly.

Human reproduction and development

The gametes in animals are the egg cell and the sperm cell.

Fertilisation happens when the nucleus of a male gamete fuses with the nucleus of a female gamete.

Humans change throughout their lifetime, from the moment of conception to the time they grow old.

Some changes occur much faster than others. We change fastest during the first few months of our existence

What will I know by the end of the unit?

Variation

There is variation within a species and this can be measured and classified as continuous or discontinuous variation.

Variations can be caused by the environment or by inheritance, but many are caused by a combination of both factors

Variation between organisms ensures that some organisms survive.

Species that have too little variation may become extinct

Human reproduction

The male and female human reproductive systems are adapted for successful reproduction.

Puberty and reproduction are controlled by hormones. Drugs can be used to support infertility and contraception.

When an egg is fertilised, it develops into a foetus. This grows in the uterus until it becomes a fully grown baby.

Many factors affect the growth and development of a foetus, including the mother's use of alcohol, cigarettes and drugs

Vocabulary

Adaptation	Over generations the characteristics of a species are adapted to particular environmental conditions. Variation helps a particular species in a changing environment.
Amniotic fluid:	Liquid that surrounds and protects the foetus.
Bias	When an experimenter affects the outcome, or when a journalist favours a point of view
Characteristics (Inherited)	A feature or characteristic that has been passed on from parent to offspring, genetically.
Characteristics (Environmental)	A feature or characteristic that has been affected by the environment. E.g poor diet resulting in poor growth.
Claim	To present evidence and reasoning
Embryo	Young foetus before its main organs are formed
Evidence	Information gathered in a scientific way, which supports or contradicts a conclusion
Fertilisation	When the nucleus of a male sex cell fuses (joins with) of a female sex cell.
Foetus	Developing baby during pregnancy
Gamete	Gamete: The male gamete (sex cell) in animals is a sperm, the female an egg.
Genetic	caused by genes, inherited
Gestation	Process where the baby /foetus develops during pregnancy.
Infertility	The inability to reproduce by natural methods
Implantation	If an egg is fertilised it settles into the uterus lining.



Justify	The process of proving that an idea is correct or incorrect
The menstrual cycle	prepares the female for pregnancy and stops if the egg is fertilised by a sperm. The menstrual cycle lasts approximately 28 days. But is not the same in all women.
Menstruation	Breakdown and loss of the uterus lining, during the menstrual cycle. Leading to bleeding from the vagina (a period.)
Opinion	a view formed about something, not necessarily based on fact or supported by evidence
Ovary:	Organ which contains eggs.
Oviduct.	or fallopian tube : Carries an egg from the ovary to the uterus and is where fertilisation occurs
Ovulation	Release of a mature egg cell from the ovary during the menstrual cycle.
Placenta	Organ that provides the foetus with oxygen and nutrients and removes waste substances.
Penis:	Organ which carries sperm out of the male's body.
Premature	When a baby is born before it is fully developed.
Reasoning	The act of thinking about something in a logical way; the steps can be used to justify the conclusion reached
Reliable	Results from an experiment which display overall consistency; it produces similar results under consistent conditions
Reproductive system	Organ in a male or female organism involved in producing offspring; in humans it is where sperm or egg cells are produced.
Sample size	The number of observations to include in a sample as part of an investigation
Semen	Fluid in which sperm are carried
Species	Group of organisms that have more in common with each other than with other groups; they can interbreed and produce fertile offspring.
Survival advantage	Variation between individuals is important for the survival of a species, helping it to avoid extinction in an always changing environment.
Testicle:	Organ where sperm are produced.
Umbilical cord	Connects the foetus to the placenta. The developing foetus relies on the mother to provide it with oxygen and nutrients, to remove waste and protect it against harmful substances.
Uterus,	or womb : Where a baby develops in a pregnant woman.
Urethra	In a male, a tube in the penis through which sperm travel in semen
Vagina	Where the penis enters the female's body and sperm is received.
Valid	The suitability of a procedure to answer a particular question
Variation	The differences within and between species. There is variation between individuals of the same species. Some variation is inherited, some is caused by the environment and some is a combination.
Variation (Continuous)	Continuous variation Differences in characteristics (or other data) can have any numerical value e.g. Weight, height.
Variation (Discontinuous)	Discontinuous variation. Differences in characteristics can only be grouped in discrete (separate) categories e.g. eye colour, left or right handedness.
Zygote	The cell formed when two gametes fuse during fertilization



Useful Websites

Oak Academy. Home learning, missed lessons and revision. All of this topic can be found in the KS3 Science section of this website, Year 7 Unit 4 Reproduction and Variation

<https://continuityoak.org.uk/lessons>

BBC bitesize

Reproduction <https://www.bbc.co.uk/bitesize/topics/zybbkqt>

Variation <https://www.bbc.co.uk/bitesize/topics/zpffr82/articles/z6j66g8>

https://www.youtube.com/watch?v=cGxMKn_e_AA

Revision Monkey on youtube

Variation https://www.youtube.com/watch?v=DjGZp_IU5EY

Peppered moth <https://www.youtube.com/watch?v=Pop-xetGaBM>

Natural Selection https://www.youtube.com/watch?v=MX3KJMu_Gq0

Competition and adaption <https://www.youtube.com/watch?v=rNmyq8NPgSI>

Fertilisation and the developing foetus <https://www.youtube.com/watch?v=o7Z9XrTA5sM>

Male and female reproductive systems <https://www.youtube.com/watch?v=QkqDoF9KK60>

Menstrual Cycle <https://www.youtube.com/watch?v=QkqDoF9KK60>

Fertilisation and the developing foetus <https://www.youtube.com/watch?v=o7Z9XrTA5sM&t=92s>

Education quizzes

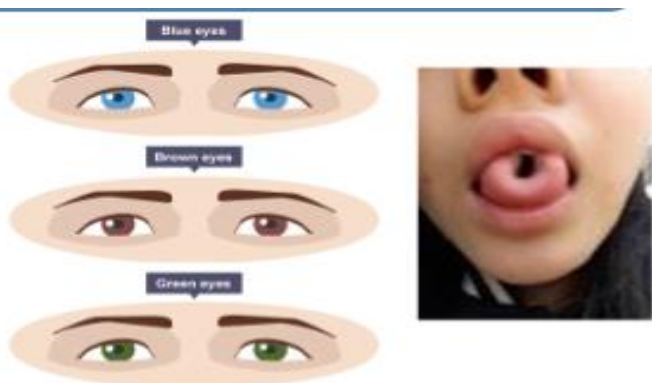
<https://www.educationquizzes.com/ks3/science/reproduction-01/>

Extension

<https://www.bbc.co.uk/bitesize/guides/zw9jq6f/revision/1>

Key information Variation

Genetic Variation

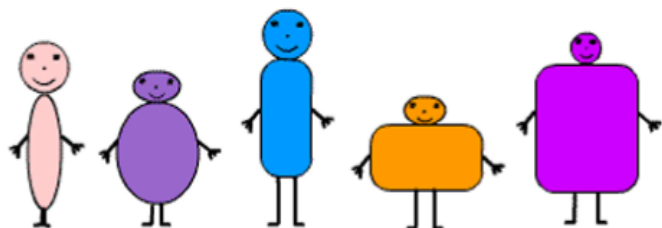


Eye colour is an example of **genetic** variation. Other examples are blood group, lobed or lobeless ears and the ability to roll your tongue

Key information Reproduction

Key Vocabulary

1	Gametes	The male gamete (sex cell) in animals is a sperm, the female gamete is an egg.
2	Gestation	Process where the baby develops during pregnancy.
3	Fertilisation	Joining of a nucleus from a male and female sex cell.
4	Amniotic fluid	Liquid that surrounds and protects the fetus.
5	Placenta	Organ that provides the fetus with oxygen and nutrients and removes waste substances. It also acts as a barrier, stopping infections and harmful substances reaching the fetus.



There is **variation** between individuals of the same species. Some variation is **inherited**, some is caused by the **environment** and some is a **combination**.

Variation between individuals is important for the survival of a species, helping it to avoid extinction in an always changing environment.

Continuous and Discontinuous Variation

[KS3 Biology](#) [Genetics and Evolution](#) [Continuous and Discontinuous Variation](#)

Organisms of the same species show two types of variation, which show the differences in characteristics between individuals.

The two types of variation are:

Continuous variation

Discontinuous variation

Continuous Variation

In **continuous variation**, there is no fixed value

Instead, there is a complete range of measurements, from one extreme to another.

An example of continuous variation is human height, which ranges between the shortest person and the tallest person.

Any given human will have a height between this range (for example 1.7m, 1.71m, 1.72m, 1.725...), which makes it continuous variation.

Some other examples of continuous variation are:

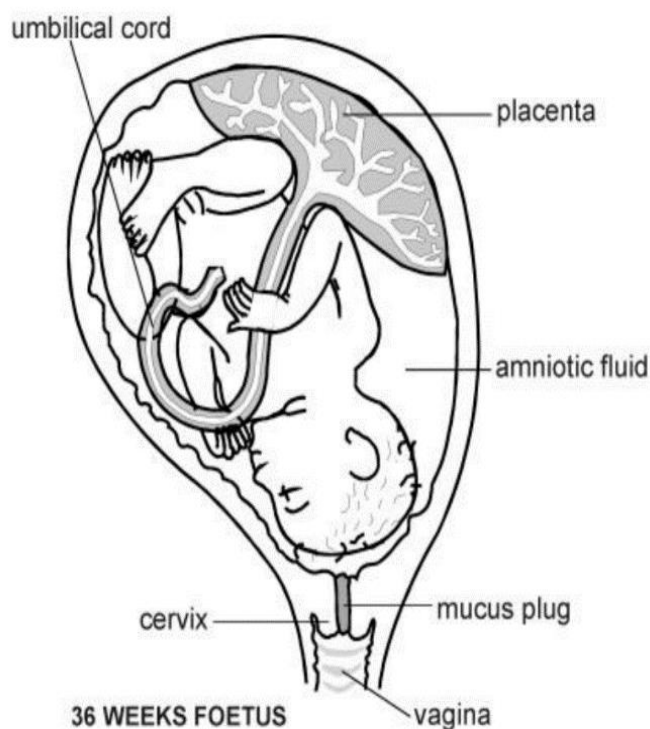
Weight

Heart rate

Rate of photosynthesis

Pregnancy

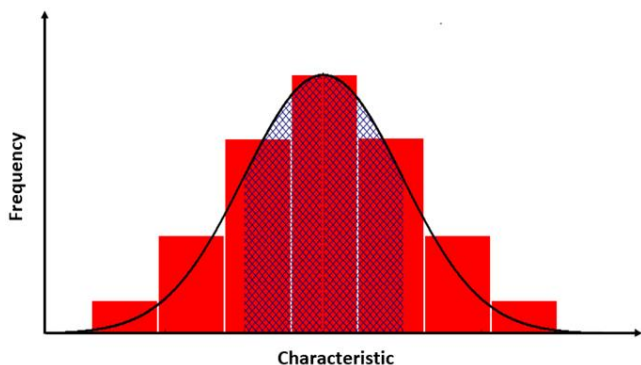
The fertilised egg develops into an **embryo** and then a **foetus**. It is protected by the **amniotic fluid** and obtains food from the mother's blood via the **placenta**. Pregnancy lasts **9 months** and then the muscles of the uterus push the baby out through the vagina.



IVF

This stands for 'in vitro fertilisation', and helps couples who cannot conceive to have a baby. The egg is fertilised by the sperm in a **petri dish** and then the **embryo** is placed back in the **uterus** to develop.

Characteristics that change gradually overtime show continuous variation. You can record data with a continuous range of values and plot it as a histogram. The



data will show a smooth curve (usually the normal distribution curve).

The more data you collect and the more categories you use, the closer your results will be to the bell curve,

In continuous variation, the characteristics:

- Are usually quantitative, with each category being continuous with the next
- Have no distinct categories which individuals in a species can be placed into
- Are determined by a large number of genes (which is known as polygenic inheritance)

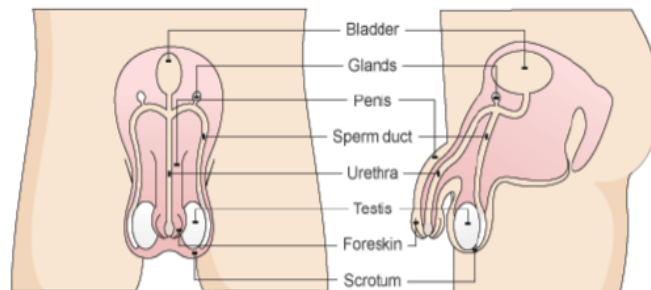
Are significantly affected by the environment

Humans have around 20,000 genes.

Discontinuous variation

In **discontinuous variations** there are differences in characteristics that only have a limited number of possible values (fixed values). Individuals fall into a number of categories, by which characteristics cannot be measured across a complete range. Discontinuous variation is controlled by alleles of one gene or a small number of genes, without much influence from the environment.

Male reproductive system



Parts of Male Reproductive System	Functions of the part
Testes	The organ where sperm cells are made
Scrotum	The skin that holds the testes
Sperm ducts	The tubes that carry sperm from the testes to the urethra
Glands	These add liquids, including nutrients for the sperm, to the sperm cells from the testes to make semen
Urethra	The tube that carries either urine or semen out of the body through the penis
Penis	The organ that enters the vagina during sexual intercourse
Foreskin	The skin that protects the end of the penis

Sperm Cell Adaptations

The head is covered with an acrosome, which releases enzymes to digest the egg cell membrane.

The midpiece contains many mitochondria to release energy for movement.



The nucleus contains genetic information from the father. The sperm cell carries half the genetic information that will be received by the offspring.

The sperm cell has a tail (flagellum) to allow it to move towards the egg cell to fertilise it.



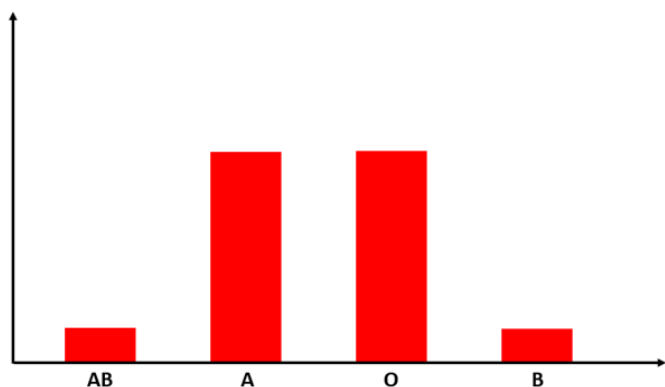
An example of discontinuous variation are human blood groups. It is only possible to have one of four blood groups (A, B, AB or O). As you can either have one blood group or another, this is discontinuous variation.

Some other examples of discontinuous variation:

Hair colour

Gender

When plotting discontinuous variation on a graph, the data is called discrete or categorical data. For example, with human blood types:



Features of discontinuous variation graphs:

Usually qualitative

Well defined categories

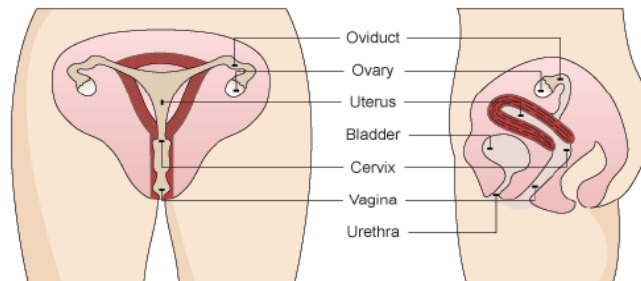
Controlled by few genes

Unaffected by the environment

Environmental Causes of variation

Characteristics of animal and plant species can be affected by factors such as e.g. climate, diet, accidents, culture, lifestyle

Female reproductive system

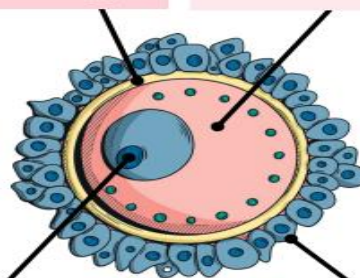


Parts of Female Reproductive System	Functions of the part
Ovary	The organ where eggs (ova) are produced and where they mature ready for release each month
Oviduct	The small tube leading from each ovary to the uterus – the egg travels along here and fertilisation happens here
Uterus	The organ where an embryo grows into a foetus and eventually a baby
Uterus lining	The wall of the uterus
Cervix	A ring of tissue between the uterus and vagina; this helps keep a foetus in place in the uterus during pregnancy
Vagina	The organ that is entered by the penis during sexual intercourse; this is also part of the birth canal

Egg Cell Adaptations

The cell membrane changes after fertilisation so no more sperm cells can enter the egg.

The cytoplasm contains nutrients to support the developing embryo after fertilisation.



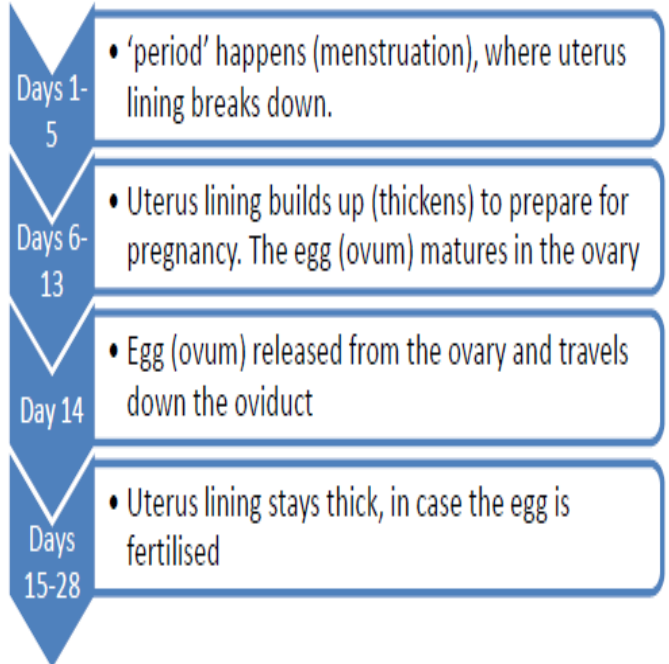
The nucleus contains genetic information from the mother. The egg cell carries half the genetic information that will be received by the offspring.

The large size of the egg cell increases the chance of it being fertilised and allows more space for nutrients to be stored.



The menstrual cycle

The menstrual cycle prepares the female body for pregnancy by causing eggs (ova) to mature and be released. It lasts for 28 days.

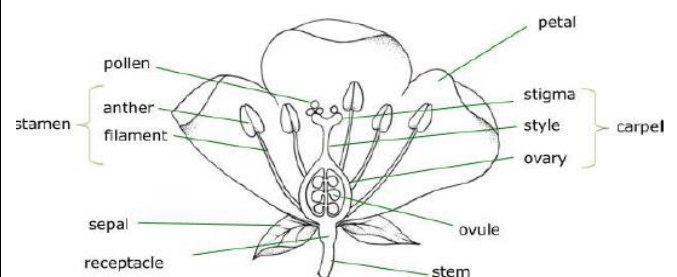


Examples of characteristics controlled by the **environment** are: climate, diet, accidents and lifestyle. A plant in the shade of a big tree will grow taller as it tries to reach more light.



Some features vary because of a **combination** of genetic and environmental causes. For example, identical twins inherit exactly the same features from their parents. But if twin A eats more than twin B (and all other conditions stay the same), then twin A is likely to end up heavier.

Plant reproductive system



Selective breeding

These dogs are all the same species but they are different varieties as they have been selectively bred by dog owners.



Parts of plant Reproductive System	Functions of the part
Pollen	The male gamete (sex cell)
Stigma	Structure that the pollen sticks to
Style	Connects the stigma to the ovary
Ovary	Produces and stores ovules
Ovule	The female gamete (sex cell)
Anther	Produces the pollen
Filament	Holds the anther to the edge of the flower



Topic: Genes

Variation and Human reproduction

Book 1

Chapter 10

Strand: Biology

YOUR NOTES

Variation

YOUR NOTES

Reproduction