

Types of Reproduction

Sexual	Asexual
<p>2 Parents</p> <p>Gametes are produced with half of the genetic information of both parents. A combination of these gametes at fertilisation produces new offspring.</p> <p>Offspring show genetic variation and as a species are more likely to survive sudden environmental change.</p>	<p>1 Parent</p> <p>Offspring are produced from 1 parent. No energy is wasted on gametes and finding a mate meaning a lot of offspring can be produced quickly.</p> <p>No genetic variation. Offspring are clones of the parent; they are genetically identical.</p>

Genetic or environmental variation - Variations are differences between members of the same species. **Variation is caused by:**

- **Genetic factors** - These are characteristics that are caused by genes, inherited from parental DNA. For example, eye colour, blood type, being able to roll tongue, flower colour.
- **Environmental factors** - These are characteristics that change due to the environment. For example, language development, tattoos and piercings, competition in plants reducing access to light or water restricting growth.

Most variation is not caused by just one gene but by groups of genes or a combination of both genetic and environmental factors.

Evolution

Variations in species that can be inherited (are heritable) are the basis of evolution.

Charles Darwin and **Alfred Russel Wallace** worked on the theory of evolution by **natural selection**.

1. **Mutation** - Random changes in genes cause variations in species.
2. **Variation** - Small differences within a species make some individuals better adapted to the environment.
3. **Competition** - Organisms compete for survival, some may have a gene allowing resistance to a toxin.
4. **Survival of the fittest** - Those with advantageous genes have a selective advantage over others. They can compete better for resources or survive an antibiotic, pesticide or other toxin that kills others of the species.
5. **Breeding** - The organisms that survive can breed, **passing on their advantageous genes** to the next generation.

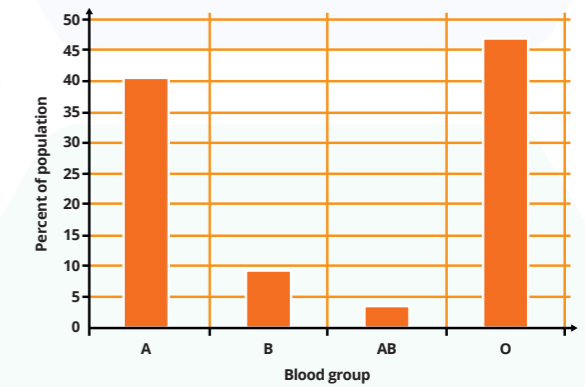
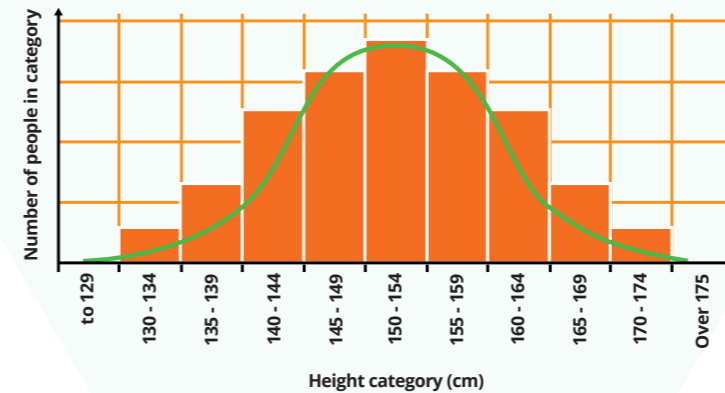
If environmental change is too quick for species to adapt by natural selection **extinction** may occur.

Continuous and discontinuous variation

The types of variation are:

Continuous variation - Controlled by more than one gene and environmental factors such as height and weight.

Discontinuous variation - Usually controlled by one gene and so individuals fit clearly into discrete groups such as eye colour, blood type.



Mutation - A change in a gene. They occur randomly but the rate of mutation can be increased by ionising radiation. Some mutations can be inherited and cause disease.

Cystic fibrosis - A genetically inherited disease.

	N	n
N	NN	Nn
n	Nn	nn

If both parents carry the **recessive** Cystic fibrosis gene there is a $\frac{1}{4}$ chance that a child will have the disease.

Cystic fibrosis causes **thick sticky mucus** that block bronchioles in the lungs.

Gene therapy can be used to treat the disease. An **inhaler** can be used to get the gene into lung cells but as cells renew the gene is not copied and so new cells do not contain the normal gene. **Gene therapy is a treatment not a cure.**

Modelling natural selection

We can use a model to demonstrate how camouflaged organisms have an advantage against predation.

1. Arrange small pieces of plain and patterned card on a plain background.
2. Use forceps to model a predator beak/jaw and record how many of each type of card you pick up in 15 seconds with the forceps.

This model shows that you are more likely to select prey that is more easily seen (less camouflaged). This leaves the camouflaged organisms to breed and pass on their genes.

Human genome project

Studying human DNA gives us more information to develop new ways to treat, cure, or even prevent disease.

Limitations of this model include:

- The model prey does not move.
- The model background is flat not textured.