

### Variation

Differences in characteristics are called **variation**.

#### Inherited variation

Characteristics are passed on from parents to offspring

genetic diseases  
eye colour  
blood group

#### Surroundings affects your characteristics

dyed hair  
tattoos  
accent

#### Environmental variation

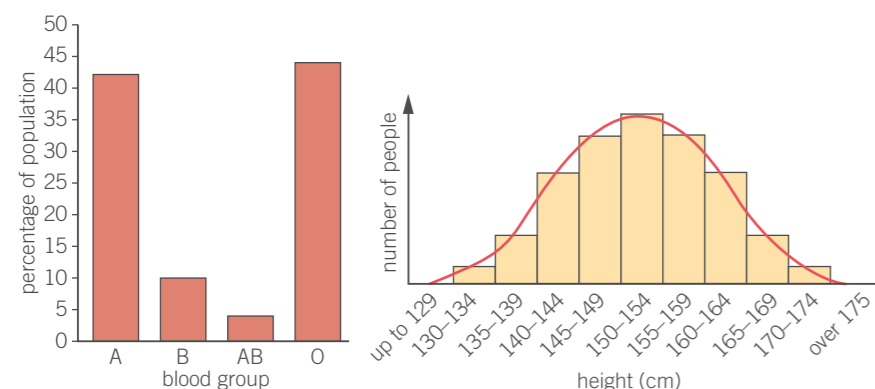
Many characteristics, such as height, are affected by both inherited and environmental variation.

#### Discontinuous variation

can only result in certain values (e.g., blood group or eye colour)

#### Continuous variation

can take any value within a range (e.g., height or hair length)



Discontinuous variation should be plotted on a bar chart, and continuous variation should be plotted on a histogram.

### Inheritance

#### Characteristics

Characteristics are inherited from your parents through genetic material stored in the nucleus of cells.

We inherit half of our DNA (deoxyribonucleic acid) from our mother and half from our father.

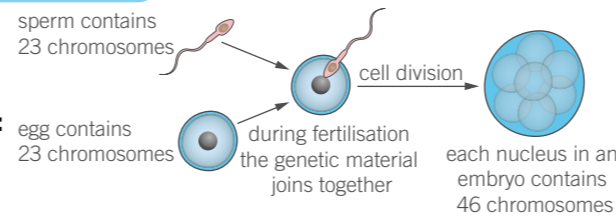


#### DNA

- contains all the information needed to make an organism
- is arranged into long strands called **chromosomes**.
- each chromosome is divided into sections of DNA
- sections of DNA that contain the information to produce a characteristic are called **genes**

Scientists Watson, Crick, Franklin, and Wilkins, worked together to produce a model of the structure of DNA.

#### Inheritance of genetic material:



### Natural selection

Organisms in a species show variation caused by differences in their genes.

#### Process of natural selection

- All living organisms have **evolved** from a common ancestor, through the process of natural selection.
- Organisms change slowly over time.
- Those better adapted to their environment are more likely to survive.

Organisms with the most useful characteristics survive and reproduce.

This is called 'survival of the fittest'.

Successful genes are passed on to the offspring.

This is repeated many times and over a long time can lead to a new species.

### Adaptation and change

#### Adaptation

- Adaptations are characteristics that help an organism to survive and reproduce.
- For example, the cheetah is the fastest land animal. This speed makes it a very successful predator.

#### Competition

Animals compete for: food, water space (for shelter and to hunt), and mates (to reproduce).

Plants compete for: light, water, space, and minerals (plants produce their own food through photosynthesis).

#### Environmental changes

- Plants and animals adapt to changes in their environments.
  - Habitats can change through fire, climate change, or disease causing reduced food supplies.
- For example, deciduous trees look different in each season, and bears hibernate somewhere warm in the winter.

#### Competition and adaptation

- Predator and prey species are **interdependent**.
  - This occurs when a change in the population of one animal directly affects the population of the other.
- For example, the number of Canadian lynx and its prey the snowshoe hare.

### Extinction

If a species is not well-adapted to its environment it will not survive, and the organisms will die before reproducing. A species becomes **extinct** when there are no more individuals of that species left anywhere in the world. The **fossil record** shows that many species that once lived have become extinct.

Factors leading to extinction:

- changes to the organism's environment
- destruction of their habitat
- new diseases
- new predators
- increased competition.

Scientists are trying to prevent **endangered** species (at risk of extinction) from becoming extinct. For example, by using gene banks to store genetic samples from different species. In the future these can be used for research, or to produce new individuals.



#### Key terms

Make sure you can write definitions for these key terms.

adaptation competition chromosome continuous characteristic discontinuous DNA inherited variation environmental variation evolution extinct fossil record gene gene bank interdependent natural selection species variation