

Genes

4. Inheritance

CONCEPT 1

LESSON GUIDE

DNA, CHROMOSOMES AND GENES

PRECISE LEARNING POINTS

KNOW

I know what DNA, chromosomes and genes are.

APPLY

I can apply my knowledge to explain how the structure of DNA is linked to genes.

EXTEND

I can extend my knowledge to describe the discovery of DNA and the key individuals involved.

NOTES

The big question covered by this concept is 'How do you inherit characteristics from your parents?'

Your inherited characteristics from your parents through genetic material stored in the nucleus of your cells. This material is a chemical called **DNA (deoxyribonucleic acid)**. DNA contains all the information needed to make an organism.

Chromosomes

Inside the nucleus your DNA is arranged into long strands called chromosomes. Different species have different number of chromosomes in their nucleus. Humans have 46 chromosomes whereas cats have 38 chromosomes.

You inherit half your chromosomes from your mother and half from your father. This is why you share some of your characteristics with your mother and some with your father.

Genes

Each chromosome is divided into sections of DNA. The sections that hold the information to produce a characteristic are called genes. For example, one gene contains the information that sets your eye colour, while a different gene sets your hair colour. Genes have a specific location on a chromosome.

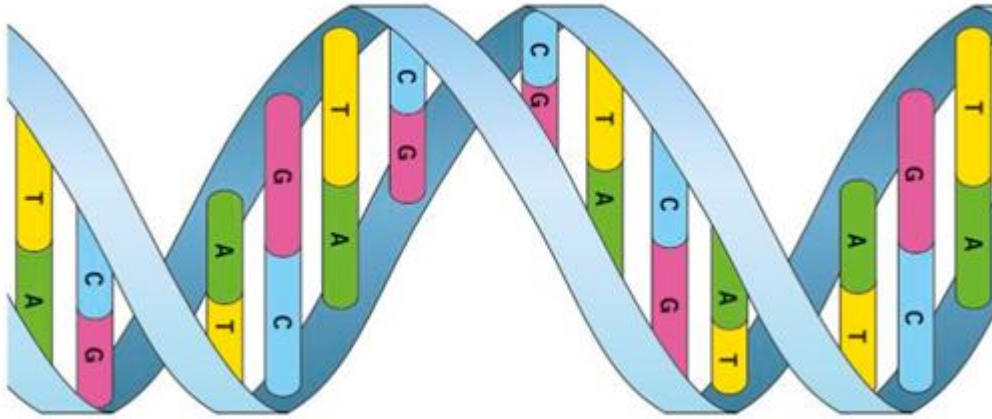
DNA structure

DNA has 3 main features

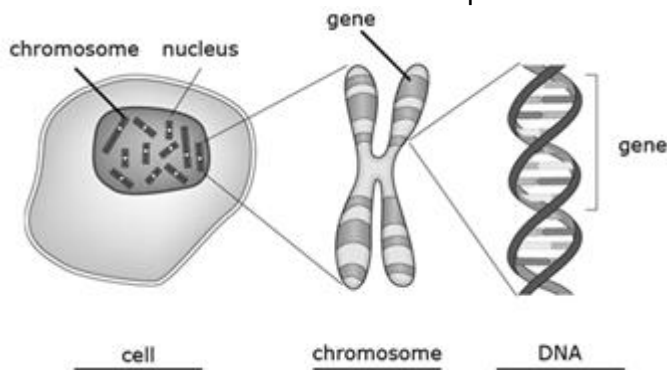
1. It is made of 2 strands
2. The strands are joined together by four different chemicals called DNA bases. The bases are normally referred to by the letters A (adenine), T (thymine), C (cytosine) and G (guanine).
3. The strands are twisted together to form a double helix shape.

Relationship between DNA, genes and chromosomes

The shape of DNA is a double helix – a bit like a twisted ladder. It contains four chemical bases. It is the order of these chemical bases which dictates the code for the gene.



DNA is found in the nucleus bundled up and twisted into long strands called chromosomes.



Discovery of DNA

Many scientists have worked together to discover the structure of DNA. Some key steps include:

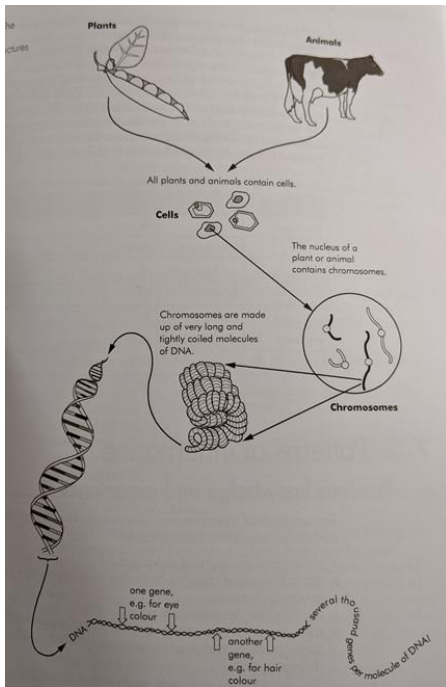
1886 – Gregor Mendel carries out experiments using peas to notice that certain characteristics such as height and colour are passed from parents to their offspring.

1952 – DNA crystals are photographed by Maurice Wilkins and Rosalind Franklin using X-rays

1953 – James Watson and Francis Crick, using the x-ray images, worked out that the structure of DNA is like a twisted ladder known as a double helix.

1953-2000 – Individual genes that code for genetically inherited disorders such as cystic fibrosis are discovered

2003 – Scientists working across the globe complete the human genome project which identifies the complete set of genes in a human body (around 24,000 genes)



- Share facts which help students understand the relative size of DNA eg
 - 1 meter of DNA is packed into every human cell
 - All the DNA in one human, if pulled into a single fine strand would stretch 10 billion miles, to beyond Pluto
 - We share 50% of our DNA with bananas
 - It would take you 50 years to type the entire human genome if you typed at a speed of 60 words-per-minute and worked 8 hours a day, every day
 - A strand of DNA is so thin that you could lie 40,000 strands together to form something the same width as a human hair

- Build model of DNA strand with complementary base pairs and critique model to evaluate it's usefulness (<https://sciencing.com/cool-ideas-3d-model-dna-6326347.html>)

- Group work enquiry into discovery of DNA – See Kerboodle 10.4.2 Activity – The discovery of DNA

- Extraction of DNA from kiwi