Your notes

GCSE Biology: revision notes

DNA and the genome

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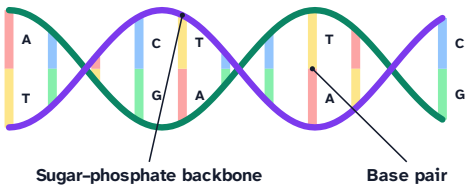
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Start here: DNA, genes and chromosomes

- DNA is the chemical that carries the instructions for making and running you. It is a very long molecule, found in the nucleus of your cells.
- DNA is coiled up into **chromosomes**: humans have 23 pairs. A **gene** is a short section of DNA that codes for one protein.
- From biggest to smallest: your **genome** (all of your DNA), then **chromosomes**, then **genes**. The proteins your genes code for decide features like your eye colour.

DNA and genes

- The genetic material in the nucleus of a cell is DNA. DNA is a polymer made of two strands that form a **double helix**.
- DNA is found in structures called **chromosomes**.
- A **gene** is a small section of DNA on a **chromosome**. Each **gene** codes for a particular sequence of amino acids, which makes a specific protein.



A pairs with T, and C pairs with G (complementary base pairs)

The genome

- The **genome** of an organism is its entire genetic material. The whole human **genome** has now been studied.
- This helps scientists search for **genes** linked to different diseases, understand and treat inherited disorders, and trace human migration patterns from the past.

The structure of DNA (separate sciences)

- DNA is made of repeating units called **nucleotides**. Each **nucleotide** has a sugar, a phosphate group and one of four bases: A, C, G or T.
- The strands have alternating sugar and phosphate sections, with a base attached to each sugar.
- The bases pair up across the two strands: A always pairs with T, and C always pairs with G. These are complementary pairs.

Making proteins (Higher, separate sciences)

- The order of bases in a **gene** determines the order of amino acids in a protein. Each amino acid is coded for by a sequence of three bases.
- In the nucleus, the **gene** is copied into a molecule of **mRNA**, which moves to a **ribosome** in the cytoplasm.
- Carrier molecules bring specific amino acids to the **ribosome**, which joins them in the order set by the **mRNA**.
- When the chain is complete, it folds into a unique shape, which lets it do its job, for example as an enzyme, a hormone or a structural protein such as collagen.

Mutations (Higher, separate sciences)

- **Mutations** are changes in DNA. They happen continuously.
- Most **mutations** do not change the protein, or change it only slightly so its appearance or function is not affected.
- A few **mutations** change the shape of a protein, so an enzyme's active site may no longer fit its substrate, or a structural protein may lose its strength.
- Not all DNA codes for proteins: some non-coding parts switch **genes** on and off, so **mutations** there can affect how **genes** are expressed.

Exam tip

- Keep the scale in your head: a nucleus holds **chromosomes**, **chromosomes** are long molecules of DNA, and a **gene** is a small section of that DNA.
- A **gene** codes for a particular sequence of amino acids, to make a specific protein. Use those words.

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Common mistakes

- Mixing up **gene** and allele: an allele is a version of a **gene**.
- Saying DNA is one strand. It's two strands in a **double helix**.

Key terms

DNA	The polymer that carries genetic information, made of two strands in a double helix.
Double helix	The twisted-ladder shape of a DNA molecule.
Chromosome	A structure made of DNA that carries many genes.
Gene	A section of DNA that codes for a particular sequence of amino acids to make a protein.
Genome	The entire genetic material of an organism.
Nucleotide	The repeating unit of DNA: a sugar, a phosphate group and a base.
Complementary base pairs	The pairing of A with T and C with G across the two DNA strands.
Mutation	A change in the DNA.
mRNA	A copy of a gene that carries the code from the nucleus to a ribosome.
Ribosome	The organelle where amino acids are joined to make proteins.

Quick questions

Cover the answers and test yourself: remembering is what makes it stick.

1. What shape is a DNA molecule?
2. What is a gene?
3. What is the genome?
4. Give one reason studying the human genome is useful.
5. Which base pairs with A in DNA? (Separate sciences)
6. Which base pairs with C in DNA? (Separate sciences)
7. What are the three parts of a nucleotide? (Separate sciences)
8. How many bases code for one amino acid? (Higher)

Answers

1. A double helix
2. A small section of DNA that codes for a protein
3. The entire genetic material of an organism
4. Finding genes linked to diseases
5. T

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6. G
7. A sugar, a phosphate group and a base
8. Three

What to do next

Practise 11 questions on this topic

Try 7 exam questions, with mark schemes

Read the lesson, one step at a time

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