Your notes

KS3 Science: revision notes

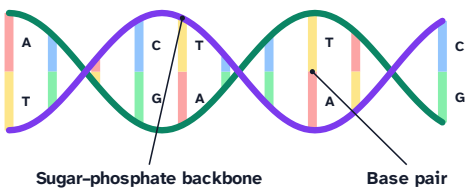
B3.3 Genetics

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DNA, genes and proteins

- DNA is a long molecule made of two strands twisted into a double helix. It is found in **chromosomes** in the nucleus.
- A **gene** is a section of DNA that codes for a particular protein. The **genome** is all of an organism's genetic material.
- In protein synthesis, the code in a **gene** is copied, and ribosomes use it to join amino acids in the right order.
- Characteristics depend on **genes** and on the environment.
- Gregor Mendel's experiments with pea plants in the 1860s showed that characteristics are passed on in "units" (**genes**). In 1953, Watson and Crick worked out the double helix, using X-ray images made by Rosalind Franklin.



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

Mitosis, meiosis and reproduction

- Mitosis makes two identical body cells, for growth and repair.
- **Meiosis** makes sex cells (**gametes**) with half the number of **chromosomes**: 23 in humans. It makes four cells that are all genetically different.
- Fertilisation joins two **gametes**, so the fertilised egg has the full 46 **chromosomes**.

- Sexual reproduction gives variation, which helps a species survive changes, but needs two parents and takes longer. Asexual reproduction is quick and needs one parent, but gives no variation.

Your notes

Alleles and Punnett squares

- **Alleles** are different versions of the same **gene**. A **dominant** allele (a capital letter, B) shows even if there is only one copy. A recessive allele (a lower-case letter, b) only shows if there are two copies.
- The **genotype** is the **alleles** an organism has (BB, Bb or bb). The **phenotype** is the characteristic you can see (brown or blue eyes).
- **Homozygous** means two identical **alleles** (BB or bb). **Heterozygous** means two different alleles (Bb).
- A **Punnett square** predicts offspring: Bb × Bb gives BB, Bb, Bb and bb, a 3 : 1 ratio. There is a 75% chance of the **dominant** characteristic and a 25% chance of the **recessive** one.

Inherited disorders and sex

- Cystic fibrosis is caused by a **recessive allele**; it makes thick mucus build up in the lungs. Polydactyly (extra fingers or toes) is caused by a **dominant** allele.
- Humans have 23 pairs of **chromosomes**; one pair decides sex. Females are XX and males are XY.
- The father's sperm carries either an X or a Y, so each baby has a 50% chance of being a boy or a girl.

Key terms

DNA	The molecule that carries genetic information, shaped like a double helix.
Gene	A section of DNA that codes for a protein.
Allele	A different version of the same gene.
Dominant	An allele that shows even if there is only one copy.
Recessive	An allele that only shows if there are two copies.
Genotype	The alleles an organism has, such as Bb.
Phenotype	The characteristic that shows, such as brown eyes.
Homozygous	Having two identical alleles, such as BB or bb.
Heterozygous	Having two different alleles, such as Bb.
Chromosome	A long strand of DNA in the nucleus.
Meiosis	Cell division that makes sex cells with half the chromosomes.
Gamete	A sex cell, such as a sperm or an egg.
Punnett square	A diagram that predicts the alleles of offspring.

Genome	All the genetic material of an organism.

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 are alleles?
4. What does "recessive" mean?
5. What is a genotype?
6. How many chromosomes are there in a human sperm cell?
7. What type of cell division makes sex cells?
8. What are the sex chromosomes of a human male?

Answers

1. A double helix
2. A section of DNA that codes for a protein
3. Different versions of the same gene
4. The characteristic only shows if both alleles are recessive
5. The alleles an organism has, such as Bb
6. 23
7. Meiosis
8. XY

What to do next

Practise 15 questions on this topic

Try 4 exam questions, with mark schemes

Read the lesson, one step at a time

Free revision for GCSE and KS3 at lycolearn.co.uk. Some notes are for one exam board only, and say so in brackets.

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