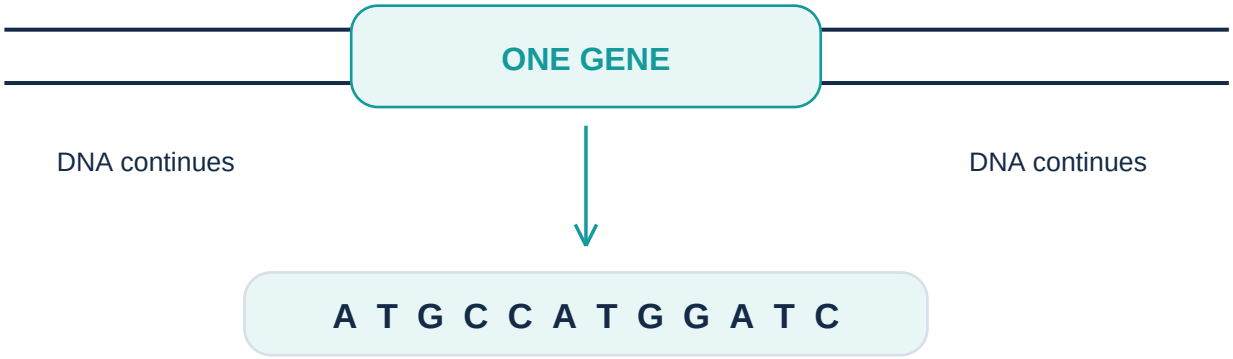
A gene is part of a DNA molecule

A gene is a sequence of nucleotides that forms part of a DNA molecule. For this lesson, focus on a protein-coding gene: its information specifies a polypeptide.

1. LOCATE THE GENE WITHIN DNA

Part of one long DNA molecule



Map view, not to scale. The letters show only a short illustrative base sequence from one strand within the gene, not a complete gene.

2. THE ORDER OF BASES STORES INFORMATION

DNA uses four bases: A, T, C and G. Different sequences can carry different instructions, even when they contain the same types of nucleotide. The information is in base order, not in a changing sugar-phosphate backbone.

3. KEEP THE LEVELS DISTINCT

A nucleotide is a building block. A gene is a stretch of DNA containing a particular set of instructions. A DNA molecule can contain many genes; a gene is not an entire chromosome and is not an amino acid.

Broader context: some genes produce functional RNAs rather than polypeptides. This lesson concerns genes that code for polypeptides.

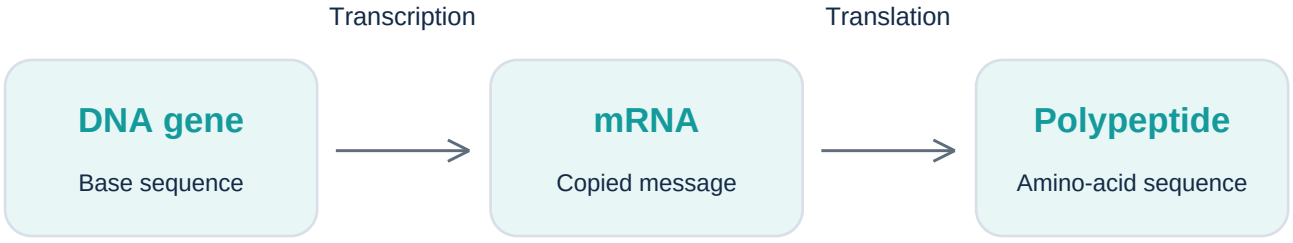
Gene definition and functional RNA genes: NHGRI, Gene.
Relationship between a gene sequence and a polypeptide: NHGRI, Protein.

Scope: Cambridge Biology 9700 syllabus, section 6.2, outcome 1, p. 24.

From base order to amino-acid order

A polypeptide is a chain of amino acids joined by peptide bonds. A protein-coding gene supplies the information for the sequence of that chain.

1. FOLLOW THE INFORMATION



RNA carries the message to ribosomes, where amino acids are joined in the required order. DNA is not physically turned into protein. The genetic code and the detailed steps follow in later lessons.

2. RECOGNISE A POLYPEPTIDE CHAIN



Each box represents an amino-acid residue; each link represents a peptide bond. This is a short illustrative fragment, not the translation of the DNA shown on page 1.

3. CONNECT SEQUENCE, STRUCTURE AND FUNCTION

The amino-acid sequence is the primary structure. Interactions involving the amino acids help the chain fold. A functional protein may contain one or several polypeptide chains. Its structure enables its role, such as catalysis or transport.

Why sequence matters: a DNA change may alter an amino acid and affect protein behaviour. It does not always do so. For example, an altered enzyme active site may bind its substrate less effectively.

Polypeptides, protein chains and DNA instructions: NHGRI, Protein.
Peptide bonds, folding and protein function: OpenStax Biology 2e, section 3.4.

Scope: Cambridge Biology 9700 syllabus, section 6.2, outcome 1, p. 24.