

DNA, genes and genomes - General

Making proteins

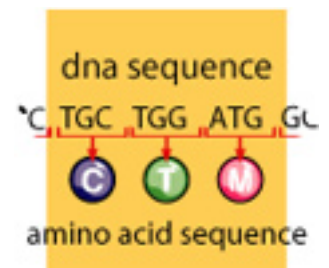
What are proteins made of?

The ingredients of a protein are amino acids. To build a protein we need to build a long chain of amino acids. There are 20 different types of amino acids, so there are lots of different protein chains we can build. Biologists give amino acids a code letter, as for DNA. This is much easier than writing out the whole name each time. For example, M is methionine, L is leucine, F is phenylalanine (because P is proline).

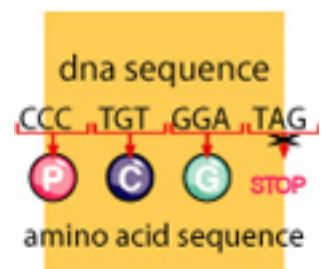


Three DNA letters, one amino acid?

The DNA code uses groups of three 'letters' to make meaning. This means that when the cell reads the instructions encoded in the DNA sequence to make a protein, it reads it three letters at a time. Most groups of three letters - known as triplets or codons - code for an amino acid.



Since there are four different DNA letters (A, G, C and T), there are $4 \times 4 \times 4 = 64$ different combinations that can be used. However, as there are only 20 different types of amino acid, some of these 64 codons code for the same amino acid. Some of the 64 codons don't code for any of the amino acids. Instead they provide the punctuation and grammar, like where the cell should start and stop reading the sequence.



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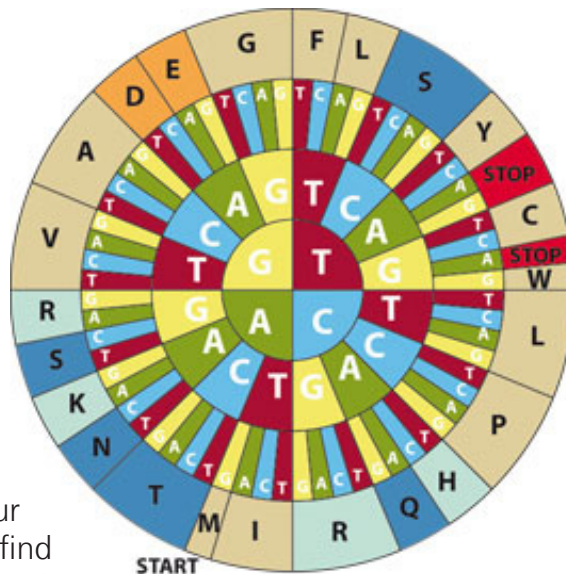
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An Example:

An example of a DNA sequence might be

CCCTGTGGAGCCACACCCTAG

If you use our DNA decoder (codon wheel), you can decode this triplet by triplet (you can get a copy from our downloads section). Start from the inside of the wheel: find the first letter of your codon in the centre of the wheel and work outwards, through the second ring (with the next letter) and so on, to find the corresponding amino acid.



This would make the amino acid chain:

P - C - G - A - T - P

Proline-Cysteine-Glycine-Alanine-Threonine-Proline

We talk about genes having different characteristics. For instance, if you hear about 'genes for eye colour', it means that these genes code for protein pigments in the iris of each of our eyes. Genes can come in different versions. Some people's versions code for proteins that make their eyes look blue while other people's versions make proteins that make their eyes look brown.

Most proteins are actually much longer than this. Many of the proteins that make your body makes contain hundreds of amino acids. So if we know what the DNA sequence is, we can work out which amino acids the protein must contain and in what order.

