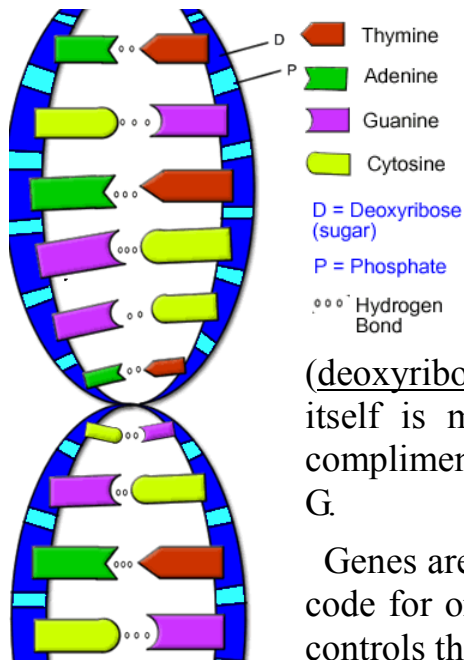


# Biology Top-Up

## Genetics



### The Genetic Code

All of the characteristics expressed by an organism are due to different proteins. It is the order of the amino acids in a protein which determine its structure and function.

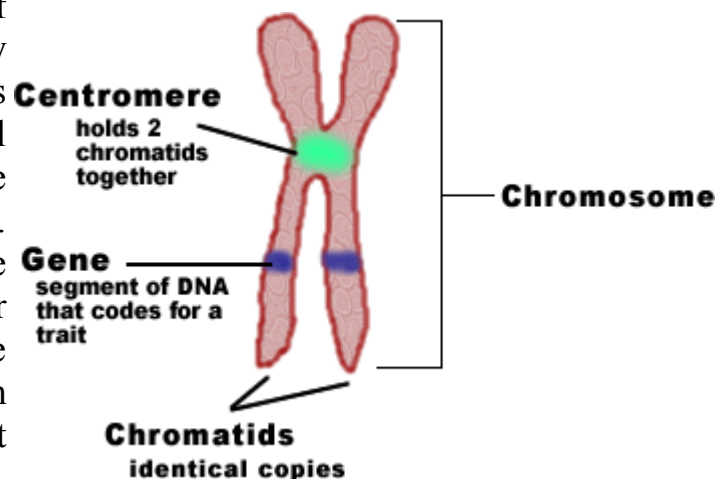
Within a cell it is the genes that control the proteins that are made. Genes are short sections of DNA (deoxyribonucleic acid), and build up chromosomes. The DNA itself is made up of four bases (A, T, C and G). These are complimentary - A is always paired with T; C is always paired with G.

Genes are divided into triplets, which are sequences of 3 bases that code for one particular amino acid. It is in this way that the DNA controls the amino acid sequence.

Mutations occur when sections of the DNA change. This means that the triplets can become different, and so code for amino acids that do not give the correct protein. Most mutations are harmful to the organism, but there are mutations that have no effect and others that are beneficial. Certain external factors can increase the likelihood of mutations occurring. These include: ionising radiation (x-rays, UV light,  $\alpha$ ,  $\beta$  and gamma radiation), and also some chemicals. Cancer cells are cells in which a mutation causes them to divide uncontrollably.

### Chromosomes

These are found in the nucleus of eukaryotic cells. They are tightly wound lengths of DNA that contains between a few hundred and several thousand genes. In humans, there are 23 homologous pairs of chromosomes. These are chromosomes that are the same size and carry genes that code for the same characteristics. One chromosome of each pair comes from each parent, and usually carry different alleles (versions of the same gene).



The X shaped chromosomes are two chromatids that are joined at a centromere. They are only X shaped after the DNA has been replicated (copied), just before cell division.