DNA Structure

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DNA is a nucleic acid. So is RNA.

Nucleic acids are one of the four kinds of “biomolecules” (because they are found in living things). The other three are lipids, proteins, and carbohydrates. You may also see them referred to as “organic molecules” (because they are based on carbon structures), or “macromolecules” (because they are so huge!).

Each DNA strand contains the genetic information of one chromosome. There are 46 chromosomes in 46 linear strands in each body cell.

The monomers of DNA are called nucleotides. Since there are 46 strands of DNA, there are over 3 billion nucleotide pairs in each body cell. Each chromosome contains 50 - 250 million nucleotide pairs, depending on the length of the chromosome.

DNA is composed of 2 helices wound together - a double helix.

These spirals have a phosphate-sugar backbone and they run anti-parallel to each other, something that comes up when students learn about DNA replication.

Nitrogenous bases connect the helices are the “code” of DNA.

So a nucleotide is composed of a Phosphate, a Sugar, and a Nitrogenous Base.

Nitrogenous bases attach to the sugar of the nucleotide.

The four nitrogenous bases of DNA are:

- Adenine
- Guanine
- Thymine
- Cytosine

Adenine and guanine are double-ringed purines. Thymine and cytosine are single-ringed pyrimidines.

If you know one side’s sequence, you can predict the other side’s sequence.

Adenine can only bind to thymine; Guanine only can bind cytosine. You can remember this by Apples on Trees and Gas for Cars. If you always say it this way, you’ll also remember that adenine and guanine are the big purines, and thymine and cytosine are the smaller pyrimidines.

The order of the nitrogenous bases is the genetic code; segments called genes determine which proteins are made.

An example of mutations are when the nucleotides are paired incorrectly when replicating the DNA and the sequence is changed.

Base pairs (A&T or C&G) are held together with hydrogen bonds that form between electronegative oxygens and hydrogen, and between electronegative nitrogens and hydrogen. Hydrogen allows a place to “unzip” the DNA in order to use the code for making protein, or to use the code to replicate an identical strand of DNA. A & T form 2 hydrogen bonds, and C&G form 3 hydrogen bonds.