

Highlights/Nucleic Acids

1. Nucleic acids (DNA and RNA) are composed of building blocks called nucleotides. Nucleotides have three components - a sugar (ribose in ribonucleotides of RNA or deoxyribose of deoxyribonucleotides of DNA), at least one phosphate, and a nitrogenous base (adenine, guanine, thymine, cytosine, or uracil).
2. DNA differs from RNA in that DNA contains the sugar deoxyribose instead of ribose and DNA contains the base thymine, whereas RNA substitutes the base, uracil.
3. A nucleoside differs from a nucleotide in that a nucleoside only has a sugar and a base. It does NOT have phosphate.
4. Note the numbering of the sugar in a nucleotide. The phosphate goes on carbon number 5. the differences between ribose and deoxyribose are on carbon #2, where ribose contains a hydroxyl, but deoxyribose contains only a hydrogen.
5. The 5' end of a nucleic acid is the end of the nucleic acid that has a free 5' end (no bond). The 3' end of a nucleic acid is the other end of the nucleic acid and it too is not tied up in a bond. All other 5' and 3' ends are joined together in phosphodiester bonds.
6. The "backbone" of a nucleic acid is composed of alternating phosphates and sugars and the bond linking them is called a phosphodiester bond. Phosphodiester bonds are to nucleic acids what peptide bonds are to proteins. The bases are NOT part of the backbone and in a DNA molecule are internal to the surrounding backbone.
7. The double helix of DNA was discovered by Watson, Crick, and Franklin in 1953. The most common form is called the B-form. It consists of two strands oriented in an anti-parallel fashion (slide 10) arranged in a right-handed fashion. Bases are located on the inside such that adenine forms 2 hydrogen bonds (pairs) with thymine and cytosine forms 3 hydrogen bonds with guanine.
8. Thus, it will take more energy to break G-C bonds than A-T bonds.
9. Besides the most common B form of DNA, two other forms exist in cells. They include the A form and the Z form. Both the A and B forms have right handed helices, whereas the Z form has a left handed helix.