3-D Molecular Designs

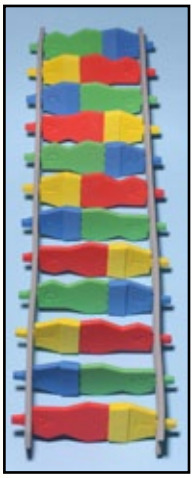
...where molecules become real ™

Instructions

DNA Structure

Build your DNA model with either the long continuous backbone, or the individual sugar-phosphate pieces. Remember, the base always attaches to the sugar (deoxyribose or ribose). Create half of your model by attaching 12 bases to the backbone. Then attach the complementary bases to either the long backbone or individual pieces.

Note: Pull the base through the DNA backbone hole until flared ends pop through. To remove a base from the DNA backbone, squeeze the flared ends until they fit through the hole.

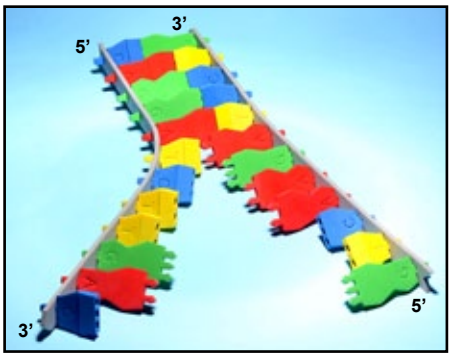


To create the double helix, rotate the bases so that they are vertical instead of horizontal, as shown left.

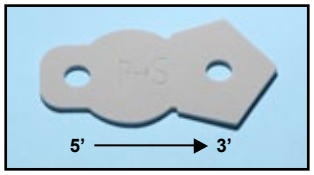
With your right hand on the top base pair and left on the bottom twist your hands in opposite directions. (Your right hand should twist counterclockwise and your left hand clockwise.) Twist until the DNA backbones touch each other in a tight coil.

Release the bases and allow the model to relax into its double-helical shape.

Replication

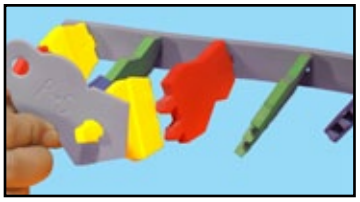


Start with your DNA Starter Kit© model in its ladder shape and unzip the base pairs at one end of the DNA. The two strands of complementary DNA should be *antiparallel*. Begin by adding complementary deoxyribonucleotides to the 3' end of the single-stranded DNA (the end with the point of the arrow).

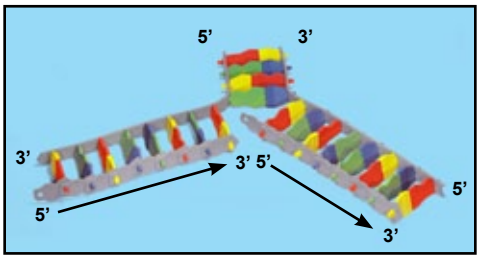


Replication Continued

Each time another nucleotide is added, form the phosphodiester bond to the previous nucleotide by slipping the hole in the remaining phosphate over the peg in the deoxyribose.



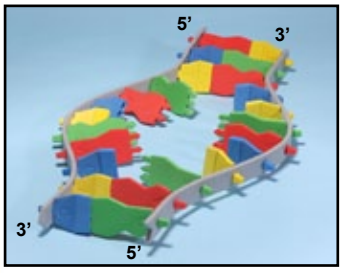
Note that to replicate the opposite strand of DNA, you would have to start at the replication fork – and join complementary nucleotides together as you move along the opposite strand – toward the unzipped end. In this way, both replicated double-stranded DNAs will be anti-parallel. This idea may be too sophisticated for younger students – who could simply replicate one strand of the DNA in an anti-parallel manner – and then replicate the opposite strand once it is completely freed from the original double-stranded DNA.

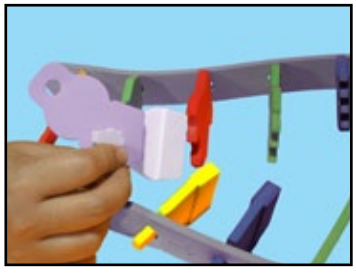


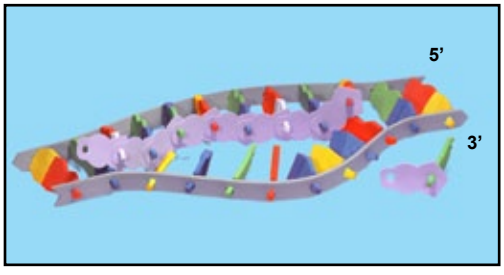
Transcription

RNA can be transcribed from either of the two DNA strands in much the same way as DNA was replicated. But rather than unzipping the DNA from one end, we suggest that you create a transcription bubble by separating several base pairs in the middle of the DNA model.

And then as you begin transcribing one of the two strands of DNA – by adding ribonucleotides together, be sure that the RNA strand that you are making is anti-parallel to the template strand of DNA.







You might also want to point out to students that only one of the two strands of a gene is transcribed into mRNA. Transcription of the opposite strand would result in an RNA that would encode an entirely different sequence of amino acids.