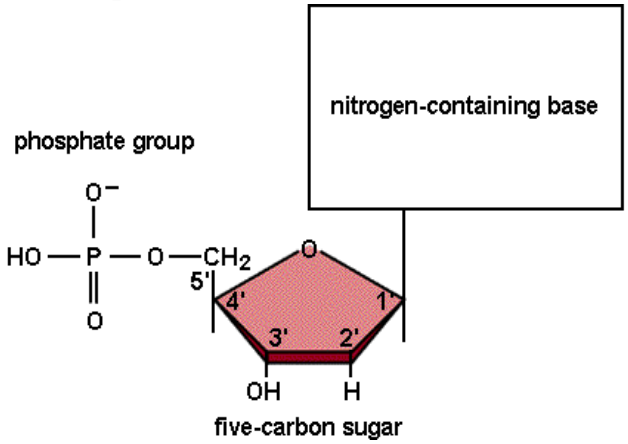
DNA Structure, Replication, Transcription and Translation

In this activity, we will use some common everyday materials to represent DNA replication

Materials needed:

A handful of Fruit Loops™	
4 pentose Honey Combs cereal pieces	4 curly pretzels
2 thin pretzel sticks	

If you need help with any of the questions, discuss with another student or ask your TA.



Step One: DNA Structure

1. Construct a nucleotide: To illustrate the structure of DNA, take one piece of pentose sugar (Honey Combs) cereal and place a **blue** loop at the right arm of the cereal. Break one pretzel stick in half and place one of the pieces on the left arm.
   What do each of the pieces of your structure represent?

2. Assume that the **blue** loop represents thymine. Make three more nucleotides using a **red** loop to represent adenine, **yellow** for cytosine, and **green** for guanine.
   T=blue A=red G=green C=yellow
3. Now, make a dinucleotide by attaching the pretzel stick of the **blue** (T) to the left corner of the Honey Comb of **green** (G).
   Which end of this dinucleotide represents the 3' OH end of the molecule?
   Which end represents the 5' phosphate end?
   Why?

4. What kind of bond did you just form when you made the dinucleotide?

5. Make a second string of two of nucleotides (dinucleotide).
   One of the nucleotides should be **yellow** (C), and the other, should be **red** (A).
   The 2 dinucleotides you have made are short single-stranded DNA molecules.
   DNA usually exists as a double-stranded molecule in which 2 strands are bonded together through hydrogen bonds between the bases of each strand.
   Figure out how to bind your two strands together
   Which bases can bond with each other?
   Explain anti-parallel.

Step Two: DNA Replication

Now that you understand the structure of DNA, for the rest of the exercises, you may just use the loops to represent the whole nucleotide.

1. Make a line of loops (in any order of colors you wish) that is 12-15 nucleotides long. Using the base pairing rules you learned above, attach the complementary strand to make a double-stranded DNA molecule.
2. Now that you have a double-stranded DNA molecule in front of you, how would you use this to produce 2 double-stranded DNA molecules exactly like the one you have?
   Explain what the term "semi-conservative replication" means.

3 .What steps need to occur before new nucleotides can be added?

4. Do the DNA strands completely separate all at once? If not, what happens? How does PCR differ from *in vivo* DNA replication?

5. Why is the primer important? Does the role of the primer differ in PCR and the cell?

6. At which end of the growing strand do new bases get added?

If you didn't include these details, try replicating your DNA molecule again.
7.What is the function of DNA replication and when in the life of the cell or organism does it take place?