Activity: **BUILDING A MODEL DNA**

**Class Copy**

**Purpose:** To help you understand how sugars, phosphates and bases fit together to form DNA, you and your partner will make a model of DNA with string, dried pasta, and different colored pipe cleaners.

**Objectives:** Students will…

1. Understand that the genetic code is transmitted biochemically through molecules call deoxyribonucleic acid (DNA).
2. Understand that DNA molecules are in the nucleus of a cell and carry genes.
3. Understand that genes are smaller segments of DNA that code for traits.
4. Understand the structure of the DNA molecule.

**Materials:** For each *pair* of students:

* Two 35-centimeters pieces of string
* Four 7.5-centimeters pieces of green pipe cleaners
* Four 7.5-centimeters pieces of white pipe cleaners
* Four 7.5-centimeters pieces of brown pipe cleaners
* Four 7.5-centimeters pieces of pink pipe cleaners
* Sixteen pieces of dried pinwheel pasta
* Sixteen pieces of dried ziti past

**Procedures:**

1. First, get two strings, 16 pieces of pinwheel pasta, 16 pieces of ziti pasta and four of each different colored pipe cleaners. The materials represent the following:
   * **Pinwheel Pasta = Pentose Sugar Component**
   * **Ziti Pasta = Phosphate Component**
   * **Different Colors of Pipe Cleaners = Each Type of Base**

Step 3 & 4:

1. Here is the color coding for the bases:
   * Red Pipe Cleaner represents **adenine**.
   * Green Pipe Cleaner represents **thymine**.
   * Brown Pipe Cleaner represents **cytosine**.
   * White Pipe Cleaner represents **guanine**.

Step 5:

**Building 1st Strand:**

1. Thread a piece of pinwheel pasta on the string and tie the string to the pasta.
2. Next, add a piece of ziti pasta directly on top of the pinwheel.
3. Connect one of your colored pipe cleaners to the pinwheel
   * You can use any color at this point!
4. Continue this process until you have use 8 pinwheel pastas, 8 ziti pastas, and 8 multi-colored pieces of pipe cleaner.

Step 6:

**Building the Complementary Strand:**

1. Thread a piece of ziti pasta onto the string and tie the end to secure it.

Step 7 & 8:

1. Add a piece of pinwheel pasta on top of the ziti pasta.
2. Pick one end of the pasta and pipe cleaner strand you have already created to start at, and locate the pipe cleaner that pairs with the starting pipe cleaner
3. To represent base pairing, you will loop the appropriate pipe cleaners around each other into pairs.
   * Wrap just the tip of each color around the tip of the corresponding color (to make the base pairs longer to work with).
   * **Red** pipe cleaner **pairs with** **green** pipe cleaner
   * **Brown** pipe cleaner **pairs with white** pipe cleaners
4. Loop the appropriate pipe cleaner into the pinwheel, and twist the pairing pipe cleaners into the runs of the ladder

Step 9-11:

1. Continue adding pasta and pipe cleaners, pairing pipe cleaners according to the pairing rules stated in # 10, until you have completed
2. Continue building your ladder, one step at a time, until you have connected the last two pieces of pinwheel pasta. After all the pipe-cleaners have been woven, your DNA model is complete!

**Analysis:** Note- #1-2 must be done before class ends for successful completion of the rest of the analysis.

1. Draw a picture of your final model of DNA. Label the following:
   * A phosphate molecule and what kind of pasta represents it.
   * A sugar molecule and what kind of pasta represents it.
   * What base does each color represent?
2. Using the letters A, T, G, C, give the sequence of bases on one side of your DNA molecule.
3. Take your model/diagram/sequence up to your teacher to get it checked off.`
4. How do the bases pair up in a DNA molecule? How does your model help you figure this out?
5. What differentiates one DNA molecule from another (compare your DNA model to another group’s DNA model)? How could you change your DNA model to reflect changes among DNA molecules?
6. What is the relationship between DNA molecules and genes and between chromosomes and genes?

Note: Do a little research online to help you answer questions 7 and 8.

1. In 1999, scientists finished mapping the sequence of the human genome (all of the genes in a human)-that is, all the instructions needed for making a human being. Aptly call the “Human Genome Project,” it is considered on e of th e biggest milestones in scientific history. Why do you think this project is so important? What types of information could it provide?
2. In 1997, scientists were able to clone a sheep. What do you think the potential of cloning is?
3. What does “complimentary base pairing” mean?
4. How many individual sugar-phosphate strands did you make when creating your DNA?
5. Give the sequence of bases for the strand that is complimentary to the strand in #2.
6. Draw a picture of one nucleotide. Us the pasta and the pipe cleaners to represent the different structuresof the nucleotide. Label each part.