**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_**

**DNA Paper Helix**

**Introduction: DNA (deoxyribonucleic acid)** is the genetic information that is located in eukaryotic and prokaryotic cells. In eukaryotic cells, DNA can be found in the nucleus and mitochondria. In prokaryotic cells, such as bacteria, DNA is located in the cytoplasm. In the nucleus of a eukaryotic cell, DNA is condensed into a structure called a chromosome. In 1953, James Watson and Francis Crick proposed the first DNA model after viewing an X-ray picture of DNA taken by researcher Rosalind Franklin. They proposed that DNA was a double helix (double spiral).

Imagine DNA is a twisted ladder. The outside of the ladder is made up of alternating *sugar* and *phosphate* molecules. The sugar is called **deoxyribose**. The rungs of the ladder are made of a pair of molecules called *nitrogen bases* or *nitrogenous bases*. This is usually shortened to just *bases*. There are four bases in DNA: **adenine**, **guanine**, **cytosine**, and **thymine**. Because of the chemical structures are four bases, adenine only pairs with thymine and cytosine only pairs with guanine to form a rung.

**Purpose:**

1. Construct a paper model of the DNA molecule.
2. Identify the three components of a DNA molecule.

**Materials:**

* Colored paper sheets of paper guanine, adenine, cytosine, and thymine (the number you need depends on your code)
* 24 sugars and 24 phosphates
* Scissors
* Glue or scotch tape

**Procedures:**

1. Cut out the chemical bases, sugars, and phosphates
2. Arrange the cut-outs on your lab table to form the pattern described in the introduction.
3. Attach the nitrogen base to the sugar molecule by matching up the squares.
4. Attach the phosphate group onto your model by matching up the stars.
5. Attach the phosphates to the sugars by matching up the dots.
6. **Write 3’ next to the stars on each deoxyribose sugar, and write 5’ next to the dots on each sugar.**
7. Be sure to maintain the order of base pairs assigned to you! Arrange the bases in order going down from 5’ to 3’.
8. Put your group members’ initials onto the model and attach it to the other groups’ fragments.
9. When finished, your class should have constructed a long DNA molecule. We will carefully twist it into a helix and hang it in the classroom.

**Analysis:**

1. **What base does adenine pair with? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
2. **What base does guanine pair with? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
3. **The shape of a DNA molecule is described as a: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
4. **What is the name of the sugar in DNA? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
5. **What are the three components of a nucleotide?**
6. **Suppose you know that the sequences of bases on one DNA strand (one side of the DNA ladder) is AGGCTCGT. What is the sequence of the bases on the opposite strand?**
7. **If one strand of DNA is arranged in a 5’ to 3’ fashion, how must the other strand align? What do you notice about your two strands?**
8. **Assume that a 100 base pair DNA molecule contains 45 cytosines. How many adenines are there? Explain your reasoning.**
9. **Why would attaching guanine with adenine make the DNA molecule weaker?**
10. **The paper model of DNA has definite strengths and weaknesses when showing the structure of DNA. How does this model show DNA’s structure well? How could this model be improved?**