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| ***Constructing a DNA Model Coding for your Name!*** | clip0223 |

**DNA is a complex molecule found in all living things.**  **Constructing a DNA model is a great way to learn about DNA transcription and translation. DNA carries the codes for all the proteins that make up organisms. Its structure is that of a twisted double helix composed of linked nucleotides made of sugars, phosphates, and nitrogenous bases (adenine, thymine, guanine and cytosine).**

**The base code sequences (genes) DNA carries are used to form chains of amino acids. As all brilliant CHON know, amino acids are the monomers that form the primary structure of the polymer, protein. RNA must first transcribe (make a copy) of the section of DNA (gene) in the nucleus that codes for the particular protein needed. After the code is transcribed, the protein can be translated (built) by ribosomes in the cytoplasm. This project will introduce you to protein synthesis, the process that transcribes and translates the language of DNA into the language of proteins: the sequence of amino acids that form the primary structure of proteins. Happy learning!**

***Objectives:***

* **Students will learn the structure of the four nucleotides making up DNA**
* **Students will be able to produce part of a DNA model**
* **Students will demonstrate understanding of transcription by using Genetic Code to encode their name into the DNA molecule.**
* **Students will demonstrate understanding of translation through determining the amino acid sequence that could be made from their DNA model.**

***Possible Materials (your choice):***

* **The basic subunits of DNA**
* **Beads, pipe cleaners, string, marbles, electrical tape, wired ribbon, etc.**
* **NO STYROFOAM!**
* **Colors (red, green, yellow, blue, black, & purple)**
* **Scissors**
* **Glue &/or tape**
* **Pencils/pens/markers**
* **String/wire**

***Procedure:***

***PART A - Building DNA***

1. **Construct all of the units needed to make the nucleotides from a single strand encoding your name.**
2. **Color code the Nitrogenous bases, phosphorus, and sugars: Adenine (Blue), Guanine (Green), Thymine (Yellow), Cytosine (Red), Phosphate ((Purple) and Deoxyribose(Black).**
3. **Construct a NUCLEOTIDE by gluing or taping a phosphate, sugar, and one base together (see Diagram 1)**
4. **Finish constructing the other nucleotides, and give your model a “TWIST” so that it resembles a double-helix!**

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| **BASE PAIRING RULE For DNA:** |
| **A   pairs with   T** |
| **C   pairs with   G** |

1. **Use a single strand of your nucleotides to make the LEFT STRAND of your DNA model by taping the phosphates of ONE nucleotide to a deoxyribose sugar of ANOTHER nucleotide. 5’ should be at the top, 3’ at the bottom of the strand.**
2. **When you have completed the left side of your model, RECORD the BASE SEQUENCE starting with the TOP base in Table 2.**
3. **Use your other nucleotides to construct the COMPLEMENTARY RIGHT STRAND of DNA (A with T and C with G). 3’ should be at the top, 5’ at the bottom of the strand.**
4. **Record the sequence of your Right Strand in Table 2.**
5. **Your model of DNA should look like a ladder.**
6. **Attach an unfolded paper clip to your DNA model for hanging from the ceiling.**

**TABLE 1**

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| --- | --- | --- |
| **Nucleotide Component** | **Quantity** | **Color** |
| **Thymine** |  | **YELLOW** |
| **Adenine** |  | **BLUE** |
| **Cytosine** |  | **RED or Pink** |
| **Guanine** |  | **GREEN** |
| **Phosphate** |  | **Purple or Lavender** |
| **Deoxyribose Sugar** |  | **BLACK** |

**Diagram 1**



**Table 2**

|  |  |
| --- | --- |
| **Base Sequence LEFT Strand** | **Base Sequence Right Strand** |
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 ***Conclusion:***

**1. Name the 4 DNA nucleotides.**

 **2. What 2 molecules make up the sides of DNA.**

 **3. Your DNA model appeared ladder-like. What is the true shape of a DNA molecule?**

 **4. Where in a cell would you find DNA?**

 **5. If 25% of DNA is Adenine, what percent is Cytosine?**

 **6. What would happen if RNA made mistakes when it copied DNA's instructions?**

**Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**DNA Project Rubric**

**Use the samples and this rubric as a guide to make sure your project is done correctly.**

**\_\_\_\_\_\_\_\_\_\_ Title of Project, Shows Ownership (5 points)**

**\_\_\_\_\_\_\_\_\_\_ Key with mRNA codons clearly indicating your name (15 points)**

**\_\_\_\_\_\_\_\_\_\_ Base sequences correctly spell out your name (10 points)**

**\_\_\_\_\_\_\_\_\_\_ Complementary core of bases clear (10 points)**

**\_\_\_\_\_\_\_\_\_\_ Alternating deoxyribose/phosphate backbone (10 points)**

**\_\_\_\_\_\_\_\_\_\_ Base pairs connect to deoxyribose (10 points)**

**\_\_\_\_\_\_\_\_\_\_ 5’direction and 3’ direction are clear (10 points)**

**\_\_\_\_\_\_\_\_\_\_ Can assume double helix shape (10 points)**

**\_\_\_\_\_\_\_\_\_\_ Hydrogen bonds joining base pairs (10 points)**

**\_\_\_\_\_\_\_\_\_\_ PAP level work (10 points)**

**\_\_\_\_\_\_\_\_\_\_ Total Points earned out of 100**