

# Creating a DNA model



## Introduction

All life functions within a plant are controlled by the genetic material found within its cells' nuclei. The nucleus houses the cell's genetic material of DNA. The structure of DNA and the arrangement of the nucleotides determine an organism's genotype, which allows scientists to isolate specific genes.



**Grade Level:** 8 – 10

**Time Needed:** 40 - 60 minutes

## Learning Objectives

After completing this lesson, students will:

1. Identify the nucleotides associated with DNA
2. Arrange and bond each nucleotide appropriately
3. Demonstrate the structure of a DNA molecule

## Next Generation Science Standards (NGSS)

As a result of activities for grades 8-10, all students will learn content in these areas:

### Topic

- **ETS1:** Engineering Design
- **LS3:** Heredity: Inheritance and Variation of Traits

### Performance Expectation

- **HS-LS3-1:** Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

### Dimension

#### Practices:

- Developing and Using Models

#### Disciplinary Core Ideas:

- **LS3.A:** Inheritance of Traits
- **LS1.A:** Structure and Function

#### Cross-Cutting Concepts:

- Patterns



## Materials

- Side cutters
- Wire
- Several bags of gumdrops or colored marshmallows
- Paper towel roll or a cylinder
- Toothpicks

## Instructional Process



### ***Day of Class:***

1. Assemble all lab materials near the front of the room.
2. Make copies of the Student Lab Sheet and distribute to students.
3. Verbally “walk through” the steps of the lab activity and explain what is happening at each step. Highlight the need to be precise in all steps of the lab activity.
4. Have students complete the lab activity and answer the discussion questions.

## Supplemental Content – Explanation of the Process



1. On the board, place the following sequence:  
CCGCAACATTGGTGATGCCCCGATAGGTG
2. Explain that each gumdrop (or marshmallow) color represents each base pair (i.e., red is adenine, green is cytosine, etc.). Next, explain that each toothpick represents the bond between each of the base pairs.
3. Using the side cutters, have the students cut two identical wires, each 45 cm in length.
4. Have the students loosely wrap both wires around the paper towel roll.
5. Using both wires, the gumdrops, and the toothpicks, have the students assemble the DNA model that matches the nucleotide sequence from step one.
6. Discuss the follow-up questions (see Student portion of this handout)

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## Procedure

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1. Using the side cutters, cut two identical wires, each 45 cm in length.
2. Loosely wrap both wires around the paper towel roll or cylinder.
3. Create one strand (or side) of the DNA model that represents the nucleotide sequence given by your teacher.
4. Create the complementary strand to the nucleotide sequence given by your teacher.
5. Using the toothpicks, assemble the DNA model.



## Follow-up Questions

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1. Explain the relationship between the nucleotides and genes.
2. If scientists are analyzing a DNA strand, how could they identify each base pair?
3. Explain what causes the coiling or double helix of DNA.
4. Draw a DNA molecule and correctly label it. Make sure to include the backbone, the sugar, the phosphate, and the nitrogen molecules.