

# DRAFT

## Georgia Performance Standards

### HS Biology

#### **The task**

Student groups were asked to design and build models representing DNA molecules. The models were to include details such as base pairs and nucleotide components, and to illustrate the overall double-stranded and helical nature of DNA.

#### **Circumstances of performance**

Students were expected to work in a group, with teacher feedback, outside of class, with an opportunity for revision.

#### **Prior Learning**

This task requires that students have studied the basic constituents of DNA.

#### **What the work shows**

#### **Characteristics of Science**

#### **Habits of Mind**

**SCSh4. Students will be able to use the ideas of system, model, change, and scale in exploring scientific and technological matters.**

- b. Understand that computers are used to develop, test, and revise models, including mathematical models that involve long, complicated, or repetitive computations, and graphic models that simulate complicated processes or make it possible to design and test devices and structures.

#### **Content**

**SB2. Students will understand how biological traits are passed on to successive generations.**

- a. Students will analyze the characteristics and components of DNA and RNA.
- b. Students will analyze the molecular basis of heredity/DNA including:
  - Replication
  - Protein synthesis (transcription, translation)

**A** The students illustrate complementary base pairs; alternate sugar-phosphate side chains, and appropriate placement of the nucleotide components. The model also shows the double stranded and helical nature of DNA. It includes an illustrated key [not shown]. The students attempted to illustrate the dynamic nature of the molecule with a crank handle that turns the model that is not visible in the photo.

**B** The students had an opportunity to revise their initial submission **A**. They more accurately depict the sugars and they added the phosphates. An attempt was made to illustrate more clearly the spatial relationship between these nucleotide components. In further revising the model, the hydrogen bonds between the nucleotide base pairs could be illustrated along with a more accurate depiction of accurate base pair size.

**C** The students illustrate complementary base pairs, hydrogen bonding, alternate sugar phosphate side chains, and appropriate placement of the nucleotide components. The model also shows the double stranded nature of DNA and the process of the unzipping and formation of replicated strands. However, this model does not illustrate the helical nature of DNA, an omission that should be corrected in a revision.

**S4a Scientific Connections and Applications:** *The student produces evidence that demonstrates understanding of big ideas and unifying concepts, such as order and organization....*

**A B C** The students demonstrated in model form the organization of the DNA molecule.

**A B C** The students developed and executed designs that, while requiring revision, were creative and largely accurate.

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New York City Performance Standards