

Modeling Recombinant DNA

SKILLS

- Modeling
- Comparing

OBJECTIVES

- **Construct** a model that can be used to explore the process of genetic engineering.
- **Describe** how recombinant DNA is made.

MATERIALS

- paper clips (56)
- plastic soda straw pieces (56)
- pushpins (15 red, 15 green, 13 blue, and 13 yellow)

Before You Begin

Genetic engineering is the process of taking a gene from one organism and inserting it into the DNA of another organism. The gene is delivered by a **vector**, such as a virus, or a bacterial **plasmid**.

First, a fragment of a chromosome that contains the gene is isolated by using a **restriction enzyme**, which cuts DNA at a specific nucleotide-base sequence. Some restriction enzymes cut DNA unevenly, producing single-stranded **sticky ends**. The DNA of the vector is cut by the same restriction enzyme. Next, the chromosome fragment is mixed with the cut DNA of the vector. Finally, an enzyme called **DNA ligase** joins the ends of the two types of cut DNA, producing **recombinant DNA**.



In this lab, you will model genetic engineering techniques. You will simulate the making of recombinant DNA that has a human gene inserted into the DNA of a plasmid.

1. Write a definition for each boldface term in the paragraph above and for the term *base-pairing rules*. Use a separate sheet of paper.
2. Based on the objectives for this lab, write a question you would like to explore about the process of genetic engineering.

Modeling Recombinant DNA *continued*

8. Simulate the action of the restriction enzyme on the section you identified in step 7. Open both strands of your model plasmid's DNA by pulling apart the adjacent green and blue nucleotides in each strand. Make a sketch of the split plasmid DNA molecule.
9. Move your model human DNA fragment into the break in your model plasmid's DNA molecule. Imagine that a ligase joins the ends of the human and plasmid DNA. Make a sketch of your final model DNA molecule.

PART B: CLEANUP AND DISPOSAL

10.  Dispose of damaged pushpins in the designated waste container.
11.  Clean up your work area and all lab equipment. Return lab equipment to its proper place. Wash your hands thoroughly before you leave the lab and after you finish all work.

Analyze and Conclude

1. **Comparing Structures** Compare your models of plasmid DNA and human DNA.

2. **Relating Concepts** What do the sections of four unpaired nucleotides in your model human DNA fragment represent?

3. **Comparing Structures** How did your original model plasmid DNA molecule differ from your final model DNA molecule?
