

**Chapter 14 The Human Genome**

**Real-World Lab**

**Modeling DNA Probes**

A DNA probe is a short, single-stranded DNA molecule bound to a detectable tag such as a fluorescent dye. Because the probe is single stranded, it can bind to other DNA that has a complementary sequence. To find a specific DNA sequence, scientists mix a probe with an unknown DNA sample. The probe will only bind to a DNA sample that has a complementary sequence, showing where the desired sequence is. In this lab, you will model how scientists use DNA probes.

**Problem**

How do DNA probes help to identify individuals?

**Materials**

- graph paper
- scissors
- colored pencil or marker

**Skills** Using Models, Classifying

**Procedure** 

1. DNA sequences from five individuals are shown below. Copy each individual's number and DNA sequence onto graph paper, putting one letter from the DNA sequence into each square. Skip five lines between each sequence and the next one.

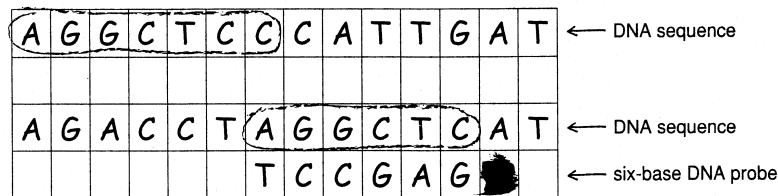
|                     |                                |
|---------------------|--------------------------------|
| <b>Individual 1</b> | ATCTCGAGACTGATAGGCTCTAAGCTCGAG |
| <b>Individual 2</b> | ATTGGCCACTCGAGACGTTGGCCAAGTCCG |
| <b>Individual 3</b> | ATGACCATGGCCAGGCTCGAGCTGATGACG |
| <b>Individual 4</b> | ATATGGCCATTGCTCGAGTGGCCAGATCCG |
| <b>Individual 5</b> | ACTCGAGGTCCCTCGAGTGTAGGCTCATCG |

2. Copy the following sequence for a six-base DNA probe onto graph paper, as you did the DNA sequences in step 1: T C C G A G
3. Fill in the square that follows the probe sequence with a colored pencil or marker to represent the fluorescent dye bound to the probe.



DNA probe

4. Cut out the strip of graph paper that represents the probe and its attached fluorescent dye.
5. Move the probe along each individual's DNA sequence as shown on the example below. As you do so, look for parts of the DNA sequences that are complementary to the probe's sequence.



6. Circle the part of any individual's DNA sequence that is complementary to the sequence of the DNA probe.
7. Record the numbers of the individuals who were identified by the DNA probe on the lines below.
 

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8. Choose one of the five individuals, and construct a new DNA probe that will identify only that individual. Write out the DNA sequence of this new probe as you did in step 2. Your new probe does not have to be six bases long.
9. Cut out your new probe and exchange it for one written by a classmate.
10. Repeat steps 5 and 6 with the probe you received to identify the individual that your classmate selected.

**Analyze and Conclude**

1. **Observing** What DNA sequence is complementary to the sequence of the probe shown in step 2?
 

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2. **Classifying** Which individual(s) was (were) identified by the DNA probe given in step 2?
 

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Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

3. **Using Models** Is it possible for the same DNA probe to identify more than one individual? Explain your answer.

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4. **Drawing Conclusions** Would DNA probes with longer or shorter sequences be more likely to identify only one individual? Explain your answer.

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## MODELING DNA PROBES

Individual #1

A T C T C G A G A C T G A T A G C C T C T A A G C T C G A G

Individual #2

A T T G G C C A C T C G A G A C G T T G G C C A A G T C C G

Individual #3

A T G A C C A T G G C C A G G C T C G A G C T G A T G A C G

Individual #4

A T A T G G C C A T T G C T C G A G T G G C C A G A T C C G

Individual #5

A C T C G A G G T C C C T C G A G T G T A G G C T C A T C G

Six Base DNA Probe (Cut Out)

T C C G A G

My DNA Probe (Cut Out)