# CHAPTER 16 DNA TECHNOLOGY

## Applying Scientific Methods

At the DNA level, humans are very similar, and the genes that code for their proteins follow fairly standard patterns. However, the segments of noncoding DNA found between the genes—referred to as "junk" DNA—follow patterns that vary from one individual to another. For example, in Individual A the "junk" DNA base sequence represented by CAT (cytosine, adenine, and thymine) could be repeated 3 times (CATCATCAT) in one place in that individual's genome and 6 times in another place. In Individual B, the same noncoding DNA sequence could form a different pattern, with 10 repetitions of CAT in one place and 30 repetitions in another. In a given population, there may be a large number of segments of DNA that differ on the basis of the noncoding DNA pattern. So if Individuals A and B have a child, the child is likely to be heterozygous for the segments of DNA involving noncoding sequences.

The patterns of noncoding DNA sequences give all individuals (except identical twins) a distinctive "fingerprint." The fingerprint is constructed by isolating DNA from a few cells, cutting it into fragments using restriction enzymes, and sorting the fragments by size using a gel electrophoresis. The shorter the DNA fragment, the farther it will migrate through the gel. The result is a visual representation of an individual's DNA.

A DNA fingerprint can be used to identify a child's biological father. The basis for such an identification is that a repetitive, noncoding sequence present in the child but not found in the mother must have been inherited from the father. Examine the bands in the diagram of a gel electrophoresis shown below. Each band represents a fragment of DNA. The first vertical lane of bands represents standard markers of known size, which are used as a reference. To the right of the standard markers is the lane of bands representing the child's DNA "fingerprint." The next lane is the mother's DNA, followed by the DNA fragments from two men who might be the child's father. Study the pattern of each lane of DNA bands. Then answer the questions.