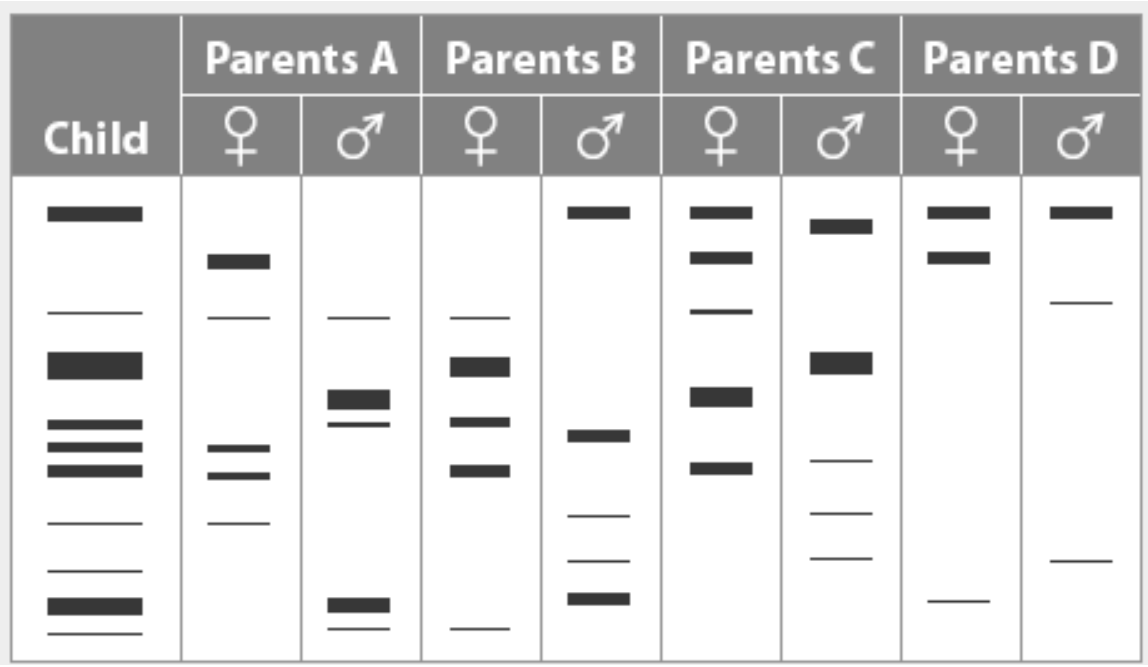
CHAPTER 18 HANDOUT	DNA Fingerprinting	BLM 18.3.11

A **DNA fingerprint** is a pattern of DNA fragments that results when DNA undergoes a process known as gel electrophoresis. A solution containing DNA fragments is applied at one end of a gel, and an electric current is passed through it, causing a positive electric charge to develop at one end of the gel and a negative electric charge to form at the other. DNA has a negative charge, and the fragments thus move toward the gel's positive end. Smaller fragments move more quickly than larger ones. As a result, the fragments separate into a pattern of bands, a DNA fingerprint.

Once a DNA fingerprint has been created, scientists identify fragments of DNA that contain sequences that are unique to an individual. These sequences are known as VNTRs, or variable number tandem repeats. They contain 20-100 base pairs and are found in the non-coding regions of human DNA. VNTRs are inherited from parents. This means that some of your VNTRs came from your mother and some from your father. Your pattern of VNTRs will be unique to you, however.

As a result of this unique pattern, DNA fingerprinting can be used to identify an individual. How is this done? While DNA fingerprinting cannot distinguish an individual directly, it can do so through means of comparison. For example, a DNA fingerprint can help determine if two DNA samples are from the same person. This is useful in solving crimes in which DNA evidence, such as hair, blood, or skin tissue, has been found at the scene. If the DNA fingerprint of a suspect matches the DNA fingerprint found at the crime scene, this indicates that the individual was likely to have been at the scene of the crime. It's important to note that DNA fingerprinting is not foolproof. It can only determine that there is an extremely high probability that the DNA run though the gel belongs to a certain person. Technical errors can occur in the lab. The margin for error increases if the DNA sample is very small. Also, until recently, strict lab standards for DNA testing were not universal.

DNA fingerprinting can also help determine the paternity or maternity of a child, as you will learn in Thought Lab 18.5: Reading a DNA Fingerprint. As indicated, a person's VNTRs are inherited from both parents. By comparing a child's DNA fingerprint with those of the adults, the child's parent(s) can be identified. The following diagram shows the results of a gel electrophoresis analysis of one child and four different sets of parents. Use these DNA fingerprints to complete Thought Lab 18.5.



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