Name _____ Date _____ Class _____

10–1 Enrich

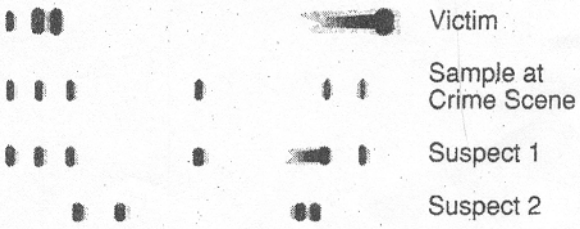
A DNA Fingerprint

How can a single drop of blood found at a crime scene provide evidence that a suspect is either guilty or innocent? It is not the blood itself that investigators are interested in, but the deoxyribonucleic acid, or DNA, that the blood contains. By a process popularly known as "DNA fingerprinting," scientists can compare patterns in the DNA found at the scene of the crime with patterns in the DNA of crime suspects and establish with near certainty whether a suspect was at the crime scene or not. The key to DNA fingerprinting is to have enough DNA to run the tests.

DNA is a large molecule made up of two long strands twisted together to form a double helix. Each strand is made up of molecules called nucleotides that are linked to one another like beads on a string. There are four different kinds of nucleotides, and they can be linked together in any order. The fact that no two people (except identical twins) have exactly the same order of nucleotides in their DNA is what makes DNA fingerprinting possible. However, a significant quantity of DNA may be needed to run the necessary tests. What can be done if only a very small amount is found at the crime scene?

The answer, surprisingly, is just to make more of it. A technique known as the polymerase chain reaction, or PCR, enables investigators to take a tiny amount of DNA, perhaps as little as a picomole, and recopy or amplify it until they have a sufficient quantity. In the PCR technique, the double-stranded DNA is first separated into its two component strands. Then each strand serves as a pattern to build a new "copy" strand of DNA. The copy strand is assembled by a bacterial enzyme called a polymerase. The polymerase reads the nucleotide order on the pattern strand and puts together matching nucleotides to create the copy strand. These copy strands can now serve as pattern strands, and the whole process starts again. The end result is that in a matter of hours millions of copies of the DNA sample can be generated, more than enough to carry out DNA fingerprinting.

Once sufficient quantities of the sample have been produced, the nucleotide sequence of the sample DNA can be compared to the sequences of the suspect's DNA (see diagram). If the sequences do not match, investigators can safely conclude that the blood at the scene of the crime is not that of the suspect. If the sequences do match, on the other hand, investigators have a stronger case against the suspect.



DNA Fingerprinting

Critical Thinking

1. If you were on a jury and were shown the DNA fingerprint from the diagram, how would this evidence affect your decision on the guilt or innocence of the suspects? (*Interpreting diagrams*)
2. If on the same jury, other evidence contradicted the DNA fingerprint evidence, how much weight would you give to the DNA fingerprint evidence in making your decision? (*Making judgements*)