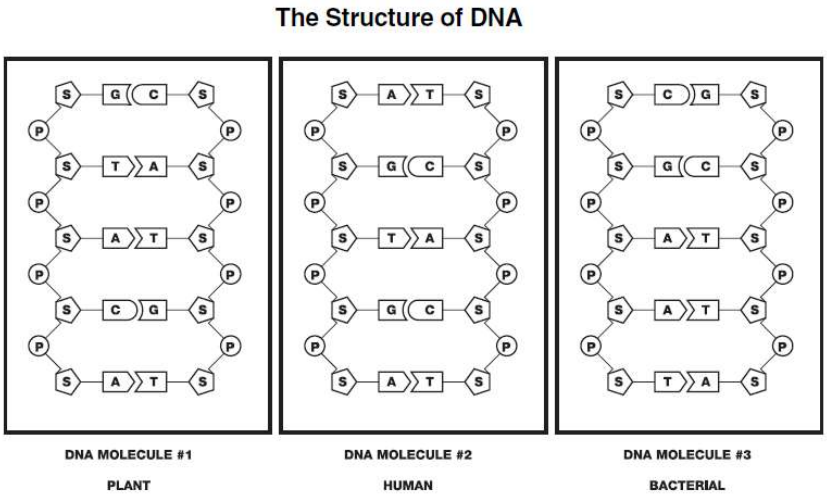
# AP Investigation #9 – Forensic DNA Fingerprinting

## LESSON 1: Introduction to DNA Fingerprinting

**PRE-LAB QUESTIONS**:

1. Compare the "backbone" of the sugar-phosphate arrangement in the side chains of all three figures. Are there any differences?




2. Are the bases paired in an identical manner in all three samples? Describe the pattern of the base pair bonding.

3. What will you need to compare between these DNA samples to determine if they are identical or non-identical?

## LESSON 2: Restriction Digests of DNA Samples

**PRE-LAB QUESTIONS:** *(continued)*

Consider the following:


1. How many pieces of DNA would result from this cut?

2. Write the base sequence of both the LEFT and RIGHT side DNA fragments.

3. What differences are there in the two pieces?

4. DNA fragment size can be expressed as the number of base pairs in the fragment. Indicate the size of the fragments *(mention any discrepancies you may detect)*.

   The smaller fragment is _____ base pairs (bp), while the longer fragment is _____ bp.

5. Consider the two samples of DNA shown below – *single strands are shown for simplicity:*

**Sample #1**

CAGTGATCTCGAATTCGCTAGTAACGTT

**Sample #2**

TCATGAATTCCTGGAATCAGCAAATGCA

   a. If both samples are treated with a RE [*recognition sequence **GAATTC***], indicate the number of fragments and the size of each fragment for both samples of DNA.
   b. List fragment size in order: largest → smallest for each sample.

**LESSON 3: Electrophoresis and Staining of DNA Samples**

**PRE-LAB QUESTIONS:** *(continued)*

1. The electrophoresis apparatus creates an electrical field with positive and negative poles at the ends of the gel. DNA molecules are negatively charged. To which electrode pole of the electrophoresis field would you expect DNA to migrate? Explain.
2. What color (on the apparatus, *or ANY electrical equipment)* represents the negative pole?
3. After DNA samples are loaded into the sample wells, they are "forced" to move through the gel matrix. What size fragments (*large vs. small*) would you expect to move toward the opposite end of the gel most quickly? Explain.
4.

**RESULTS:**

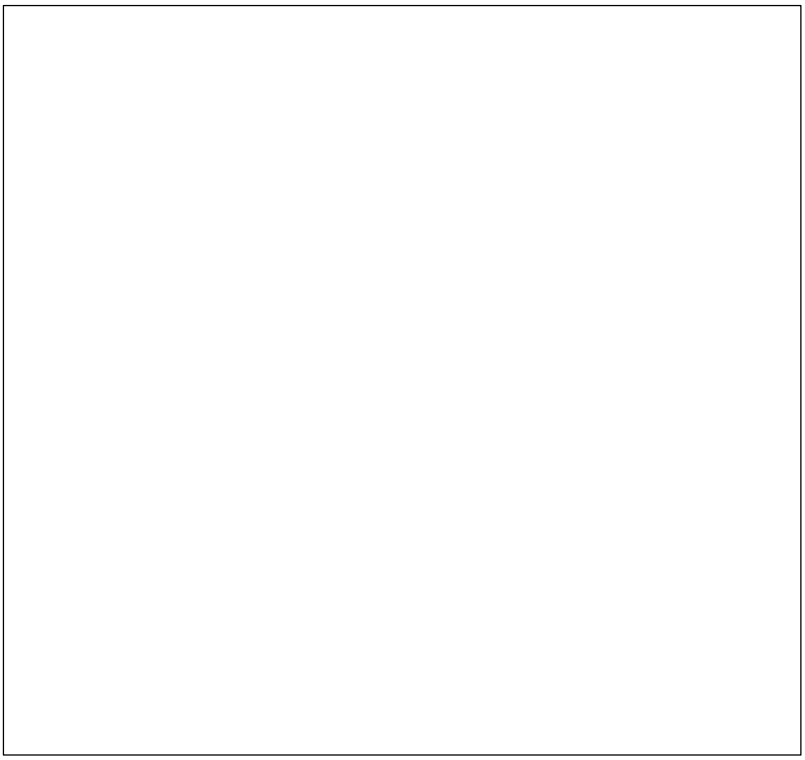


Figure 1: Qualitative Results of DNA Fingerprint Analysis

Table 1: Quantitative Results of DNA Fingerprint Analysis

| | Lambda/*Hind*III size marker | | Crime Scene | | Suspect 1 | | Suspect 2 | | Suspect 3 | | Suspect 4 | | Suspect 5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Band | Distance (mm) | Actual size (bp) | Distance (mm) | Approx. size (bp) | Distance (mm) | Approx. size (bp) | Distance (mm) | Approx. size (bp) | Distance (mm) | Approx. size (bp) | Distance (mm) | Approx. size (bp) | Distance (mm) | Approx. size (bp) |
| 1 | | 23,130 | | | | | | | | | | | | |
| 2 | | 9,416 | | | | | | | | | | | | |
| 3 | | 6,557 | | | | | | | | | | | | |
| 4 | | 4,361 | | | | | | | | | | | | |
| 5 | | 2,322 | | | | | | | | | | | | |
| 6 | | 2,027 | | | | | | | | | | | | |

**QUESTIONS:**

1. What are we trying to determine? *Restate the central question.*
2. What can you assume is contained within each band on the gel?
3. If there were a fingerprinting gel, how many samples of DNA can you assume were placed in each separate well?
4. What would be a logical explanation as to why there is more than one band of DNA for each of the samples?
5. What caused the DNA to become 'fragmented'?
6. Which sample had the smallest DNA fragment? What as its size (in bp)?
7. Based on your analysis of the gel, what is your conclusion about the DNA samples in your gel? Do any of the samples seem to be from the same source? If so, which ones? Describe the evidence that supports your conclusion.