Gel Electrophoresis Lab

Background:
DNA is unique from person to person. DNA fingerprints can be used for anything from determining a biological mother or father to identifying the suspect of a crime. A process called gel electrophoresis is used to make DNA fingerprints. Gel electrophoresis separates and analyzes DNA fragments based on their size and charge.

Goal:
To understand how DNA is separated into a fingerprint by using a chromatography activity to simulate gel electrophoresis.

Scenario:
A pair of expensive shoes were stolen from a locker in the gym. A drop of blood was found on the floor. Two people were seen leaving the gym during the time of the crime. Your job is to identify which suspect matches the drop of blood.

Teacher's Guide:
Materials: (per group)
- scissors
- white cone-style coffee filters
- clear containers, such as Mason jars or plastic cups
- water
- ruler
- pencils or dowels
- tape
- Solution 1- (red, yellow, blue)
  Solution 2- (yellow, green, blue)
- Solution 3- (red, yellow, blue)
  - The solutions should appear green/black
- pipette
- paper towels

Time Required: 45 - 60 minute class period

Prep:
- Mix the solutions in beakers
- Solution 1 (Crime Scene Drop)- 16 drops blue, 12 drops yellow, 8 drops red food coloring
- Solution 2 (Suspect #1) - 10 drops green, 8 drops blue, 18 drops yellow food coloring
- Solution 3 (Suspect #2)- 16 drops blue, 12 drops yellow, 8 drops red food coloring

Student's Sheet

Materials: Gather the following materials for your group

- 3 coffee filters
- 1 scissors
- 3 jars
- 3 pencils
- 1 graduated cylinder
- 1 ruler

Procedure:

1. Cut the seam off the coffee filters and open it flat. Cut a strip about 2cm wide from the widest part of the filter. You need three strips.
2. Label the strips #1, 2, and 3 respectively
3. Fill the containers with 50 ml of water
4. Tape the top of each strip to the pencil
5. Place one small drop of Solution 1(Crime Scene Drop) about 2 cm from the bottom of the strip labeled 1.
6. Place one small drop of Solution 2 (Suspect #1) about 2 cm from the bottom of the strip labeled 2.
7. Place one small drop of Solution 3 (Suspect #2) about 2 cm from the bottom of the strip labeled 3.
8. Fill out the observation chart.
9. Carefully lower the strip into the container so that 3 to 5 mm of the end of the strip is in the water. Do not allow the part of the strip with the color drop to touch the water. If necessary, re-tape the strip on the pencil. Rest the pencil on the rim of the jar.
10. Repeat procedure # 9 for strip #2 and 3.
11. Observe your setups for 15 to 20 minutes. Then remove the strips from the containers and lay them on a paper towel.

Observation Table

	Initial Color of Solution	Final Colors of Solution
Solution #1		
Solution #2		
Solution #3		

Analysis:

1. What happened to the dots of solution on each of the strips as the water traveled up the strip? Draw and describe the color patterns on each strip.
2. Which suspect committed the crime? How do you know?

Adapted from www.beyondbenign.org