**CRIME SCENE ANALYSIS**

**HISTORY**

Yesterday, biology teacher Mr. Boddy was found dead in his classroom. He was killed by poisoning with cyanide. Apparent time of death was 10 am yesterday. His body was discovered by the janitor and the phrase "pavo cristatus" was written in blood beside his body. Mr. Boddy was not bleeding, so the blood must have come from the murderer during a struggle. A clump of hair (not belonging to Mr. Boddy) was found clenched in Mr. Boddy's fist further supporting that a struggle had occurred. At the approximate time of the murder, Mr. Boddy was preparing his class for that day. The rest of the classroom was untouched. Upon examination of Mr. Boddy's belongings and evidence left at the scene, the following list of suspects was prepared. All the suspects were questioned as to their whereabouts at the time of the murder and the following alibis were given:

1. Professor Plum:
*Reason for being a suspect:* Was fired from Arizona State University for conducting dangerous cloning experiments. Became a biology teacher at the school. Had a lab in her classroom and was in competition with Mr. Boddy to find a cure for cancer. She was involved in a laboratory accident when she was thirteen and had plastic surgery to correct the facial scars. She was adopted as a child and never knew anything about her parents.
*Alibi:* Was in her classroom next to Mr. Boddy's classroom experimenting with toxic chemicals.
2. Ms. Peacock:
*Reason for being a suspect:* Was a student at the school and was assisting Professor Plum with her experiments.
*Alibi:* Was in the restroom reading the graffiti on the walls.
3. Colonel Mustard:
*Reason for being a suspect:* Is the janitor at the school and discovered the body. Always disliked messes left in Mr. Boddy's classroom.
*Alibi:* Had just finished cleaning the principal's office and was bringing chalk to Mr. Boddy's classroom.
4. Mr. Green:
*Reason for being a suspect:* Was a student in the school and greatly disliked Mr. Boddy because he failed the last two exams that were graded by Mr. Boddy.
*Alibi:* Was in the locker room getting ready for football practice.
5. Ms. Scarlett:
*Reason for being a suspect:* Was a student in the school and greatly disliked Mr. Boddy because Mr Boddy told her that women weren't smart enough to be scientists.
*Alibi:* Was at the pool practicing her synchronized swimming routine.
6. Ms. White:
*Reason for being a suspect:* Was the principal at the school and was about to fire Mr. Boddy due to numerous complaints from students and parents. Was told by her parents that she had an identical twin who was given away at birth.
*Alibi:* Was in the library reading books on ancient methods of torture

**OBJECTIVES**

1. Learn scientific method of obtaining and analyzing data (including fact vs. opinions)
2. Learn how DNA is responsible for phenotypic differences between individuals
3. Learn how to determine blood type of an individual. Gain an understanding of what an antibodies and antigens are.
4. Learn how to perform DNA fingerprinting. Gain an understanding of DNA sequence diversity and uniqueness, gel electrophoresis, DNA restriction enzymes, and polymerase chain reaction.

**PROCEDURES**

Each one of the suspects will be assigned to a group. Your task, as the defense attorney team for your suspect, is to attempt to prove your client innocent.

####  Hair Analysis

####  Seven samples of hair are available (six suspects and sample collected at crime scene)

####  Place each strand of hair collected on a white sheet of paper. Remove only one strand at a time and return it to its proper bag. Observe the strands of hair using a dissecting microscope. Begin analyzing the crime scene's hair first so that you can compare its' characteristics to all of the suspects. Record characteristics of each sample including:

color (lt. brown, dk. brown, black, blonde, gray, etc.)

thickness (thin, thick, etc.)

texture (rough, smooth, etc.)

style (curly, straight, frizzy, split ends)

Record the results of the hair analysis:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Color | Thickness | Texture | Style |
| Crime Scene |  |  |  |  |
| Professor Plum |  |  |  |  |
| Ms Peacock |  |  |  |  |
| Col. Mustard |  |  |  |  |
| Mr Green |  |  |  |  |
| Ms Scarlett |  |  |  |  |
| Ms White |  |  |  |  |

 **Blood Sample Analysis**
 Seven samples of blood are available:
 The identification of blood type is based on the recognition of blood cells by a specific antibody.

 Four blood types are present in humans including A, B, AB and O. If antibodies to A blood are mixed with A type blood, the blood will agglutinate or clump. If antibodies to A blood are mixed with B type blood, the blood will not clump. Type AB blood will agglutinate with both anti-A and anti-B, while type O will not agglutinate with either.

 In these pictures the blood samples have been tested using known antibodies.

 The following chart is used to determine the blood type:

 Reaction to antibodies Interpretation

|  |  |  |
| --- | --- | --- |
| **Anti - A** | **Anti - B** | **Blood Type** |
| + | = | A |
| = | + | B |
| + | + | AB |
| = | = | O |

 + means agglutination (clumping) seen

 = means no agglutination seen

 Record the results of the blood typing.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Anti -A** | **Anti-B** | **Interpretation** |
| Mr Boddy |  |  |  |
| Professor Plum |  |  |  |
| Ms Peacock |  |  |  |
| Col. Mustard |  |  |  |
| Mr Green |  |  |  |
| Ms Scarlett |  |  |  |
| Ms White |  |  |  |
| Crime Scene |  |  |  |

#### DNA Analysis Experiment

Gel electrophoresis is a technique used for the separation of DNA, RNA, or [protein](http://en.wikipedia.org/wiki/Protein) [molecules](http://en.wikipedia.org/wiki/Molecule) using an electric field applied to a gel matrix. The larger the size of the molecule, the slower it moves on the gel. Bands in different lanes that end up at the same distance from the top contain molecules that passed through the gel with the same speed, which usually means they are approximately the same size. There are [molecular weight size markers](http://en.wikipedia.org/wiki/Molecular_weight_size_marker) (ladders) available that contain a mixture of molecules of known sizes. If such a marker was run on one lane in the gel parallel to the unknown samples, the bands observed can be compared to those of the unknown in order to determine their size.

Seven samples of DNA are available. Compare the banding patterns of the suspect versus the banding patterns of the DNA evidence found at the crime scene. Banding patterns should match.