

Teacher's Notes:

Student Groups:

The students will be split into 6 groups. The groupings will be done by me prior to the class and they will be heterogeneous, ensuring that there is a good mixture of student abilities, gender, extroverts and introverts.

Classroom Organization:

The classroom will first be split in half. The side of the classroom that is closest to the entrance will be labeled as "Uptown", while the other side which is closest to the window will be labeled as "Downtown". Clear signage will be made and posted in the appropriate areas of the classroom.

Crime Scenes:

On the following pages there are three different Crime Scene Scenarios. Two copies of each crime scene will be made and placed at specific areas in the classroom. Both "Uptown" and "Downtown" will get one copy of each of the three Crime Scenes. The Crime Scenes will be placed in areas where 6 students can comfortably sit and discuss the Crime Scenes.

Crime Scene #1 – The Case of the Hot Pepper:

During a family brunch, it was discovered that the perpetrator had taken bits of a radioactive source and mixed it in with the peppercorns in a pepper mill. There were 6 people at the brunch. Jason and Jessica sprinkled the pepper on their eggs, and ate them before realizing the pepper was tampered. Leon and Lisa sprinkled their eggs with pepper, but they didn't have a chance to eat their eggs. The remaining two guests, Charlie and Chelsea, didn't use the pepper at all. All they did was pass the pepper.

Clues:

Pepper grinder was contaminated with Polonium-210.

The pepper was in a sealed container.

Questions:

1. What kind of emitter is Polonium-210?
2. What does Polonium-210 form when it is decayed? Write the formula for this.
3. Will the Jason and Jessica suffer radiation poisoning? Why or Why not?
4. Will the Leon and Lisa suffer radiation poisoning? Why or Why not?
5. How about Charlie and Chelsea? Why or Why not?

Crime Scene #2 – The Case of the Hot Potato Sword:

When doing renovations on their recently acquired mansion, Mr. and Mrs. Curie discovered a hidden vault. After opening up the vault, a jewel-encrusted sword was discovered. The sword was dubbed the “Potato Sword” because it had a stone shaped like a potato in the hilt of the sword. Delighted by the discovery, Mr. and Mrs. Curie had a special Plexiglas case made and they mounted the sword on the wall of their front entrance. Soon after, mounting the sword, all of the occupants of the mansion started to exhibit signs of radiation poisoning. Even visitors to the mansion started to get sick.

Mansion’s History:

Prior to Mr. and Mrs. Curie buying the mansion, the Gray family owned it.

Three different generations of the Gray family lived healthy lives in the mansion for over a hundred years.

Questions:

1. Describe what kind of emitter is probably causing the radiation sickness? Justify your answer.
2. Why do you think no one got sick prior to the discovery of the sword?
3. Given the evidence, what kind of material do you think the safe was made out of? Why?
4. Suggest 3 possible radioactive materials that could have caused the radiation sickness. Write down their decay formulas.

Case #3 – The case of the Hot Nurse

Ms. Becquerel, a private nurse, is accused of mixing P-32 with insulin medication and administering it to her patient Mr. Tyler (someone she obviously didn't like). After a lengthy 6 month investigation, the police have finally gotten a search warrant. They find some mysterious glass vials in her apartment and test for radioactive emissions using a Geiger counter. Unfortunately, the vials exhibit no evidence of radioactivity. Based on this, the police officers, who have had no radiation training, are beginning to think that Ms. Becquerel might be innocent. You, the ever so wise and intelligent CSI, who knows a thing or two about radioactive materials, scoff at the police's gullibility.

Clues about this case:

Medical tests done on Mr. Tyler suggest that a single mass dose of P-32 was given to Mr. Tyler over 6 months ago.

The half-life of P-32 is 14.5 days.

1. You have to explain to the police officers why there would be very little evidence of any radiation left in the vials. When you do your mini-lesson to the police, include the following:
 - a. The type of emitter P-32 is along with its decay formula.
 - b. Define what a half-life is to the police officers and indicate how this might play a part in the lack of any radiation evidence in Ms. Becquerel's apartment.
 - c. Describe why Ms. Becquerel was able to keep P-32 in her apartment without harming herself.
 - d. Describe why her patient, Mr. Tyler was harmed by the P-32.
2. Some of the officers still don't understand why Ms. Becquerel should be let go, so you need to try another teaching strategy. Assume that when Ms. Becquerel was contaminating the insulin, there was 100% of the P-32. The graphically show how much of the P-32 is left after 6 months and explain how this relates to why no evidence of radioactivity was found in Ms. Becquerel's apartment.