

Disaster at the Daisys': The Analysis of Forensic Evidence

by

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On June 12, 2017, neighbors reported hearing arguing and banging at the house next door. The house in question was occupied by Mr. and Mrs. Daisy. This was the second time in the past month that the neighbors had heard a dispute. They were about to call the police department when the noises ceased. A week later, police and fire trucks were called to the Daisys' house by the same neighbors, who saw flames coming from the kitchen window. Firefighters arrived at the scene and quickly put out the fire. Mrs. Daisy was found in the kitchen with several gunshot wounds to the chest. The garage near the house was not damaged. Mr. Daisy was found in the garage, leaning against a wall with a bullet wound in his right temple and a gun in his right hand.

The bodies were taken to the state medical examiner's office for an autopsy and processing. An arson investigation team from the state fire marshal's office was called to determine the cause of the fire.

Questions

1. The medical examiner performs a visual examination of Mr. Daisy's body and finds a bullet entrance wound. There appears to be a ring of deposited smoke and lead as a halo around the bullet hole. What would be the approximate distance from which the bullet was shot?
2. The medical examiner performs a visual examination of Mrs. Daisy's body and finds a bullet entrance wound. There is a heavy concentration of lead and smoke around the hole and a stellate tear pattern around the hole. What would be the approximate distance from which the bullet was shot?
3. The medical examiner swabs an area near the entrance wound. She is trying to determine if there is gunshot residue (GSR) near each of the wounds. List three elements that might be present in GSR. What are the chemical symbols for these elements? How many protons, neutrons, and electrons do they have?

4. The medical examiner sends the swab to the inorganic analysis laboratory section. What analytical techniques might they use to *simultaneously* determine the three elements found in the previous question?
5. The medical examiner finds an unknown metal object in Mrs. Daisy's pocket. She requests that the inorganic analysis laboratory section perform a non-destructive test on the metal to determine the elemental composition. Which analytical technique might the lab choose?
6. There are several cans of kerosene in the garage. Based on the flash point, how do you think this would compare to gasoline for use as an accelerant? Which has the higher flashpoint?
7. Based on the composition of gasoline and kerosene, why would gasoline be easier to ignite?
8. An hourglass pattern was found on one wall of the kitchen. What might this indicate about the cause of the fire?
9. Residue is found in the kitchen that needs to be taken back to the lab for analysis. How should the evidence be transported?
10. Residue is taken from near the location in the kitchen where the hourglass pattern was found. Prior to testing, the sample undergoes solid-phase micro extraction. Why is this technique needed prior to testing?
11. Gas chromatography is used to analyze the sample. Is this considered a qualitative or quantitative technique? Support your answer with an example.
12. Results of the gas chromatograph indicate that a combination of accelerants may have been used. What technique might assist in determining the accelerants used?
13. Based on your answers above, develop a working hypothesis regarding what happened at the Daisys'. Be sure to discuss how the forensic evidence supports your hypothesis.