Battle at Valley Forge Invitational

January 8th, 2011

Forensics Exam

It is a dark day in Hollywood. Police cars crowd around the residence of a famous Hollywood celebrity. Cameras flash everywhere as you step out of your police car and over the strung out yellow tape. Just two hours ago the doorman, Jimmy, found the victim face down just outside his enormous penthouse suite. An officer leads you up the elevator to the crime scene. As the door opens your eyes open wide to take in the whole scene. There's evidence everywhere. It's going to be a long night.

Your job, as chief detective, is to analyze the evidence at the scene and compare it to the statements of those suspects who have already been detained for questioning. The mayor wants closure on this case quickly and you need to narrow down the suspect pool. Good luck.

The Crime Scene

Inside the victim's foyer it seems there was a large struggle. This is where the victim was found wearing a white cotton bathrobe face down on the floor by the night doorman. Initial reports show that the victim died from a massive blow to the head. The bleeding from this attack was internal, the medical examiner says, although blood spatters (**Bloodstains A and B**) were found in the immediate vicinity. The source of these blood spatters could be from a pair of scissors found in the victim's hand although there do not appear to be any wounds on his body.

Three powders were found at the scene (**Samples 1, 2, and 3**). Two plastics were also found at the scene (**Samples 6 and 7**) as was a hair sample (**Sample 10**). A ripped up note was found on the ground and an ink sample was taken from it (**Part III Paper Chromatography**). Outside the door, a smeared footprint was found that contained a liquid sent to the lab for analysis (**Part III Mass Spectroscopy**). A clear fingerprint (**Part IV (a)**) was found on the doorknob and was collected by one of your assistants.

The Suspects

The following people have been detained by police already as "Persons of Interest" in the case. Their statements and associated physical evidence are summarized below.

Louie- Louie had been a personal assistant to the victim for almost ten years. Recently, the two had a loud disagreement about something in the lobby of the building, after which, Louie was fired. Louie was found a smudge of white powder on his pants, which was analyzed at the lab to be calcium nitrate. He explained this by saying that since he got fired, he had to take a job sweeping the floors of a fireworks store down on 2nd street. Slivers of plastic were found in the soles of his boots which the crime lab say are polymethylmethacrylate.

Sharky- Sharky was one of the victim's former business partners. He was picked up by police because phone records indicated he had made numerous phone calls to the victim over the past few days. "He was late on a couple of payments," Sharky said, "so I called to remind him. But I never came over." Sharky has a cut just above his left knee, which he says he got playing basketball in the park yesterday. His fingerprints were taken and are brought to your attention in part IV of the answer packet.

Jimmy- Jimmy has been the doorman at this building as long as anyone can remember. He is an amateur photographer and is well liked by most everyone in the building. "Another one of our tenants thought they heard some strange noises up on the penthouse floor so I went upstairs to check it out. The door to his suite wasn't shut tight so I pushed the door open and saw him lying there. I turned around and ran downstairs to call the police." Jimmy was found with a white powder on his sleeve, which has been collected and sent for analysis (**Sample 4**). Jimmy has an apartment underneath the building where it is said he has over a dozen cats.

Mikey "the Hammer"- Mikey has worked off and on as the victim's bodyguard over the years. "Sometimes he needs me and sometimes he don't. But the money's good so I stay available. He ain't called in a while though." A fiber was found in Mikey's coat (**Sample** 9) which did not match any of the clothes he was wearing at the time. Small fragments of plastic were found in his pant leg that have been analyzed to be polycarbonate. He has a gash on his left shoulder that he says happened at a club where he works as a bouncer. "Some guy got drunk and pulled a knife on me. I got a cut on the arm and he lost the ability to speak clearly for a few months. I'd say I won." Mikey was found with a purple magic marker in his pocket. The ink from this marker was analyzed and found to contain two dyes with R_fs of 0.96 and 0.27.

Charlene- Charlene is the downstairs neighbor of the victim. She is the one who contacted the doorman after she heard a commotion upstairs. "I was up late with a bad case of heartburn when I heard all that noise upstairs. I liked the guy," she said. "But I always told him that he kept too much money laying around the place. I'd see it whenever I went up to borrow something. Thousands of dollars, just lying around." Charlene had plastic shards (**Sample 8**) in the soles of her slippers that she can't explain and a white powder was found under her fingernails (**Sample 5**) that has been sent off for analysis. A short while before she reported the incident, Charlene was seen walking her dog outside the building.

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Team Name: _____ Team Number: _____

Participant Names: _____

Forensics Answer Packet

All answers should go in this packet. Answers that are recorded elsewhere (such as the Information Packet) will not be considered. Write your answers as neatly as possible. Answers that cannot be read or understood will be marked as incorrect.

Part I Qualitative Analysis (20 points)

You are given samples of five (5) white powders. Use available methods to determine their identities and record your answers here. Either chemical names or correct formulas will be accepted.

1.) _____

2.) _____

3.) _____

4.) _____

5.) _____

Part II Polymers & Fibers (20 points)

You are given five (5) samples of polymers and fibers. Use available methods to determine heir identities and record your answers here. You may record polymer names using their appropriate 2-4 letter abbreviations but **not** by resin code numbers 1-7. Fibers may be burnt but polymers may not. Anyone seen burning the polymer samples will lose all credit form this part of the exam.

6.) _____

7.) _____

8.) _____

9.) _____

10.) _____

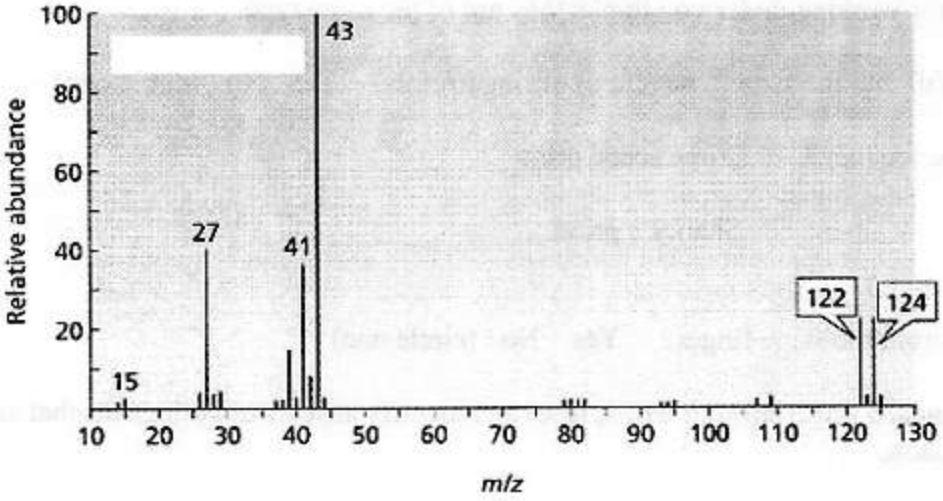
Part III Chromatography/Spectroscopy (15 points)

You are given a sample of ink found at the crime scene. Use available methods to develop a paper chromatogram of this ink and determine the R_f value of each dye in the ink. Tape your paper chromatogram below and show the measurements and calculations that led to your R_f values. After that, look at the given mass spectrum and answer the related questions.

Paper Chromatogram Analysis:

Mass Spectrum Analysis:

The mass spectrum below was taken of the liquid found at the crime scene



1.) What is the most likely molar mass of this chemical compound? _____

2.) What is the m/z value of the base peak? _____

3.)The pattern shown by the peaks at 122 and 124 point toward the presence of a specific element. What element is it? _____

Part IV (a) Fingerprint Analysis (5 points)

Answer the questions below.

The first fingerprint below was found at the crime scene and the second was taken from the suspect Sharky. They have been brought to your attention because a young investigator working under you thinks they are of the same type.

Do they fall into the same type (class) of fingerprints? Yes No (circle one)

What type are they? Crime scene print: _____

Sharky's print: _____

Are they from the same finger? Yes No (circle one)

Using standard fingerprinting terms, label and identify aspects of both prints that support your decision.

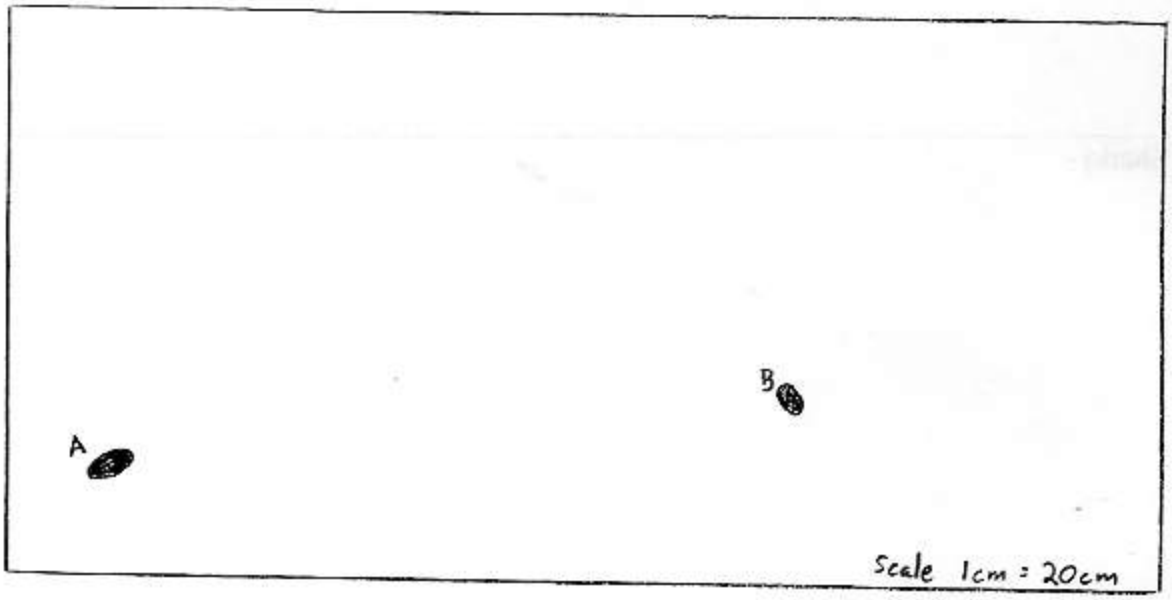
Crime Scene Print

Sharky's Print

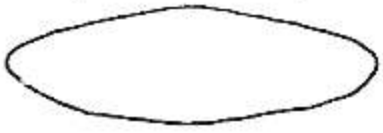
Part IV (b) Blood Spatter Analysis (10 points)

Two bloodstains were found at the crime scene in good shape. The map below depicts their relative positions. Enlargements of the stains are also included. From these pictures, determine the following:

1.) The point of convergence. Clearly label this on the map below and explain in the margin how you came to this conclusion.
2.) The angle of impact for each bloodstain. Calculate this in the space below the map and show all of your work. Circle your answers.
3.) The point of origin. Using bloodstain "A", calculate the height above the point of convergence from where the blood originated. Calculate this in the space below the map and show all of your work. Circle your answer.



Enlargement of spatter A



Part V Analysis of the Crime (30 points)

Using data both from the Information Packet and analysis of the physical evidence provided, determine which suspects should be retained and which ones you can let go. For each suspect, justify your decision with a discussion of the crime scene and/or the physical evidence available.

Louie-

Sharky-

Jimmy-

Mikey "the Hammer"-

Charlene-

List here any additional investigations you would undertake based on the evidence presented to you. In other words, what evidence has left some loose ends that need attention?