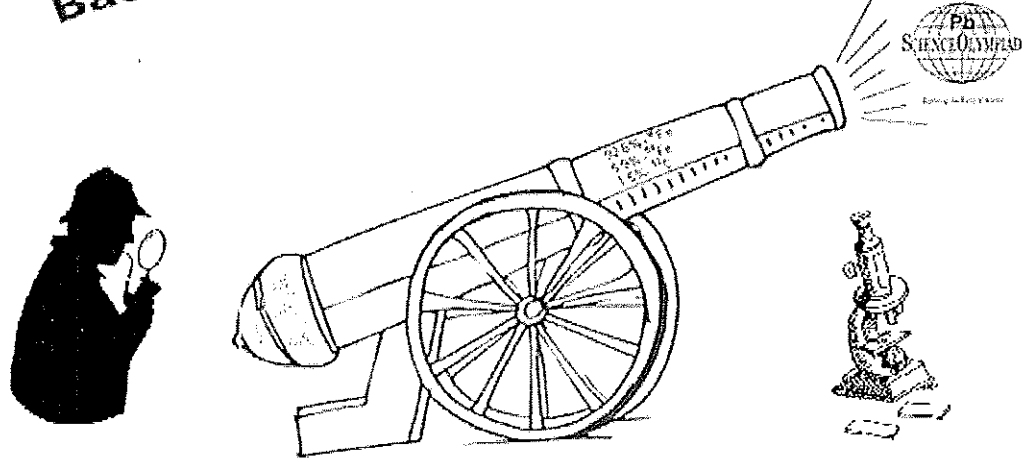


**Conestoga High School
Battle at Valley Forge Invitational**



**Forensics Information
Packet**

Division C

January 14, 2012



SCHOOL NAME _____ TEAM NUMBER _____

Who really killed Professor Dumbledore?

As all of you know, the legend of Harry Potter and everyone associated with the books are actually real people who are actual wizards. And that Professor Snape is credited with disposing of Professor Dumbledore in the final chapters of "The Half-blood Prince". What you are not aware of is what actually happened in real life may have been exactly as written or completely different and that Joanne Rowling took the facts and twisted them around to make Harry Potter the supreme protagonist of the series.

Here are the accounts of several eyewitnesses which were taken immediately after the tragedy as to what really happened to Professor Dumbledore in his last days. Each person who was interviewed may have also had means and motive for the murder of Professor Dumbledore and each is being investigated as a suspect. It is up to you to solve this mystery and make known once and for all whether Professor Snape is truly the wizard we all expect him to be or that someone else is responsible for the demise of Professor Dumbledore.

Crime scene:

A note was found in Professor Dumbledore's pocket that was a little disturbing. It was a threatening note that said if the professor did not leave Hogwarts within 24 hours, something terrible would happen. It was not determined if that something terrible meant to him or to Hogwarts itself. A single finger print was lifted from the note that was not Professor Dumbledore's. A sample of the note was taken for analysis and it is up to you to determine the Rf values of the instrument used to write the note. There were two powders found at the scene and samples were taken, exhibit 1 and 2. There were also pieces of some sort of plastic in the good professor's robe and these were taken as exhibits 6 and 7. We know that he had a phoenix as a pet and it seemed odd that there was a bunch of hair all around his one arm as if some had rubbed off in a struggle. Samples of this were taken as exhibit 8. There were also some torn fibers that appeared to be from a wizard's robe strewn about the ground near the blood spatters. These were taken as exhibit 9.

Harry Potter:

"It did not happen exactly as it was written in the book. Throughout my whole life, Lord Voldemort tried to kill me and Professor Dumbledore was my friend and protector. I had visited my godfather's house earlier in the day (who often transformed into a dog). When I returned, I went to my room and was there until just before Professor Dumbledore was found dead in the courtyard, not in the bell tower as shown in the movie. I was busy mixing some of my potions in Pepsi bottles and had a hard time finding the missing ingredients which wound up being sodium acetate and this powder I found in the potions room. (A sample of the unknown powder was taken as exhibit 3). Every time I made a bad potion, the whole thing kept exploding. When I was told about the Professor, I ran down the stairs where I tripped and fell which is why I have this cut on my wrist. I loved the professor and would never do him harm. Although there were many a time that he really made me mad by ignoring me or making me do stuff that almost got me killed, especially the last time. Nevermind. I really didn't mean that." Harry's robe is made of nylon. A pen found on Harry did not seem to be the pen that Harry used every day. The Rf's found on this pen were 0.38, 0.63, and 0.84.

Hermione Granger:

"I was nowhere near the bell tower where Professor Dumbledore fell. I was in the potions room working on an Amortentia love potion for Ron because he can be so dense. I was boosting it up a little with some magnesium sulfate and boric acid. I almost had it done when Argus Filch's cat came into my room and knocked over my potion which was in a plastic cup that broke and spilled all over the place. That darn cat went crazy as I yelled and it scratched my hand all up which is why I have this bandage. I was taking the cat back to him when I was told of the horrible tragedy. When I arrived on the scene it did not look like he fell, it looked like he was in a struggle because there was a bunch of scuff marks on the ground around his body like there was a wizards duel. I will miss Professor Dumbledore but I won't miss how he treated Harry. I can't tell you how many times my friend almost died because of the professor's poor judgment. Harry was too young to go up against Lord Voldemort and Professor Dumbledore should have known better." Hermione's robe was made of silk. Hermione's pen had an exceptionally long quill and everyone knew it was a present from Professor Dumbledore himself. It had at least two Rf's of .61 and .93

Professor Snape:

"Could you give me a moment as I finish my powdered donut? It happened just as it was written. He was diagnosed with dragon fever which would make him go crazy and burst into flames in the near future. Professor Dumbledore and I agreed that he would rather go painlessly than in a ball of fire or at the hands of Draco Malfoy. I and I alone am responsible for casting a spell on Professor Dumbledore. He fell which is why there is a blood spatter on the ground. (There were shards of broken plastic in his robe and these were taken as exhibit 10). I knocked over a plastic vase which broke when it hit the ground and it cut my ankle. I wish I didn't wear black all of the time because it always gets hair on it, especially this bat hair which is all over the hallway outside of my room. I am going to truly miss him but I followed his wishes to the letter." Upon investigating Professor Snape's story, a powder was found in the clock tower where he said he was standing. Samples were taken as exhibit 4. Professor Snape's robe was made of polyester. His favorite pen was found to have at least two Rf's at 0.65 and 0.76.

Dolores Umbridge:

"I was in the courtyard when Professor Dumbledore was found prostrate on the ground next to a few spatters of blood. I know what you are thinking because I have a bandage on my knee but that occurred when I climbed off of my broom and knelt down on a CD. (It should be noted that a powder was seen on her pink outfit and the investigating wizard collected a sample. It is labeled exhibit 5.) Everyone knows I did not like Professor Dumbledore and I am glad to see him go but not like this. But maybe now the school will be more disciplined like when I was headmaster." You could see the entire lower hem of her robe was covered in hair and everyone knows how fond she is of cats. Dolores Umbridge's robe was made of linen. A pen from her robe was shown to have at least two Rfs at 0.34 and 0.85.

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 (exhibits 1-5). Use available methods to determine their identities and record your answers here. Either chemical names or correct formulas will be accepted.

- 1.) _____ (Scene)
- 2.) _____ (Scene)
- 3.) _____ (Harry)
- 4.) _____ (Snape)
- 5.) _____ (Umbridge)

Part II Polymers & Fibers (20 points)

You are given five (5) samples of polymers and fibers (exhibits 6-10). Use available methods to determine their 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 from this part of the exam and possibly disqualified.**

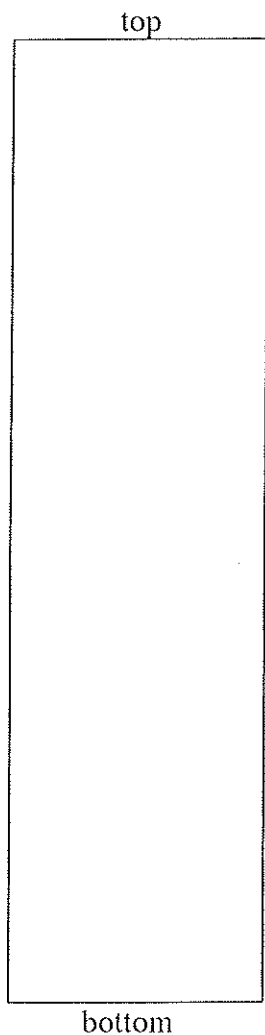
- 6.) _____ (Scene)
- 7.) _____ (Scene)
- 8.) _____ (Scene)
- 9.) _____ (Scene)
- 10.) _____ (Snape)

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 (label each R_f value by its color). **Tape** your paper chromatogram below in the outlined space and show the measurements and calculations that led to your R_f values in the space next to it. After that, look at the given mass spectrum and answer the questions related to the mass spectrum.

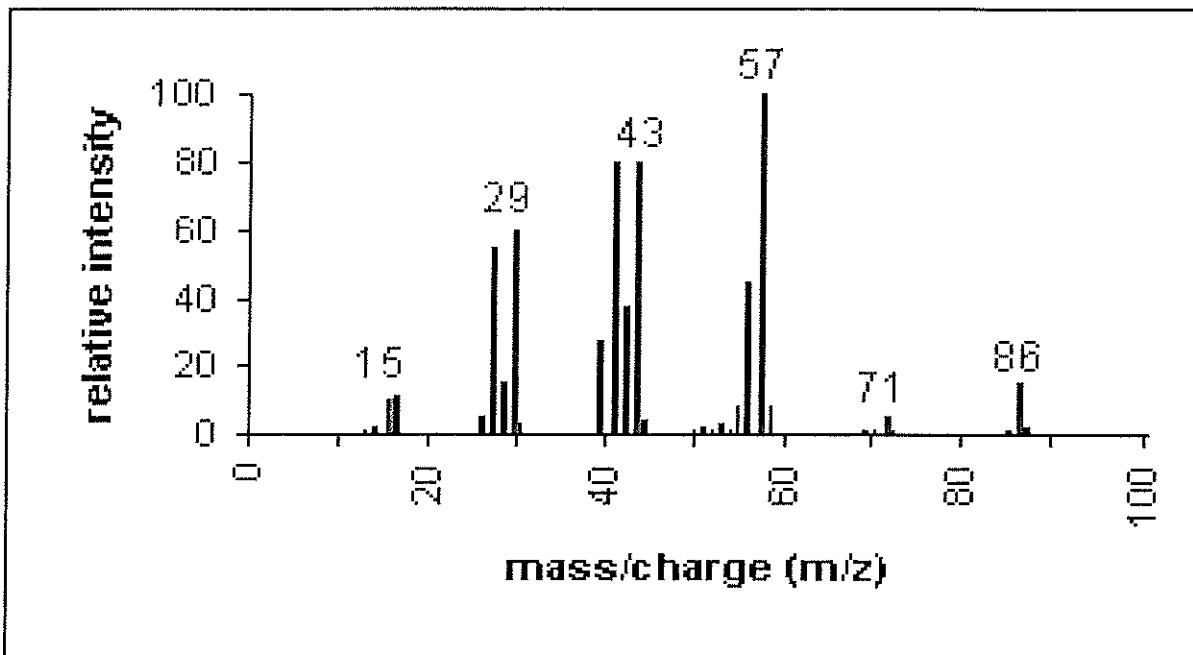
Paper Chromatogram

Paper Chromatogram Analysis:



Mass Spectrum Analysis:

The mass spectrum below was taken of a 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 identify specific parts of the compound. What is the probable molecular formula for this compound? _____

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 Hermione.

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

What type are they? Crime scene print: _____

Hermione'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



Hermione'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 provided and show all of your work. Put answers in correct spaces.
- 3.) The point of origin. Using bloodstain "A", calculate the height above the point of convergence from where the blood originated in feet. Calculate this in the space below the map and show all of your work. Put answer in correct space.

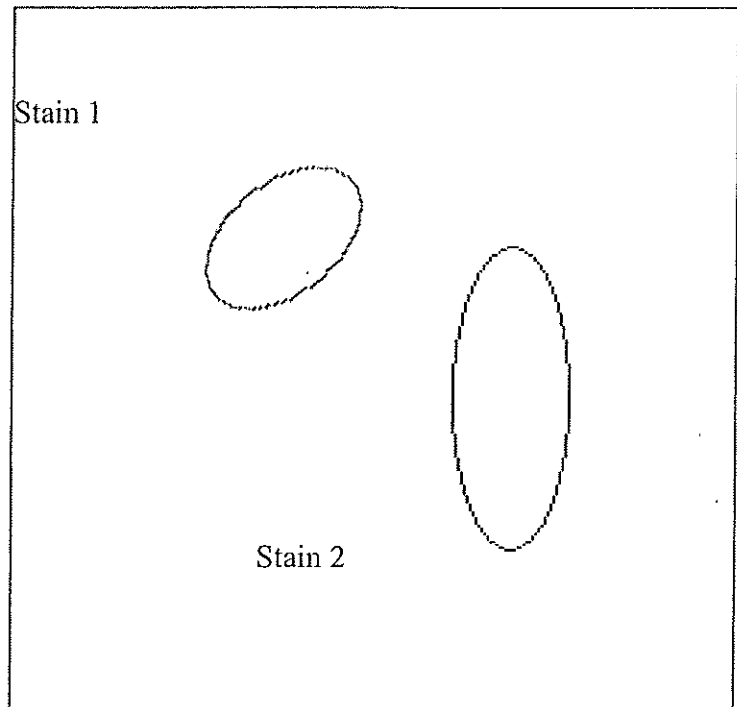
Angle of impact stain 1: _____

Calculations:

Calculations:

Angle of impact stain 2: _____

Calculations:



Point of origin: _____

1 cm. = 2 ft.

Calculations:

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. Circle your choice. For each suspect, justify your decision with a discussion of both the incriminating evidence and the exonerating evidence from the crime scene and/or the physical evidence available. In other words, use all evidence possible for each suspect to show how they are implicated or not.

Harry Potter-

Release

Hold for Questioning

Hermione Granger-

Release

Hold for Questioning

Professor Snape

Release

Hold for Questioning

Dolores Umbridge-

Release

Hold for Questioning

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?

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.) _____ MgSO₄ _____
- 2.) _____ NaCl _____
- 3.) _____ NaHCO₃ _____
- 4.) _____ Glucose _____
- 5.) _____ NH₄Cl _____

Part II Polymers & Fibers

(20

points)

You are given five (5) samples of polymers and fibers. Use available methods to determine their 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 for this part of the exam.

6.) _____ PETE _____

7.) _____ PMMA _____

8.) _____ cat hair _____

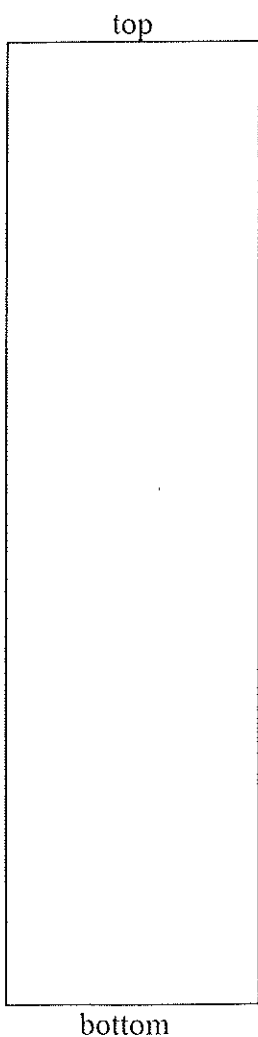
9.) _____ silk _____

10.) _____ LDPE _____

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 in the outlined space and show the measurements and calculations that led to your R_f values in the space next to it. After that, look at the given mass spectrum and answer the questions related to the mass spectrum.

Paper Chromatogram



Paper Chromatogram Analysis:

A brown marker was used in a water solvent.

Students were given a premade chromatography paper.

The calculated R_f values were obtained:

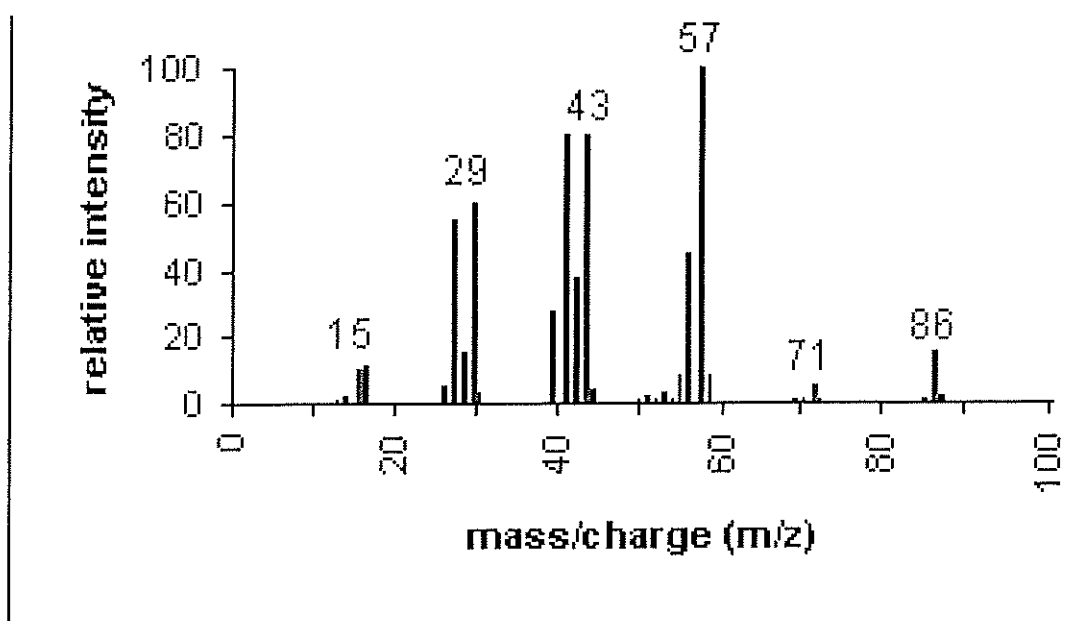
Total distance of solvent = 75mm

Red $R_f = 46\text{mm}/75\text{mm} = .61$

Yellow $R_f = 62\text{mm}/75\text{mm} = .82$

Black/blue $R_f = 59\text{mm}/75\text{mm} = .78$

Acceptable ranges for all R_f s were +/- .05 full credit
+/- .10 half credit



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? 86
- 2.) What is the m/z value of the base peak? 57
- 3.) The pattern shown by the peaks identify specific parts of the compound. What is the probable molecular formula for this compound? hexane

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 Hermione.

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

What type are they? Crime scene print: ___ Whorl _____

Hermione's print: ___ Whorl _____

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

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

Crime Scene Print



Hermione's Print



Up to two points for identifying and labeling differences between the prints such as differing islands, bifurcations, ridge endings, etc. Do not accept "lack of delta" in the second print because there is not enough of the print there to even see the delta.

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 (actual distance from point of convergence for Stain 2 may not be exact). From these pictures, determine the following:

- A.) The point of convergence. Clearly label this on the map below and explain in the margin how you came to this conclusion.
- B.) The angle of impact for each bloodstain. Calculate this in the space provided and show all of your work. Put answers in correct spaces.
- C.) The point of origin. Using bloodstain "A", calculate the height above the point of convergence from where the blood originated in feet. Calculate this in the space below the map and show all of your work. Put answer in correct space.

Angle of impact stain 1: 23-27 degrees

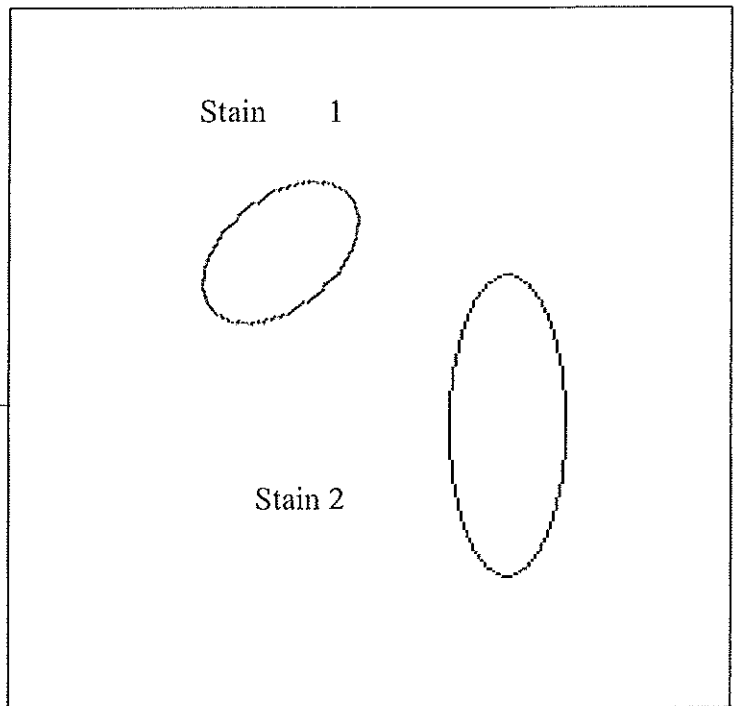
Calculations:

$$\sin^{-1}(10.0/23.5) = 25.2.$$

Angle of impact stain 2: 20-24 degrees

Calculations:

$$\sin^{-1}(15.0/40.0) = 22.0$$



Point of convergence: 3.0-3.4 feet

1 cm. = 2 feet

Calculations:

$$\tan (22)/8 = 3.2 \text{ feet}$$

Approximately wrist/arm height

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 both

the incriminating evidence and the exonerating evidence from the crime scene and/or the physical evidence available. In other words, use all evidence possible for each suspect to show how they are implicated or not.

Harry Potter-	Hold for questioning
Evidence:	Compared to crime scene
Motive	
Sodium Acetate	No match
Sodium Bicarbonate (unknown #3)	No match
PETE (Pepsi bottle)	Match
Cut on hand	Match (same height as P of O)
Nylon Robe	No match
Rf's 0.38, 0.63 and 0.84	No match

Total matches to crime scene: 2 Possible suspect.

Side note: "Well, I guess now that Hermione is going to Azkaban, I can be headmaster now as Professor Dumbledore would have wanted it."

Hermione Granger-	Hold for questioning
Evidence:	Compared to crime scene
motive	
Magnesium sulfate	Match
Boric Acid	No match
Cat hair	Match
PS (plastic cup)	No match
Cut on hand	Match (correct height)
Silk robe	Match
Rf's 0.61 and 0.93	No match
Fingerprint	No match

Total matches to crime scene: 4 Most likely suspect.

Side note: When held for questioning she completely confessed to the whole plot stating, "He was never going to leave. I was next in line for headmaster since anyone else who could have been up for that position was not as smart as I am. Not even the great Harry Potter could beat me in a wizard's duel of wits."

Professor Snape	Release
Evidence:	Compared to crime scene
motive	

Sucrose (powdered donut)	No match
Glucose (unknown #4)	No match
LDPE (sample #10)	No match
Bat hair	No match
Cut on ankle	No match (too low)
Polyester robe	No match
Rf's 0.65 and 0.76	Match

Total matches to crime scene: 1 Not a suspect.

Side note: Snape's reply after the confession, "I wrote the note to get the professor out of harms way. I had to make up that entire story about Professor Dumbledore because I could not let his legend be known to have lost in a wizard's duel to a student. If that got out, everyone who did not agree with the headmaster would just challenge them to a wizard's duel."

Dolores Umbridge-	Release
Evidence:	Compared to crime scene
motive	
NH ₄ Cl (unknown #5)	No match
PC (Broken CD)	No match
Cat hair	Match
Cut on knee	No match (too low)
Linen robe	No match
Rfs 0.34 and 0.85	No match

Total matches to crime scene: 1 Not a suspect.

Side note: Upon hearing that Harry was going to be appointed headmaster of Hogwarts, she ran into the forbidden forest to be taken away by the centaurs again. At least then she would be free of the reminder that she was bested by a bunch of students.

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?

Any logical reasoning that could be an extension from the evidence was accepted. Far fetched ideas with no evidence were not, regardless of their relationships and ongoings from the movie or the book.