

Names (1)

(2)

School

Date

Forensics SSSS 2017 Test

Div. C

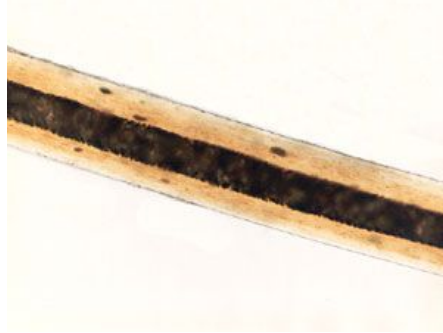
Qualitative Analysis (30 points)

1. Name two common uses for boric acid. (3 points)
2. An unknown chemical reacts violently with HCl (hydrochloric acid), glows red and yellow, is neither soluble nor conductive. What is the chemical? (3 points)
3. Name the color of the flame (if any) each of the following chemicals produces during a burn test: (2 points each)
 - a. Sodium chloride -
 - b. Calcium sulfate -
 - c. Glucose -
 - d. Lithium chloride -
 - e. Calcium nitrate -
 - f. Sucrose -
 - g. Boric Acid -
4. Multiple Choice: Of the following chemicals, which is soluble? (4 points)
 - a. Calcium sulfate
 - b. Cornstarch
 - c. Magnesium sulfate
 - d. Calcium nitrate
5. Why is testing for Benedict's solution useful? (2 points)
6. What color does sucrose turn when heated with Benedict's? (2 points)
7. What color does Ammonium Chloride turn when mixed with Benedict's? (2 points)

Plastics (15 points)

1. A burn test is performed on a certain plastic and black soot appears. What does the appearance of black soot mean? *(4 points)*
2. Provide the name and three common uses for a clear plastic with a density of 1.37g/cm^3 . In a burn test, this plastic produces bubbles and burns slowly, leaving behind black soot. The plastic drips and there is light smoke present. *(4 points)*
3. What is a step-growth polymer? *(4 points)*
4. Name two common uses of HDPE. *(3 points)*

Hair (20 points)

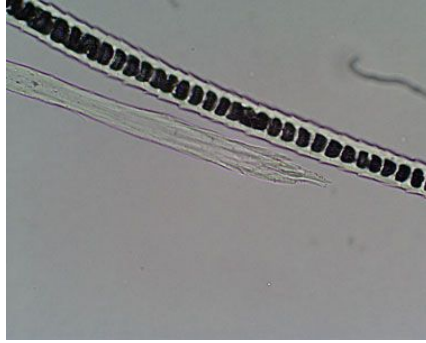


Use the picture above to answer questions 1 - 3

1. To what species does this hair belong to? (4 points)
 - a. Human
 - b. Dog
 - c. Bat
 - d. Cat

2. What kind of medulla does this hair have? (3 points)
 - a. None
 - b. Ladder (stack)
 - c. Continuous
 - d. Broken

3. What is a possible medullary index of this hair? (3 points)
 - a. $MI = 1/8$
 - b. $MI < 1/50$
 - c. $MI > 1/2$



Use the picture above to answer questions 4 - 6

4. To what species does this hair belong? (4 points)
 - a. Horse
 - b. Human
 - c. Pigeon
 - d. Cat

5. What kind of medulla does this hair have? (3 points)
 - a. Ladder
 - b. Continuous
 - c. None
 - d. Bubble

6. What is a possible medullary index of this hair? (3 points)
 - a. $MI = 1/4$
 - b. $MI < 1/50$
 - c. $MI > 1/2$

Fingerprints (20 points)

1. Find the whorl ratio for a suspect with the following whorls present on their fingers:

(6 points)

- Right index
- Right middle
- Right pinky
- Right thumb
- Left middle
- Left pinky
- Left ring

2. Which of the following is not a way to detect fingerprints on a porous surface? (2 points)

- a. Fuming
- b. Iodine fuming
- c. Ninhydrin fuming
- d. Magnetic powder

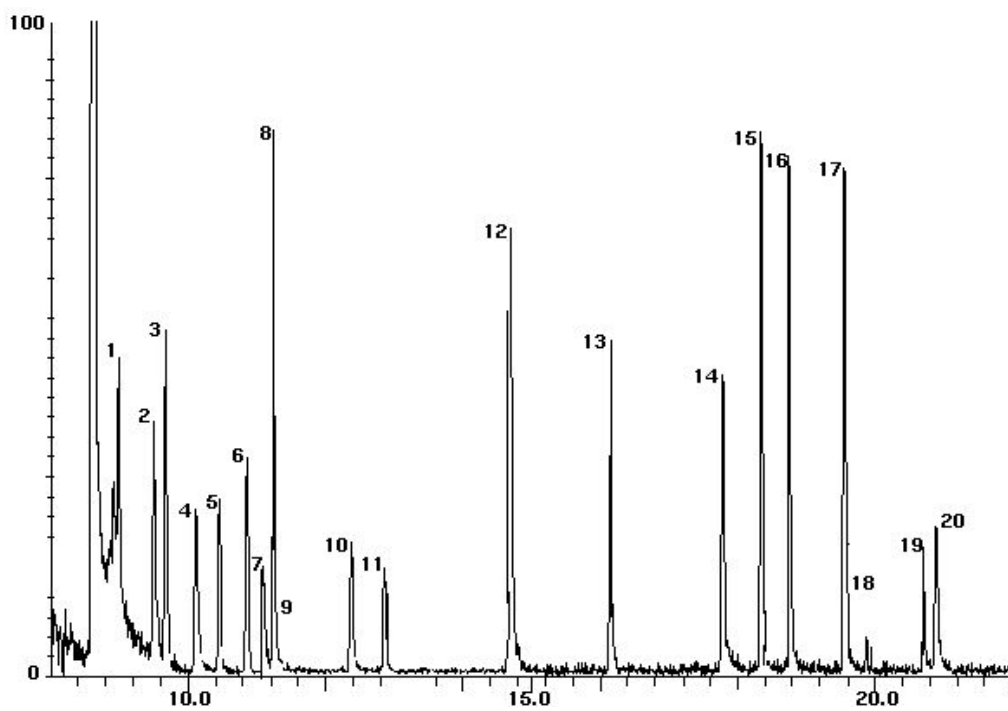
3. Identify the following fingerprints from left to right: (2 points each)



4. Draw and label the following ridges: (2 points each)

- a. ridge crossing
- b. bridge
- c. dot

Chromatography & Mass Spectrometry (5 points)



1. What is a possible chemical the spectra above could represent?

Crime Scene Analysis (60 points)

There has been a murder at Sharon's weekly book club meeting! At around 7:00 pm, there was a commotion in Sharon's living room. Upon arrival, the book club members saw Barbara's body on the floor. Paramedics arrived, but it was too late - she was dead before they even arrived. The suspects and evidence have been collected and organized as follows:

Sharon Barnes has been hosting the weekly book club for almost three years. She loves baking all of the snacks for every meeting they have at her house. However, things aren't as happy as Sharon would like others to believe. She and Barbara have been engaged in a very public power struggle over whose role as co-president in the neighborhood's HOA (Homeowner's Association) is stronger. Sharon has two white cats, and a few goldfish.

Jeff Barnes is Sharon's husband. Over the past few months, he's gotten increasingly more frustrated with his wife's rants about the book club and the leadership of the neighborhood HOA. The stress has caused him multiple visits to the hospital for heart issues. He's made it quite clear to her that if there was a way to end all of her conflicts, he would do it just for the sake of some peace and quiet for once.

Margaret ("Margie") Smith has lived in the neighborhood for 19 years, and is a total soccer mom. She supports all of her friend's children, even if they play on different teams. Margie loves to show up with healthy, gluten free cookies for all of her son's team mates after a hard match, so it would only be fitting that she finds it particularly upsetting when Barbara shows up to the book club with a homemade pizza that contains flour. Margie recently adopted an orange tabby cat.

Martha Jones is frustrated with her role in the book club. It seems as if she's the least desired member, and that everything she has to say is either too obvious, or just plain incorrect. She finds it annoying when Barbara feels the need to critique one of the ideas she's come up with. If only there was a way to shut her up. She also has a golden retriever.

Carol Johnson is a new member to the book club. She's one of the most valued members, especially because she always has a different perspective to the novels they read. She is also one of the older women on the book club as a recent grandmother. She's stated on numerous occasions that she'd kill to have hair like Barbara's. Carol has two dogs, and a cat.

*The following evidence found at the **crime scene** is listed below as follows:*

- Cat hair, color *not* white, was found on Barbara's sweater. She does not have any pets.
- Alka seltzer powder
- Sodium bicarbonate
- Calcium carbonate

*The following **blood and fingerprints** were found at the crime scene:*

- Fingerprints on knife point to Jeff
- Blood points to Margaret
- Fingerprints on Barbara's bracelet point to Sharon

Use the information you have been given to determine Barbara's murderer. Make sure to provide reasons the other suspects are innocent using what you know about each of them, as well as the evidence found at the crime scene. (ie: why a particular fact from the blood and fingerprints does not implicate a subject because of something that is true about that particular subject).

Remember, it is not just about identifying the true criminal. Points will be awarded for **logical reasoning, elimination, and analysis** of the motives each of the suspects may have had. More points will be awarded for logical thinking as opposed to correctly identifying the criminal.

You may use bullets or a flow chart to work through the evidence provided, but a conclusion paragraph (5 - 12 sentences) with the following components must be provided:

- Who the murderer is
- What evidence points to them
- What their motives were