Forensics – EXAM

2022 UMD Invitational

Team Number: _____

Team/School Name: _____

No abbreviations / PRINT LEGIBLY

Student Names (First & Last): PRINT LEGIBLY

1. _____

2. _____

Total Points Possible (written test): **200**

Total Points Earned:_____

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I. Qualitative Analysis *(40 points)*

Identify these powders, using any method available to you, then complete the following table, indicating each unknown's name and chemical formula. *(3 points each)*

Powder A: dissolves in water, fizzes in contact with HCl, dissolves in NaOH, pH = 9, not magnetic, sinks in water, does not smell, no reaction to Benedict's test, reacts to form bubbles in heat, burns yellow

Powder B: 4. No solubility, fizzes in HCl, does not dissolve in NaOH, neutral solution, no response to iodine but mixture looks like peanut butter, the powder itself is very porous, no reaction to Benedict's, reacts to form bubbles in heat, burns yellow

Powder C: Non-soluble in water (pH = 7), no HCl, NaOH, or iodine reaction, makes water more viscous,does not react to Benedict's solution, does not burn

Powder D: Soluble, does not react with HCl, NaOH, or iodine, smells sweet, pH = 5.No reaction to Benedict's test, burns yellow.

Powder E: Soluble in water and HCl, dissolves slowly in NaOH, no reaction with iodine, pH = 7, no smell, not magnetic, no reaction with

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Benedict's test, burns yellow

Powder F: Soluble in water and HCl, yellows in iodine, pH = 6, no reaction to Benedict's solution, burns red, not magnetic

Powder G: Soluble in water and HCl, pH = 7. No reaction to Benedict's test. Melts and burns with a yellow flame, sweet smell when burned. Not magnetic

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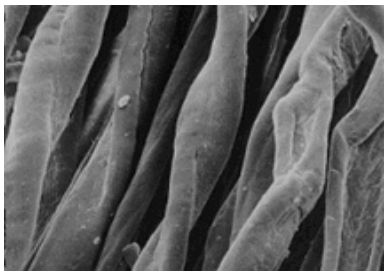
Powder	Name of Powder	Chemical Formula
A		
B		
C		
D		
E		
F		
G		

II. Polymers *(40 points)*

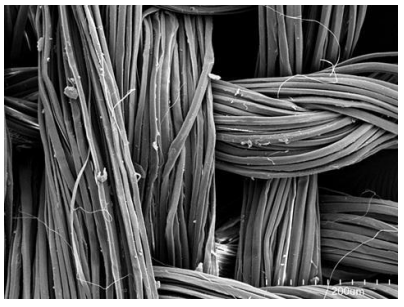
Identify these polymers, using this information. *(3 points each)*



a. Fibers

Fiber A: Burns readily with a yellow flame, doesn't melt, smells like burning paper. Gray to charcoal colored residue, ash light and feathery, easily crumbles

Identity: _____

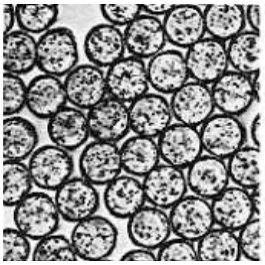


Fiber B: Smolders and curls away from the flame. It burns slowly and splutters as it burns with difficulty. Smells like burning hair. The ash from the burn is like a small dark bead.

Identity: _____

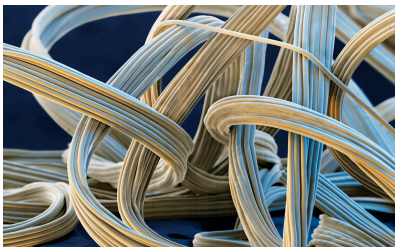
Team Number: _____ School Name: _____

Fiber C: Melts and burns with a sputtering flame; gives off thick black smoke. Distinct sweet chemical odor. Residue: initially a round and shiny bead that may become hard and black



Identity: _____

Fiber D: It melts as it burns and continues to burn with a sharp, bitter odor. The ash or residue is sticky to touch. Also found at the crime scene



Identity: _____

b. Plastics (recycling number and abbreviation)

Plastic A: floats in water

Plastic A identity: _____

Team Number: _____ School Name: _____

Plastic B: sinks in water

Plastic B identity: _____

Plastic C: floats in water

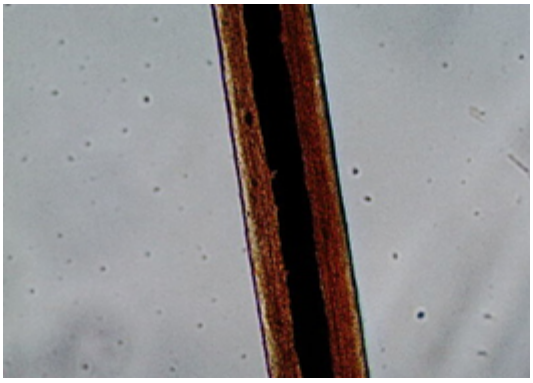
Plastic C identity: _____

Team Number: _____ School Name: _____

Unknown plastic (not to identify): sinks in water

c. Hair

Hair A  identity: _____

Hair B  identity: _____

What is the name of the tough clear exterior of a hair shaft?:

_____

What appearance will hair that has an oval cross section have?:

_____

Name the layers of the hair shaft, in order from outside to inside:

_____

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III. Chromatography/Spectroscopy *(30 points)*

You are given a sample of the ink found at the crime scene, as well as three possible suspect pens. Describe how you would go about developing a chromatogram of these inks. Describe in detail what the results of your chromatography look like, and how you would calculate the Rf value of each of them (show your calculations). Describe how you would determine which pen was found at the crime scene.

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IV. Crime Scene Evidence *(30 points)*

a. Fingerprint analysis *(2 points each)*

Identify the fingerprint pattern of each of the fingerprints provided.

Fingerprint A: _____ 

Fingerprint B: _____ 

Fingerprint C: _____ 

Fingerprint D: _____ 

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Fingerprint E: _____ 

Unknown Fingerprint (not to identify) 

Identify the fingerprint minutiae.

Minutia A: _____

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Minutia B: _____

Minutia C: _____

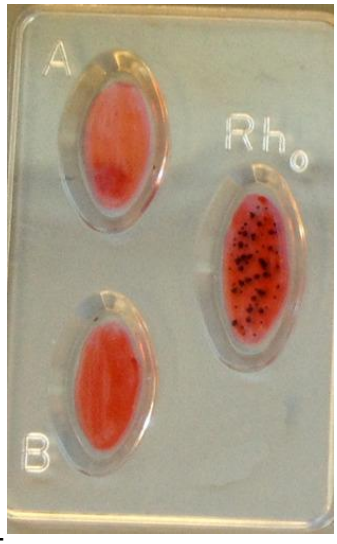
Minutia D: _____

b. Blood analysis *(3 points each)*

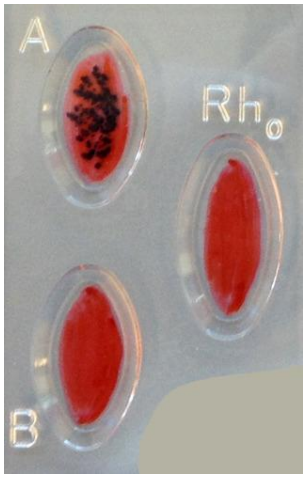
Identify the blood type.

Team Number: _____ School Name: _____

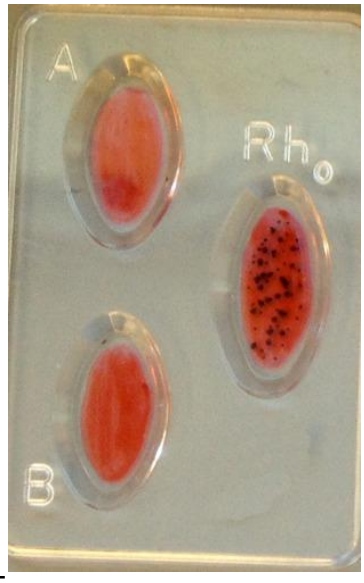
Blood sample A: _____



Blood sample B: _____



Blood sample C: _____



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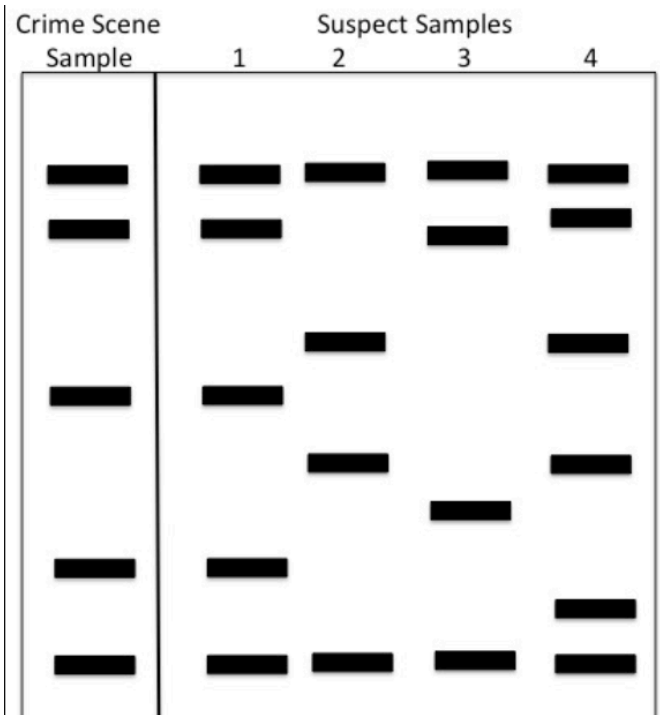
Unknown blood: Type A-

C. DNA



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Evidence List

Powders:

- Powder A- Suspect 1
- Powder B- Suspect 4
- Powder C- Suspect 2
- Powder D- Suspect 4
- Powder E- Suspect 3
- Powder F- Suspect 2
- Powder G- Suspect 1

Fibers:

- Fiber A- Suspect 2 clothing
- Fiber B- Suspect 1 clothing
- Fiber C- Suspect 4 clothing
- Fiber D- Suspect 3 clothing

Plastics:

- Plastic A- Suspect 2
- Plastic B- Suspect 3, Suspect 1
- Plastic C- Suspect 4

Hair:

- Hair A- Suspect 1
- Hair B- Suspect 4

Fingerprints:

- Fingerprint A- Suspect 2
- Fingerprint B- Suspect 4
- Fingerprint C- Suspect 1
- Fingerprint D- Suspect 2
- Fingerprint E- Suspect 3

Blood

- Blood Sample A- Suspect 1 and 4

- Blood Sample B- Suspect 3
- Blood Sample C- Suspect 2

DNA:

- Sample 1- Suspect 3
- Sample 2- Suspect 1
- Sample 3- Suspect 4
- Sample 4- Suspect 2

V. Analysis of the Crime *(60 points)*

Someone has stolen the testudo statue in front of McKeldin Library! Without the statue, none of the students at the University of Maryland are able to rub its nose for good luck, and the semester is doomed! It is your job to figure out who stole the school mascot! The profiles of the suspects and their possible motives are listed below.

Using the evidence presented and the data in the information packet, determine who is responsible for the crime. Points will be awarded for all evidence and suspects correctly paired. Make sure to support any conclusions based on the evidence and reasoning. Describe any possible use for each piece of evidence, and why it would be in the possession of the suspect.

Suspect 1: Nate Shade, an undergraduate student at UMD. He is an environmental science major and volunteers a lot of his time picking up trash on campus. The most common trash he picks up are disposable water bottles, which he is annoyed by. He goes into the woods often and comes into contact with a lot of poison ivy. He has diabetes, so he always carries around some hard candy in his pockets, in case his blood sugars go low. He also carries around a silk handkerchief, which he finds very helpful. As part of his coursework, he regularly interacts with the cows on campus: his job is cleaning their environment and feeding them.

Suspect 2: Ann T. Mony, a chemistry professor. Her office is in the chemistry building, which is currently under construction, and she regularly walks by pieces of exposed drywall on her way to her office. Her particular field of research requires a really dry environment, so she is constantly using desiccants in order to make sure her lab stays dry. She is almost always wearing a cotton lab coat, even when she is walking around campus (which is bad laboratory safety practice, but she says it's "for the look"). Occasionally she even walks out of the lab with some bottles of powders in her pocket!

Suspect 3: Cyan Ide, an athlete on the soccer team. Whenever he is not at practice or in class, he is cooking himself large pieces of chicken, which he seasons with salt and pepper. He frequently drinks Gatorade. His usual outfit of choice is shorts with spandex underneath, frequent in soccer players.

Suspect 4: Clara Form, one of the employees who cleans the buildings at night after everyone has left. She is often covered in chalkdust, due to having to clean the chalkboards each night. Her favorite work snack is yogurt, as it's portable and gives her a lot of energy. Her favorite chips are salt and vinegar chips, but she doesn't usually bring those to work. She usually wears some sort of polyester scrubs to work, as they

are easy to clean. She has 2 young daughters, both of whom look forward to their weekly horseback riding lesson.