

Forensic Microscopy

Scenario

Early one morning just before mid-semester the biology laboratory manager arrived on campus to find the biology laboratories had been burglarized. Chairs and materials were strewn across the floor and at first site it appeared the lab fish were missing as were several anatomic torso models. The lab manager immediately called public safety. With mid-term exams quickly approaching, the materials either had to be found or re-purchased quickly.

When officer Friendly arrived she started to examine the premises, took photographs and collect evidence. Officer Friendly found debris on the floor, potentially from the perpetrator. The labs had been swept and mopped earlier in the week so this 'dirt' was a recent addition. She took a sample of the debris. On the back counter, small brown dried stains were observed. Suspecting these were blood droplets the officer took samples of these also. The top rim of the aquarium which formerly held the lab fish had a small crack in which the officer found several fibers. Suspecting these came from the perpetrator's clothing, the officer removed them and placed them in an evidence bag. Officer Friendly also found a note created from letters cut from a publication and taped to a sheet of paper. The note said, "The imprisoned souls have been set free. If you want your plastic bodies back leave \$1000 in the hollow of the old oak tree at College Avenue and Front Street by 10 PM tonight." The note was bagged and all the exhibits were sent to the crime lab.

As the crime scene laboratory technician, your job is to examine the evidence and provide information to the detectives investigating the case. You will use your stereomicroscope and compound light microscope to examine the samples. Once you have examined and identified the exhibits complete your report and discuss your lab findings with your fellow technicians.

The Crime Scene Report

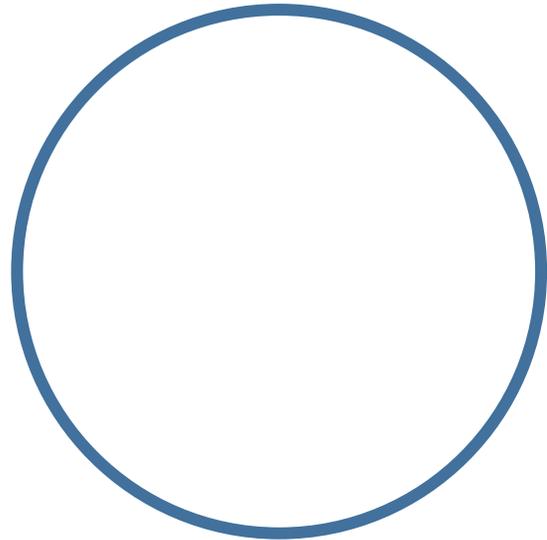
Every technician is responsible for completing their own report. For each exhibit you will need to include the following information:

1. Observations made using the naked eye, include color, shape, smell (if appropriate), and texture.
2. Images, drawings or photographs of the exhibits as viewed under the microscope.
3. Your identification of the materials in the exhibit.

Exhibit: Debris

1. Obtain a small sample (1 scoop) of debris using the scoop and place it in a petri dish. Examine the debris with your naked eye. Describe its appearance below and draw or insert a photograph of the debris in the circle below.

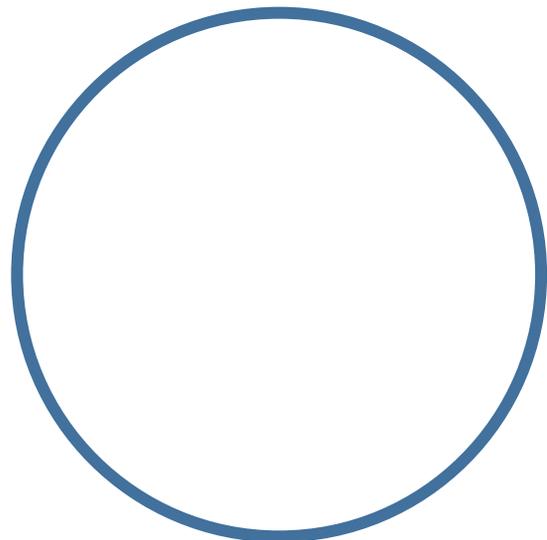
Description:



Observations with your naked eye

2. Place the petri dish on the stage of the stereomicroscope. Try lighting the specimen from the top, from the bottom and from both the top and bottom. Examine the debris at 1X, 4X and 10X. Choose the magnification which provides the most detail. Take note of the texture and consistency of the sample. Are all of the components the same size and same shape? Are the components the same color? Are there any unusual feature to the specimen? Describe what you see below and then draw (or insert photograph) and label the specimen.

Description:



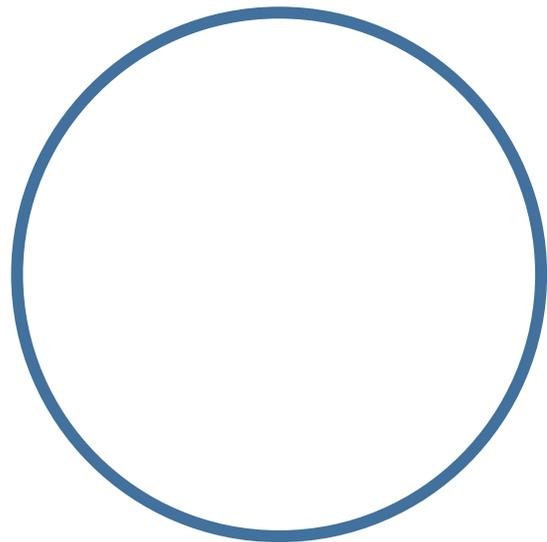
Total Magnification: _____ X _____

3. What did you find in the debris? List your observations and what you concluded from the observation.

Exhibit: Blood

1. The purported blood sample was prepared by the histology technician and delivered to your lab. Place the prepared slide on the stage of the compound microscope. Begin with the scanning objective (4X) focus the slide. Increase magnification by changing the objectives until you have correctly focused the slide at a total magnification of 400X. Describe its appearance below and draw or insert a photograph of the blood in the circle below. Are all of the cells the same? If not, be sure to draw the different types of cells in the sample.

Description:



Total Magnification: _____ X _____

*Mammalian red blood cells are anucleate, which means mature red blood cells of mammals lack a nucleus. The red blood cells of other vertebrates, birds, amphibians, fish and reptiles do have a distinctive nucleus.

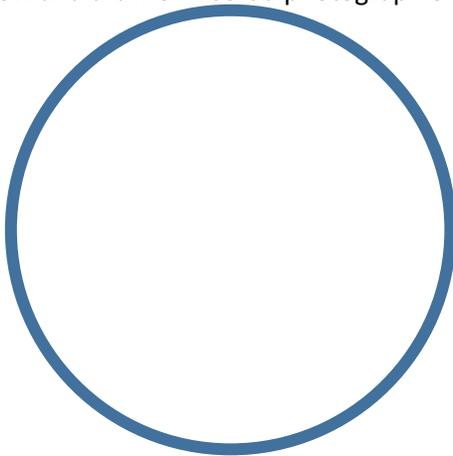
2. What did you observe in the blood sample? List your observations and what you concluded from the observations.

Exhibit: Fibers

1. Obtain a sample of the fibers found at the crime scene and place the fibers in a petri dish. Fibers of silk, cotton and polyester cloth are also provided for comparison. Obtain a sample of these also. Fibers may available as prepared slides, if not make a wet mount (refer to the lab section on preparing wet mounts) for each fiber. Do not apply stain to the fibers. Place a prepared or wet mount slide on the stage of the compound microscope. Start with the scanning objective and focus the specimen. Increase the magnification until you have achieved a total magnification of 400X. Recall that all specimens have thickness and you may need to focus up and down through the depth of field to see all the characteristics of the material. Describe the fiber's appearance below and draw or insert a photograph of the fibers in the labeled circles below.

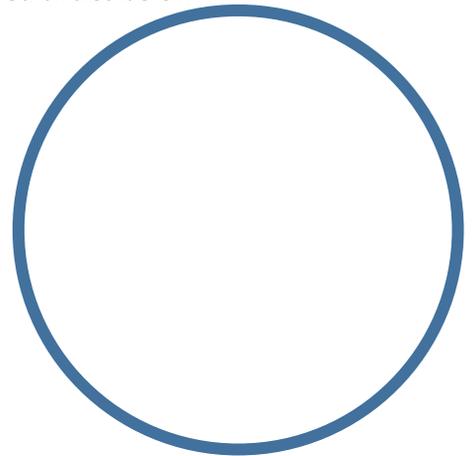
Crime Scene

Magnification:
____X



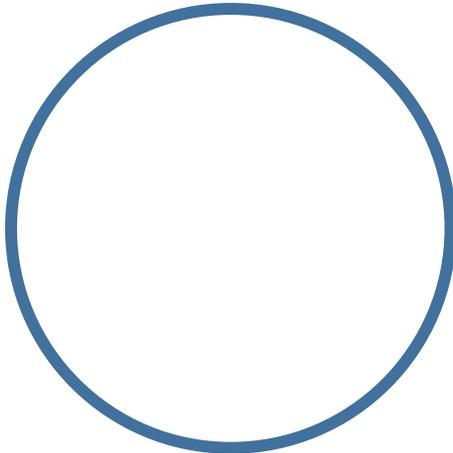
Silk

Magnification:
____X



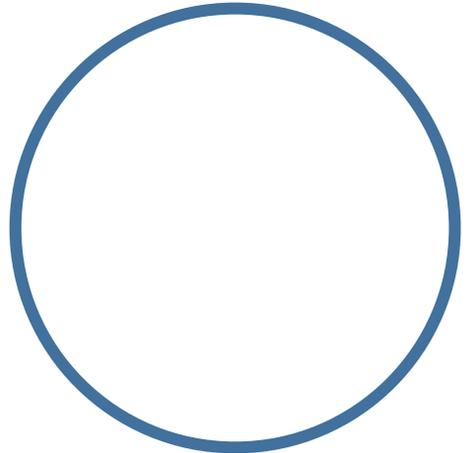
Polyester

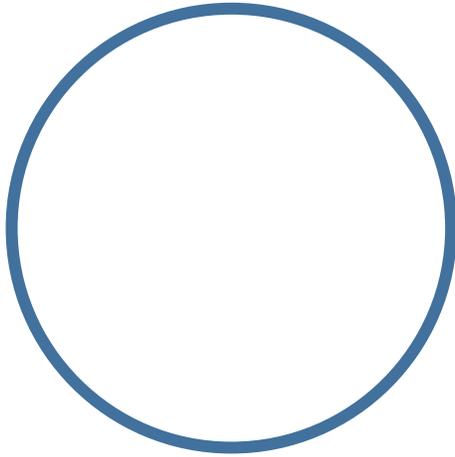
Magnification:
____X



Cotton

Magnification:
____X





Wool

Magnification:
_____X

Description:

__Silk: _____

__Polyester: _____

__Cotton: _____

__Wool: _____

__Crime scene: _____

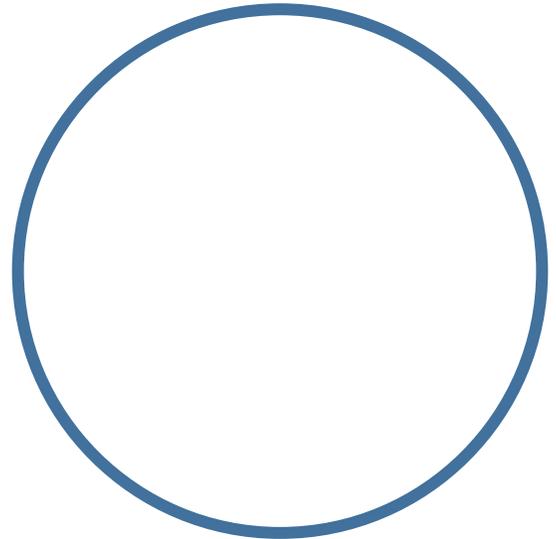
2. What fiber was found at the crime scene? How did you draw that conclusion?

Exhibit: note Left at the scene

1. The note left at the scene of the crime was made by cutting letters from a publication and taping them to a sheet of paper. You are only going to examine one letter and compare that letter to samples from other publications. Obtain a letter 'e' from the crime scene container and representative samples from the publications provided.

Examine the letter 'e' with your naked eye and draw it in the circle below. Indicate which part of the letter is 'up' and in which direction the letter is facing.

Letter 'e' as seen with the naked eye

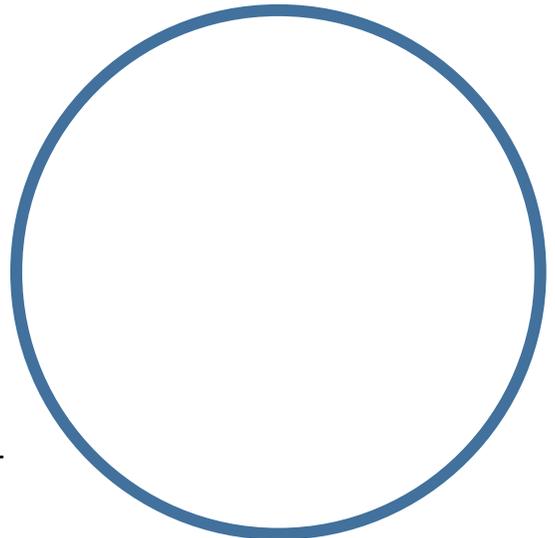


2. Place the slide on the compound microscope. Observe the letter with the scanning objective. If necessary, increase the magnification to 100X. Draw the virtual image of the letter in the circle below.

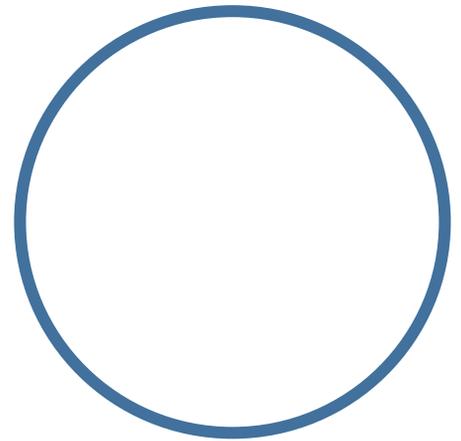
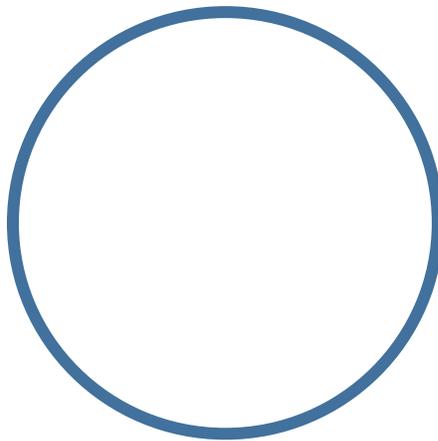
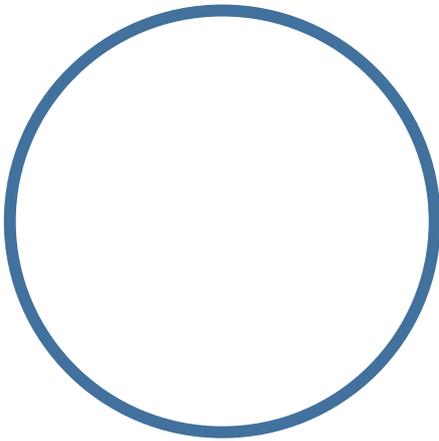
Letter 'e'
Magnification _____ X

Description:

How does appearance of letter 'e' when viewed on the microscope differ from when it was observed with the naked eye?



3. Prepare wet mounts of the letter 'e' samples from representative publications. Examine these with the microscope. Draw the letters in the circles below



Sample 1

Publication name: _____

Total Magnification: _____ X

Sample 2

Publication name: _____

Total Magnification: _____ X

Sample 3

Publication name _____

Total Magnification: _____ X

4. The letter 'e' was cut from which publication? How do you know?

Clean up:

1. When you have finished examining all of the exhibits, return materials including used slides, and samples to the appropriate location as indicated by your instructor.
2. Use lens paper and lens cleaner to wipe the optical elements of your microscopes.
3. Use a damp paper towel to remove any chemicals or samples from the stages of the microscopes.
4. Lower the stage (compound microscope) or head (stereomicroscope). Wrap the cord for storage.
5. Return the microscopes to their storage location. Remember to carry the microscopes with two hands.

Suspects

Although no video recording of the actual third floor biology lab or hallway outside the lab was available, video footage from the ground floor revealed 5 individuals in the building at the time of the burglary. These are the primary suspects. From the evidence you examined, which individual is the most likely perpetrator?

Suspect #1:

Currently lives in town and attends college part-time. Apartment is next door to an auto body collision repair shop. The suspect is frequently seen carry want ads from the local paper. When questioned about this choice of reading, the suspect replied that they were actively looking for a new apartment. The suspect has a pet iguana that they frequently carry on their shoulder as they walk around town. The suspect often wears an old wool sweater.

Suspect #2:

Suspect #2 is a full-time art major. They are often observed on campus wearing a flamboyant silk caftan. The suspect's interests are in natural environments and sustainability. These interests led the suspect to living outside town and renting a small apartment on a commercial agricultural interest. They park their bicycle near the greenhouse on the property. The suspect has a macaw for a pet. The suspect subscribes to both an art magazine and the Green Peace newsletter.

Suspect #3:

Suspect #3 is a part-time business major from California. The suspect is frequently seen reading the Wall Street Journal. The suspect's primary goal is to graduate and return to a coastal community. To keep this dream alive, the suspect has a 200 gallon aquarium filled with fish in their apartment and often wears colorful cotton Hawaiian shirts. The suspect works part-time at a local pet store.

Suspect # 4:

Suspect #4 is a fulltime biology major interested in agricultural sciences. They live at home on a 200 acre farm, in Georgia clay country. The suspect has a large breed dog which recently had surgery for a large fatty tumor. The suspect commonly wears camo shirts that are a cotton-poly blend. The suspect reads the community newspaper and subscribes to a magazine for fish enthusiasts.