

SI Forensics - Full Discipline Demo

Fiber and Hair

Final Report - Answer Guide

Institution	Science Interactive University
Session	SI Forensics - Full Discipline Demo
Course	SI Forensics - Full Discipline Demo
Instructor	Sales SI Demo

Test Your Knowledge

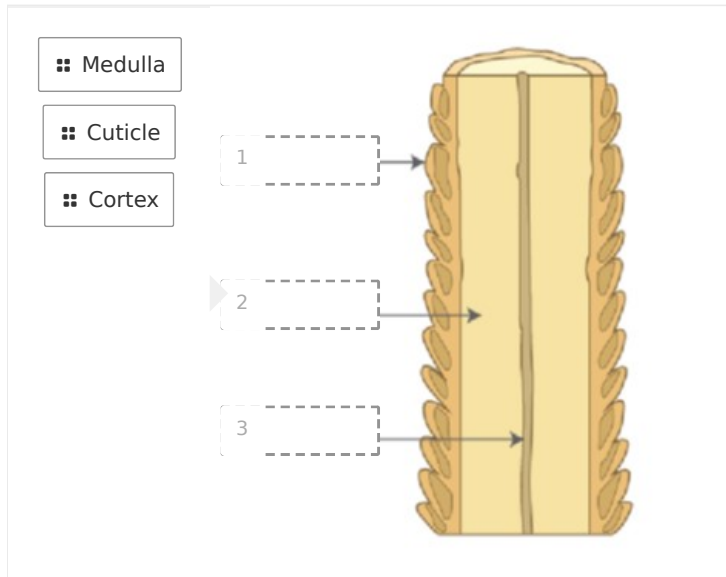
Classify each statement as pertaining to natural or manufactured fibers.

⚡ Cross-sectional shape is determined by the manufacturing process.	
⚡ Cross-sectional shape is determined by the fiber type.	
⚡ Originate from plants and animals.	⚡ Originate from synthetic materials.
⚡ Are filament fibers.	⚡ Most commonly are staple fibers.
Natural Fibers	Manufactured Fibers
1	2

Correct answers:

- 1 Cross-sectional shape is determined by the fiber type.
Originate from plants and animals. Most commonly are staple fibers.
- 2 Cross-sectional shape is determined by the manufacturing process.
Originate from synthetic materials. Are filament fibers.

Label each layer of the hair follicle.



Correct answers:

1 Cuticle 2 Cortex 3 Medulla

Exploration

Which of the following is a synthetic fiber?

- ☐ Cotton
- ☐ Silk
- ☒ Polyester
- ☐ Wool

✓

The pigmentation of the hair is located in the _____.

- ☐ Cuticle
- ☒ Cortex
- ☐ Medulla

✓

Exercise 1

What was the fiber type of your unknown sample?

What are some differences you observed between your thread samples and your hair samples?

You're investigating a crime scene and you find some hairs that have uniform pigmentation throughout the cortex and smooth keratin scales. Is this a human hair or a dog hair? Use your results recorded in Data Table 2 to inform your answer.

Data Table 1: Fiber Observations
(SAMPLE ANSWER BELOW)

Fiber Type	Color	Filament or Staple	Cross-Section Shape
Polyester	Green	Filament	Round
Cotton	Grey	Staple	Bean
Silk	White	Filament	Triangular
Wool	Red	Staple	Oval or Round
Unknown	Grey	Staple	Bean

Photo 1: Polyester Cross-Section
(SAMPLE ANSWER BELOW)



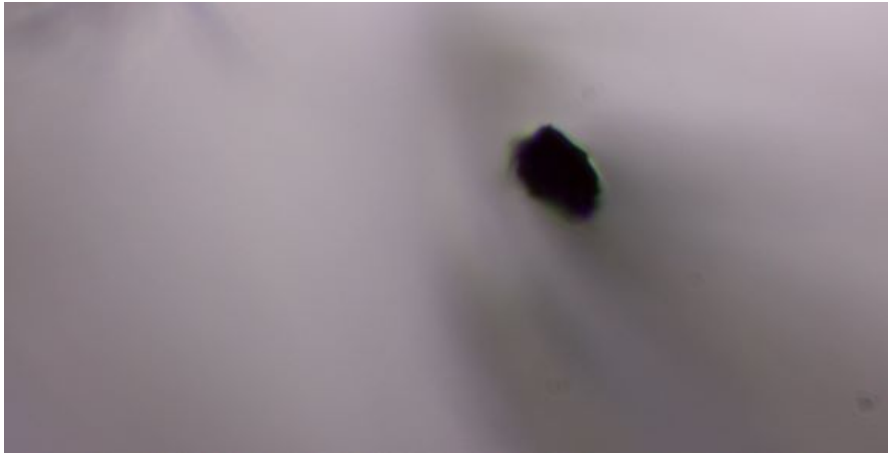
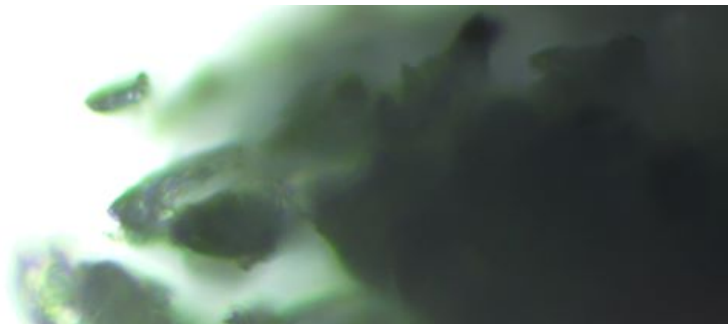


Photo 2: Cotton Cross-Section
(SAMPLE ANSWER BELOW)



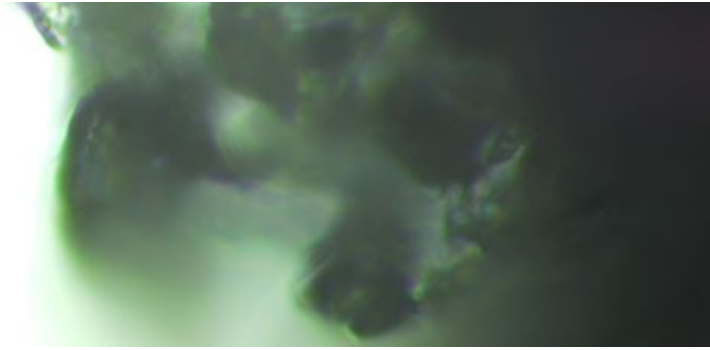


Photo 3: Silk Cross-Section
(SAMPLE ANSWER BELOW)





Photo 4: Wool Cross-Section
(SAMPLE ANSWER BELOW)

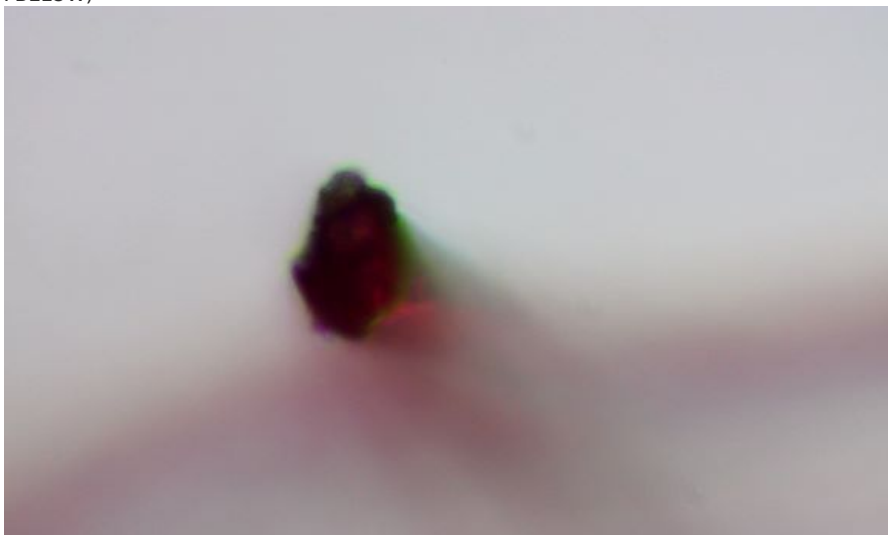
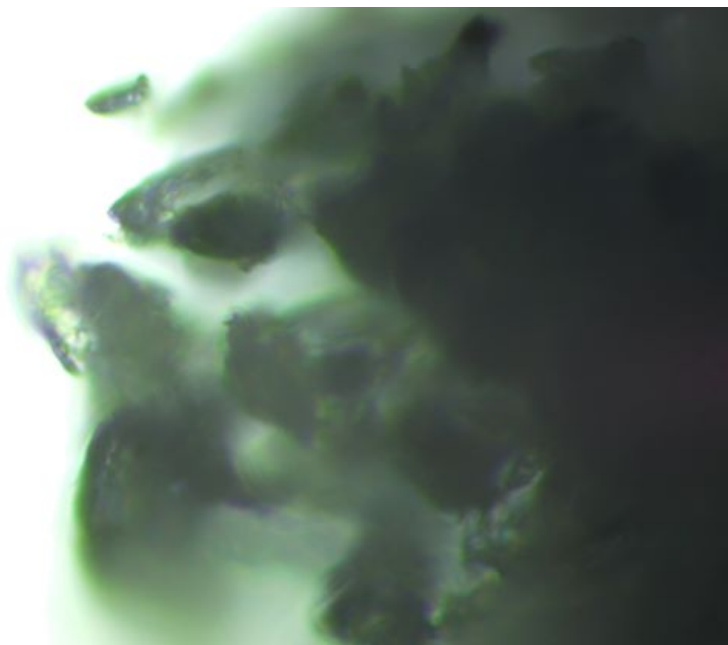




Photo 5: Unknown Fiber Cross-Section
(SAMPLE ANSWER BELOW)

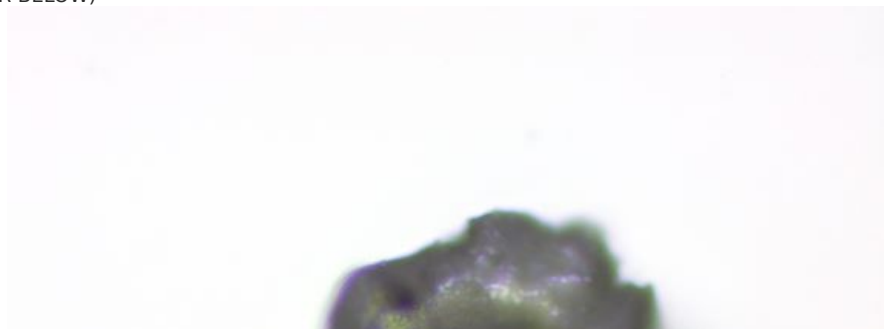




Data Table 2: Hair Observations
(SAMPLE ANSWER BELOW)

Hair Type	Color	General Observations	Cross-Section Observations
Dog	Answers will vary. White	Pigment concentrated around the medulla of the hair, distinctive keratin scales that can be seen at higher magnifications	Round shape, ridging around the cuticle produced by the distinctive keratin scales
Human	Answers will vary. Brown	Uniform color throughout, smooth surface with what appear to be smooth, less defined keratin scales seen at higher magnifications	Oval shape, smooth cuticle, few or no noticeable scales

Photo 6: Dog Hair Cross-Section
(SAMPLE ANSWER BELOW)



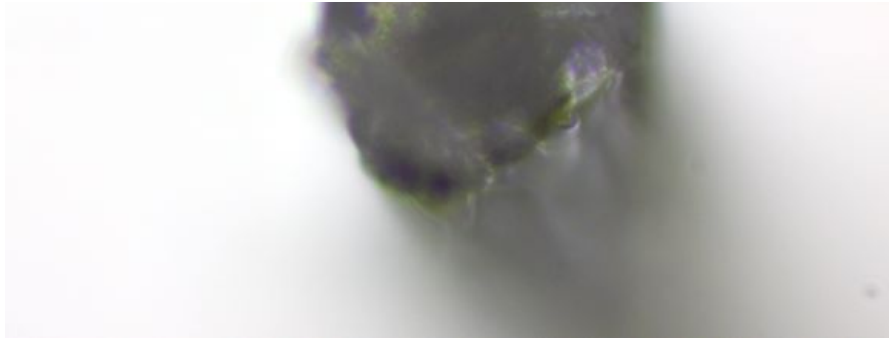
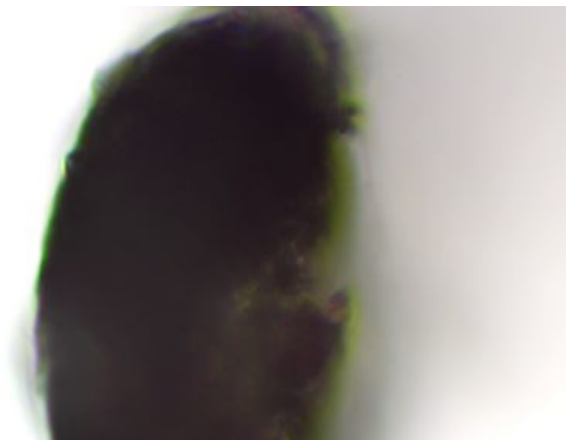
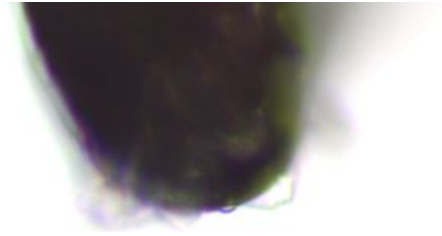


Photo 7: Human Hair Cross-Section
(SAMPLE ANSWER BELOW)





Competency Review

Staple fibers cannot be used to produce long threads.

- ☐ True
- ☒ False



The ends of staple fibers can be observed along the length of the thread.

- ☒ True
- ☐ False



Different mammal species will display different scale patterns on the _____ of the hair.

- ☐ Cuticle ✓
- ☐ Cortex
- ☐ Medulla

Hair can be associated with a particular individual based on class characteristics.

- ☐ True
- ☐ False ✓

In Exercise 1, each thread was embedded in the pipet using glue in order to observe the _____.

- ☐ fiber type
- ☐ cross-section shape ✓
- ☐ color
- ☐ thread count

The unknown fiber sample was composed of natural fibers.

- ☐ True ✓
- ☐ False

Dog hair has more distinctive keratin plates than human hair.

- ☐ True ✓
- ☐ False
-

In what sample would you expect to see long strands with uniform coloration and a triangular cross section?

- ☒ Silk fibers
- ☐ Human hair
- ☐ Cotton fibers
- ☐ Dog hair



Extension Questions

DNA analysis is the only way to match a hair with a specific individual. However, DNA analysis is both expensive and time consuming to perform. What advantages are there to performing an analysis of class characteristics of a hair sample before running a DNA analysis? (SAMPLE ANSWER BELOW)

Analyzing the class characteristics of a hair will let investigators know if it is worth it to run a DNA analysis. For example, if a hair sample is recovered and is determined not to be human, a DNA analysis to compare the hair sample to a human suspect would be a waste of time and money. Likewise, if a suspect is found with short blonde hair, it would also be a waste of time and money to run a DNA analysis comparing them to a hair sample that is long and brown.