Students will be allowed to use their sketches only to identify hairs through the microscope.

The definitions from the notes and the forensic packet will be matching.

Any type of question from the worksheets, labs and packet are fair game.

For sure you should be able to:

1. Answer and explain each question from the text under the section "Question Concerning Hair Analysis" in the Forensic Text.

2. Identify each part on the diagram of hair.

3. Illustrate the different types of medullae. continuous; interrupted; fragmented

4. Identify the species, condition, and medullary index of any slide which has been shown in class.

5. Identify the species, condition, and medullary index of any type hair which has been viewed in the lab.
True or False

1. The shaft of the hair is considered class evidence in a trial.
2. Hair is composed of a protein called cellulose.
3. All hairs on the head of a person are identical.
4. The cortex may contain pigment granules.

Multiple Choice

5. The hair shaft is composed of the cuticle, cortex, and
   a) medulla
   b) root
   c) crown
   d) granules

6. Which factors are used to calculate the medullary index of the hair?
   a) scale diameter of cuticle and the length of the hair
   b) width of cortex and the width of the medulla
   c) length of entire hair and the pattern of pigmentation
   d) width of medulla and the width of the hair

7. Which of the following characteristics is found in typical Asian hair?
   a) dark medulla
   b) sparsely distributed pigment granules
   c) flattened cross section
   d) hair is curly

8. Human hair has which type(s) of cuticle?
   a) imbricate
   b) spinous
   c) coronal
   d) pigmented

9. Neutron activation analysis can check hair for the presence of
   a) silver
   b) DNA
   c) water content
   d) hair dye

10. Which part(s) of a hair can be analyzed for DNA?
   a) root
   b) cuticle
   c) medulla
   d) cortex
11. The cuticle scales of the hair always point toward the
   a) root
   b) medulla
   c) tip of the hair
   d) follicle

12. The period of active hair growth is called the _____ stage.
   a) catagen
   b) telogen
   c) anagen
   d) imagen

13. Although variations can occur, which of the following best describes northern European hair?
   a) kinky with dense, unevenly distributed pigment
   b) straight with evenly distributed granules
   c) round cross section with a large diameter
   d) coarse with a thick cuticle and a continuous medulla

14. Which of the following is most likely a result of hair bleaching?
   a) increased number of disulfide bonds
   b) a yellowish tint to the hair
   c) a more triangular cross section
   d) thickened scales on the cuticle

**Short Answer**

15. Why is hair considered class evidence?

16. Describe the structure of hair. Include in your answer the terms follicle, medulla, cortex, and cuticle.
17. Crime-scene investigators collected hair from a dead person’s body. One of the first things that needs to be established is if this hair is human or animal. Describe two ways that animal hair differs from human hair.

________________________________________________________________________

________________________________________________________________________

18. The body of a woman was found in the woods. Some hair fibers found on the body were sent to the crime lab for analysis. The ends of the hair attached to the body were gray, but the tips of the hair showed that it had been dyed. The distance from the root of the hair to the beginning of the dyed area measured 8 mm. Investigators determined that the victim’s hair had last been dyed on August 1, 2004. Assuming the hair grows at the rate of 0.44 mm per day, on approximately what date did the woman die? Explain your answer.

________________________________________________________________________

________________________________________________________________________

19. Calculate the medullary index of a hair whose diameter is 110 microns wide and whose medulla measures 58 microns. Is this a human or animal hair?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
20. A woman with long hair is a suspect in a burglary case. At the crime scene, several long hairs were found attached to a broken lock of the safe. The police obtain a warrant and request a sample of 25 to 50 hairs from this woman. They tell the woman it is important that they pull the hairs from her head rather than to merely cut the hairs. The police suspect that the woman was stealing to help support a drug habit.

a. Why is it important that the police pull the hairs from her head rather than cut her hair?
b. Why is it necessary to obtain 25 to 50 hairs from this woman?
c. The woman denies that she is currently taking drugs and states that she stopped using drugs a year ago. Explain how the police can determine if the woman has been off drugs for over one year.
d. Suppose the hairs of the woman match the hairs found at the crime scene. Why does this not necessarily prove that she was the guilty party?

Bibliography

Books and Journals

Web sites
* "Ama Tirtsche." http://www.history.com/this-day-in-history.do?printable=true&action=tdihArticlePrint&id=982
* Gale Forensic Science Collection, school.cengage.com/forensicscience.
Multiple Choice

1. Natural fibers can be harvested from
   a) plants and animals
   b) only from plants
   c) only from animals
   d) plants, animals, and minerals

2. The shiny nature of silk can be related to
   a) its hollow core
   b) its ability to refract light
   c) its smooth, round fibers
   d) mucus secretions from the silkworm

3. What characteristics of cotton make it a great source of fiber for clothing?
   a) It is very easy to grow.
   b) It is resistant to staining.
   c) The fibers are easily woven and dyed.
   d) The fibers are extremely long.

4. Mineral fibers such as asbestos are very durable. These fibers are used in all of the following except
   a) rope
   b) shingles
   c) floor tiles
   d) brake liners

5. All of the following are characteristics of a synthetic fiber except
   a) They are formed by combining monomer compounds into polymer molecules.
   b) They are man-made.
   c) They are used in the production of carpet fibers.
   d) They do not contain any natural fibers.

6. A characteristic of natural fibers is that they
   a) are stronger than synthetic fibers
   b) will not break down when exposed to bright light
   c) melt at a lower temperature than synthetic fibers
   d) are affected by microscopic organisms

7. Which of the following observations are used to help identify a specific fiber?
   a) smell of the burned fiber
   b) on contact with the flame, does the fiber coil or melt?
   c) color and structure of the residue left after the fiber burns
   d) all of the above
8. Fibers are an excellent source of trace evidence because
   a) They are easily transferred from victim to suspect.
   b) They are often overlooked by a suspect.
   c) They can be easily collected and stored.
   d) all of the above

9. A fiber is collected at a crime scene. When viewed under a compound microscope, what two traits would indicate that the fiber was a human hair and not a piece of fiber obtained from an article of clothing? (Choose 2)
   a) the presence of a cuticle
   b) a medullary index of 0.33 or less
   c) a wide diameter
   d) its ability to dissolve in water

10. Describe the weave patterns of each of the fabrics pictured below. Justify your answer for each.
    Weave pattern:
    
    100% cotton

    Weave pattern:
    
    100% wool

    Weave pattern:
    
    100% nylon rope

    Weave pattern:
    
    100% spandex nylon
Questions to Research

11. Explain how the inhalation of asbestos fibers can lead to lung cancer.

12. Explain why roofers removing old asbestos roofs are more at danger of developing lung cancer than a person who installs asbestos flooring.

13. Describe three sources of natural fibers. Provide an example of each type of natural fiber.

14. Silk is a natural fiber produced by the silkworm. How is silk produced by the body of the silkworm?

15. A crime-scene investigator views two small, red fibers. One fiber was obtained from the crime scene off the victim’s body, and the other red fiber was removed from the cuff of the suspect’s pants. Although the two fibers appear to be from the same fabric, the crime-scene investigator determines that the two fibers are indeed very different. List five other characteristics of the fibers that can be detected under a compound microscope that could be used to distinguish the two red fibers.

16. Fibers collected as trace evidence are often considered to be class evidence and not individual evidence. For example, the presence of a white cotton fiber found on a suspect and found on a victim at a crime scene is not enough evidence to convict the suspect. Justify this statement.
fabric is another characteristic, which is known as thread count. Every package of bed sheets includes information on thread count, as well as the type of fiber used to make them. The price of sheets varies a great deal, and high prices tend to come with all-natural fibers and high thread counts. A high thread count is more costly to manufacture and provides a smoother finish. Thread count is often written as threads per inch. Typical sheets will have a thread count between 180 and 300 threads per inch, but high-quality sheets can have thread counts of 500 threads per inch.

**SUMMARY**

- Fibers are a form of class evidence used by crime-scene investigators; they are also a form of trace evidence.
- Forensic scientists will try to determine the type of a fiber, its color, how many fibers of each kind were found, where they were found, what textile the fiber came from, and whether there were transfers of multiple types of fibers.
- Fiber evidence may be gathered using special vacuums, sticky tape, or with tweezers.
- Fibers may be analyzed using polarized light microscopy, infrared spectroscopy, burn tests, or tests for solubility in different liquids.
- Fibers may be classified as natural or synthetic.
- Natural fibers include animal hair, plant fibers from seeds, fruit, stems, or leaves, and mineral fibers.
- Synthetic fibers include regenerated or modified natural fibers and synthetic polymer fibers.
- Fibers are spun into yarns that have specific characteristics.
- Yarns are woven, with different patterns, into textiles.

**CASE STUDIES**

The Murder of George Marsh (1912)

Four bullets were found in millionaire George Marsh’s body. Evidence indicated that he had not been robbed. A piece of cloth and a button were found near the corpse. In the rooming house where Marsh lived, an overcoat missing all of the buttons was found in the abandoned room of Willis Dow. The weave of the overcoat matched the weave pattern of the piece of cloth found at the crime scene. Based on this fiber evidence, Dow was convicted of the murder and sentenced to death.

Roger Payne (1968)

Bernard Josephs arrived home to find his wife dead. She had been wearing a purplish-red (cerise) woolen dress. On examination, it was determined that Claire Josephs had been choked into unconsciousness and then had her throat cut with a serrated knife. There was no forcible entry, and Claire appeared to have been in the middle of cooking. This indicated to the police that the murderer was probably someone Claire knew.