Unit 3-Hair and Fiber Review

Match the definition on the right with the word on the left.

1. Hair shaft  D  A. The middle layer of the hair shaft, made up of keratin molecules and pigment.
2. Hair cuticle  L  B. Portion of the hair below the skin that is embedded in the follicle.
3. Hair cortex   A  C. The intermediate phase of hair growth where the outer sheath shrinks.
4. Hair medulla  I  D. Portion of the hair above the surface of the skin, made up of three layers.
5. Coronal scales  J  E. Scale pattern that looks petal-like.
6. Spinous scales  E  F. Tube like organ in the under layer of the dermis and is linked to the body’s blood supply.
7. Imbricate scales  G  G. Scale pattern where the layers are flattened against each other.
8. Hair root   B  H. The active phase of hair growth where hair is growing about 1 cm per month.
9. Hair follicle  F  I. A row of cells running along the center of the shaft.
10. Anagen phase  H  J. Scale pattern that looks crown-like.
11. Catagen phase  C  K. The resting phase of hair growth, where the hair spends the majority of its life.
12. Telogen phase  K  L. The clear outer covering of the hair shaft, made up of overlapping scales.

Answer the following questions.

1. What is Locard’s Exchange principle? How does it apply to the collection of hair and fiber evidence?
   Locard’s Exchange Principle states that every contact leaves trace evidence. This means that forensic scientists can use the hair and fibers they collect to connect a suspect or object to a victim.

2. Label the parts of the hair in the diagram below.
3. Label the three parts of the hair shaft below.

![Labelled hair shaft diagram]

- Cortex
- Medulla
- Cuticle

4. What are you looking for in the cortex of the hair?
   When you look at the cortex of the hair, you are looking at the pigment granules. This is important because it can identify the hair as human (very consistent pigments) or animal (banding).

5. What are the three main cuticle patterns?
   a. Spinous
   b. Imbricate
   c. Corona

6. Identify the scale pattern in the following pictures.
7. Draw a picture of the following medullary patterns.

<table>
<thead>
<tr>
<th>Medulla Type</th>
<th>Picture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid</td>
<td><img src="image1.png" alt="Solid Medulla" /></td>
</tr>
<tr>
<td>None</td>
<td><img src="image2.png" alt="None Medulla" /></td>
</tr>
<tr>
<td>Fragmentary</td>
<td><img src="image3.png" alt="Fragmentary Medulla" /></td>
</tr>
<tr>
<td>Continuous</td>
<td><img src="image4.png" alt="Continuous Medulla" /></td>
</tr>
<tr>
<td>Stacked</td>
<td><img src="image5.png" alt="Stacked Medulla" /></td>
</tr>
</tbody>
</table>

8. How do you tell the difference between a solid medulla and a continuous medulla?
   A solid medulla fills the entire inside of the hair so that you cannot see any cortex. A continuous medulla is where the medulla spans the entire length of the hair with no breaks but you can clearly see cortex on both sides.

9. How do you tell the difference between a fragmented and interrupted medulla?
   A fragmented medulla will have uneven fragments of medulla at an uneven interval. An interrupted medulla will have even fragments of medulla at even intervals.

10. What is the medullary index and why is it important when identifying hairs?
    The medullary index is a measure of the diameter of the medulla compared to the total diameter of the hair. It is important because it can tell us if the hair is human or animal. If the hair is human, the medullary index will be less than 1/3. If the hair is animal, the medullary index will be more than 1/3.

11. What type of information can you tell about a person by looking at a hair under the microscope?
    Location on the body that the hair came from, human or animal, broad racial origin, if the hair was forcibly removed or fell out, DNA analysis, Mitochondria DNA analysis.
12. What part of the hair are you looking at when trying to determine if it was pulled out or fell out naturally? What will each look like?
   You are looking at the root of the hair. If the hair was pulled out, the root tends to be elongated and will usually have follicular tissue attached. If the hair fell out, the root tends to be more bulbous and there will usually be no follicular tissue attached.

13. What type of information can’t you tell about a person by looking at a hair under the microscope?
   The age and sex. Also, you can’t use a hair (without DNA) for personal identification purposes.

14. How can you tell if a fiber is natural or synthetic?
   A natural fiber tends to be irregular in shape and diameter and tends to have a lot of twisting. A synthetic fiber is uniform in shape and diameter and will have none or very little twisting.

15. Label the following weave patterns.
   Plain    Twill    Satin

16. Label the weft and warp in the previous diagrams.

17. How can you tell the difference between a twill weave and a satin weave?
   A twill weave tends to look like a stair case or will look like it has a diagonal pattern. A satin weave tends to look like a brick pattern.

18. What makes a fiber valuable as evidence?
   The uniqueness of the fiber is what gives the fiber value as forensic evidence. The most common type of fiber is white cotton, which could come from almost any source and therefore is practically useless as forensic evidence.