TRAINING LAB – HAIR AS EVIDENCE: PART 2 – ANIMAL HAIR

NAME_____

Background: Animal hair can be just as important in helping to solve a crime as human hair. Example: a criminal breaks in to a house and steals some jewelry. The owners of the house have a pet Labrador retriever that sheds. A suspect is being investigated for the crime and Labrador retriever hair has been found on his clothes – and the suspect does not own a dog. This important piece of evidence can be used to help prove the suspect was inside the house where the jewelry was stolen. Do animal hairs have the same characteristics as human hairs? Is it possible to distinguish between cat and dog hairs? This Training Lab will help you see animals from a new perspective – their hair!

1. You will be trained to observe the different characteristics of animal hair.
2. You will be trained to identify an animal based on the characteristics of their hair.

Animal Hair Reference Information:
*animal fur is usually composed of two types of hairs – <u>WOOL HAIRS</u> are usually thin, soft, kinked and not straight, and are found close to the skin, while <u>GUARD HAIRS</u> are longer, thicker, straight, and make up the hairs you typically see when you look at an animal's fur.
*animal hairs look different from human hairs in the following ways:
1. animal hairs can have an Imbricate, Spinous, or Coronal cuticle scale pattern, while all human hairs have an Imbricate cuticle scale pattern.
2. all animal hairs contain a medulla and the medulla is large (the Medullary Index is is usually 0.5 or larger). Human hairs don't always contain a visible medulla, and if it is present it is usually thin (the Medullary Index is usually 0.25 or smaller).
3. animal hairs have a medulla that is usually an intricate pattern of air-filled compartments. Human hairs have a medulla (if present) that looks more like a thin, dark line running through the hair.

Procedures:
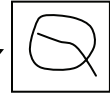**Part 1 – General Animal Hair Observations**
1. Grab a microscope, microscope slide, cover slip, and forceps.
2. <u>You will be observing the animal hair you brought with you OR an animal hair supplied by your supervisor</u>. Record the identity (cat, dog, etc.) of the animal hair you will be observing in Table 1.
3. Make a wet mount that contains a few <u>Guard Hairs</u> from your animal (read the "Animal Hair Reference Information" above if you do not know the difference between a Guard Hair and a Ground Hair).
4. Find your animal's hair on <u>low power first</u>, then move on up to medium and high power. All hair observations should be completed using <u>high power</u>.
5. You should be able to locate the same three hair layers that you observed in human hair: the <u>CUTICLE</u>, <u>CORTEX</u>, and <u>MEDULLA</u>. You should also notice that the Medulla of animal hair is thicker and more obvious than it is in human hair.

Part 2 – Observing The Specific Characteristics Of Your Animal Hair

<u>CUTICLE DESCRIPTION</u>

1. What is the **CUTICLE SCALE PATTERN**? The thin, pointed tip of an animal hair often has a different Cuticle Scale Pattern than the rest of the hair. Try to make your observations toward the middle of the hair. Observe the pattern of overlapping cuticle cells on the surface of your animal's Guard hair using High Power (adjust focus and light for best view!). If the Cuticle Scale Pattern is hard to see, try this method:

   A. First paint a <u>very thin layer</u> of clear fingernail polish in the center area of a cover slip (<u>NOT</u> a microscope slide).

   B. Lay most (but not all) of a hair in the wet polish and <u>let the polish dry</u>.

   C. Grab the free end of hair with forceps and lift the hair out of the dried polish. You can discard the hair. You will be looking at the hair's imprint left in the polish.

   D. Place the cover slip (with the hair removed) <u>polished side DOWN</u> on a dry microscope slide (<u>do not</u> use a drop of water). Place the slide and cover slip on a microscope stage and observe the hair's Cuticle Scale Patten imprint left behind in the dried polish.
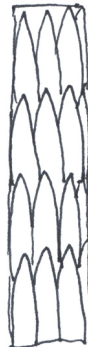
2. Pick one of the Cuticle Scale Patterns below that best describes your animal hair's cuticle.

random overlapping scales – often flattened

<u>Imbricate</u>

longer, pointed scales that overlap

<u>Spinous</u>

ring-like scales – often look like cups one inside the other

<u>Coronal</u>

3. Record the Cuticle Scale Pattern of your animal's Guard hair in Table 1.
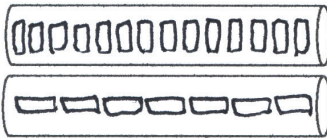
<u>CORTEX DESCRIPTION</u>

1. What is the **GENERAL COLOR OF THE CORTEX** when viewed through the microscope: White or Clear, Light Yellow, Medium Yellow, Light Brown, Medium Brown, Dark Brown, Black, Red, etc..

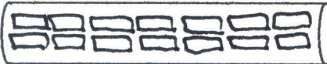2. Record the Cortex Color of your animal's Guard hair in Table 1.
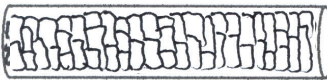
<u>MEDULLA DESCRIPTION</u>

1. What is the **MEDULLA STRUCTURE**? The medullas found in animal hairs are usually composed of air-filled compartments that are more obvious than the medullas found in human hairs. Each kind of animal typically has its own medulla shape or structure, which can help you identify the animal's hair.
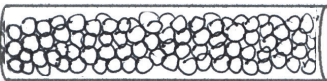
2. Observe your animal's Guard hair and pick the Medulla Structure below that best describes your animal's medulla.

Amorphous – medulla appears as a solid line

Uniserial – medulla appears as a single row of disc-shaped, square, or rectangular compartments

Multiserial – medulla appears as two or more rows of disc-shaped, square, or rectangular compartments

Cellular – medulla appears as a wide band that is composed of randomly-shaped, "bubbly", compartments

Lattice – medulla appears as a wide band that is composed of many small, circle-shaped, compartments

3. Record the Medulla Structure of your animal's Guard hair in Table 1.
4. What is the **MEDULLARY INDEX**? Medullary Index describes the thickness of the medulla layer that is present. A human hair Medullary Index is almost always "0.25" or "0". An animal hair Medullary Index is almost always "0.5", "0.75", or "0.9". Observe your animal's Guard hair on high power and choose the Medullary Index below that best describes the hair's medulla.

Is the medulla about ¼ the thickness of the hair?   Medullary Index = 0.25

Is the medulla about ½ the thickness of the hair?   Medullary Index = 0.5

Is the medulla about ¾ the thickness of the hair?   Medullary Index = 0.75

Is the medulla almost the entire thickness of the hair?   Medullary Index = 0.9

4. Record the Medullary Index of your animal's Guard hair in Table 1.

ANIMAL HAIR SKETCH
1. USE A PENCIL to make a neat and accurate, colored sketch of your animal Guard hair as viewed with High Power. Make your sketch in the space provided below Table 1.
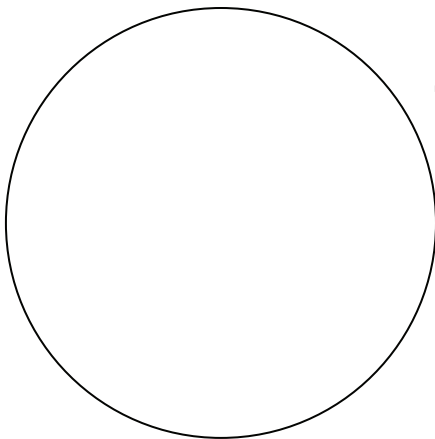
Part 3 – Observing Photographs Of Other Kinds Of Animal Hairs
OBSERVE THE ANIMAL HAIR PHOTOGRAPHS SUPPLIED BY YOUR SUPERVISOR.
REPEAT ALL THE OBSERVATIONS, FOUND IN PART 2, FOR EACH ANIMAL HAIR. Record your observations in Table 1. You do not need to sketch the animal hairs from the pictures.

Table 1 – Observations of guard hairs taken from different animals

Identity of Animal	Cuticle Scale Pattern	Cortex Color	Medulla Structure	Medullary Index
(my animal's hair)				
Cat				
Dog				
Rabbit (small hair)				
Rabbit (large hair)				
Rat				
Guinea Pig				
Deer				

Sketch of my animal's hair on High Power

Identity of Animal = _____

QUESTIONS – HAIR AS EVIDENCE: PART 2 - ANIMAL HAIR

NAME_____

1. Name the TWO types of hairs that are commonly found in animal fur.

2. The two types of hairs from Question #1 have been placed in front of you. Describe what you would look for to help you correctly identify each hair type.

3. Based on your observations, which hair below would most likely contain a Uniserial Medulla Structure? (circle the correct answer)

    A. a thinner hair   B. a thicker hair

4. Based on your observations, which hair below would most likely contain a Spinous Cuticle Scale Pattern? (circle the correct answer)

    A. dog hair   B. rat hair   C. cat hair   D. rabbit hair   E. guinea pig hair

5. Based on your observations, which hair below would contain a medulla with the smallest Medullary Index? (circle the correct answer)

    A. dog hair   B. rat hair   C. cat hair   D. rabbit hair   E. guinea pig hair

6. A hair arrives at the crime lab and, after observing it with a microscope, you immediately identify it as an animal hair – and not a human hair. Describe TWO characteristics of the hair you probably observed that made you believe it was an animal hair, and not a human hair.

7. As you have observed, animal hairs usually have a large medulla composed of air-filled compartments. These air-filled compartments are present for a reason – and can actually help the hair do its job better. Describe ONE reason that might explain why having a hair made of air-filled compartments could be helpful to an animal.