

	Fiber Type	Chemical Description	Trade name	Common Uses
Natural	Hair	mammals	protein	apparel, blankets
	Silk	insects	protein	apparel
	Cotton	plant	cellulose	apparel, textiles
	Rayon	plant	regenerated cellulose	apparel, upholstery, curtains
	Acrylic	polyacrylonitrile	Creslan, Acrilon, Orlon	home furnishings, cigarette filters
	Nylon	polyamide	Antron, Meryl	apparel, household furnishings, rope, seatbelts, tents
	Polyester	polyaromatic esters	Dakron, Kodel, Fortrel	apparel, household furnishings, fiberfill, auto upholstery, rope
Synthetic	Spandex	segmented polyurethanes	Lycra, Clearspan	stretchable apparel

Websites you might want to check out:

- FBI standard information about hair evidence, with links to fiber evidence

<http://www.fbi.gov/hq/lab/fsc/backissu/july2000/deedric1.htm#Hair%20Evidence>

- Microscopy of Hair Part 1: A Practical Guide and Manual for Human Hairs

http://www.fbi.gov/hq/lab/fsc/backissu/jan2004/research/2004_01_research01b.htm

- Napoleons' Hair controversy

<http://www.nytimes.com/2008/06/10/science/10napo.html>

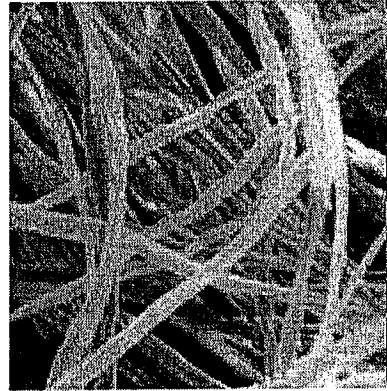
- If you trust the reliability of TruTV

http://www.trutv.com/library/crime/criminal_mind/forensics/trace/1.html

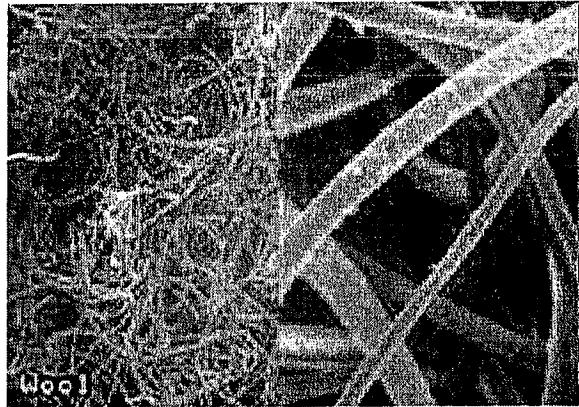
- The discovery of _____ and multiple fiber transfers between the suspect's clothing and the victim's clothing dramatically increases the likelihood that these two individuals had physical contact.

NATURAL FIBERS

Cotton-



Animal-



SYNTHETIC FIBERS

Nylon, Rayon, Polyester, etc-



Fibers under a microscope

HAIR ANALYSIS

- It is a common type of *trace evidence* found at a crime scene
- DNA tests can be performed if a bulb root is present
- If the bulb root is not present, hair can only be used as *class evidence*
- Between 25 and 50 hairs should be collected from the suspect and victim for comparison
- Step 1: Store, label and transport properly
- Step 2: Determine whether the hair is human or not
- Step 3: Compare sample to the known sample
- Step 4: Evidence is presented stating the hair is or is not "consistent with" the evidence; the hair samples are never identical.
- The first document referencing hair was written in 1831
- The first forensic use of hair in a criminal case occurred in 1861
- Hair analysis is still used as evidence in cases today
Ie: OJ Simpson case

Fiber	Length	Diameter	Yarn	Fiber Transfer
Cross transfers	Natural	Cotton	Wool	Synthetic

FIBER

- A _____ is the smallest unit of a textile material that has a _____ many times greater than its _____. A fiber can be spun with other fibers to form a _____ that can be woven or knitted to form a fabric.
- The _____ and length of fiber used, the type of _____ method, and the type of _____ construction all affect the transfer of fibers and the significance of fiber associations. This becomes very important when there is a possibility of fiber _____ between a suspect and a victim during the commission of a crime.
- Matching _____ fibers on the clothing of a victim to fibers on a suspect's clothing can be very helpful to an investigation, whereas the matching of common fibers such as white cotton or blue denim fibers would be less helpful.

Cuticle

The cuticle varies in its **scales** (How many are there? Do they overlap? What is their shape?), its **thickness** and whether it contains **pigment**.

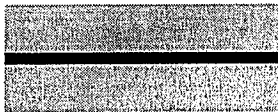
*Characteristics of the cuticle may be important in distinguishing between hairs of different **species** but are often not useful in distinguishing between different **people**.*

Cortex

The cortex varies in **thickness**, **texture** and **color**. This is one of the most important structure of hair in determining the individual that the hair came from.

Medulla

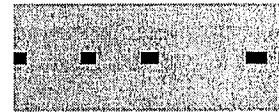
The medulla varies in its **thickness**, **continuity** (whether its one long band or broken up into pieces) and **opacity** (or how much light can pass through it). The medulla may be absent in some species. *Like the cuticle, the medulla can be important for distinguishing between hairs of different **species**, but often does not lend much important information to the differentiation between hairs from different **people**.*



Continuous

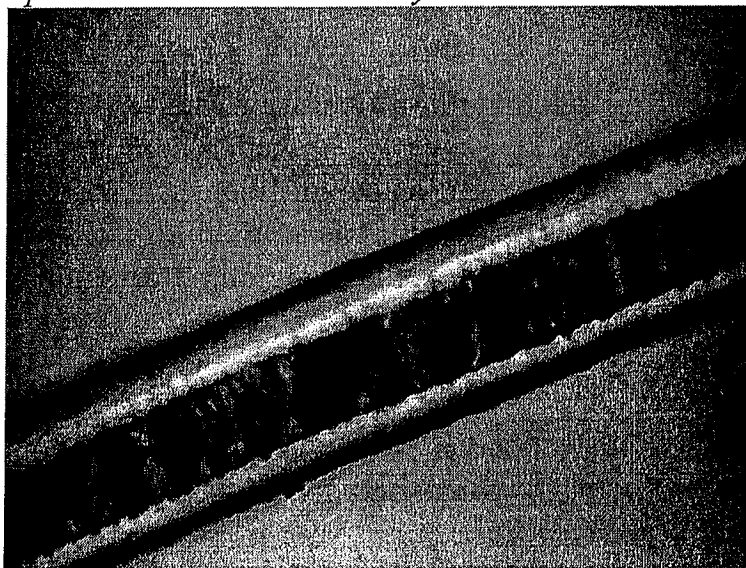


Interrupted



Fragmented

ANALOGY: A pencil? A Good and Plenty?

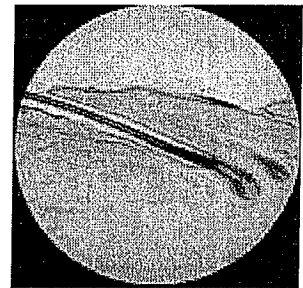


Keratin	Nails	Follicle	Pigments	Shape	Texture
Genes	Root	Nutrition	Alteration	Body Area	

HAIR

HAIR BIOLOGY OVERVIEW

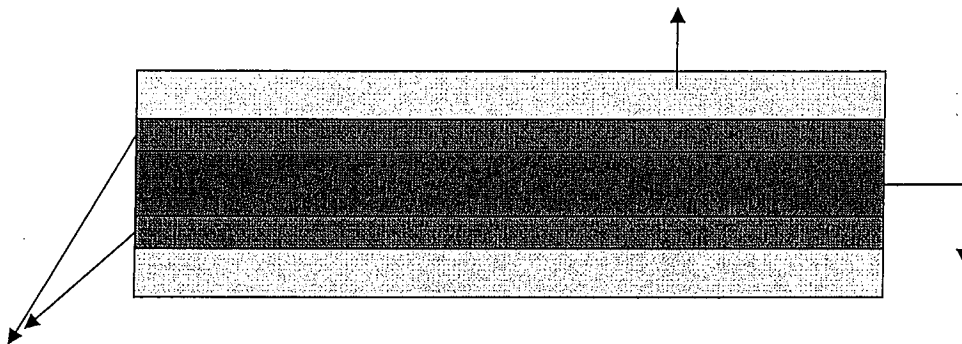
- Hair is composed of the protein _____, which is also the primary component of finger and toe _____.
- Hair is produced from a structure called the hair _____. Humans develop hair follicles during _____ development, and no new follicles are produced after birth.
- Hair color is mostly the result of _____, which are chemical compounds that reflect certain wavelengths of visible light.
- Hair _____ (round or oval) and _____ (curly or straight) is influenced heavily by _____. The physical appearance of hair can be affected by _____ status and intentional _____ (heat curling, perms, straightening, etc.).
- The _____ (head, arm, leg, back, etc.) from which a hair originated can be determined by the sample's length, shape, size, color, and other physical characteristics.
- In order to test hair evidence for DNA, the _____ must be present.



hair follicle

HAIR STRUCTURE

Hair consists of 3 main parts: cuticle, cortex, medulla



Name _____
Date _____

HAIR AWARE...ness

Answer True or False to the following questions:

_____ Human hair has the same basic structure as bird feathers.

_____ Hair cannot be used as evidence at a crime scene

_____ The hair root does not have to be present in order to extract DNA from the hair

_____ Blondes have the most number of hair follicles, or pockets of cells where hair grows from

_____ On average, adults lose 100 hairs per day

_____ Humans have 10 million hairs on their scalp

Microscope/Activity Guide

Hair Observations

At your station, observe the prepared slides and record what you see on the handout provided. Be sure to label what type of hair you're observing.

Descriptions for the hair might include:

- length
- appearance (curly, straight or wavy)
- color
- unusual features
- shape and appearance of root if present

If there is time, prepare a slide of your own hair and record your observations.

Fiber Observations

At your station, observe the prepared slides and record what you see on the handout provided.

NOTE: Are you looking at a hair or a fiber? How can you tell? Include this in your description.

What type of fiber is it?- Burn Test

Caution- please be very careful with the candle and burning fabrics

Use tweezers to pull a few fibers from the fabric or yarn, you don't need a lot.

Holding the fibers with tweezers, bring them SLOWLY into the flame, note odor or smoke, and the SLOWLY remove from the flame to see if the fibers hold a flame. What color is the flame, the ash/residue, the smoke?

Words you might use to describe the burning...

Scorches, smolders, fuses, melts, glows, shrinks, sizzles, flickers, flares, sputters, burns fast/slow, smoky, sooty, etc.

And the residue/ash...

Color, shiny, clumpy, beady, sticky, feathery, etc.

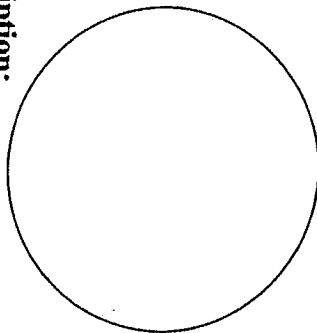
Fiber	Behavior nearing flame	Behavior in flame	Behavior leaving flame	Odor	Ash or Residue

Hair and Fiber Samples

Name _____

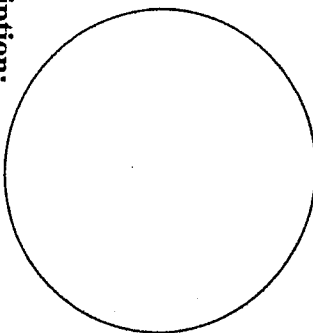
Observe the hair and fiber samples provided by your teacher. Sketch the view under medium power and write a description that would help you identify the hair or fiber sample, such as unique marks or areas.

Type of Hair _____



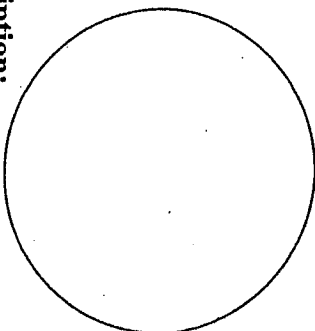
Description:

Type of Hair _____



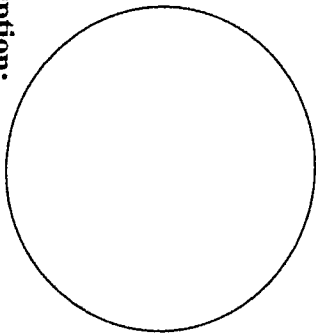
Description:

Type of Hair _____



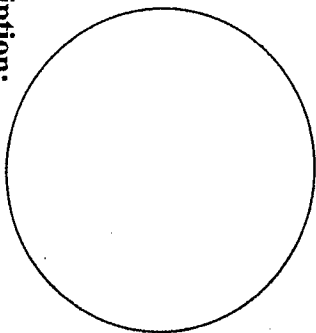
Description:

Type of Hair _____



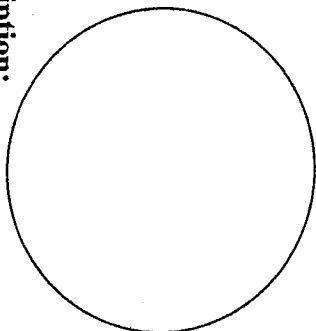
Description:

Type of Hair _____



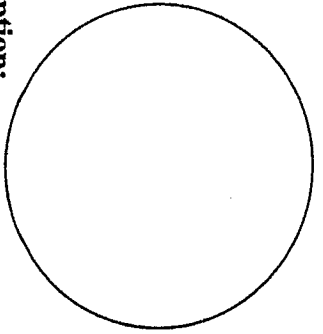
Description:

Type of Hair _____



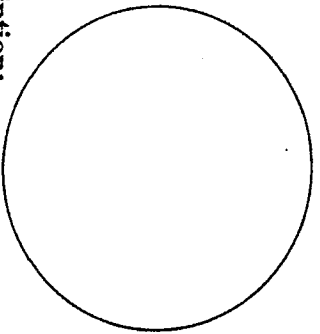
Description:

Type of Fiber _____



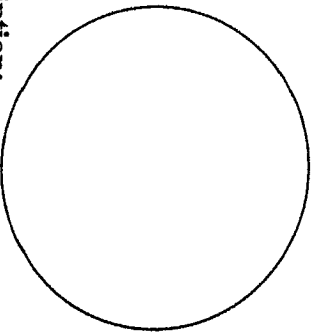
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Type of Fiber _____



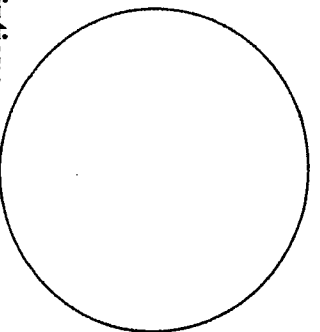
Description:

Type of Fiber _____



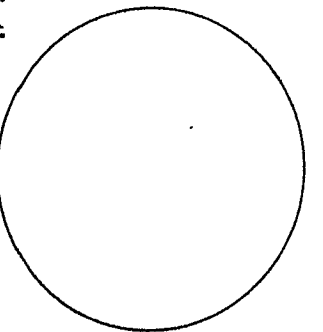
Description:

Type of Fiber _____



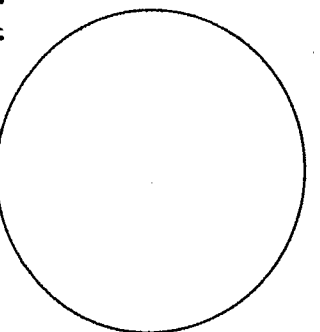
Description:

Type of Fiber _____



Description:

Type of Fiber _____



Description: