Forensic Science Midterm Review

1. What is Forensic Science?
   It is the direct application of scientific knowledge and techniques to matters of law.

2. What is Locard Exchange Principle? “...that any two surfaces coming in contact leave trace evidence behind.” Dr. Edmond Locard, French investigator, believed there was cross-transference of small traces between a perpetrator and a victim. Locard theorized that whenever two surfaces come into contact, a transfer of minutiae, however slight, would occur or the crime scene.

3. Who created the first crime lab in Lyons, France in 1910, the first crime lab was created by Edmond Locard.

4. a. What is evidence? Anything that has been used, left, removed, altered, or contaminated during the commission of a crime is considered evidence.
   b. What is trace evidence?
      Taken from its name, trace evidence is considered to be any minutiae that can be found. This includes fingerprints, hairs, fibers, and various fluids (blood, semen).

5. Describe the trace evidence associated with convicted Atlanta Child Serial Killer, Wayne Williams.
   1. Carpet fibers from his home and auto
   2. Dog hairs from the family pet
   3. Fibers from a bedspread from his bedroom

6. SKIP

7. What is Physical Evidence? (I know, the same as evidence) Anything that has been used, left, removed, altered, or contaminated during the commission of a crime.

8. What is impression evidence? When shoe, footprints or tire prints are found at a crime scene, all attempts are made to preserve the impressions or reproductions are created.

9. Describe 2 differences between impressions and prints?
   (1.) prints are 2D and made by placing material on, transferring from or by removing it from a hard surface. But an impression is 3-D and usually created on pliable materials such as soils.
   (2.) usually prints are lifted from a surface, impressions are preserved with a cast.

10. What technique is used to preserve a print in dirt or dust?
    If the print is made of dust or dirt, the print is lifted by applying a lifting material (it is dusted and lifted with an adhesive) If the print is difficult to lift and electrostatic charge is applied, especially with sand prints.

11. How does the Kastle-Meyer Test identify Blood Evidence?
    Peroxidase-like reaction an enzyme reaction with peroxide and color reaction with phenolphthalein which turns PINK. Sometimes though, FALSE-Positives can occur if potatoes or horseradish are in the scene

12. Describe the Luminol Test for the presence of blood? Instead a color reaction: it is a reaction to create LIGHT called Luminescence.

13. What is a blood drop spatter pattern?
    Blood drop’s behavior in the air once it has left the body. Once the drop of blood impacts a surface, the spatter pattern or the blood stain is created.

14. The size and shape of the blood drop patterns depends
    (1.) the amount of blood. (2.) the distance it is dropped (3.) the angle it was dropped.
    And on the angle at which it impacts. The general rule is that the greater the angle, the more elliptical the shape.
15. A blow back pattern is created in what way? because of the high gas pressures created in the wound, you see these patterns on the hand of the shooter and in the barrel of the gun.

16. Finally, the shape of the blood drop patterns depends on distance blood dropped. The general rule is that the greater the distance the larger the spatter diameter.

17. Essay: Using Newton’s Laws of Motion, how is the amount of force related to the velocity of the blood drop? If more force is involved there will be an acceleration on the same droplet of blood.

a.) When does low velocity become medium velocity blood spatter? Low becomes to medium velocity > 25 m/s

b.) When does medium velocity changes to high velocity? medium velocity changes to high velocity > 100 m/s

18. In the study of Blood Spatter Patterns (BSP), what is a Void Pattern? It is an empty space where blood should have been.

19. How is a cast-off blood spatter pattern created? Cast-off is created by the movement of a bloody object to throw off the blood.

20. Essay

a. What are blood trails? dripping pattern, the blood had dripped from a bloody source onto a surface and the trails from a body being dragged or carried

b. The pattern of Blood trails depend on what 2 things?
   1.) how fast the person was moving or dragged
   2.) the volume of blood they are casting off

c. What is Directionality? blood stains will have “tails” with the drop. The tail points in the direction in which the drop was moving.

d. What does it mean about the movement of a victim if the path of the blood drops is several feet apart with tails? indicates someone was bleeding and also running.

21. What are the 2 types of transfer blood pattern stains and how are they created?

(1.) Wipes-created when an object moves through an existing stain, removing and altering its appearance

(2.) Swipes-the transfer of blood from a moving source onto an unstained surface.

22. Blood patterns from a major artery are called an arterial spurt.

23. How are these spurts created? When injury to the neck is involved, the carotid artery may be severed and the heart pumps the blood out in spurts.

24. What 2 factors determine the shape and size of pooled blood?
   (1.) Amount of blood pooled near a bloody object or from the victim.
   (2.) time it takes for the blood to coagulate - solid and liquid parts separate

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41. For what 2 reasons is an examination of physical evidence considered in an investigation? (1.) it is done for identification and (2.) comparison

42. What are exemplars and how are they used? a standard and /or reference specimen, sometimes collect at the crime scene. To subject both to the samples to analysis and test and to determine if they have the same or similar origins

43. Who is a Forensic Odontologist? a dentist who specializes in the comparison and identification of dental evidence from impressions or from actual teeth in/from a skull

44. **ESSAY**

   a. In criminal investigation, describe 2 ways in which dental evidence or “bite marks” can be helpful? To establish the age and identity of a homicide victim and to associate a suspect with a crime scene using bite-mark analysis (compare).

   b. Explain why individuals can be identified by their teeth, sometimes over using a fingerprint? because everyone’s teeth are different. Since almost everyone has been to a dentist at one time, most of us have a dental record. Teeth are a better identifier than fingerprints, Not everyone has been fingerprinted!

47. **ESSAY**

   What are class characteristics and how do they differ from individual characteristics?

   Give an example of each.

   properties of evidence that can only be associated with a group and never with a single source

53. What are Fibers? strands of threads or filaments that make up yarn

54. Why are Fibers considered as Evidence? As you interact with these products, fibers are released and come in contact with you. Fibers can connect a victim or suspect to a crime scene

55. What are the 2 main types of fibers? Man made and natural.

56. a.) What are Natural Fibers?

   Threads come from plant or animal material

   b.) Name a commonly found natural fiber from plants. Cotton Threads come from plant or animal material Cotton, flax – plants Wool, angora, silk - animals

57. a.) When collecting fiber evidence, make a Bindle, a small paper envelope to store collected crime scene fibers.

   b.) Who was the Atlanta Child Murderer convicted of serial murder based on the green carpet fibers found on his victims? Wayne Williams.

58. What are the 3 layers of Hair?

   (1.) Cuticle, Hard outside covering that protects the inner layers of hair;

   (2.) The Cortex is made of cells within the cuticle; and the
59. a.) What is the Medullary Index? The ratio of hair medulla diameter divided by the hair diameter. For humans this is equal to or less than 30, for animals its 50% of more.

b.) What is the Equation for calculating the ratio:

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\text{Ratio} = \frac{\text{Diameter of Medulla}}{\text{Diameter of the Hair}}
\]

60. How does the human hair differ from animal? What measurement is used to distinguish human hair from animal? The scale patterns and medulla shape might be different, the Medulla ratio (index) can be measured to determine if the hair is human or animal. Animals have much more medulla in their hair compared to humans.

61. When cells from the hair follicle can not be collected for DNA, what is located in the Medulla, that can provide DNA? Mitochondrial DNA, mtDNA

62. Which layer(s) of hair is used to identify species? How do animals compare to humans? The medulla, it is ratio or fraction of medulla diameter to hair diameter. Usually, Humans = 1/3 (about 33% or less) and Animals = ½ (about 50% or more).

63. a.) What are the 4 types of Medulla Classifications (human)? Continuous, Interrupted, fragmented and no medulla.

b.) What are the medulla types found in animals? Uniserial ladder, multiserial ladder, cellular or vacuolated, and amorphous.

64. Give 2 reasons why fingerprints have been used for identification.

(1.) Because no 2 people have the same ridge patterns.

(2.) Fingerprints are impressions created by the ridges on the surface of the skin (called lands) the individual characteristics of which are unique (location of ridge endings and dots for example.)

65. What is meant by at latent print? When a person touches a surface, oils and perspiration are transferred as an impression. If not visible, it is called latent (hidden).

66. How are latent prints need to be made visible on plastic bags? Use of super glue fuming to make the print visible, then it is dusted and photographed.

67. Which Ridge Pattern type is the most common? Loop
68. How many points of comparison does an Examiner will need to say they have matched a fingerprint to an individual? 12 points of comparison to say it is a match

b.) What are the 4 main types of minutiae? Ridge endings, eyes or enclosures, bifurcations, islands or dots

71. a.) What are the main 3 types of fingerprint ridge patterns? 1.) loop 2.) whorl 3.) arch
b.) Duplicate Which type is most common? Loop

72. Ridge characteristics called __minutiae__ are the unique details in a fingerprint ridges, there are up to 150 per print.

73. What is a plastic print? Give an example of how it may have been created. It is 3-D, an individual has touched some type of pliable material (putty, wax, or chocolate, grease)

**Essay questions:** **Answer in complete sentences for full credit**

1. When making observations of tire evidence, what is the difference between a print and an impression as evidence?
2. Describe 4 unique characteristics of shoe impression evidence.
3. Is it possible to identify a suspect from a bare footprint left at a crime scene? Explain your answer.
4. Explain how investigators can solve crimes using dental evidence.
5. Where would latents be found and who would have left them? At a crime scene?
6. Explain why you should not place a suspect’s shoe on top of a bloody shoe print left on a kitchen floor.
7. What is the relationship between blood stain shape and the angle the blood drops?
8. Explain how the surface texture (rough versus smooth) will have an affect on the blood drop shape.
9. Explain how it is possible to have a false positive reaction for blood, say at a crime scene occurring at a restaurant.
10. Teeth are a better identifier than fingerprints, explain why?
11. What is trace evidence? How does it differ from other physical evidence?
12. What is the difference between comparison and identification when using physical evidence?
13. In criminal trials dental evidence can be helpful in what 2 ways?