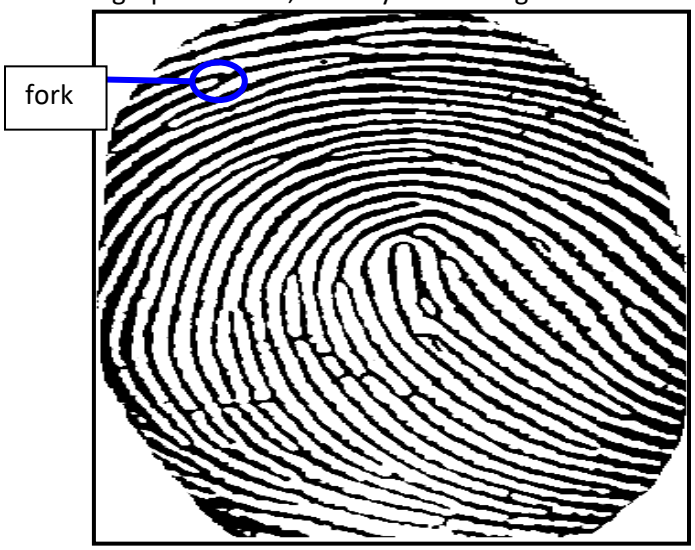
Forensic Science Final Study Guide

Practice questions:

1. What should you do in the forensics lab if you break a glass beaker full of chemicals? Describe the steps. Follow the instructor's directions for cleaning up the chemicals. Use a broom and dustpan to clean up the glass fragments, not your fingers. Dispose of the glass in the broken glass box.
2. What kind of behaviors are unacceptable in the lab? Anything that is not responsible science behaviors. Mixing chemicals that were not part of the procedure, putting extra things in the Bunsen burner, punching your friends, swinging keys, not wearing goggles, etc.
3. How do CSI-type shows affect actual criminal cases? Jurors expect to see forensic evidence in all criminal cases, which may influence their deliberations.
4. Define forensic science, toxicology, ballistics. Forensic science—applying science to "matters of law" (https://nij.ojp.gov/topics/forensics). Toxicology—analyzing samples for toxins and/or drugs (https://nij.ojp.gov/topics/articles/forensic-toxicology-research-and-development). Ballistics—studying the flight path of projectiles, like bullets (https://aboutforensics.co.uk/firearms-ballistics/).
5. Differentiate between class evidence and individual evidence. Individual evidence is unique to a single person or specific item, like fingerprints or DNA. Class evidence isn't unique to one person but to a group, like brown hair or type A+ blood.
6. Give three examples each of class evidence and individual evidence. Explain why each is classified as such. Class evidence: A+ blood—many individuals have this blood type; brown hair—just examining the hair with a microscope can't identify one person but several with brown hair; black cotton fiber—could have come from multiple black cotton fabrics. Individual evidence: DNA and fingerprints are unique to each person; bullet rifling pattern is specific to each gun.
7. Define observations and inferences. Observations: noting physical characteristics or points in an event. Inferences: conclusions based on observations
8. Give two examples each of observations and inferences. Observations: a friend has wet hair and smells like chlorine. Inferences: this friend just went swimming in a pool and hasn't showered yet.
9. In your class of 30 students, 7 are wearing jeans. What percentage of students in your class are wearing jeans? If you apply this percentage to the entire student body of 2214 students, how many of your peers might be wearing jeans? 7/30*100 = 23.3% of students in class are wearing jeans; 0.233*2214 = 517 students might be wearing jeans
10. Video surveillance shows the suspect in a crime wearing jeans. Is this "good" evidence? Probably not. There are many students wearing jeans, so this evidence does not help identify a suspect.
11. What is Locard's exchange principle? "Every contact leaves a trace." You collect traces of evidence as you go through your day, like your dog's fur sticking to your shirt or grains of sand lodging in your shoe tread. You also leave traces, like fingerprints on your table and hairs that fall out of your scalp as you walk through the halls.
12. How do you see Locard's exchange principle in your own life? Give specifics. See #11.

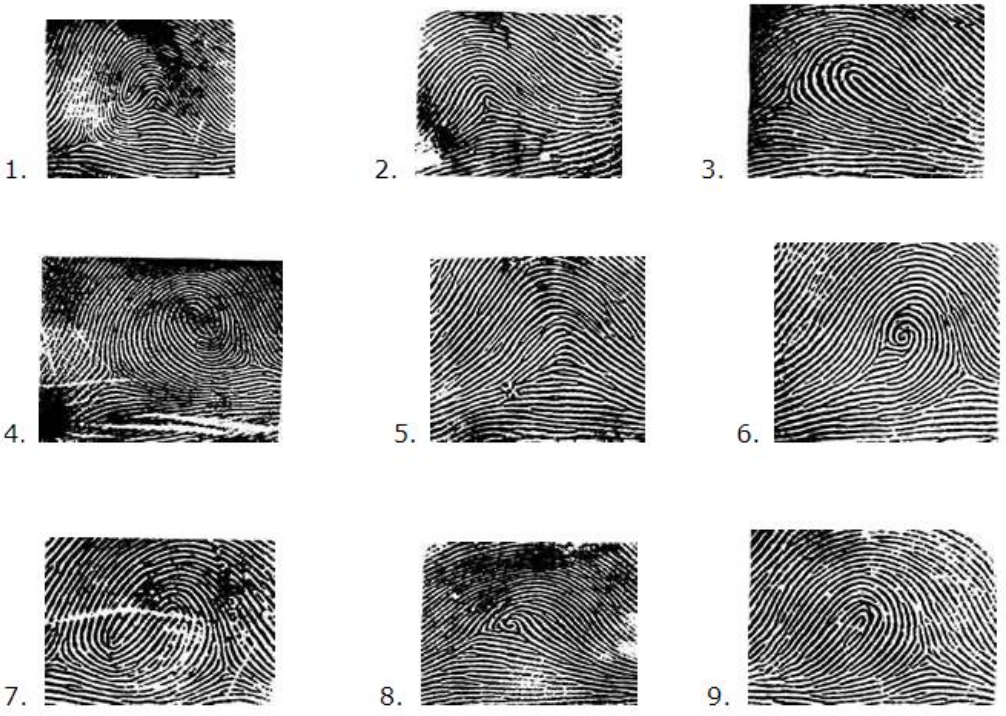
14. In the fingerprint below, identify at least eight different ridge characteristics.



You could circle and label characteristics like eyes, spurs, bifurcations, bridges, ridge endings, dots.

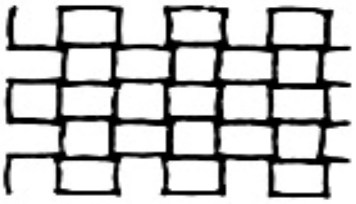
15. Identify each fingerprint pattern below using the classification groups listed:

Plain arch	Plain whorl
Tented arch	Central pocket loop
Radial loop (right thumb)	Double loop
Ulnar loop (right thumb)	

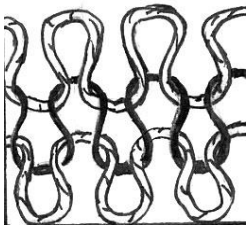


1 = whorl (accidental, don't worry about this types); 2 = tented arch; 3 = ulnar loop; 4 = plain whorl; 5 = plain arch; 6 = central pocket whorl; 7 = double loop; 8 = weird stuff; 9 = radial loop

16. Describe how you would dust for fingerprints. Describe the best method that you found for dusting prints. Talk about the type of powder and how you used the brush. How did you use the tape?
17. Draw a picture of a strand of hair as seen under a microscope. Label the different parts of the hair. Include cortex, medulla, and cuticle.
18. How are human hair and animal hair similar? Different? Describe the similarities and differences that you saw between the human hair and various animal hairs.
19. What information can be determined from looking at a hair under the microscope? What cannot be determined? Can determine color; cuticle pattern; diameter, distribution, shape, color intensity of pigment granules; scale type; medulla pattern; medullary index; maybe cross-section if you're fancy. Cannot determine DNA, age, or gender.
20. How is hair individual evidence? Explain. Nuclear DNA from root matches to only one individual.
21. How is hair class evidence? Explain. Class evidence if you look at color or other evidence seen under microscope in #19. This might not lead to a single individual but could be matched to several individuals.
22. Draw an example of a woven fabric. (left) Identify the warp (lengthwise) and weft (crosswise).



plain



23. Draw an example of a knitted fabric. Above right
24. What are natural fibers? Give at least three examples. Made from animal, vegetable, or inorganic substances. Cotton, wool, linen, asbestos, silk.
25. What are synthetic fibers? Give at least three examples. Synthesized from altered natural sources. Polyester, nylon, rayon, acrylic, spandex
26. In the fiber lab, what were some common properties of natural fibers? Synthetic fibers? Use your fiber lab to answer this.
27. How did specific fibers react to the chemicals in the fiber lab? How did they react to the dyes? Use your fiber lab to answer this.
28. How are a dissecting microscope and compound microscope different? Give several microscope tasks and identify which microscope is better suited for each task. Both have different ways of directing the light. Dissecting microscopes can shine a light on the surface from above and don't magnify as much. They can be useful when looking at well plates or dissecting a specimen. Compound microscopes shine light from below the slide. They can magnify more than dissecting microscopes. They can be used to look at very small specimens, hairs, or fibers.
29. A white cotton fiber was found on the red sweatshirt of a victim. A white cotton fiber was taken from a suspect's shirt. After testing 310 white shirts, the lab found the fiber matched 13 of them. What is the probability that the crime scene fiber and that of the suspect matched simply by chance? 13/310*100 = 4.2%

30. What does a high probability in the question above indicate? What does a low probability indicate? A high probability indicates that fibers from a lot of the shirts matched those found at the crime scene. A low probability indicates that fibers from only a few shirts matched.
31. In an investigation, is a high or low probability more useful? Explain. Probably a low probability. If you have a high probability, then many shirts can match and you won't be able to narrow your suspect list.
32. List the eight different blood types. O+, O-, A+, A-, B+, B-, AB+, AB-
33. Describe how you would experimentally determine the blood type of a suspect. You could use a kit similar to what we used in the lab and look for agglutination.
34. What does "agglutination" mean? Particles clumping. In the lab, agglutination of the simulated blood with the anti-A serum and not the anti-B serum indicated that the blood is type A.
35. If a suspect has type B+ blood,
    a. What ABO antigens are present on the red blood cells? B antigens
    b. What ABO antibodies are found in the blood? Anti-A antibodies
    c. If the suspect needed a blood transfusion, what types could they receive? B+, B-, O+, O-
    d. What blood types could safely receive this suspect's blood? B+, AB+
36. How is blood individual evidence? Explain. DNA found in blood can be linked to one individual.
37. How is blood class evidence? Explain. There are only 8 blood types, so many people will have each blood type, even though some types are more common than others.
38. In the blood splatter lab you performed three different experiments. Briefly describe how the blood splatters changed based on your variables. Describe the splatters based on your lab.
39. What does LD_{50} mean for a substance? The dosage that killed 50% of the test animals.
40. Use your mass in lbs to calculate your mass in kg. Show all work including units. Varies for each individual. I will be looking for correct calculations, all units shown, and you know what you're doing.
41. The LD_{50} in mice for ethanol is 8100 mg/kg of body mass. Using this information, calculate the grams of ethanol it would take to maybe kill you. Show all work including units. I will be looking for correct calculations, all units shown, and you know what you're doing.
42. You find an unlabeled bottle of other-the-counter painkillers. As a stellar forensic science student, describe how you would determine what painkiller it is. You can test known OTC painkillers like we did in the lab and compare the unknown's results with the known pills. Describe how you would do this and what tests you could run.