

# Person's Forensics Test

SSSS 2018-2019

*EXAM*

Competitor Names:

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School Name: \_\_\_\_\_

The information regarding the crime is in a separate packet. Unless otherwise noted, each question is worth 1 point (parts will be counted as “questions”). **For questions asking about who is implicated, the answer may have more than one suspect, or none at all.** You have 50 minutes, good luck!

1. A small pile of whitish crystal is found at the scene. A flame test shows a yellow color. What element is most likely present in the crystal?
  - a. After close examination, you discover that the sample was contaminated. What piece of equipment can be used to view the true color of the flame?
  - b. Using that piece of equipment, you find that the flame is red. Identify the substance and give its chemical formula.
  - c. Who does this substance implicate?

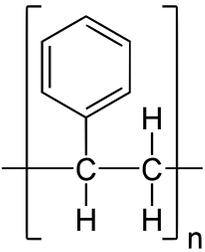
2. Complete the following table. Each cell is worth 0.5 point. All of the following powders were found at the crime scene. [12 pt total]

Substance	Formula	Flame Test	Uses (give one)	Implicated suspect(s)
		Green		
			Lethal injection	

	$C_{12}H_{22}O_{11}$			
Calcium nitrate				
Ammonium chloride				
	$NaCH_3COO$			

3. Name two medical applications of calcium carbonate. [2 pt]
  
4. The Solvay process can be used to synthesize which **two** powders on the list? [2 pt]
  - a. In one of this process' steps, carbon dioxide is passed through a concentrated aqueous solution of sodium chloride and ammonia. Write the described chemical reaction, giving both reactants AND products. [3 pt]
  
5. How can sucrose and glucose be differentiated? Give a brief 2-3 sentence description. [3 pt]

6. Complete the following table of polymers found at the crime scene. Each cell is worth 0.5 pt. [12 pt total]

Polymer (name or abbreviation)	Monomer	Flame Test	Uses (list one)	Implicated Suspect (s)
		Green		
Polypropylene				
			Water bottles	
				

			Six pack rings	
HDPE				

7. PMMA would float in:

- a. 25% NaCl solution
- b. Corn oil
- c. 46% isopropyl alcohol solution
- d. Distilled water

8. Which of the polymers has the recycling number 2?

9. What is the purpose of a desiccant in PETE production?

10. What makes nylon useful for food packaging?

11. A pair of glasses was found at the scene. Which of the polymers is commonly used to make lenses for glasses?

a. Who does this implicate?

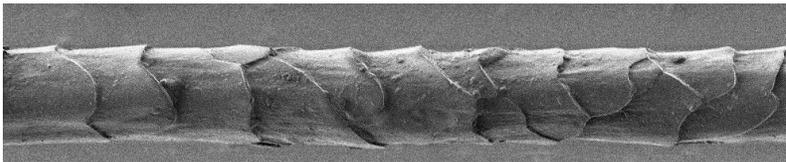
12. Give one example each of a plant, animal, and synthetic fiber. [1 pt each, 3 pt total]

13. Complete the following table of fibers found at the crime scene. Each cell is worth 0.5 points. [8 pt total]

<b>Fiber</b>	<b>Origin</b>	<b>Odor</b>	<b>Ash</b>	<b>Implicated suspect(s)</b>
	Sheep			
		Sweet, chemical scent		
			Sticky, gummy	

Linen				
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14. What is the scientific name of the organism that produces silk?
15. Why does silk appear to shimmer?
16. What protein is the structural center of silk?
17. Draw the cross sections of unmercerized and mercerized cotton. [2 pt]
- a. How does mercerization affect dye retention?
- b. Which other fiber on the list can be mercerized?
18. Identify the following fiber.



19. In an airplane, where a high level of safety is necessary, should carpets be made out of cotton or wool?

a. Why? [2 pt]

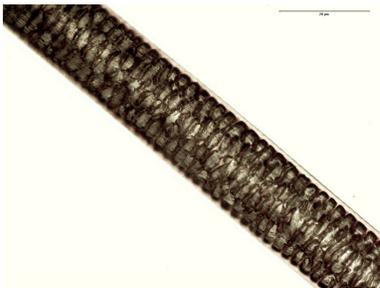
20. Linen is THIS type of fiber:

- a. Bast
- b. Leaf
- c. Stalk
- d. Seed

21. Identify the hair based on its description.

- a. Thin/invisible medulla, club shaped root
- b. Imbricate scales with few ovoid structures
- c. Fine diameter, coronal scales

22. Identify the following hair found at the crime scene.



a. Who does this implicate?

23. Which part of hair contains melanin?

24. What determines the shape of the hair shaft?

MATCHING: Answer A for anagen phase, C for catagen phase, and T for telogen phase. Each may be used more than once or not at all.

25. \_\_\_ Most hairs on the head are in this stage

26. \_\_\_ Also known as the “resting” phase

27. \_\_\_ Cells divide to form new fibers

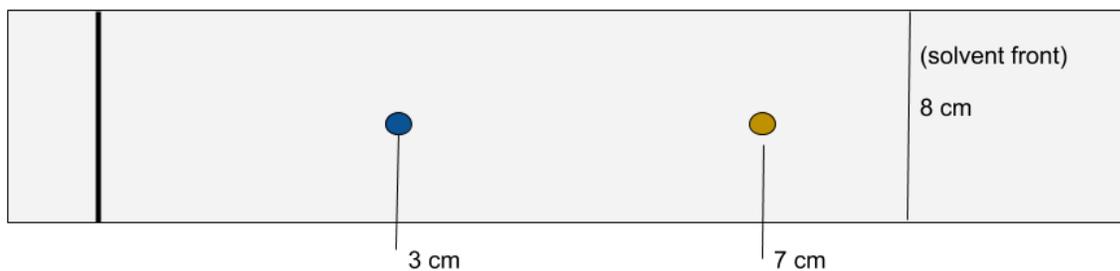
28. \_\_\_ Hair is cut off from blood supply

29. \_\_\_ Lasts 2-3 weeks

30. What are the stationary and mobile phases for paper chromatography?

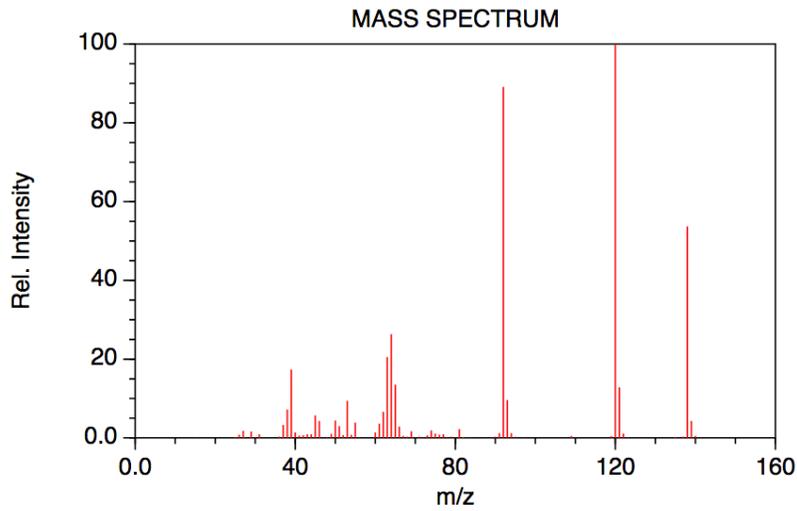
31. Which type of molecules generally has high R<sub>f</sub> values?

32. Calculate the R<sub>f</sub> value for the pigment at 3 cm. [2 pt]



a. Whose pen does this match?

33. Label the base peak on the following mass spectrum:



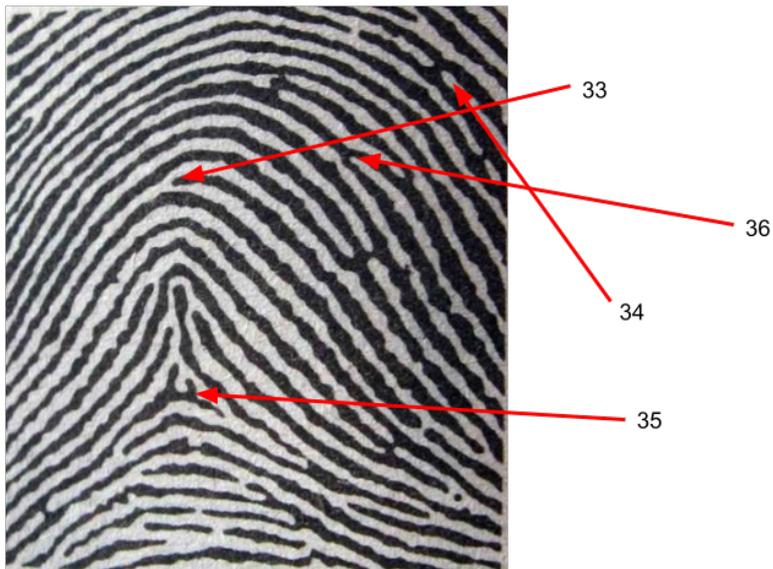
- a. What is the value of the M<sup>+</sup> peak?
- b. What substance is this?
- c. Who does this implicate?

34. What is Stephen's fingerprint pattern?

35. Make a basic drawing of a tented arch fingerprint.

- a. A tented arch fingerprint was found at the site. Who does this implicate?

Identify the minutiae indicated on the following picture:



36. \_\_\_\_\_

37. \_\_\_\_\_

38. \_\_\_\_\_

39. \_\_\_\_\_

40. Which fingerprinting technique is preferred for nonporous surfaces?

41. What does ninhydrin react with during fingerprinting?

42. Name the 3 layers of skin. [1 pt each, 3 pt total]

a. Which layer contains sweat glands?

b. Which layer provides insulation for the body?

c. Which layer contains the pigment responsible for skin color?

43. What are typically the first insects to arrive at a body?
- Blowflies
  - Flesh flies
  - Mites
  - Beetles
44. A body is found to have blowfly pupa in it. Assuming the body has stayed at a constant 70 °F, about how many hours ago did the person die?
45. A sample of blood agglutinates when treated with anti-A. What ABO type blood is this?
- What type(s) of blood could this person receive?
46. What is one visible difference between mammal and amphibian blood cells?
47. A blood spatter has a width of 1.2 inches and a length of 3.4 inches. What was the angle of impact?

48. Based on your findings, who committed the crime? Justify your answer. Be sure to include why you chose the suspect, as well as why you did NOT choose the others.

[46 pt]