

Science Crime Busters

Div. B

Northridge Invitational 2009

By Katie Mika



A) ____/50

B) ____/10

C) ____/5

D) ____/10

E) ____/25

Total: ____/100

CRIME

At 12:36pm today, in the coastal town of Granlago, a phone call was placed to the police from a local bakery. The police, not having much to do in this town other than watch the local tourists and eat donuts, responded quickly to a call from their favorite bakery. When they arrived, the baker told them that while he was at lunch someone broke into the bakery and stole all the donuts he had made for the day. Needless to say the police were furious and quickly on the case. While looking around, the police found many pieces of forensic information so they called in their forensic investigators (aka: you). The window on the door was broken through, presumably so the perpetrator could open the door, and there was a white powder there. There was also a shred of fabric on the door jam. The donuts were stored in the back room. Leading up to the door of the back room there was a trail of different powders, as well as a few hairs. The police also found a few powders on the way to the register. Back in the back room it seemed as if there was an explosion of powders and liquids and everything. This wasn't completely unexpected because the baker is know to be a bit of a slob. More hair, and even some fabrics, was found in the chaos. Along the way, the police found a few plastics. They found one in the front room and one in the back room. There was some blood on the on the broken window. The police believe that their perpetrator will have a cut on his hand. Fingerprints were found on the doorknob to the bakery and the doorknob to the back room. Lastly, the police found a scrap of paper with what seemed like a grocery list written on it with a pen.

The police found four suspects: the baker, a local hobo, a visiting surfer, and a frequent customer with a police record. Each has been interviewed and all their information is listed for you below.

Remember to wear your goggles at al times and to clean up when you are done.
Good Luck!

UNKNOWNNS

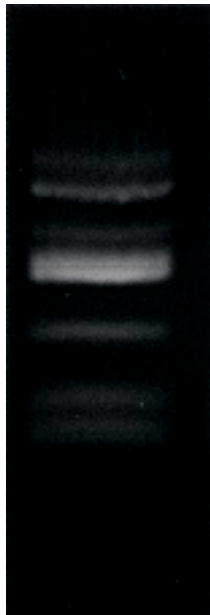
Found Fingerprint #1 (on entrance):



Found Fingerprint #2 (on door to the back room):



Unknown DNA from blood by door:



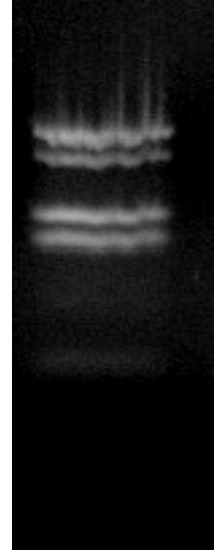
SUSPECTS

Bob Thatcher: The owner of the bakery that was broken into. Police believe that he was getting desperate for attention for his bakery because he was losing business to the new Dunkin Donuts that opened down the street. He doesn't have any pets because he is worried about accidentally getting hairs into something and selling to someone with allergies. It's bad for business. He uses a lot of cling wrap in the bakery.

Fingerprint:



DNA:



Joe Smith: The town's local hobo. He lives right next to the bakery. Joe generally goes into the bakery once a day asking for bread and Bob chases him out. Bob will occasionally throw bread out after him. The police think Joe got desperate and may have broken in to get some food. Joe is often seen in the company of a stray cat, affectionately named Muggles. He keeps all of his belongings in plastic bags he has found around town.

Fingerprint:



DNA:

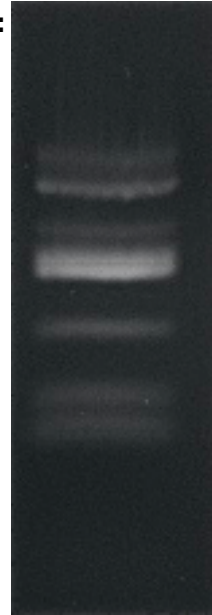


David Jones: A tourist who comes into town a few times a year to surf the waves on the local beach. He claims that they have the best waves around. Witnesses saw David and Bob arguing the other day at the beach about the rising prices in the bakery. They also heard David announce that he wouldn't go to the bakery until the prices came down. David says that claims that he broke in are ridiculous because he loves that bakery and has been going there since he was a child, but he did say he would not be going there any time soon. The police believe he may have broken in and stolen the donuts as a stand against the store's rising prices. David has a dog, named Killer, who he brings with him to Granlago every time he comes. He also always has a bottle of lemonade on him; he believes it has properties that help him surf.

Fingerprint:



DNA:



Julia Sommers: A local housekeeper with a record of breaking and entering. Police know that she goes to the bakery to buy bread for the family she works for. With her record, the police have decided to watch her as well. Julia says this is ridiculous. She was just there the day before while doing the family's shopping, why would she need to break in? And why would she steal donuts and not cash? Neither she, nor the family she works with, has any pets. She is allergic to fur. She always carries sandwich bags on her, in case one of the children need it for something, plus they make good temporary storage for small things. She has also been sick lately.

Fingerprint:



DNA:



ANSWERS

A. Qualitative Analysis (1pt. Each)

1	What is the identity of powder #1?	Calcium Carbonate
2	How did you identify it?	Reacts with HCL, Not soluble in water
3	Who does this implicate?	Joe Smith
4	What is the identity of powder #2?	Gypsum
5	How did you identify it?	Hardens in water
6	Who does this implicate?	Joe Smith
7	What is the identity of powder #3?	Cornstarch
8	How did you identify it?	Turns purple/black with KI
9	Who does this implicate?	Bob Thatcher
10	What is the identity of powder #4?	Powdered Alka-Seltzer
11	How did you identify it?	Reacts with HCL, KI, and H ₂ O
12	Who does this implicate?	Julia Sommers

13	What is the identity of powder #5?	Yeast
14	How did you identify it?	Tan Pellets
15	Who does this implicate?	Bob Thatcher
16	Name one use for this powder.	Bread
17	What is the identity of metal #6?	Aluminum
18	How did you identify it?	Fizzes in HCL, Delayed reaction, light density
19	Who does this implicate?	Bob Thatcher
20	What is the identity of metal #7?	Zinc
21	How did you identify it?	Reacts with HCL, shiny, heavy density
22	Who does this implicate?	Julia Sommers
23	What is the identity of metal #8?	Magnesium
24	How do you identify it?	Reacts with HCL, dull, light density, slightly reacts with water
25	Who does this implicate?	Joe Smith
26	What is the identity of liquid#9?	Lemon Juice

27	How did you identify it?	Low pH, citrus scent
28	Who does this implicate?	David Jones
29	What is the identity of liquid #10?	Household Ammonia
30	How did you identify it?	High pH, Odor
31	Who does this implicate?	Julia Sommers
32	What is the identity of liquid #11?	Water
33	How did you identify it?	Neutral pH, nothing
34	Who does this implicate?	Bob Thatcher, David Jones
35	What is the identity of powder #12?	Vitamin C
36	How did you identify it?	Clears KI, soluble in H ₂ O
37	Who does this implicate	Julia Sommers
38	What is the identity of powder #13?	Sugar
39	How did you identify it?	Soluble, slightly rounder than salt, caramelizes when burnt, smells when burnt

40	Who does this implicate?	Bob Thatcher
41	What is the identity of one of the powders in mixture #1?	Sand
42	How did you identify it?	Does nothing
43	What is the identity the other powder in mixture #1?	Table Salt
44	How did you identify it?	Soluble, crystalline, burns orange-nothing else
45	Who does mixture #1 implicate?	David Jones
46	What is the identity of one of the powders in mixture #2?	Baking Soda
47	How did you identify it?	Reacts with HCL, High pH
48	What is the identity of the other powder in mixture #2?	Powdered Gelatin
49	How did you identify it?	Gels in Water
50	Who does mixture #2 implicate?	Bob Thatcher

B. Polymer Testing/Natural and Man-made Substances (1 pt. Each)

51	What kind of hair is #1?	Human
52	What kind of hair is #2?	Cat

53	What kind of hair is #3?	Human
54	What kind of hair is #4?	Dog
55	Who does this implicate?	David Jones
56	What is fiber #1?	Cotton
57	What is fiber #2?	Cotton
58	What is polymer #1?	PETE
58	What is polymer #2?	LDPE
59	Who does this implicate?	Bob Thatcher

C. Paper Chromatography (5 pts)

60-64	Chromatography of suspects' pens versus the unknown. You must share the pens, located in the front.	Paperclip/staple your chromatography to your test. 1pt per pen.
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D. Crime Scene Physical Evidence (1 pt. Each)

65	Whose fingerprint is #1?	Joe Smith
66	What type is it?	Loop
67	Whose fingerprint is #2?	David Jones

68	What type is it?	Whorl
69	Name a third type of fingerprint.	Arch
70	What does AFIS stand for?	Automated Fingerprint Identification System
71	What is the most common type of fingerprint?	Loop
72	What is the least common type of fingerprint?	Arch
74	Whose DNA was found at the crime scene?	Bob Jones
75	Name the 4 DNA bases. Full names needed for credit.	Adenine, Cytosine, Guanine, Thymine

E. Analysis (25 points)

David Jones did it.

Supporting Evidence:

Lemon Juice

Water

Sand/Salt mixture

Dog Hair

PETE plastic

Pen matches

Fingerprint on the back door knob

DNA matches

All of this supports that David Jones stole the donuts because none of this evidence should exist in an everyday occurrence. David swore that he wouldn't go into the bakery until the prices come down so we know he isn't supposed to be there. His fingerprints shouldn't be on the door to the back room because only Bob Thatcher should be going in or out, no one else since it is not a room open to the public. The fact his pen matches that of the note and that his blood was found on the broken window are two other important clues that no one could match and he has no way of explaining off. All the unknowns and the dog hair point to him as well, and his surfing habits.

Why-----did not do it:

Bob Thatcher:

His Evidence:

- Cornstarch
- Yeast
- Aluminum
- Water
- Sugar
- Baking Soda/Gelatin
- LDPE

All of these materials are commonly found in a bakery and nothing is out of the normal. Because Bob is a bit of slob, on any given day that the police came into his bakery they could have found these powders. Nothing is unusual.

Joe Smith:

His Evidence:

- Calcium Carbonate
- Gypsum
- Magnesium
- Cat Hair
- Fingerprint on the front door

All of this evidence is also circumstantial. Joe lives right outside the bakery and goes into the bakery everyday. Because of his close living arrangements and daily habits, on any day the police investigated they could have found all of this evidence as well. And because Bob is slob, he may not have cleaned and the evidence would still exist a few days later. Nothing is unusual.

Julia Sommers:

Her Evidence:

- Alka-Seltzer
- Zinc
- Ammonia
- Vitamin C

All of these unknowns are common to either treating an illness or cleaning. Since Julia is sick and a housekeeper we know that these could be present on her at all times lately. We also know that she was just at the bakery yesterday, and once again due to Bob's cleaning habits, the evidence she left behind could still remain. Plus, she has no other incriminating evidence. All of these fit, there is nothing unusual.