

Team # _____

Name _____

Name _____

Science Olympiad
Virginia Regional
Tournament
2009

Science Crime
Busters

Crime:

A cat was missing from a home on the 1400 block of Main Street. The home was well-known in the neighborhood for its beautiful gardens and had just had the clay soil amended to loosen it up a bit. The owner, an elderly grey-haired woman who lived alone, heard the cat's call of distress earlier that morning. She had assumed it just wanted to get into the house. A note was found in the woman's mailbox written in a water soluble ink. It read, "Your cat has annoyed me for the last time. Finally we can have some peace around our neighborhood!" A chromatogram was made from the ink on the note. The cat was discovered unharmed in a dumpster and returned to the woman. There were hairs found on the cat that were not cat hairs, and the owner had no other pets. Fibers and hair were removed from the claws of the cat.

Suspects:

Suspect #1

Suspect is a 12 year old male with brown hair
Was wearing a torn polyester shirt
Always seems to be in trouble with authorities
Was eating jello that morning
Was seen drinking bottled water and walking down Main Street in the morning.

Suspect #2

Suspect is a 62 year old female with grey hair
Was wearing a wool shirt with a small hole in it
Was seen walking her chocolate Labrador retriever down Main Street in the morning while drinking her coffee with lots of cream and sugar
She carried a small aluminum pipe for protection
Last month she complained that the cat scratched her dog as it passed the house.

Suspect #3

Suspect is a 25 year old male with brown hair
Lives in the adjacent house
Was busy with the installation of a new hot tub
Enjoys leather tanning as a hobby
Was wearing an old wool shirt and a pair of ragged jeans
Was seen in the morning sitting on his deck taking his vitamins

Suspect #4

Suspect is a 10 year old male with brown hair
Suspect's yard backs up to the woman's house
Was wearing a polyester soccer jersey and nylon pants with a rip in the knee
Was seen in the yard in the morning launching bottle rockets for a science project
Was baking cookies earlier that day

Evidence was collected from the scene and the suspects homes as follows:

Sample: Location Found:

A	Clothing of suspect #3
B	In the backyard
C	In the kitchen of suspect #1
D	By the garden
E	In the dumpster
F	In the kitchen of suspect #4
G	In the kitchen of suspect #4
H	In the kitchen of suspect #4
I	In the backyard
J	In the dumpster
K	In the house of suspect #1
L	In the house of suspect #2
M	In the dumpster
N	In the backyard
O	Clothing of suspect #3
P	Clothing of suspect #1 & 4
Q	In the cat's claws
R	In the cat's claws
S	Ink from threatening note found in mailbox

Part 1: Qualitative Analysis (50%)

Identify the unknown substances found at the crime scene.

Unknown solid A	___ sodium acetate _____	(3 1/3pts)
Unknown solid B	___ calcium carbonate _____	(3 1/3pts)
Unknown solid C	___ yeast _____	(3 1/3pts)
Unknown solid D	___ calcium sulfate (gypsum) _____	(3 1/3pts)
Unknown solid E	___ vitamin C (ascorbic acid) _____	(3 1/3pts)
Unknown solid F	___ cornstarch _____	(3 1/3pts)
Unknown mixture G	___ sugar _____	(3 1/3pts)
	___ powdered gelatin _____	(3 1/3pts)
Unknown mixture H	___ table salt _____	(3 1/3pts)
	___ flour _____	(3 1/3pts)
Unknown liquid I	___ water _____	(3 1/3pts)
Unknown liquid J	___ rubbing alcohol _____	(3 1/3pts)
Unknown liquid K	___ 3 % hydrogen peroxide _____	(3 1/3pts)
Unknown liquid L	___ vinegar _____	(3 1/3pts)
Unknown metal M	___ tin _____	(3 1/3pts)

Part 2: Polymer/Natural and Man-made Substances Testing (10%)

Identify the unknown substances found at the crime scene.

For plastics choose from: PETE, HDPE, PS, LDPE, PP, PVC

For hair choose from: human, dog, cat

For fibers choose from: animal, vegetable, synthetic

Unknown plastic N PVC (2pts)

Unknown hair O cat (2pts)

Unknown hair P human (2pts)

Unknown fiber Q animal (wool) (2pts)

Unknown fiber R vegetable (cotton) (2pts)

Part 3: Chromatography (5%)

Sample S represents the ink in the note from the woman's mailbox.

Do a paper chromatogram. You may use the flask and the paperclip for the developing chamber if you wish.

Tape the chromatogram in the space below.

Part 4: Scene Physical Evidence (10%)

The broken broom was found at the crime scene. The fingerprints left on it had 5 different fingers with an arch characteristic.

Identify the suspect that matches these prints: Suspect # 3 (8 pts)

Give clear evidence for your selection: (2pts)

Analysis of the Crime: (25%)

Suspect #	Things that implicate this suspect: (4pts each)
1	answers vary
2	answers vary
3	answers vary
4	answers vary

Which samples seemed to implicate none of the suspects? Explain. (4pts)

_____ answers vary _____

Which of the four suspects was the most probable for kidnapping the cat?

_____ 3 _____ (5 pts)

Plastic Sample

N

Hair Samples

O

P

Fiber Samples

Q

R