

Crime Busters 2019 SSSS Practice Test Key

Qualitative Analysis

(Lab Set-Up Directions: Provide 4 grams of each powder sample (2 grams of each substance for mixtures), 4 mL of each liquid, and 2 mini pieces of each metal put into plastic containers. As per the rules, also provided Iodine reagent (KI solution), 1M HCl, and distilled water (max 250mL).)

Sample	Identification (2pts per substance)	Who does it implicate? (1pt max)
P1	Flour	N/A
P2	Calcium Carbonate	Derrick B. Robert K.
P3	Vitamin C	Jane B. Nancy Z.
P4	Sand	N/A
P5	Alka Seltzer	Jane B.
Mix1	Cornstarch + Sugar	Jane B.
Mix2	Baking Soda + Salt	N/A
Mix3	Gelatin + Gypsum	Derrick B. Robert K.
L1	Water	N/A
L2	Lemon Juice	Robert K.
L3	Vinegar	Nancy Z.
M1	Copper	Robert K.
M2	Aluminum	Robert K.

Qualitative General Questions

- 1.a Cornstarch
- 1.b Yeast
- 1.c Alka Seltzer
- 2. Starch (b)

Polymer Testing/Natural and Man-made Substances

(Lab Set-Up Directions: Provide one strand of each fiber type, one strand of each hair sample, and one piece of each plastic type each in a bag/container. Also provide matches/a candle for burning the fibers and a microscope for each pair if possible. For the sake of organization, provide a sample body of corn syrup and different NaCl Solutions for each team or table with density labeled for density comparison for the plastics. (No burning plastics)

Sample	Identification (1pt each)
F1	Animal
F2	Synthetic
H1	Human
H2	Human
PL1	PETE
PL2	PVC
PL3	Non-expanded PS

Polymer Testing/Natural and Man-made Substances Concept Questions

1. False
- 2a. Synthetic
- 2.b Animal
- 2.c Vegetable
3. LDPE, HDPE, PP, PVC

Paper Chromatography

(Lab Set-Up Directions: Select 4 different pens and label each one as belonging to one of the suspects. Use the pen belonging to Robert Keeling to write the note from the background and provide it to the competitors along side the four pens. Provide filter paper, chromatography solvent (like dH_2O), and tape.)

Each chromatogram is worth 0.5 points if a lab is completed, otherwise the 3.5 points will be completely distributed to the question.

1. Robert Keeling wrote the message.
2. Mobile and Stationary

Physical Evidence

Fingerprints

- 1.a Whorl
- 1.b Loop
- 1.c Whorl
- 1.d Whorl
- 1.e Arch
- 2.a Robert Keeling's RH thumb
- 2.b Robert Keeling's RH index
- 2.c Robert Keeling's LH middle
- 3.a Latent
- 3.b Patent
- 3.c Plastic

Blood Spatter

1. NW (WNW also acceptable)
2. Medium Velocity (B)
3. a Spine
3. b Satellite Drop
- 4a. A
- 4b. AB
- 4.c A
- 4.d O
- 4.e B

Soil

1. Robert Keeling
2. Oxides

Analysis

The suspect most likely of committing crime is Robert Keeling (2 points)

Motive: Wanted to teach students a lesson *Other answers open to ES interpretation.* (1 pt)

Evidence + Reasoning: (10 pts max)

- Matching Qualitative Evidence to his background (max 4 points): P2, Mix 3, L1, L2, M1, M2
- Matching Fiber, Hairs, and Plastics: F1, H1, PL2, PL3 (max 3 points)
- Matching Fingerprints
- Matching Pen
- Matching Blood Type
- Matching Soil Sample

Disproving other suspects: (9 pts) 1 pt for each mention, 1 pt for each of their alibis, and 1 pt for evidence.

- Derrick Briwin: Due to dealing with a variety of travelers, it is plausible for some specks of sand to be left behind on his uniform.
- Jane Boron: Considering how often kids eat in her classroom, it wouldn't be far fetched that she has picked up remnants of some ingredients like flour.
- Nancy Zhon: Baking soda is a common additive while salt is a natural preservative, meaning it is fairly likely for her to pick up powders from work.