Kidnapped

Teacher Information

Summary

Students conduct simulated forensics tests to determine which suspect might have kidnapped a wealthy celebrity.

Core Concepts

Laboratory tests can be used to analyze evidence from a crime scene.

Time Required

Two 40-minute class periods

Suggestion

The Forensic Report sheet for this lab activity is on the last page. To make it easier for students, you may tell them to tear this page off for use during the lab activity.

Kit contains

- Tubes of Anti-A and Anti-B Antibodies and labeled droppers
- Tubes of Blood from Crime Scene and from Suspects A, B, and C and labeled droppers
- Blood Type Test Strip
- Bag of White Powder
- White Powder Test Strip
- Small scoop
- Tube of Starch Indicator and labeled dropper
- Tube of Acid and labeled dropper
- Photos of Fingerprints
- Chromatography paper with ink samples
- Plastic cup for chromatography
- Simulated DNA electrophoresis gel
- Plastic tray for gel staining
- Tube of DNA stain
- Stirrer
- Small measuring cup

Teacher Provides

- Safety goggles
- Access to water
- Paper towel for clean-up

Warning: Choking Hazard This Science Take-Out kit contains small parts. Do not allow children under the age of seven to have access to any kit components.

Reusing *Kidnapped* kits

Kits may be refilled and reused. Allow approximately 30 minutes for refilling 10 student kits. Teachers will need to instruct students on how to handle clean-up and return of the re-usable kit materials. For example, teachers might provide the following information for students:

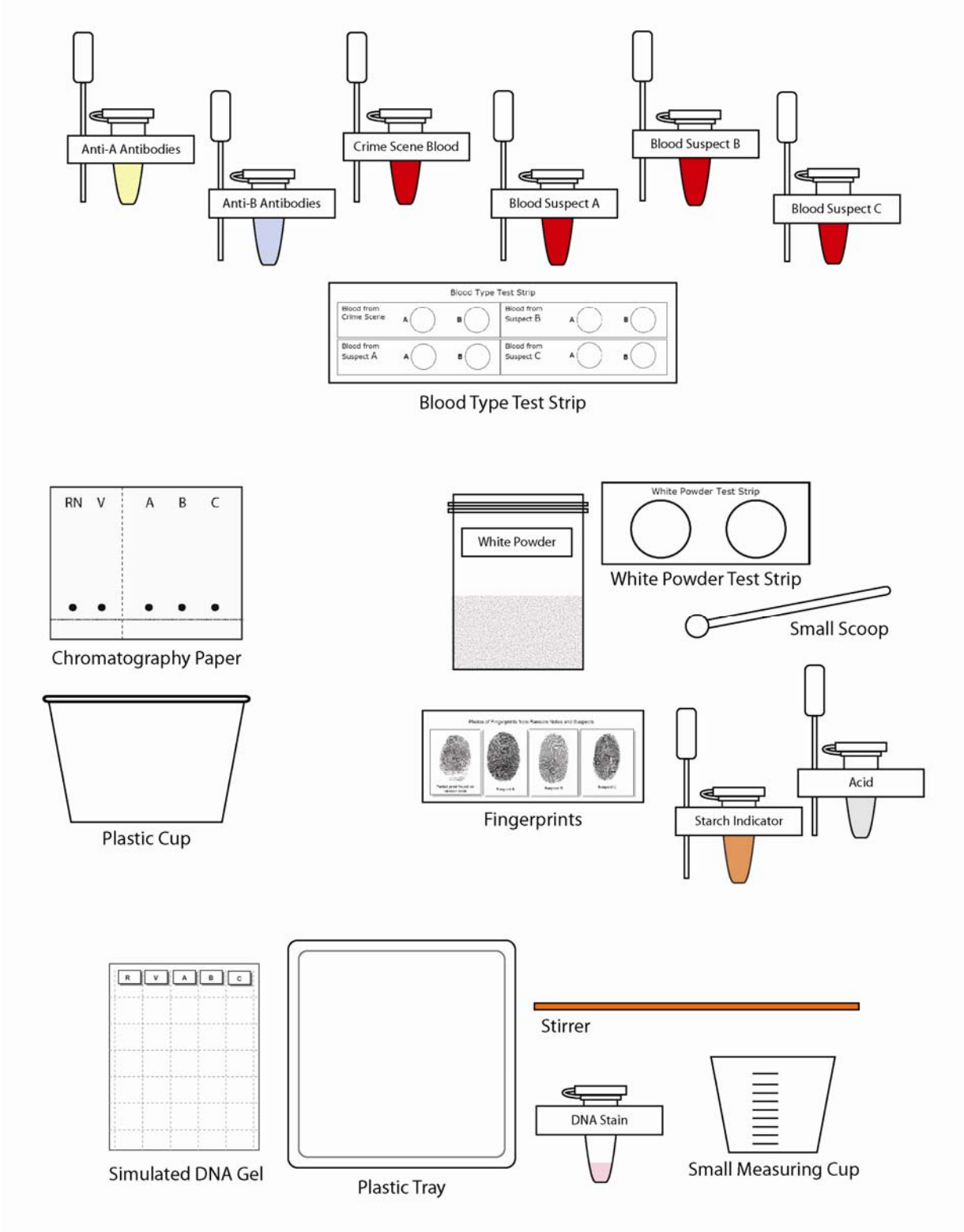
Discard	Rinse with water and dry with paper towel	Refill and Return to kit
• Used chromatography paper • Used electrophoresis gel • Used DNA stain	• All droppers • Blood type test strip • Chromatography cup • Plastic tray and stirrer • Small scoop	• All labeled microtubes • All labeled droppers • Plastic tray and stirrer • Chromatography cup • Small scoop • Small measuring cup • Fingerprint photos • Blood Type Test Strip • White Powder Test Strip

***Note:** Consider laminating printed parts of the kits (such as the fingerprints) that will be reused.

Refills for the *Kidnapped* kits are available at www.sciencetakeout.com. The 10 Kit Refill Pack includes the following materials:

- 10 electrophoresis gels (pre-spotted)
- 10 ink chromatography papers (pre-spotted)
- 10 ml of each of the following blood testing materials:
    - Anti-A and Anti-B antibodies
    - Blood samples from crime scene and Suspects A, B, and C
- White Powder
- 10 ml of Acid
- 10 ml of Starch Indicator
- DNA Stain
- 8 graduated droppers and small scoop (for refilling tubes)

Kit Contents Quick Guide



Read these instructions before using Science Take-Out kits

Parental or Adult Supervision Required

This kit should be used only under the supervision of an adult who is committed to ensuring that the safety precautions below, and in the specific laboratory activity, are followed.

Safety Goggles and Gloves Strongly Recommended

We encourage students to adopt safe lab practices, and wear safety goggles and gloves when performing laboratory activities involving chemicals. Safety goggles and gloves are not provided in Science Take-Out kits. They may be purchased from a local hardware store or pharmacy.

Warning: Choking and Chemical Hazard

Science Take-Out kits contain small parts that could pose a choking hazard and chemicals that could be hazardous if ingested. Do not allow children under the age of seven to have access to any kit components. Material Safety Data Sheets (MSDS) provide specific safety information regarding the chemical contents of the kits. MSDS information for each kit is provided in the accompanying teacher instructions.

Chemicals Used in Science Take-Out Kits

Every effort has been made to reduce the use of hazardous chemicals in Science Take-Out kits. Most kits contain common household chemicals or chemicals that pose little or no risk.

General Safety Precautions

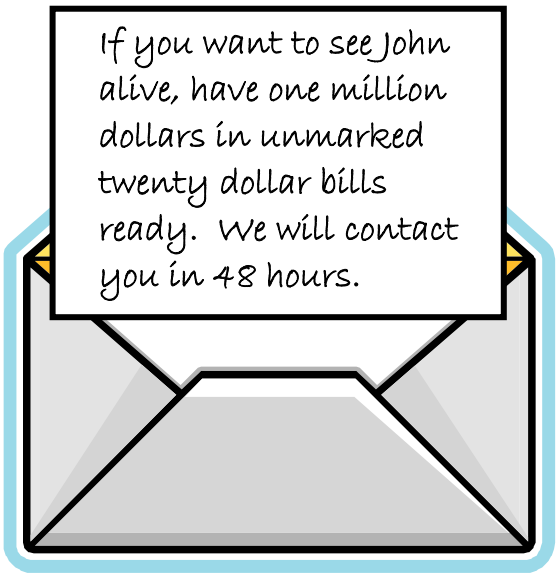
1. Work in a clean, uncluttered area. Cover the work area to protect the work surface.
2. Read and follow all instructions carefully.
3. Pay particular attention to following the specific safety precautions included in the kit activity instructions.
4. Goggles and gloves should be worn while performing experiments using chemicals.
5. Do not use the contents of this kit for any other purpose beyond those described in the kit instructions.
6. Do not leave experiment parts or kits where they could be used inappropriately by others.
7. Never taste or ingest any chemicals provided in the kit - they may be toxic.
8. Do not eat, drink, apply make-up or contact lenses while performing experiments.
9. Wash your hands before and after performing experiments.
10. Chemicals used in Science Take-Out experiments may stain or damage skin, clothing or work surfaces. If spills occur, wash the area immediately and thoroughly.
11. At the end of the experiment, return ALL kit components to the kit plastic bag. Dispose of the plastic bag and contents in your regular household trash.

No blood or body fluids from humans or animals are used in Science Take-Out kits. Chemical mixtures are substituted as simulations of these substances.

Kidnapped: *Teacher Answer Key*

The Case

A wealthy celebrity has been kidnapped. The note found at the crime scene says that the kidnap victim will be released if a ransom of a million dollars is paid within 48 hours.



The police have three male suspects (A, B, and C) in temporary custody. These suspects were seen entering the victim's home on the day of the kidnapping.

The police would like you to do a preliminary forensic analysis of the evidence that was collected. They will use the information from this analysis to determine which of the suspects should be arrested for this crime.

Important: Before beginning this lab activity, you should tear off the Forensics Report on the last page of this lab packet. You will use this Forensics Report to record the data from your laboratory work.

Forensic Test 1: Blood Typing

Drops of blood were found at the crime scene. These might be from the kidnap victim or from one of the suspects. According to medical records, the victim's blood type is O.

For this forensic test you will use:

- Tubes of blood from Crime Scene and from Suspects A, B, and C
- Tubes of Anti-A and Anti-B Antibodies
- Blood Type Test Strip
- Droppers labeled: Crime Scene Blood, Blood Suspect A, Blood Suspect B, Blood Suspect C, Anti-A Antibodies, and Anti-B Antibodies

1. Use the Blood Typing instructions on the right to determine the blood type of the blood at the crime scene and blood from each of the suspects (A, B, and C).

2. Record the blood types of the samples on the Forensic Report.

3. Based only on the results of the blood type testing, what can you conclude? Record your conclusions on the Forensic Report.

Blood Typing

1. Place the plastic "Blood Type Test Strip" onto the sheet of black paper.
2. For each of the blood samples, place 1 drop of blood into the appropriate circles (Crime Scene, Suspect A, Suspect B, or Suspect C)
3. Add 1 drop of Anti-A Antibodies to each circle labeled A.
4. Add 1 drop of Anti-B Antibodies to each circle labeled B.
5. Observe which samples clump and do not clump.
6. Use the chart below to determine the blood type.

Blood type	Mixed with Anti-A Antibodies	Mixed with Anti-B Antibodies
A	Clumps	No clumps
B	No clumps	Clumps
AB	Clumps	Clumps
O	No clumps	No clumps

Forensic Test 2: Ink Analysis

The ransom note was written using black ink. **Chromatography** can be used to separate the pigments in inks.

For this forensic test you will use:

- Chromatography paper with ink samples
- Plastic cup for chromatography
- Tap water

The police have provided a piece of chromatography paper spotted with ink samples from:

- The ransom note (**RN**)
- A pen found in the home of the victim (**V**)
- Pens found in the homes of Suspects (**A**, **B**, and **C**).

1. Follow the directions on the right to use chromatography to compare the ink samples.

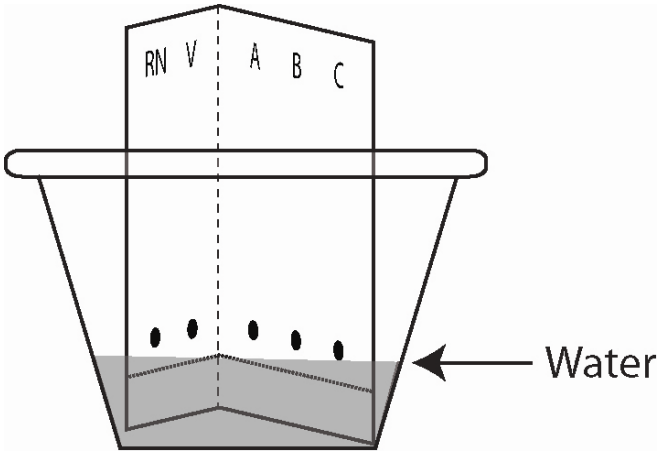
2. Record the results of the ink chromatography test on the Forensic Report.

3. Based <u>only</u> on the results of the ink chromatography test, what can you conclude? Record your conclusions on the Forensic Report.

Ink Chromatography

1. Add just enough water to cover the bottom of the cup approximately 0.5 cm deep.

2. Fold and stand the chromatography paper (with ink samples) in the cup as shown in the diagram below.



3. As the water moves up the chromatography paper, it will drag the ink samples through the chromatography paper. Because the pigments in the inks move at different rates, they will separate into colored bands of pigments.

4. While the ink samples are moving up the chromatography paper, **go on to Forensic Test 3**.

Forensic Test 3: White Powder Analysis

A suspicious white powdery substance was found at the crime scene.

- Suspect A works in a bakery. The white powder may be flour which contains starch.
- Suspect B works for a landscaping company. The white powder may be lime used to treat lawns.
- Suspect C is unemployed. He has visited Suspects A and B while they were working and may have come in contact with flour or lime.

For this forensic test you will use:

- Bag of White Powder
- White Powder Test Strip
- Small scoop
- Tube of Starch Indicator
- Tube of Acid
- Droppers labeled: Starch Indicator and Acid

1. Follow the directions to the right to test the white powder collected at the crime scene. Record the results of the powdery substance testing on the Forensic Report.

2. Based only on the results of the white powder testing, what can you conclude? Record your conclusions on the Forensic Report

3. Remember to check the chromatography paper before you start Forensic Test 4!

White Powder Testing

1. Place a small scoop of the white powder into each of the two circles on the "White Powder Test Strip."

2. Add two drops of Acid to the powder in one of the circles. If the powdery substance is lime, it will fizz when mixed with Acid.

3. Add two drops of Starch Indicator to the powder in the other circle. If the powdery substance is flour, it will turn blue-black when mixed with Starch Indicator.

Forensic Test 4: Fingerprint Analysis

The fingerprint lab has sent photos of a partial fingerprint that they lifted from the ransom note. They have also collected fingerprints from the suspects.

For this forensic test you will use the *Photos of Fingerprints from Crime Scene and Suspects*.

1. Observe the *Photos of Fingerprints from Crime Scene and Suspects*. Compare the partial fingerprint from the ransom note with the fingerprints of the three suspects.

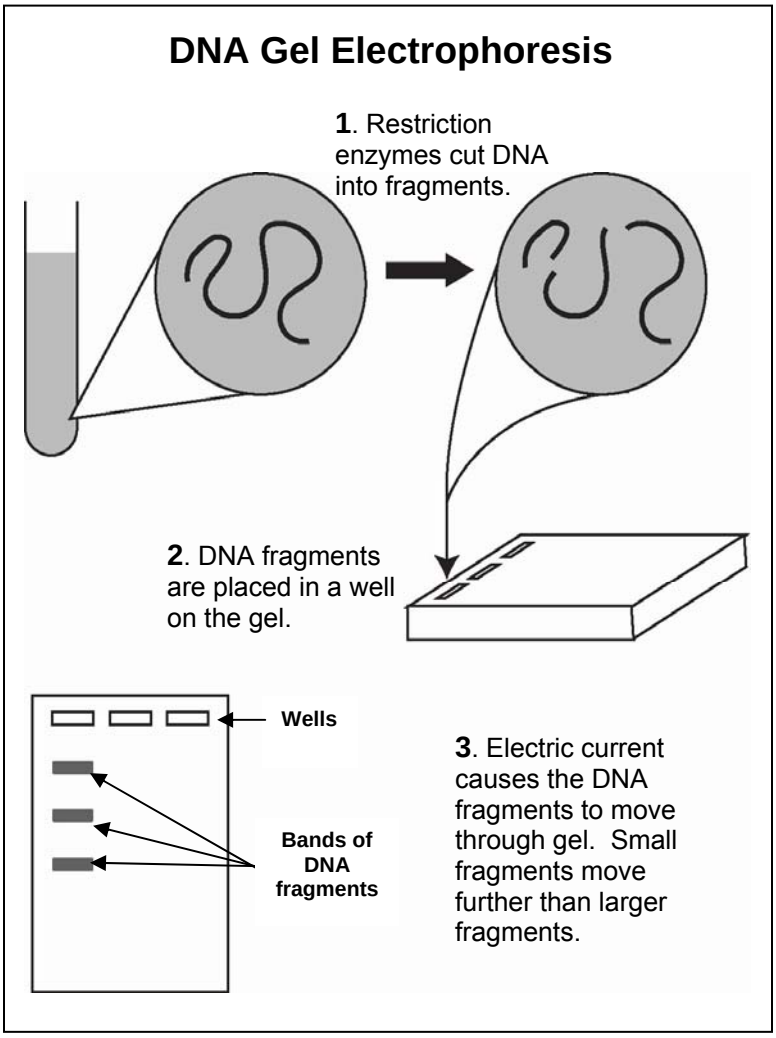
2. Record the results of the fingerprint comparisons on the Forensic Report.

3. Based only on the results of the fingerprint analysis, what can you conclude? Record your conclusions on the Forensic Report

Forensic Test 5: DNA Gel Electrophoresis

The DNA lab has been able to obtain a small amount of DNA from dried saliva on the flap of the envelope that contained the ransom note. The DNA lab has also obtained samples of the DNA from strands of the victim's hair found at the crime scene and from each of the suspects.

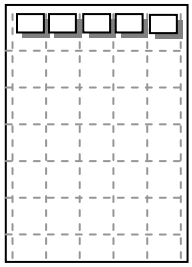
The DNA lab used a process called **gel electrophoresis** to analyze the DNA. The steps in DNA gel electrophoresis are shown in the diagram below.



For this forensic test you will need:

- Simulated DNA electrophoresis gel
- Plastic tray for gel staining
- Tube of DNA stain
- Stirrer
- Small measuring cup
- Water

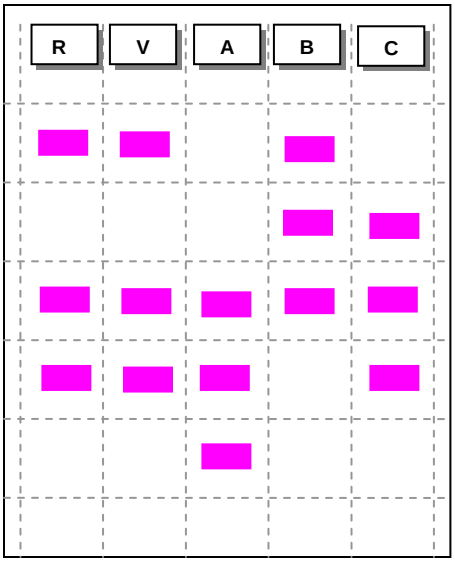
1. Your lab kit contains the electrophoresis gel that the DNA lab prepared.



   - Well **R** contains DNA from the ransom note.
   - Well **V** contains DNA from the victim.
   - Wells **A**, **B**, and **C** contain DNA from Suspects A, B, and C.

2. You can't see the DNA fragments in the gel because DNA is not colored. If you place the gel into DNA stain, the stain will turn the DNA pieces pink.
   - Pour the tube of DNA stain into the plastic tray.
   - Fill the small measuring cup with 10 ml of tap water and then pour the water into the plastic tray. Use the stir stick to stir the contents of the tray until the DNA stain dissolves completely.
   - Place the paper electrophoresis gel into the tray. Use the plastic stir stick to gently push the gel into the stain.

3. Compare the bands of DNA fragments for the DNA samples. On the diagram of the electrophoresis gel (below), draw the DNA bands. If DNA samples came from the same person, the patterns of bands should match.



4. Based only on the results of the DNA gel electrophoresis analysis, what can you conclude? Record your conclusions on the Forensic Report.

Summary Recommendations

1. What evidence suggests that Suspect A might have been involved in the crime?

   Suspect A's blood matches the type of blood found at the crime scene.

2. What evidence suggests that Suspect B might have been involved in the crime?

   The white powder found at the crime scene is lime and Suspect B works as a landscaper who uses lime to treat lawns.

3. What evidence suggests that Suspect C might have been involved in the crime?

   The ink from a pen found at Suspect C's house matches the ink on the ransom note. Also it is possible that Suspect C was exposed to lime when he visited Suspect B at work.

4. Do you think that there is sufficient evidence for the police to arrest suspects A, B, or C for the kidnapping crime?

   No. While there is some evidence linking suspects A, B, and C to the crime scene, there could be other explanations for why that evidence was at the crime scene.

5. Based on analysis of <u>all</u> of the evidence, who do you think is most likely responsible for the kidnapping crime? Support your answer using evidence from your test results.

   The DNA and ink found on the ransom note indicate that the victim may have faked the kidnapping.

Forensic Report Lab Technician's Name _____

1. Blood Typing

Test Samples	Blood Type
Victim's blood type	**O**
Blood at crime scene	***O***
Suspect A	***O***
Suspect B	***B***
Suspect C	***A***

Conclusions:

The blood at the crime scene could be from the victim or from suspect A.

2. Ink Chromatography

Test Samples	Matches ink on ransom note? (Yes, No, or Inconclusive)
Victim's pen	***Yes***
Suspect A's pen	***No***
Suspect B pen	***No***
Suspect C's pen	***Yes***

Conclusions:

The ink from the ransom note matches the ink from a pen found in the victim's house and in suspect C's house.

3. White Powder Test Results

Observations:

Powder fizzed when acid was added to it.

White Powder is: ***lime***

Conclusions:
The white powder is lime. Suspect B is a landscaper and Suspect C visited him at work so they might be the source of white powder.

4. Fingerprint Analysis Results

Test Samples	Matches fingerprint on ransom note? (Yes, No or Inconclusive)
Suspect A	***No***
Suspect B	***No***
Suspect C	***No***

Conclusions:

The print found on the ransom note does not match the prints from any of the suspects.

5. DNA Gel Analysis Results

Test Samples	Matches DNA on ransom note envelope (**R**)? (Yes, No or Inconclusive)
V - DNA from Victim	***Yes***
A - DNA from Suspect A	***No***
B - DNA from Suspect B	***No***
C - DNA from Suspect C	***No***

Conclusions:

The DNA from the victim matches the DNA from the ransom note envelope.

MATERIAL SAFETY DATA SHEET

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name (as printed on the label):
"Suspect B Blood" (simulated), "Suspect C Blood" (simulated)
"Anti-A antibodies" (simulated), "Anti-B antibodies" (simulated)

Product identity: Food coloring – < 0.1% Inorganic salts – 8-16%
Water – 84-92%

Manufacturer: Science Take-Out, LLC
P.O. Box 205
Pittsford, NY 14534

Telephone number for information: (585)764-5400
Preparation date of this MSDS: 10/5/08
Medical emergency phone number (Chemtrec): (800) 424-9300

2. COMPOSITION/INFORMATION ON INGREDIENTS

This product contains no hazardous materials as defied by the OSHA Hazards Communications Standard
Chemical Ingredients: Red food coloring (1%) Chemical Name: N/A
CAS Number: N/A Formula: N/A Synonyms: N/A
Principle Hazardous Components: No Data
TLV and PEL units: No Data OSHA-PEL 10ppm (TWA): No Data

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW
Avoid skin and eye contact.

Potential Health Effects EYES: May cause irritation. SKIN: May cause irritation.

4. FIRST AID MEASURES

EYES - Flush with water for at least 15 minutes, raising and lowering eyelids occasionally. Get medical attention if irritation persists.
SKIN - Thoroughly wash exposed area.

5. FIRE FIGHTING MEASURES No data available

6. SPILL OR LEAK PROCEDURES

Wear proper eye and skin protection. Mop/wipe spill area. Rinse with water.

7. HANDLING AND STORAGE Avoid eye and skin contact

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Respiratory Protection: N/A Ventilation: N/A
Protective Gloves: Natural rubber, Neoprene, PVC or equivalent.
Eye Protection: Splash proof chemical safety goggles should be worn.
Other Protective Clothing or Equipment: None

9. PHYSICAL AND CHEMICAL PROPERTIES

Molecular Weight: No data Melting Point: N/A
Boiling Point: No data Vapor Pressure: No data
Vapor Density (Air=1): No data Specific Gravity (H_2O=1): No data
Percent Volatile by Volume: No data Evaporation Rate (BuAc=1): No data
Solubility in Water: Soluble
Appearance and Odor: Simulated "blood" - Red liquid; Anti-A – Yellow liquid; Anti B – Blue liquid

10. STABILITY AND REACTIVITY

Stability: Stable Conditions to Avoid: No data
Incompatibility (Materials to Avoid): None Hazardous Decomposition Products: No Data
Hazardous Polymerization: Will not occur

11. TOXICOLOGICAL INFORMATION

Toxicity Data: No data Effects of Overexposure: See section 3
Target Organs: Eyes and skin Primary Route(s) of Entry: Eye or skin contact.

12. ECOLOGICAL INFORMATION No data

13. DISPOSAL CONSIDERATIONS Can be disposed of in trash or down the sink.

14. TRANSPORTATION INFORMATION D.O.T. SHIPPING NAME: N/A

15. REGULATORY INFORMATION N/A

16. ADDITIONAL INFORMATION

The information provided in this Material Safety Data Sheet represents data from the manufacturer and/or vendor and is accurate to the best of our knowledge. By providing this information, Science Take-Out LLC makes no guarantee or warranty, expressed or implied, concerning the safe use, storage, handling, precautions, and/or disposal of the products covered or the accuracy of the information contained in this fact sheet. It is the responsibility of the user to comply with local, state, and federal laws and regulations concerning the safe use, storage, handling, precautions, and/or disposal of products covered in this fact sheet.

MATERIAL SAFETY DATA SHEET

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name (as printed on the label):
"Crime Scene Blood" (simulated), "Suspect A Blood" (simulated), "Starch Indicator" (simulated)

Product identity: food coloring – 1%

Manufacturer: Science Take-Out, LLC
P.O. Box 205
Pittsford, NY 14534

Telephone number for information: (585)764-5400
Preparation date of this MSDS: 10/5/08
Medical emergency phone number (Chemtrec): (800) 424-9300

2. COMPOSITION/INFORMATION ON INGREDIENTS

This product contains no hazardous materials as defied by the OSHA Hazards Communications Standard
Chemical Ingredients: Red food coloring (1%) Chemical Name: N/A
CAS Number: N/A Formula: N/A
Synonyms: N/A Principle Hazardous Components: No Data
TLV and PEL units: No Data OSHA-PEL 10ppm (TWA): No Data

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW
Avoid skin and eye contact.

Potential Health Effects EYES: May cause irritation. SKIN: May cause irritation.

4. FIRST AID MEASURES EYES - Flush with water for at least 15 minutes, raising and lowering eyelids occasionally. Get medical attention if irritation persists.
SKIN - Thoroughly wash exposed area.

5. FIRE FIGHTING MEASURES No data available

6. SPILL OR LEAK PROCEDURES
Wear proper eye and skin protection. Mop/wipe spill area. Rinse with water.

7. HANDLING AND STORAGE Avoid eye and skin contact

8. EXPOSURE CONTROLS/PERSONAL PROTECTION
Respiratory Protection: N/A Ventilation: N/A
Protective Gloves: Natural rubber, Neoprene, PVC or equivalent.
Eye Protection: Splash proof chemical safety goggles should be worn.
Other Protective Clothing or Equipment: None

9. PHYSICAL AND CHEMICAL PROPERTIES
Molecular Weight: No data Melting Point: N/A Boiling Point: No dataVapor Pressure: No data Vapor Density (Air=1): No data
Specific Gravity (H_2O=1): No data
Percent Volatile by Volume: No data Evaporation Rate (BuAc=1): No data
Solubility in Water: Soluble Appearance and Odor: Yellow liquid

10. STABILITY AND REACTIVITY
Stability: Stable Conditions to Avoid: No data
Incompatibility (Materials to Avoid): None Hazardous Decomposition Products: No Data
Hazardous Polymerization: Will not occur

11. TOXICOLOGICAL INFORMATION
Toxicity Data: No data Effects of Overexposure: See section 3
Conditions Aggravated by Overexposure: See section 3
Target Organs: Eyes and skin Primary Route(s) of Entry: Eye or skin contact.

12. ECOLOGICAL INFORMATION No data

13. DISPOSAL CONSIDERATIONS Can be disposed of in trash or down the sink.

14. TRANSPORTATION INFORMATION D.O.T. SHIPPING NAME: N/A

15. REGULATORY INFORMATION N/A

16. ADDITIONAL INFORMATION

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MATERIAL SAFETY DATA SHEET

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name (as printed on the label): White Powder

Product identity: Sodium Bicarbonate (Baking Soda)

Manufacturer: Church & Dwight Co., Inc.
469 N. Harrison Street
Princeton, NJ 08543
Telephone number for information: (609)683-5900 (USA)

Manufacturer's Issue date of this MSDS: 9/17/02

Medical emergency phone number (Chemtrec): (800) 424-9300

2. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Ingredient: Sodium bicarbonate % by Weight: 100%
CAS Number: 144-55-8
Not hazardous under OSHA Standard 29 CFR 1910.1200.
Not a WHMIS controlled substance.

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

White crystalline powder; no odor. Not a fire hazard.
No significant health or environmental effects associated with this material.
HMIS Rating Health 0, Fire 0, Reactivity 0

Potential Health Effects
EYE: Not an eye irritant. SKIN CONTACT: Not a skin irritant.
INGESTION: Material is practically non-toxic. Small amounts (1-2 tablespoonfuls) swallowed during normal handling operations are not likely to cause injury as long as the stomach is not overly full; swallowing larger amounts may cause injury (see Note in Section IV).
INHALATION: None known.
SUBCHRONIC EFFECTS/CARCINOGENICITY: Based on published studies on its effects in animals and humans, sodium bicarbonate is not teratogenic or genotoxic. Only known subchronic effect is that of a marked systemic alkalosis. The material is not listed as a carcinogen or potential carcinogen by IARC, NTP, OSHA, or ACGIH.

4. FIRST AID MEASURES

EYES: Check for and remove contacts. Flood eyes with clean flowing water, low pressure and luke warm (not hot) if possible, occasionally lifting eyelids.

INGESTION: If large amounts of this material are swallowed, do not induce vomiting. Administer water if person is conscious. Never give anything by mouth to an unconscious person.

NOTE TO PHYSICIAN: Large doses may produce systemic alkalosis and expansion in extracellular fluid volume with edema.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES: FLASHPOINT: Not combustible METHOD USED: N/A
FLAMMABLE LIMITS: LFL: Not applicable UFL: Not applicable
EXTINGUISHING MEDIA: Non-combustible material. Use extinguishing media appropriate for surrounding fire.
FIRE-FIGHTING INSTRUCTIONS: Carbon Dioxide may be generated making necessary the use of a self-contained breathing apparatus (SCBA) and full protective equipment (Bunker Gear). Carbon dioxide is an asphyxiant at levels over 5% w/w. Sodium oxide, another thermal decomposition product existing at temperatures above 1564□F is a respiratory, eye, and skin irritant. Avoid inhalation, eye and skin contact with sodium oxide dusts.
UNUSUAL FIRE AND EXPLOSION HAZARDS: None known.

6. ACCIDENTAL RELEASE MEASURES

Scoop up into dry, clean containers. Wash away uncontaminated residue with water.

7. HANDLING AND STORAGE

Store in cool, dry areas and away from incompatible substances (see Section 10). Sodium Bicarbonate reacts with acids to yield carbon dioxide gas which can accumulate in confined spaces. Do not enter confined spaces until they have been well ventilated and carbon dioxide and oxygen levels have been determined to be safe.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

RESPIRATORY PROTECTION: Dust mask required if total dust level exceeds 10 mg/m3.
PROTECTIVE GLOVES: General purpose for handling dry product. Impervious gloves when working with solutions.
EYE PROTECTION: Safety glasses when handling bulk material or when dusts are generated.
OTHER PROTECTIVE CLOTHING OR EQUIPMENT: Full cover clothing. Apron where splashing may occur when working with solutions.

PROTECTIVE WORK/HYGIENIC PRACTICES: No special requirements with respect to chemical exposure beyond those provided above.

Requirements with respect to specific equipment and applications are the responsibility of the user.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: White crystalline powder. ODOR: None.
PHYSICAL STATE: Solid pH AS IS: Not Applicable
pH (1% SOLN. w/v): 8.2 VAPOR PRESSURE: Not applicable.
VAPOR DENSITY: Not applicable. BOILING POINT: Not applicable.
FREEZING/MELTING POINT: Not applicable.
SOLUBILITY IN WATER: 8.6 g/100 ml @ 20□C.
BULK DENSITY (g/cc): 62 lb/Ft3 % VOLATILE: Not applicable.
VOLATILE ORGANIC COMPOUNDS: Not applicable. MOLECULAR WEIGHT: 84.02

10. STABILITY AND REACTIVITY

CHEMICAL STABILITY: Stable.
CONDITIONS TO AVOID: Temperatures above 65□C (150□F).
INCOMPATIBILITY WITH OTHER MATERIALS: Reacts with acids to yield carbon dioxide. Also may yield free caustic in presence of lime dust (CaO) and moisture (i.e., water, perspiration).
HAZARDOUS DECOMPOSITION PRODUCTS: Heating above 100□C may cause dangerous levels of carbon dioxide gas to be present in confined spaces. Yields sodium oxide if exposed to temperatures above 850□C. Avoid inhalation, eye and skin contact with sodium oxide.
HAZARDOUS POLYMERIZATION: Not applicable.

11. TOXICOLOGICAL INFORMATION

EYE EFFECTS: The material was minimally irritating to unwashed eyes and practically non-irritating to washed eyes (rabbits).
SKIN EFFECTS: Not a skin irritant or dermally toxic. Not a contact sensitizer.
ACUTE ORAL EFFECTS: Acute Oral-rat LD50 = 7.3 g/kg
ACUTE INHALATION: LC50 (rat) > 4.74 mg/l

12. ECOTOXICOLOGICAL INFORMATION

AQUATIC TOXICITY: Daphnids: EC50 = 4100 mg/l; Bluegill: LC50 = 7100 mg/l
Rainbow Trout: LC50 = 7700 mg/l

13. DISPOSAL CONSIDERATIONS

Bury in a secured landfill in accordance with all local, state and federal environmental regulations. Empty containers may be incinerated or discarded as general trash.

14. TRANSPORTATION INFORMATION

D.O.T. SHIPPING NAME: Not regulated D.O.T. HAZARD CLASS: None
TECHNICAL SHIPPING NAME: Sodium Bicarbonate
U.N./N.A. NUMBER: None HAZARDOUS SUBSTANCE/RQ: None
D.O.T. LABEL: None

15. REGULATORY INFORMATION

CLEAN AIR ACT SECTION 611: Material neither contains nor is it manufactured with ozone depleting substances (ODS).

FEDERAL WATER POLLUTION CONTROL ACT (40 CFR 401.15): Material contains no intentionally added or detectable (contaminant) levels of EPA priority toxic pollutants.

FOOD AND DRUG ADMINISTRATION: Generally Recognized As Safe (GRAS) direct food additive (21 CFR 184.1736).

US DEPARTMENT OF AGRICULTURE: List of Proprietary Substances - Permitted Use Codes 3A, J1, A1, G1, and L1.
CERCLA REPORTABLE QUANTITY: None
OSHA: Not hazardous under 29 CFR 1910.1200
RCRA: Not a hazardous material or a hazardous waste by listing or characteristic.

SARA TITLE III: Section 302, Extremely Hazardous Substances: None
Section 311/312, Hazardous Categories: Non-hazardous
Section 313, Toxic Chemicals: None

Sodium Bicarbonate is reported in the EPA TSCA Inventory List.

This material is listed on the Canadian DSL.

This material is not listed as carcinogen or potential carcinogen by NTP, IARC, OSHA, ACGIH or NIOSH.

This material is neither a volatile organic compound nor does it contain VOCs.
NATIONAL STOCKING NUMBER: 6810002646618, Contract No. DLA 40086C1831
NSF STANDARD 60: Corrosion and Scale Control in Potable Water. Max use 200 mg/l.
EUROPEAN INVENTORY (EINECS): 205-633-8
JAPANESE INVENTORY (MITI): 1-164
AUSTRALIAN INVENTORY (AICS): Carbonic acid, monosodium salt.

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16. ADDITIONAL INFORMATION

The information provided in this Material Safety Data Sheet represents data from the manufacturer and/or vendor and is accurate to the best of our knowledge. By providing this information, Science Take-Out LLC makes no guarantee or warranty, expressed or implied, concerning the safe use, storage, handling, precautions, and/or disposal of the products covered or the accuracy of the information contained in this fact sheet. It is the responsibility of the user to comply with local, state, and federal laws and regulations concerning the safe use, storage, handling, precautions, and/or disposal of products covered in this fact sheet.

MATERIAL SAFETY DATA SHEET

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name (as printed on the label): Acid

Product identity: Vinegar (dilute acetic acid)

Distributor: Wegman's Food Markets, Inc.
Rochester, NY 14603

Telephone number for information: (585)764-5400 Date of this MSDS: 10/5/08
Medical emergency phone number (Chemtrec): (800) 424-9300

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2. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Ingredient: Vinegar Chemical Name: Acetic Acid
CAS Number: 64-19-7 Formula: CH_3COOH
Synonyms: Ethanoic Acid Principle Hazardous Components: Acetic Acid (CAS#64-19-7) 4-6%
TLV and PEL units: ACGIH-TLV 10ppm(TWA), STEL 15ppm OSHA-PEL 10ppm(TWA)

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3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW
Do not ingest. Avoid skin and eye contact. Avoid exposure to vapor or mists.

Potential Health Effects

EYES: May cause irritation. SKIN: May cause irritation.
INGESTION: May cause gastrointestinal discomfort. INHALATION: May cause irritation to respiratory tract.

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4. FIRST AID MEASURES

Emergency and First Aid Procedures:

EYES - Flush with water for at least 15 minutes, raising and lowering eyelids occasionally. Get medical attention if irritation persists.

SKIN - Thoroughly wash exposed area for at least 15 minutes. Remove contaminated clothing. Launder contaminated clothing before reuse. Get medical attention if irritation persists.

INGESTION - Do not induce vomiting. If swallowed, if conscious, give plenty of water immediately and call a physician or poison control center. Never give anything by mouth to an unconscious person.

INHALATION - Remove to fresh air. Give oxygen if breathing is difficult; give artificial respiration if breathing has stopped. Keep person warm, quiet, and get medical attention.

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5. FIRE FIGHTING MEASURES

Flash Point (Method Used):109F (cc)
NFPA Rating:
Health: 2
Fire: 2
Reactivity: 1
Extinguisher Media: Use dry chemical, CO2 or appropriate foam.Flammable Limits in Air % by Volume: 5.4%LEL 16.0%UEL
Autoignition Temperature: No data available
Special Firefighting Procedures: Firefighters should wear full protective equipment and NIOSH approved self-contained breathing apparatus.
Unusual Fire and Explosion Hazards: No data available

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6. SPILL OR LEAK PROCEDURES

Steps to be Taken in Case Material is Released or Spilled: Ventilate area of spill. Eliminate all sources of ignition. Remove all non-essential personnel from area. Clean-up personnel should wear proper protective equipment and clothing. Absorb material with suitable absorbent and containerize for disposal.

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7. HANDLING AND STORAGE
Store above 62 degrees F, away from direct heat, ignition sources and oxidizers. Other Precautions: Do not reuse container. Residue may make empty containers dangerous.

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8. EXPOSURE CONTROLS/PERSONAL PROTECTION
Respiratory Protection: A NIOSH/MSHA chemical cartridge respirator should be worn if PEL or TLV is exceeded.

Ventilation: Local Exhaust: Preferred Mechanical(General): Acceptable
Special: No Other: No

Protective Gloves: Natural rubber, Neoprene, PVC or equivalent.
Eye Protection: Splash proof chemical safety goggles should be worn.
Other Protective Clothing or Equipment: Lab coat, apron, eye wash, safety shower.

Requirements with respect to specific equipment and applications are the responsibility of the user.

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9. PHYSICAL AND CHEMICAL PROPERTIES
Molecular Weight: 60.05 Melting Point: 16.7C Boiling Point: 118.1C Vapor Pressure: 11.4 at 20C
Vapor Density (Air=1): 2.07 Specific Gravity (H_2O=1): 1.049
Percent Volatile by Volume: 100 Evaporation Rate (BuAc=1): 0.97
Solubility in Water: Miscible
Appearance and Odor: Clear colorless liquid with pungent odor.

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10. STABILITY AND REACTIVITY
Stability: Stable Conditions to Avoid: Heat, ignition sources, metals
Incompatibility (Materials to Avoid): Oxidizers, strong alkalis, metals, amines, cyanides, sulfides, chromic acid, nitric acid, hydrogen peroxide, carbonates.
Hazardous Decomposition Products: COx
Hazardous Polymerization: Will not occur

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11. TOXICOLOGICAL INFORMATION
Toxicity Data: aihl-mus LC50: 5620 ppm/1H orl-rat LD50: 3530 mg/kg skin-rbt LD50: 1060 mg/kg

Effects of Overexposure: Acute: See section 3
Chronic: Mutation and reproductive effects data cited. Not listed as causing cancer by IARC, NTP, or OSHA.
Conditions Aggravated by Overexposure: Respiratory conditions
Target Organs: Eyes, skin, and respiratory tract. Primary Route(s) of Entry: Inhalation, ingestion or skin contact.

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12. ECOLOGICAL INFORMATION EPA Waste Numbers: D002 D001

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13. DISPOSAL CONSIDERATIONS
Waste Disposal Methods: Dispose in accordance with all applicable Federal, State and Local regulations. Always contact a permitted waste disposer (TSD) to assure compliance.

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14. TRANSPORTATION INFORMATION D.O.T. SHIPPING NAME: Not regulated

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15. REGULATORY INFORMATION
EPA TSCA Status: On the TSCA Inventory List.
Hazard Category for SARA Section 311/312 Reporting: Acute
SARA EHS Section 302 TPQ(lbs.): No
SARA Section 313 Chemicals Name List: No Chemical Category: No
CERCLA Section 103 RQ(lbs.): 5,000 RCRA Section 261.33: No

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16. ADDITIONAL INFORMATION
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