## Contributors

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## Intended Audience

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Appropriateness</th>
</tr>
</thead>
<tbody>
<tr>
<td>K-4</td>
<td></td>
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<tr>
<td>5-8</td>
<td></td>
</tr>
<tr>
<td>9-12</td>
<td>X</td>
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</tbody>
</table>

## Activity Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Classroom Setting</td>
<td>Requires special equipment</td>
</tr>
<tr>
<td></td>
<td>Uses hands-on manipulatives X</td>
</tr>
<tr>
<td></td>
<td>Requires mathematical skills</td>
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<tr>
<td></td>
<td>Can be performed individually</td>
</tr>
<tr>
<td></td>
<td>Requires group work X</td>
</tr>
<tr>
<td></td>
<td>Requires more than one (45 min class) period</td>
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<tr>
<td></td>
<td>Appropriate for special needs student</td>
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</tbody>
</table>
Introduction

Description

In this lab activity, students will compare and contrast how different fibers burn. Students will be helping solve a mysterious robbery by identifying an unknown fiber by comparing the burning fibers.

Abstract

Fiber evidence is valuable because it creates links among victims, suspects, and places. In this activity students will compare and contrast how different fibers burn and the residues left behind to help solve a crime.

Core Themes Addressed

<table>
<thead>
<tr>
<th>Microbial Cell Biology</th>
<th>Microbial Genetics</th>
<th>Microorganisms and Humans</th>
<th>Microorganisms and the Environment</th>
<th>Microbial Evolution and Diversity</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td>X</td>
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</tbody>
</table>

Keywords

Residue, Odor

Learning Objectives

At completion of this activity, learner will

1. Compare and contrast how different fibers burn

National Science Education Standards Addressed

Standard A: Science as Inquiry

Abilities necessary to do scientific inquiry
Teacher Handout

Fiber Analysis Burn Lab

Student Prior Knowledge

Students should have the following knowledge prior to completing this activity:

1. Be able to recognize the importance of fibers as evidence.

Teacher Background Information

Fibers are everywhere. Because textiles are mass produced, it is difficult to trace a fiber back to a specific source but fiber evidence is valuable because it creates links among victims, suspects, and places. Investigators identify and compare fibers physically, using microscopy, as well as chemically. Textile fibers are among the most common items left at a crime scene. Trace evidence usually has no individuality; this is especially true of fibers, because they are mass-produced in huge quantities. Fibers have probative value (ability of evidence to prove something that is relevant to the crime) because they can create connections, or association. For example, a suspect may deny he or she was ever in a particular place or ever in contact with a particular person. Yet questioned fibers (those found in the area or on the person) may be linked to the suspect. Anything that can aid in narrowing down a fiber’s origin to a limited number of sources make that fiber much more valuable as evidence.

Fabric is made from fibers; fibers are usually made up of twisted filaments that can be classified as either natural or artificial. Natural fibers may come from animal, vegetable, or inorganic sources. Artificial fibers are synthesized from altered natural sources.

Class Time

This activity will require a minimum of one 50 minute class period.

1. Introduction PowerPoint – 10 minutes
2. Lab Activity – 30 minutes
3. Wrap up questions/Review – 10 minutes
Teacher Preparation Time

This lesson will require approximately 45 minutes preparation time to pull individual fibers from each different material. The different materials were purchased from thrift shops and can substituted for materials you have on hand.

Materials and Equipment (2 per group)

1. Tea light
2. Lighter
3. Forceps
4. Aluminum foil
5. Twill fiber
6. Polyester fiber
7. Silk fiber
8. Cotton fiber
9. Burlap fiber
10. Poly chiffon fiber
11. Unknown victim fiber

Methods

1. Provide a short overview of fibers and safety precautions needed for this lab (PowerPoint).
2. Generate groups with two students per group.
3. Give each group one set of activity materials: tea light, lighter, forceps, aluminum foil, unknown victim fiber, one of each other fiber.
4. In this activity, students will:
   a. Burn each fiber while making observations.
   b. Record observations for each fiber in the lab worksheet.
   c. Decide the identity of the unknown victim fiber.
5. As a wrap up, facilitate student discussion on how and why fibers burn differently.

Tips/Suggestions

1. Have students place the tea light on aluminum foil to aid in the cleanup process.
2. Remove the lighters from each group after everyone has lit their tea light.
Answers to Student Handouts

1. This answer will vary depending on which fiber you choose as the unknown fiber. Make sure the student gives valid reasons for picking the identity of the unknown fiber.

2. Fibers have probative value because they can create associations or connections. Unknown fibers should be identified to possibly aid in suspect identification or in determining where a crime occurred.

3. Student answers will vary. As long as the student explains why they thought that fiber burned most interestingly give them credit.
Introduction

Fibers are everywhere. Because textiles are mass produced, it is difficult to trace a fiber back to a specific source but fiber evidence is valuable because it creates links among victims, suspects, and places. Investigators identify and compare fibers physically, using microscopy, as well as chemically. Textile fibers are among the most common items left at a crime scene. Trace evidence usually has no individuality; this is especially true of fibers, because they are mass-produced in huge quantities. Fibers have probative value (ability of evidence to prove something that is relevant to the crime) because they can create connections, or association. For example, a suspect may deny he or she was ever in a particular place or ever in contact with a particular person. Yet questioned fibers (those found in the area or on the person) may be linked to the suspect. Anything that can aid in narrowing down a fiber’s origin to a limited number of sources make that fiber much more valuable as evidence.

Student Background Knowledge

Students should have the following knowledge prior to completing this activity:

1. Be able to recognize the importance of fibers as evidence.

Vocabulary

Fibers: Usually made up of many filaments twisted or bonded together to form a thread or yarn.

Fabric: In this context, a cloth material made up of fibers woven or bonded together in a distinctive manner.

Materials Checklist

<table>
<thead>
<tr>
<th>Item</th>
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</thead>
<tbody>
<tr>
<td>Tea light</td>
</tr>
<tr>
<td>Lighter</td>
</tr>
<tr>
<td>Forceps</td>
</tr>
<tr>
<td>Aluminum foil</td>
</tr>
<tr>
<td>Twill fiber</td>
</tr>
<tr>
<td>Polyester fiber</td>
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<tr>
<td>Silk fiber</td>
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<tr>
<td>Fiber</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>Cotton fiber</td>
</tr>
<tr>
<td>Burlap fiber</td>
</tr>
<tr>
<td>Poly chiffon fiber</td>
</tr>
<tr>
<td>Unknown victim fiber</td>
</tr>
</tbody>
</table>

Procedure

1. Burn each fiber while making observations.
2. Record observations for each fiber in the lab worksheet.
3. Decide the identity of the unknown victim fiber.
Student Worksheet

Fiber Analysis Burn Lab

Introduction: You respond to the scene of a crime where a women’s body was found at the bottom of a stairwell. The women was beaten and robbed. Hoping to crack the case, you collect a foreign fiber on the women and want to identify the type of fiber.

You are going to compare the way the unknown fiber burns to the way known fibers burn to identify the type of fiber.

Instructions:

1. Compare the burning characteristics of the unknown fiber to the known samples. Record your observations on the data table below.
   a. Place your candle in the middle of the aluminum foil that is on your lab bench.
   b. Light your candle. CAUTION: Keep your hair pulled back and way from the flame.
   c. Pick up your fiber using a pair of forceps.
   d. Bring the fiber close to the flame and immediately remove it. DO NOT TOUCH THE FLAME. Describe the fiber’s behavior as it approaches the flame: does it begin to melt, ignite, curl, or do something else?
   e. Holding the fiber in forceps, touch the fiber to the flame. REMOVE IMMEDIATELY.
   f. Remove the fiber from the flame and describe how it behaves. Does it ignite quickly or slowly? Does it sputter, drip or melt? Does it self-extinguish, continue to burn or continue to glow?
   g. Waft and note any odor associated with the fiber in the flame. Does it smell like vinegar or hair?
   h. What kind of residue is left after the fiber is removed from the flame? Does the fiber leave a white, fluffy ash, a hard bead, or melted blob?
<table>
<thead>
<tr>
<th>Fiber from Victim</th>
<th>Approaching Flame</th>
<th>In Flame</th>
<th>Removed from Flame</th>
<th>Odor</th>
<th>Residue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Twill</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Poly Chiffon</td>
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<td>Burlap</td>
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<td></td>
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<tr>
<td>Polyester</td>
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<td>Silk</td>
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<tr>
<td>Cotton</td>
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Questions:

1. From the burning tests, which type of fiber is most similar to the unknown fiber taken from the victim? Describe at least two characteristics they have in common in at least two sentences.

2. Why might an investigator want to identify unknown fibers from a crime scene? Write at least two reasons in complete sentences.

3. From today’s lab which fiber burned in the most interesting way? Explain your pick in at least two sentences.