

Teacher Guide

Fibers & Textiles Activity

Introduction:

Many objects are made from textiles, including tapestries (wall-hangings), upholstery, quilts, clothing, etc. These objects may be functional as well as decorative, and are often collected as works of art or historic artifacts. Textiles are woven from fibers. These fibers can be animal, plant or man-made. Common historical fibers used include cotton, wool, silk, and linen. Conservators need to identify fiber types in order to make treatment decisions. Different fibers will react differently to various chemicals. Categorizing fiber types also helps conservators identify the origin of a textile because different fibers are characteristic of different regions. Cotton and wool were often used in Ancient American art. Silk had numerous uses in art and trade in China, while linen was used extensively in Ancient Egypt. In this lab, students examine various natural fiber types using physical characteristics.

Objectives:

- Learn the parts of a microscope
- Use high and low power to view specimens
- Make dry and wet mounts
- Compare and contrast different types of natural fibers using magnification and burn tests

Georgia Performance Standards:

5th grade Science Standards

S5L3. Students will diagram and label parts of various cells (plant, animal, single-celled, multi-celled).

- a. Use magnifiers such as microscopes or hand lenses to observe cells and their structure.

9-12th grade Science Standards

SCSh2. Students will use standard safety practices for all classroom laboratory and field investigations.

- a. Follow correct procedures for use of scientific apparatus.
- b. Demonstrate appropriate technique in all laboratory situations.
- c. Follow correct protocol for identifying and reporting safety problems and violations.

SCSh4. Students use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.

- a. Develop and use systematic procedures for recording and organizing information.
- b. Use technology to produce tables and graphs

c. Use technology to develop, test, and revise experimental or mathematical models.

SC1. Students will analyze the nature of matter and its classifications.

b. Identify substances based on chemical and physical properties.

SFS1. Students will recognize and classify various types of evidence in relation to the definition and scope of Forensic Science.

b. Distinguish and categorize physical and trace evidence (e.g. ballistics, drugs, fibers, fingerprints, glass, hair, metal, lip prints, soil, and toxins).

SFS2. Students will use various scientific techniques to analyze physical and trace evidence.

b. Analyze the morphology and types of hair, fibers, soil and glass.

Supplies:

Strand of human hair

Newspaper

Fabric A (wool)

Fabric B (silk)

Fabric C (cotton)

Fabric D (linen)

**Be sure to use light neutral colored fabrics (tan, beige, or off white)*

**Dryer lint can be used in an extension to see if students can separate different types of fibers based on appearance. Works well with stereomicroscope or compound microscope.*

Scissors

Compound microscope

Microscope slides

Cover slips

Distilled water

Matches

Bunsen burner

Tweezers

Safety: Students should be careful with an open flame and conduct burn tests in well-ventilated area to avoid setting off fire alarms!

Procedures:**I. Microscope Exercises****A. Letter e**

1. Cut out a lower case "e" from a newspaper and put it on a slide.
2. Place a small drop of water to cover the "e".
3. Put a cover slip on top of the "e".
4. Draw what you see, before placing under the microscope.
5. Using the lowest power (4x), put the slide on the stage, center the "e" in the field of view.
6. Draw what you see.
7. Move the slide to the left, describe what happens.
8. Move the slide to the right, describe what happens.
9. Carefully view the "e" using high power (10x). Be sure to ONLY adjust the fine adjustment to focus. Draw what you see.

B. Human Hair

1. Obtain one strand of human hair and cut it into one-inch pieces. Put one piece on a slide.
2. Place a small drop of water on the hair.
3. Put a cover slip on the hair.
4. Using the lowest power (4x), put the slide on the stage, center the hair in the field of view.
5. Draw what you see.
6. Carefully view the hair using high power (10x). Be sure to only use the fine adjustment to focus. Draw what you see.

C. Natural Fibers

1. Remove a thread from fabric A. Gently encourage the thread to unravel and fray by rolling it between thumb and finger, separating the ply with straight pins, etc. Extract a single fiber or small group of fibers from the frayed thread with tweezers.
2. Place the fiber on a slide. View the dry mount using low (4x) and high (10x) power. Draw what you see.
3. Place a small drop of water on the fabric and cover with a cover slip.
4. Using low power (4x), put the slide on the stage, center the fabric in the field of view.
5. Label, describe and draw what you see.
6. Carefully view fabric "A" using high power (10x). Be sure to only use the fine adjustment to focus. Describe and draw what you see.
7. Use Tables 2 and 3 to try to identify the fibers.
8. Repeat steps 1-7 using fabrics "B", "C", and "D".
**Students can also view fibers using 40x power if available.*

II. Burn Tests

A. Paper & Human Hair

1. Cut out a 10cm x 10cm piece of paper. Carefully set the paper on fire using matches or a Bunsen burner. Make detailed observations of the paper, including the smell.
2. Obtain a piece of human hair. Using tweezers carefully set the hair on fire. Make detailed observations of the hair, including the smell.

B. Natural Fibers

1. Obtain a 1cm x 1cm piece of fabric "A".
2. Using tweezers, bring the fiber sample near the flame. Write observations of the fabric.
3. Now put the fabric directly in the flame. Write observations of the fabric, noting the smell.
4. Write observations of the ashes of fabric "A".
5. Use the Table 1 to give possible identifications of fabric "A".
6. Repeat steps 1-5 with fabrics "B", "C", and "D".

Clean up: Return supplies and dispose of waste in the trash can.

Selected Resources:

- CCI Textile Lab (2008). Retrieved July 28, 2021 from:
<https://www.canada.ca/content/dam/cci-icc/documents/services/conservation-preservation-publications/canadian-conservation-institute-notes/13-11-eng.pdf>
- CCI Textile Lab (2010). The Identification of Natural Fibres. *CCI Notes 13/18*. Retrieved Jul 28, 2021 from:
<https://www.canada.ca/en/conservation-institute/services/conservation-preservation-publications/canadian-conservation-institute-notes/identification-natural-fibres.html>
- Goodway, M. (1987). Fiber Identification in Practice. *Journal of the American Institute for Conservation*, 26(1), 27–44.
http://cool.conservation-us.org/jaic/articles/jaic26-01-003_indx.html
- Schaffer, E. (1981). Fiber Identification in Ethnological Textile Artifacts. *Studies in Conservation*, 26(3), 119–129.