International Baccalaureate
Baccalauréat International
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3D Science Unit Planner

Marietta City Schools

MARIETTA CITY SCHOOLS

Grade & Course: Forensic Science	**Topic: Unit 3: Physical Evidence- Hair, Fiber, Soil Glass Analysis**	**Duration: 6 Weeks**
Teachers: Forensic Science Teachers		

Georgia Standards and Content:

SFS2. Obtain, evaluate, and communicate information on various scientific techniques to analyze physical, trace, and digital evidence.

a. Plan and carry out an investigation to determine the value of physical and trace evidence.

b. Plan and carry out an investigation to analyze the morphology and types of hair, fibers, soil and glass evidence in order to make a physical match examination.

e. Ask questions to determine the appropriate uses of chromatography and spectroscopy in evidence analysis.

(*Clarification statement:* Addressing spectroscopy at an analytical chemistry level is not required.)

Narrative / Background Information

Prior Student Knowledge: (REFLECTION – PRIOR TO TEACHING THE UNIT)

Students should be familiar with the history of Forensics as well as how to process a crime scene. This processing includes the collecting of trace evidence such as hair, fibers, and soil.

Year-Long Anchoring Phenomena: (LEARNING PROCESS)

An unidentified body was found in the back seat of a wrecked vehicle where the driver had fled the scene and the passenger was injured.

Unit Phenomena (LEARNING PROCESS)

Fibers found on victims bodies in the Atlanta Child murder case lead investigators to a common location

Inquiry Statement:

Locard's Exchange Principle dictates that evidence, both physical and biological, is to be found at the scene of the crime.

Global Context:

Scientific and Technical Innovation

Science & Engineering Practices:

- Planning and Carrying Out An Investigation
- Asking Questions

Disciplinary Core Ideas: (KNOWLEDGE & SKILLS)

- History of Hair, Fiber, Soil, Glass Analysis
- Characteristics of Hair, Fiber, Soil, Glass
- Collecting Hair, Fiber, Soil, Glass Evidence
- Forensic Analysis of Hair, Fibers, Soil, & Glass

Crosscutting Concepts: (KNOWLEDGE & SKILLS)

Patterns

Key and Related Concepts:

Patterns
Scientific and Technical Innovation

Possible Preconceptions/Misconceptions: (REFLECTION – PRIOR TO TEACHING THE UNIT)

Students may believe that hair and fiber evidence can positively identify an individual linked to a crime, however, this evidence is most often class evidence. Another misconception may be that hair alone can convict a criminal. Students may think that fibers only include clothing and not other natural fibers. Overall, students may think that these forms of trace evidence are a highly used and always informative way to solve a crime when , in reality, many times are not available and not useful.

Key Vocabulary: (KNOWLEDGE & SKILLS)

comparison microscope
cortex
cuticle
gas chromatography

hair follicle
hair shaft
isotope
isotope signature
isotope-ratio mass spectrometry (IRMS)
keratin
medulla
melanin granules
mitochondrial DNA (mtDNA)
nuclear DNA
neutron activation analysis (NAA)
amorphous
crystalline
direct transfer
fiber
infrared microscope
mineral fiber
monomer
natural fiber
polarizing microscope
polymer
clay
crystal
fragment
geology
humus
mineral
organic material
sand
sediment
silt
soil
soil profile
weathering
backscatter
Becke line
bullet-resistant ("bulletproof") glass
concentric fracture
conchoidal fractures
density
glass
laminated glass
lead glass (crystal)
normal line
radial (radiating) fracture
refraction
refractive index
silicon dioxide (SiO2)
tempered glass

Inquiry Questions:

Factual -

What are some of the differences between human and animal hair?

What are some differences between different types of fibers?

What are the different characteristics of different types of soil?

What types of glass are used in different products?

Conceptual –

Can it ever be stated with certainty that a fiber originated from a particular garment?

When can hair be used as individual evidence?

How can glass fractures give information about impact?

Debatable -

Is trace evidence important to solve criminal cases?

How much error is involved in measuring the diameter of hair samples?

	Summative assessment		
Unit Objectives:			
Learning Activities and Experiences	**Inquiry & Obtain: (LEARNING PROCESS)**	**Evaluate: (LEARNING PROCESS)**	**Communicate: (LEARNING PROCESS)**
Week 1:	**Phenomenon:** Fibers found on victims bodies in the Atlanta Child murder case lead investigators to a common location. Hair Analysis Notes (Bertino Chapters 3) Hair Analysis Exploration	Fiber Analysis Notes (Bertino chapter 4) Hair and Fiber Analysis Lab (Ward's Kit)	Hair and Fiber Analysis Day 2
Week 2:	Soil Analysis Notes and Lab exploration (Bertino Chapter 13 & 15)	Glass Analysis Notes and glass fracture patterns activity	
Week 3:	Mass Spectrometry Tutorial and data analysis	Review	Unit 3 Test

Resources (hyperlink to model lessons and/or resources):

- Textbook Forensic Science Bertino & Bertino, 3rd Edition
- Forensic Science Schoology Course
- Additional resources can be found in the common Schoology group under the Unit 3 folder.

Reflection: Considering the planning, process and impact of the inquiry

Prior to teaching the unit	During teaching	After teaching the unit
How are these pieces of trace evidence used by scientists to prove or disprove a suspect was at a crime scene?		