

## OXFORD HIGH SCHOOL SCIENCE DEPARTMENT

### FORENSIC SCIENCE CURRICULUM

#362 Forensic Science (A) (11-12) One Semester      0.5 Credit

This course explores the various scientific applications of solving crimes in a comprehensive approach. Students perform numerous laboratory techniques including some that may be referenced on television shows. Always focused on making the connections between science and technology and their impact on the quality of our lives, the study of forensic science uses multiple pathways of scientific reasoning to explore the analysis of a crime scene, fingerprints, hair and fiber analysis, drug analysis, trace evidence, blood, DNA, and case studies. Students work independently and as teams to develop, communicate and defend scientific arguments based on their findings to solve crime scene investigations and to analyze case studies.

## ENDURING UNDERSTANDINGS (BROAD IDEAS, USUALLY GROUNDED IN THE DISCIPLINE):

Science is a creative endeavor that uses logical, analytical processes.

### SCIENTIFIC INQUIRY

- Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.
- Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.
- Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists

### SCIENTIFIC LITERACY

- Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.
- Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media.

### SCIENTIFIC NUMERACY

- Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas.

## COURSE SPECIFIC GOALS:

EVIDENCE AND THE LAW – Creative, logical, and analytical strategies within the scope of law and governance are used to legally solve crimes.

THE CRIME SCENE – Careful analysis of a crime scene is necessary to explain a crime and to gather evidence that can be used to identify and convict criminals.

FINGERPRINTS – Fingerprints are individual evidence that can be used to identify and convict criminals.

HAIR AND FIBER ANALYSIS – Hair and fiber are generally class evidence that can absorb substances from the body and the environment which can be used to back up circumstantial evidence.

DRUG ANALYSIS – A drug is a natural or synthetic substance that can affect the function or structure of living tissue through various chemical reactions and can be identified by various chemical tests.

TRACE EVIDENCE – Trace evidence is physical evidence that is found in quantities that are too small to make physical matches, yet large enough to be analyzed.

BLOOD – Blood's general biological characteristics can be used as class evidence and, with proper time, equipment, and conditions, can be individualized.

DNA ANALYSIS – There are advantages and limits to using DNA evidence to identify or clear potential suspects in crimes.

Forensic Entomology

Firearms, Toolmarks, and Impressions

Document Analysis

COMMON UNIT EXPECTED PERFORMANCES (ALIGNED WITH STATE EXPECTED PERFORMANCES):

Standard #	Standard/Expected Performance
C-1	Identify questions that can be answered through scientific investigation.
C-2	Read, interpret and examine the credibility and validity of scientific claims in different sources of information.
C-3	Design and conduct appropriate types of scientific investigations to answer different questions.
C-4	Identify independent variables, dependent variables, constants and controls in an experiment.
C-5	Use appropriate tools and techniques to make observations and gather data.
C-6	Use mathematical operations to analyze and interpret data, and present relationships between variables in appropriate forms.
C-7	Articulate conclusions and explanations based on research data, and assess results based on the design of the investigation.
C-7	Assess the reliability and validity of the data that was generated in an investigation and justify confidence in results.
C-8	Communicate about science in different formats, using relevant science vocabulary, supporting evidence and clear logic.
C-9	Identify an issue and its implications completely.
C-10	Develop an action plan that addresses all aspects of the issue in detail.
C-11	Use a variety of reliable sources of relevant information, data, knowledge, or experiences to take and support a critical stance.

**UNIT I: EVIDENCE AND THE LAW** – Creative, logical, and analytical strategies within the scope of law and governance are used to legally solve crimes.

Standard #	Standard/Expected Performance	Common Assessments
I-1	Explain and apply federal rules of evidence, including the Frye standard and the Daubert ruling.	
I-2	Delineate the roles and jobs of forensic scientists	
I-3	Apply lateral and vertical thinking strategies to solve puzzles	
I-4	Explain the difference between indirect and direct evidence	
I-5	Differentiate between individual and class evidence	
I-6	Determine the probability significance of class evidence	

**UNIT II: THE CRIME SCENE** – Careful analysis of a crime scene is necessary to explain a crime and to gather evidence that can be used to identify and convict criminals.

Standard #	Standard/Expected Performance	Common Assessments
II-1	Isolate, record, and search for evidence at a mock crime scene	
II-2	Collect and package evidence at a crime scene using proper forensic procedures.	
II-3	Explain the significance of the chain of custody	

**UNIT III: FINGERPRINTS** – Fingerprints are individual evidence that can be used to identify and convict criminals.

Standard #	Standard/Expected Performance	Common Assessments
III-1	Define the three properties that allow individual identification of fingerprints	
III-2	Recognize and classify the three general ridge patterns (loops, whorls, and arches) and apply them for classification	
III-3	Obtain and develop latent, plastic, and visible fingerprints using various techniques	

**UNIT IV: HAIR AND FIBER ANALYSIS** – Hair and fiber are generally class evidence that can absorb substances from the body and the environment which can be used to back up circumstantial evidence.

Standard #	Standard/Expected Performance	Common Assessments
IV-1	Use microscopy to describe the structure of hair and differentiate between different species.	Microscope work
IV-2	Distinguish and identify different types of fibers samples	
IV-3	Assess the probative value of hair and fiber samples	Microscope work
IV-4	Use multiple techniques to identify and classify different types of fibers	TLC Lead acetate technique

**UNIT V: DRUG ANALYSIS** – A drug is a natural or synthetic substance that can affect the function or structure of living tissue through various chemical reactions and can be identified by various tests.

Standard #	Standard/Expected Performance	Common Assessments
V-1	Identify and classify the types of illicit drugs and their negative effects	
V-2	Explain the limitations of presumptive (screening) tests	
V-3	Analyze legal drug samples with qualitative and quantitative techniques	TLC of pain relievers Spectrophotometry of salicylic acid Alcohol breath tests

**UNIT VI: TRACE EVIDENCE** – Trace evidence is physical evidence that is found in quantities that are too small to make physical matches, yet large enough to be analyzed.

Standard #	Standard/Expected Performance	Common Assessments
VI-1	Identify traces of white powder, metal, paint chips using deductive forensic protocols.	

**UNIT VII: BLOOD** – Blood’s general biological characteristics can be used as class evidence and, with proper time, equipment, and conditions, can be individualized.

Standard #	Standard/Expected Performance	Common Assessments
VII-1	Determine blood type using the ABO/Rh system	
VII-2	Design and conduct an experiment to explore bloodstain patterns as a function of velocity, direction, and height of fall	

**UNIT VIII: DNA ANALYSIS** – There are advantages and limits to using DNA evidence to identify or clear potential suspects in crimes.

Standard #	Standard/Expected Performance	Common Assessments
VIII-1	Explain how the structure of DNA relates to its function and use in forensic science	
VIII-2	Distinguish between different DNA tests, and describe the advantages and disadvantages of each	
VIII-3	Using a VNTR-PCR procedure, amplify DNA from cheek cells to make a DNA fingerprint	