

OXFORD HIGH SCHOOL SCIENCE DEPARTMENT

MATTER, ENERGY, AND THE ENVIRONMENT (SCIENCE 9) CURRICULUM

312 Matter, Energy, and the Environment - Academic (9) Half Year 0.5 Credit

This course is designed to be a hands-on exploration of Physical and Earth Science. Always focused on making the connections between science and technology and their impact on the quality of our lives, the study of science uses multiple pathways of scientific reasoning to explore energy transfer and transformations (What is the role of energy in our world?), properties of matter (How does the structure of matter affect the properties and uses of materials?), the changing Earth (How do materials cycle through the Earth's systems?), and a variety of other topics designed to build foundational scientific understandings.

313 Matter, Energy, and the Environment - Honors (9) Half Year 0.5 Credit

This course is designed to be a hands-on exploration of Physical and Earth Science with an increased focus on the high level reading and writing to express scientific thinking for students who want to pursue higher level of study in the sciences. Always focused on making the connections between science and technology and their impact on the quality of our lives, the study of science uses multiple pathways of scientific reasoning to explore energy transfer and transformations (What is the role of energy in our world?), properties of matter (How does the structure of matter affect the properties and uses of materials?), the changing Earth (How do materials cycle through the Earth's systems?), and a variety of other topics designed to build foundational scientific understandings.

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

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

SCIENTIFIC INQUIRY

EI-A Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.

EI-B Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.

EI-C Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists

SCIENTIFIC LITERACY

EL-A Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.

EL-A 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

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

COURSE SPECIFIC GOALS (ALIGNED WITH CONTENT STANDARDS):

CS-MTR PROPERTIES OF MATTER - The structure of matter affects its properties and uses.

CS-EGY ENERGY TRANSFER AND TRANSFORMATIONS - Energy cannot be created or destroyed; however, energy can be converted from one form to another. Various sources of energy are used by humans and all have advantages and disadvantages.

CS-ETH SYSTEMS ON EARTH – Materials cycle through the Earth’s systems and have an impact on planetary equilibrium.

EXPECTED PERFORMANCES (ALIGNED WITH STATE EXPECTED PERFORMANCES)

THE NATURE OF SCIENCE

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

Unit I: HUMAN INFLUENCE ON ENERGY USAGE (6 weeks)

Standard #	Standard	Common Experiences
CS-EGY-8/ CS-ETH-1	Describe the availability, current uses and environmental issues related to the use of fossil and nuclear fuels to produce electricity.	Energy in Connecticut STS Embedded Task
CS-EGY-9/ CS-ETH-2	Describe the availability, current uses and environmental issues related to the use of hydrogen fuel cells, wind and solar energy to produce electricity	Solar Cooker Lab Embedded Task
CS-ETH-11	Describe human efforts to reduce the consumption of raw materials and improve air and water quality.	Carbon footprint activity
CS-ETH-8	Explain how the accumulation of carbon dioxide (CO ₂) in the atmosphere increases Earth's Greenhouse Effect and may cause climate change.	Movies: <i>An Inconvenient Truth</i> and <i>The Great Global Warming Swindle</i>

Unit II. ENERGY AND ELECTRICITY (3 weeks)

Standard #	Standard	Common Experiences
CS-EGY-3	Describe electrical energy transformations.	
CS-EGY-4	Explain the relationship among voltage, current, and resistance in a simple series circuit.	Series and parallel DC circuit lab Digital circuit building
CS-EGY-5	Explain how electricity is used to produce heat and light in incandescent bulbs and heating elements.	
CS-EGY-6	Describe the relationship between current and magnetism.	
CS-EGY-7	Explain how heat is used to generate electricity.	

Unit III: HUMAN IMPACT ON THE ENVIRONMENT (4 weeks)

Standard #	Standard	Common Experiences
CS-ETH-3	Explain the short- and long-term impacts of landfills and incineration of waste materials on the quality of the environment.	
CS-ETH-7	Explain how the release of sulfur dioxide (SO ₂) into the atmosphere can form acid rain, and how acid rain affects water sources, organisms and human-made structures.	Acid Rain Lab Embedded Task
CS-ETH-10	Explain how land development, transportation options and consumption of resources may affect the environment.	Brownfield Sites STS Embedded Task
CS-MTR-4	Explain the chemical composition of acids and bases, and explain the change of pH in neutralization reactions.	BSCS pH lab

Unit IV: POLYMERS (4 weeks)

Standard #	Standard	Common Experiences
CS-MTR-5	Explain how the structure of the carbon atom affects the type of bonds it forms in organic and inorganic molecules.	
CS-MTR-6	Describe combustion reactions of hydrocarbons and their resulting by-products	
CS-MTR-7	Explain the general formation and structure of carbon-based polymers, including synthetic polymers.	Polymers in CT STS Embedded Task
CS-MTR-8	Explain how simple chemical monomers can be combined to create linear, branched and/or cross-linked polymers.	
CS-MTR-9	Explain how the chemical structure of polymers affects their physical properties.	Synthetic Polymers Lab Embedded Task