

Minneapolis Public Schools
High School Science
CORE COURSE DESCRIPTIONS

Environmental Foundations

Students conduct inquiry, develop explanations based on evidence, examine the nature of science, and expand their science knowledge in a lab-based, standards aligned course focused on the earth, physical, and environmental sciences. Students will:

- Study atoms and elements, their properties, and positions on the periodic table
- Investigate how compounds and molecules are organized and react
- Explore how energy and motion are related to earth's processes
- Study fossil and alternative fuels
- Explore the substances that make up the Earth, including minerals, crystals, and rocks
- Examine the Earth as a unified system involving its atmosphere, its surface, its internal dynamics, and the interactions among these variables. Earth science topics include earth history, weather, climate, seasons, and how the earth's surface changes over time.
- Explore evidence for the theory of plate tectonics
- Investigate water quality, water use, and the cycling of water on the Earth
- Explore the concept of life on other planets
- Explore issues surrounding the use of natural resources using a Minnesota focus
- Investigate ecosystems, the energy flow needed to maintain these systems, and how the impact of human activity affects the health of terrestrial ecosystems.
- Conduct original research on an environmental issue

Grade 9

Term/Credit: Two semesters = 2 credits

Prerequisite: Completion of 8th grade science

Biology

Biology is a state standards based laboratory course that studies living things from the microscopic to the macroscopic. The ultimate goal is to help students become scientifically literate citizens. Students will:

- Investigate the biochemical processes of life
- Explore life cycles, especially that of the cell
- Study the interaction of life with non-living things
- Investigate the human circulatory, digestive, and nervous systems; study human behavior, and physiology
- Examine the evidence for several theories explaining living systems: cell theory, germ theory, chromosomal theory, theory of genetics, and evolutionary theory
- Examine the dynamics of ecosystems, including: cycles, energy, trophic levels, populations, and human issues
- Conduct an original investigation

Grades 9-10

Term/Credit: Two semesters = 2 credits

Prerequisite: Successful Completion of Environmental Foundations

Physical Science

Physical Science includes one semester of Physics and one of Chemistry, which address the Minnesota physical science standards for high school. The ultimate goal is to help students become scientifically literate citizens.

Chemistry

Students will study chemistry concepts with processes and skills integrated throughout the semester in a standards-aligned, lab-based setting. Students will:

- Investigate atomic theory
- Explore matter, its properties, and its interactions
- Study the Periodic Table
- Investigate nuclear energy
- Research nuclear power and fossil fuels
- Experiment with chemical reactions
- Study chemical bonding
- Investigate solutions/mixtures and acids/bases
- Describe the Law of Conservation of Mass and Energy
- Explore thermodynamics
- Design and conduct an original research project

Physics

Students will study physics concepts with processes and skills integrated throughout the semester in a standards-aligned, lab-based setting. Students will:

- Investigate motion
- Explore forces
- Study Newton's Laws
- Explore kinetic and potential energy
- Investigate work and power
- Research electricity and its production
- Study the electromagnetic spectrum
- Study the solar system
- Examine research on stars and galaxies
- Explore evidence for the origin of the universe
- Design and conduct an original research project

Grades 11 or 12

Term/Credit: Each semester = one credit

Prerequisite: Successful Completion of Environmental Foundations

Chemistry

The goal of Chemistry is to study matter and its interactions; to initiate a lifetime of using an organized, evidence-based approach to solving problems; and to recognize the importance of chemistry in the understanding of all other sciences with its application to daily life. Chemistry is a standards aligned course that uses inquiry and experimentation to promote scientific literacy. Students will understand how the nature of matter and chemical reactions can influence the quality of their environment and lives through the study of:

- Classification of matter using physical and chemical properties
- Atomic theory, isotopes and radiation
- The periodic table, and electron configuration
- Chemical bonding, polarity
- Stoichiometry
- Gas laws, including volume, temperature, and pressure relationships
- Energy in endothermic and exothermic reactions
- Solubility, including molarity
- Reaction rates
- Equilibrium
- Acid and base reactions
- Oxidation / Reduction reactions and electrochemistry
- Organic chemistry, organic compounds, periodicity
- Energy and the electromagnetic spectrum
- Nuclear chemistry, fission/fusion, power/fossil fuels
- The history and nature of science

Grades 10-12

Term/Credit: Two semesters = 2 credits

Prerequisite: Successful Completion of Environmental Foundations

Physics

Physics is a standards based lab course focused on how matter and energy are related, transferred, and conserved. Students will:

- Investigate the concepts of speed, velocity, acceleration, vectors, displacement, and projectile motion
- Explore and describe Newton's laws
- Investigate and demonstrate that energy exists in different forms, can be transformed, and is conserved
- Explore potential and kinetic energy
- Describe how changes in energy can result in physical changes in matter, including density, volume, and pressure
- Investigate and describe the relationship between electric currents and magnetic fields
- Explore and describe the characteristics of the electromagnetic spectrum
- Study the structure and composition of the universe

Grades 11-12

Term/Credit: Two semesters = 2 credits

Prerequisite: Successful Completion of Environmental Foundations