

Science Courses

Natural Science and Engineering Courses

[Natural Science and Engineering L2](#)

[Natural Science and Engineering L3](#)

[Natural Science and Engineering L4](#)

Biology Courses

[Biology L2](#)

[Biology L3](#)

[Biology L4](#)

[AP Biology](#)

Anatomy and Physiology Courses

[Anatomy and Physiology L3](#)

[Anatomy and Physiology L4](#)

Chemistry Courses

[Chemistry L2](#)

[Chemistry L3](#)

[Chemistry L4](#)

[AP Chemistry](#)

Physics Courses

[Physics L3](#)

[Physics L4](#)

[Calculus-Based Physics L5](#)

Science Electives

[Exercise Physiology L3](#)

[Forensics L3](#)

[Oceanography L3](#)

[Scientific Beekeeping: A hands-on study of the Honey Bee \(Apis mellifera\) L4](#)

[Topics in Environmental Science L3](#)

Natural Science and Engineering Courses

Natural Science and Engineering L2

SC121 - 1.0 Credit - Year Long - Grade 9

Prerequisite:

- Recommendation of Science 8 teacher
- Successful completion of Science 8

To prepare students for multi-faceted careers in science, technology, and engineering, this course will require students to work collaboratively to solve real-world problems.

Through projects, students will learn skills and content grounded in engineering, environmental science, chemistry, and physics. Students will show their proficiency using the designing, building, testing, evaluating, and redesigning of engineering-based solutions; and embrace the non-linear analysis of real-world problems. Coursework will emphasize guided student inquiry and guided student synthesis of course topics, including quantitative analysis, with a heavy emphasis on increasing independent problem-solving throughout the year.

Natural Science and Engineering L3

SC131 - 1.0 Credit - Year Long - Grade 9

Prerequisite:

- C+ or better in Science 8
- **and** recommendation of Science 8 teacher

In that NS&E scientific phenomena are described mathematically, it is strongly suggested that students have alignment with math and science levels.

To prepare students for multi-faceted careers in science, technology, and engineering, this course will require students to work collaboratively to solve real-world problems. Through projects, students will learn skills and content grounded in engineering, environmental science, chemistry, and physics. Students will show their proficiency using the designing, building, testing, evaluating, and redesigning of engineering-based solutions; embracing the non-linear analysis of real-world problems. Coursework will emphasize independent student inquiry and guided synthesis of course topics, including quantitative analysis, with a heavy emphasis on increasing independent problem-solving throughout the year.

Natural Science and Engineering L4

SC142 - 1.0 Credit - Year Long - Grade 9

Prerequisite:

- A- or better in Science 8
- **AND** recommendation of Science 8 teacher

In that NS&E scientific phenomena are described mathematically, it is strongly suggested that students have alignment with math and science levels.

To prepare students for multi-faceted careers in science, technology, and engineering, this course will require students to work collaboratively to solve real-world problems. Through projects, students will learn skills and content grounded in engineering, environmental science, chemistry, and physics. Students will show their proficiency

using the designing, building, testing, evaluating, and redesigning of engineering-based solutions; embracing the non-linear analysis of real-world problems. Coursework will emphasize independent student inquiry and student-driven synthesis of course topics, including quantitative analysis, laying the foundation for students to be prepared for more advanced science courses and supporting the engineering program.

Biology Courses

Biology L2

SC220 - 1.0 Credit - Year Long - Grade 10

Prerequisite:

- Completion of Natural Science and Engineering and recommendation of Natural Science and Engineering teacher

Students will gain an appreciation for the biological sciences based on curriculum units that align with the *Massachusetts State Frameworks* and the *Next Generation Science Standards*. This course is designed to give students an integrated approach to biology using real-world data. The instructional strategies and pacing in this course are designed to accommodate the needs and abilities of all students to ensure their success. Various modes of instruction will be used, along with many options to review and reinforce the material.

Biology L3

SC230 - 1.0 Credit - Year Long - Grade 10

Prerequisite:

- Recommendation of current science teacher
- **AND** C or better in Natural Science and Engineering L3, **OR** successful completion of Natural Science and Engineering L4, **OR** A or better in Natural Science and Engineering L2

This course invites students to explore life from a molecular, organismal, and ecological perspective. Topics of discussion include the chemistry of life, life processes, the genetic basis of inheritance, basic anatomy and physiology, ecological studies, and the origin, evolution, and diversity of life. Each unit includes laboratory investigation to reinforce concepts.

Biology L4

SC141 - 1.0 Credit - Year Long - Grade 10

Prerequisite:

- Recommendation of current science teacher
- **AND:** B or better in Natural Science and Engineering L4, **OR** A or better in Natural Science and Engineering L3

This course is designed for students who have a natural intellectual curiosity for the sciences. It requires a high level of reading comprehension, writing, critical thinking, and interpretation skills, and is designed for students who are self-directed. This course provides a molecular-based curriculum that emphasizes the conceptualization and application of concepts to large biological themes such as cell structure and function, energy utilization, genetic continuity, evolution, interdependence, and diversity of life. Concepts are investigated in several laboratory experiments and projects, requiring students to employ basic research skills as they follow the Scientific Method.

AP Biology

SC350 - 1.0 Credit - Year Long - Grades 11-12

Prerequisite:

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- Recommendation of current science teacher
- **AND** B- or better in Biology L4 **OR** A- or better in Biology L3
- **AND** completion of a full year of chemistry with a B or better (L3 or L4) **OR** concurrently enrolled in L4 Chemistry.

This rigorous course is equivalent to a college-level freshman biology course. Instruction in AP biology presumes students' mastery of foundational topics in biology. The expectation is that students who require review in these areas will do so independently or meet with the instructor outside of class. Students who are successful in AP biology are highly motivated independent learners, able to work at a fast pace, demonstrate skillful writing and numeric analysis, and can complete extensive work outside of class. A summer assignment is part of the course and must be completed in the first week of school. Topics and labs covered are determined by the College Board. Areas of emphasis are biochemistry, cellular biology, genetics, evolution, ecology, and 13 labs plus more that are student-designed.

Anatomy and Physiology Courses

Anatomy and Physiology L3

SC331 - 1.0 Credit - Year Long - Grades 11-12

Prerequisite:

- Recommendation of current science teacher
- **AND:** C- or better in Biology L4 **OR** C or better in Biology L3

This course involves a fascinating exploration of human anatomy and physiology in which students discover how the human body is organized and how it functions. Laboratory investigations include cat dissection and hands-on physiological studies of the fundamental systems of the body.

Anatomy and Physiology L4

SC341 - 1.0 Credit - Year Long - Grades 11-12

Prerequisite:

- Recommendation of current science teacher
- **AND:** C+ or better in Biology L4 **OR** B- or better in Biology L3

This is an accelerated course designed for students considering careers in the allied health professions, biology, or biotechnology. Topics include organization of the human body, histology, as well as an in-depth investigation of the body's systems. Laboratory investigations include cat dissection as well as the use of biotechnology instrumentation.

Chemistry Courses

Chemistry L2

SC321 - 1.0 Credit - Year Long - Grades 11-12

Prerequisite:

- Recommendation of current science teacher

Chemistry Level 2 presents a hands-on, interactive approach to learning chemistry. Students will work individually and cooperatively to solve problems, observe

demonstrations, experiment, whiteboard, build models, and create particle diagrams. Basic chemistry topics in this course include: measurements, calculations, properties and changes, states and types of matter, gas relationships and movement, early atomic theory, moles, periodic table of elements, chemical reactions, nomenclature, bonding, balancing equations, stoichiometry, solutions, and acids and bases.

Chemistry L3

SC231 - 1.0 Credit - Year Long - Grades 10-12

Prerequisite:

- Recommendation of current science teacher
- **AND:** completion of Algebra I with a C or better **OR** completion of Intermediate Algebra L2 with an A or better.

Students in this course will study the basic principles of chemistry. Specific areas of study will include the laws and theories of chemistry, stoichiometry, atomic and molecular structure, chemical bonding, properties of solutions, kinetic-molecular theory, periodicity of the elements, and acids and bases. Through this laboratory-based course, students will gain a better appreciation for chemistry in their everyday lives.

Chemistry L4

SC240 - 1.0 Credit - Year Long - Grades 10-12

Prerequisite:

- Recommendation of current science teacher
- **AND** a grade of A- or better in Biology L3 **OR** a grade of C or better in Biology L4*
- **AND** if currently in L3 math, a grade of A- or better **OR** if currently in L4 math, a grade of C or better.

*Note: rising 10th-grade students with an A or better in Natural Science and Engineering L4 **AND** recommendation of the teacher for this course will be concurrently taking Biology L4.

After the start of the school year, any change to a lower math level so that prerequisites are no longer met may also impact science placement.

This course is designed for students who are considering studying science beyond high school. Students will apply problem-solving skills in a variety of situations including

collecting and analyzing laboratory data. Topics covered will include the laws and theories of chemistry, stoichiometry, atomic and molecular structure, chemical bonding, properties of solutions, kinetic-molecular theory, periodicity of the elements, and acids and bases. Students will use web-based learning and cooperative learning as well as computer interfaces to collect and analyze data.

AP Chemistry

SC351 - 1.0 Credit - Year Long - Grades 11-12

Prerequisite:

- Recommendation of current science teacher
- **AND** B- or better in Chemistry L4; **OR** Permission of AP Chemistry teacher

The AP Chemistry class moves at a very fast pace in order to complete all of the curriculum as established by the College Board and has a major laboratory component that includes approximately twenty experiments in almost all of the topic areas. The course covers the topics and laboratory experiments typical of a first full-year college course. Topics to be studied include: stoichiometry, periodicity, gas laws, solutions, electrochemistry, thermochemistry and thermodynamics, equilibrium, acid-base, kinetics, bonding, and interparticle forces. Students taking AP Chemistry may receive college credit upon successful completion of the course and the AP examination. There is an expectation that the summer assignment will be completed before the school year begins.

Physics Courses

Physics L3

SC330 - 1.0 Credit - Year Long - Grades 11-12

Prerequisite:

- Recommendation of current science teacher
- **AND** concurrent enrollment in or C+ or better in Algebra II L3, L4 or L5

After the start of the school year, any change to a lower math level so that prerequisites are no longer met may also impact science placement.

Students in this course will study the basic principles of physics and their application to everyday life. Hands-on laboratory investigations, including real-time computer-based

experiments, are an integral part of this course. Students concentrate on the topics of kinematics, dynamics, waves and sound, momentum, work and energy, electricity, and magnetism. A primary component of this course is learning to approach and solve problems.

Physics L4

SC340 - 1.0 Credit - Year Long - Grades 11-12

Prerequisite:

- Recommendation of current science teacher
- **AND** concurrent enrollment in or B- or better in Precalculus L4 or L5

After the start of the school year, any change to a lower math level so that prerequisites are no longer met may also impact science placement.

This is an accelerated course designed for students considering careers in science or engineering. Topics studied include vector mathematics, kinematics, dynamics, waves and sound, momentum, work and energy, electricity, and magnetism. Hands-on laboratory investigations, including real-time computer-based experiments, are an integral part of this course. Honors Physics places particular emphasis on problem-solving skills, conceptual understanding, construction and interpretation of graphical data, and critical analysis of quantitative laboratory results.

Calculus-Based Physics L5

SC451 - 1.0 Credit - Year Long - Grade 12

Prerequisite:

- Recommendation of current science teacher
- **AND** concurrent enrollment in AP Calculus or Calculus L4
- **AND** either: B+ or better in Physics L4, **OR** B+ or better in VHS AP Physics 1, **OR** A or better in Physics L3

After the start of the school year, any change to a lower math level so that prerequisites are no longer met may also impact science placement.

This is a calculus-based course in physics that emphasizes the study of kinematics, dynamics, heat, electricity, magnetism, and light.

Science Electives

Exercise Physiology L3

SC332 - 0.5 Credit - Semester Long - Grades 11-12

Prerequisite:

- Successful completion of Biology L3 or L4, OR C or better in Biology L2

This course will integrate chemistry, physics, human anatomy and physiology, health, and nutrition and apply them to the human machine in exercise and sports. Course topics include the energy systems, physiological adaptations to exercise, biomechanics of exercise and sports, sports nutrition, ergogenic aids in sports, common sports-related injuries, and fitness testing. This course will appeal to students considering careers in medical fields (physical/occupational therapy, nursing, and sports medicine), health and fitness, coaching/sports management, or physical education.

Forensics L3

SC334 - 0.5 Credit - Semester Long - Grades 11-12

Prerequisite:

- Recommendation of current science teacher **AND** one of the following:
successful completion of Biology L4, **OR** C+ or better in Biology L3, **OR** A- or better in Biology L2

Forensic science is the application of science as inquiry. The application of the scientific method is central to this course – observation, collection, and classification of data, examining relationships, forming and testing hypotheses, and making conclusions based on evidence. In this course, you will use scientific techniques and learn about various types of evidence used in forensic investigations. Classroom activities include experiments, projects, case studies and simulated crime scenes. The ultimate goal is to provide an overall view of this field of science which has been subject to increased interest and popularity in recent years.

Oceanography L3

SC333 - 0.5 Credit - Semester Long - Grades 11-12

Prerequisite:

- Successful completion of Biology L2, L3, or L4

Oceanography encompasses and integrates many sciences including biology, chemistry, geology, physics, and environmental science. It is the study of anything about the oceans: the variety of organisms that live in them; the chemical/physical

aspects of the various ecosystems; and most importantly, the major factors currently impacting our oceans, and possible solutions to these problems. A field trip to the rocky shore to conduct investigations is a mandatory requirement for this course.

Scientific Beekeeping: A hands-on study of the Honey Bee (*Apis mellifera*) L4

SC345 - 1.0 Credit - Year Long - Grades 11-12

Prerequisite:

- A- or Better in L3 Biology or B or Better in L4 Biology

This course will examine the biology of honey bees and the science and art of apiculture by exploring the life history, ecology, and management of honey bees. Course topics will include: honey bee anatomy, physiology, social structure, pests/diseases, management, breeding, and current topics in beekeeping. The lab portion of the course will involve field exercises and hands-on experience including Honey Bee Dissection (Queen, Worker, Drone), Researching Honey Bee Drone Drift, Queen Grafting, Queen Mating, Evaluating Colonies for Parasitic Mites Infestation, Testing Colonies for Hygienic Traits, Drone Semen Collection, Introduction to Instrumental Insemination of Honey Bee Queens. A summer assignment is part of the course and must be completed by the end of the first week of school.

Note: Students who are allergic to bee stings should NOT enroll in this course. Students should supply their own personal protective equipment and can see the instructor for recommendations if needed.

Topics in Environmental Science L3

SC432 - 0.5 Credit - Semester - Grade 12

Prerequisite:

- Successful completion of L2, L3 or L4 Chemistry

This semester-long course will study some major environmental issues facing the world, the United States, and specifically Westborough. This includes impacts of environmental issues on the non-living and living parts of the environment, including us, as well as what can be done about these issues. Topics may include: pollution (air, water, plastic, among others), deforestation, ocean acidification, invasive species and native species, water shortages, wildfires, food production (pesticides, factory farming, production and packaging of food), and food waste, climate change, and energy production. Emphasis will be given to issues of environmental justice and exploring how marginalized groups are disproportionately impacted by environmental issues drawing on sources by some of the early environmentalism movement

advocates like Rachel Carson, as well as sources and social media campaigns by contemporary voices, especially the voices of members of indigenous and LatinX communities.