## Science Program of Studies

<table>
<thead>
<tr>
<th>Grade 9 Courses</th>
<th>Level</th>
<th>Course/Grade</th>
<th>Prerequisites</th>
<th>Teacher Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman Physics</td>
<td>Honors</td>
<td>Scheduled in H Geometry</td>
<td>Score on Math ≥ 507</td>
<td>Required</td>
</tr>
<tr>
<td>CPA</td>
<td>Scheduled in H Algebra 1, CPA Algebra 1, or H or CPA Geometry</td>
<td>Score on Math ≥ 484</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>CP</td>
<td>Scheduled in CP Algebra 1</td>
<td></td>
<td>Required</td>
<td></td>
</tr>
</tbody>
</table>

| Topics in Science and Technology | CP | Scheduled in Found. of Algebra 1 | | Required |

<table>
<thead>
<tr>
<th>Grade 10 Courses</th>
<th>Level</th>
<th>Course/Grade</th>
<th>Prerequisites</th>
<th>Teacher Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>Honors</td>
<td>Students must meet all of the following: H Fresh Physics B- or better AND earn a C or better on the Honors Physics Research Project OR CPA Fresh Physics A – or better</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>CPA</td>
<td>CPA Freshman Physics C- or better</td>
<td></td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>CP</td>
<td>None</td>
<td></td>
<td>Required</td>
<td></td>
</tr>
</tbody>
</table>

| Topics in Biology | CP | Topics in Science and Technology | | Required |

<table>
<thead>
<tr>
<th>Grade 11 Courses</th>
<th>Level</th>
<th>Course/Grade</th>
<th>Prerequisites</th>
<th>Teacher Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>Honors</td>
<td>B or better in Honors Algebra 2 B+ or better in Freshman Physics Students must also meet the following: A in CPA Biology OR B in H Biology and C or better on the Honors Biology Research Project.</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>CPA</td>
<td>B- or better in CPA Algebra 1 and C or better in CPA Biology (B recommended)</td>
<td></td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>CP</td>
<td>Successful completion of CP Algebra 1</td>
<td></td>
<td>Required</td>
<td></td>
</tr>
</tbody>
</table>

| Topics in Physics | CP | Topics in Biology | | Required |

<table>
<thead>
<tr>
<th>Grade 12 Electives</th>
<th>Level</th>
<th>Course/Grade</th>
<th>Prerequisites</th>
<th>Teacher Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modern Physics</td>
<td>Honors</td>
<td>All of the following: B or better in all Honors math or B+ or better in all CPA math B in Honors Freshman Physics B or A- in CPA Freshman Physics Enrolled in Pre-Calculus or higher math class.</td>
<td></td>
<td>Recommended</td>
</tr>
</tbody>
</table>

| Senior Physics | CPA | C or better in all CPA or H science C or better in Algebra 2 or Pre-Calculus | | Recommended |

| Engineering Physics Project | CP | Successful completion of Freshman Physics and Algebra 1, Geometry, and Algebra 2 | | Required |

| Anatomy & Physiology | H | B or better in both CPA Biology and CPA Chemistry | | Recommended |
| CPA | B- or better in CPA Biology and B- or better in CPA Chemistry; or A- or better in CP Chemistry. | | Required |

| Environmental Science | CPA | Biology | | Recommended |

| Environmental Issues | CP | Successful completion of two lab sciences | | Recommended |

| Natural History of New England | CPA/CP | Successful completion of two lab sciences | | Recommended |

| AP Biology | AP | B+ or better in CPA Biology or B- or Better in H Biology | | Required |

| AP Chemistry | AP | B+ or better in CPA Chemistry or B- or better in H Chemistry | | Required |

| AP Environmental Science | AP | B- or better in all CPA or H science classes | | Required |
Department Philosophy - The Science Department of Wachusett Regional High School strives for excellence in the science education of all its graduates. We recognize that science is a human endeavor designed to achieve an increasingly comprehensive and reliable understanding of the human species and its environment. Scientific literacy is an important key to a functioning, technology-based society.

The learning objectives of the Science Department are:

- To provide a basic understanding of how nature works in both living (life science) and non-living (physical science) systems, and to show their interrelatedness.
- To teach students the procedures and techniques used in scientific methodology (e.g. forming a hypothesis, conducting experiments, collecting and analyzing data to draw logical conclusions, etc.).
- To challenge and stimulate students to use, refine and communicate their powers of creative thinking, problem recognition, and problem solving in the scientific application of both hypothetical and real world situations.
- To provide a strong foundation to help our graduates achieve confidence and success in their introductory college science classes.

The WRHS Science Curriculum is designed to provide all students the opportunity to meet the stated objectives in a logical, sequential, comprehensive and varied manner.

The WRHS graduation requirement in Science coursework is the successful completion of three years (15 credits) of course work. College-bound students are strongly urged to take at least three years of laboratory science courses. All of the courses listed within this section are considered laboratory science courses. All full-year courses receive five credits and all semester science courses receive \(\frac{2}{2}\) credits. AP Biology and AP Chemistry meet 10\(\frac{1}{2}\) times during the seven-day cycle and receive 7\(\frac{1}{2}\) credits.

To complete these requirements the traditional course of study would have students taking Freshman Physics; then Biology in their sophomore year followed by Chemistry in their junior year. All three of these courses are offered at various levels H, CPA, and CP. As seniors, students are offered a wide variety of either full-year or half-year electives which are also offered at the various levels of study.

Laboratory sciences require many precautions in order to ensure the safety of the students in a laboratory setting. Any inappropriate behavior by a student in a laboratory class will result in serious and immediate disciplinary action.

Lower School Program

Freshman Physics is a physical science course specifically designed for 9th grade students beginning their High School science curriculum. This course provides an in-depth investigation of matter and energy. Laboratory investigations, demonstrations, and discussions include the basic physical concepts in motion and forces, conservation of energy and momentum, thermodynamics (heat and heat transfer), waves, and electromagnetism. This program includes substantial hands-on laboratory experiences, which allow students to make observations, raise questions, and formulate hypotheses; design and conduct scientific investigations; analyze and interpret results of those investigations; and communicate and apply their findings. This course boosts students’ mathematical skills as they construct and use tables and graphs to interpret data sets, solve simple algebraic equations, perform basic statistical procedures to analyze data, convert units, use scientific notation, determine the correct number of significant figures, and determine percent error from experimental and accepted values.
**Freshman Physics (H, Grade 9)** 5 credits
The **H level** requires that students have a solid mathematical and science background.

An Individual Experimental Research Project is REQUIRED for this course, due the Monday before April vacation. No late projects will be accepted.

**Freshman Physics (CPA, Grade 9)** 5 credits
The **CPA level** requires a good mathematics and science background.

**Freshman Physics (CP, Grade 9)** 5 credits
The **CP level** course is taught from a more conceptual view with the amount and level of mathematics required minimized.

**Topics in Science and Technology (CP, Grade 9)** 5 credits
The Topics in Science and Technology class studies Engineering Design, Construction Technologies, Energy and Power Technologies of Fluid Systems, Thermal Systems, and Electrical Systems as well as Communication Technologies and Manufacturing Technologies. **All students enrolled in this class will take the STE MCAS in June of their freshman year.**

**The level of Freshman Science will align with your math choice.**
- Honors Freshman Physics students will also take Honors Algebra 1
- CPA Freshman Physics students will take CPA Geometry or CPA Algebra 1 or H Algebra 1
- CP Freshman Physics students will take CP Algebra 1
- Topics in Science and Technology will take Fundamentals of Algebra 1

All Freshman Physics students will take the Introductory Physics MCAS in June of their freshman year.

**Biology (H, Grade 10)** 5 credits
Honors Biology requires students to have exceptional reading comprehension skills and a strong mathematics background. This course is a study of biology as an inquiry into life with emphasis on the laboratory approach. The investigative processes of science are used to develop an in-depth understanding of the principles of biology from the standpoints of unity of pattern, diversity of organisms, and the continuity of life. Students will complete a summer reading and writing assignment as stated in the Honors Biology Summer letter, which can be accessed online on the Science Department web page. An Individual Experimental Research Project is REQUIRED for this course, due the Monday before April vacation. No late projects will be accepted.

**Biology (CPA, Grade 10)** 5 credits
CPA Biology requires students to have strong reading comprehension and problem-solving skills. This laboratory-based class includes a study of the methods of science as a process of inquiry, including the concepts of cellular structure and function, molecular genetics, heredity, taxonomy, and evolution.

**Biology (CP Grade 10)** 5 credits
This laboratory-based course includes a study of the methods of science as a process of inquiry by including the concepts of cellular structure and function, molecular genetics, heredity, taxonomy, and evolution. More curricular reinforcement is given as students work to understand the difficult vocabulary and concepts of biology.

**Topics in Biology (CP, Grade 10)** 5 credits
This laboratory-based course includes a study of the methods of science as a process of inquiry by including the concepts of cellular structure and function, molecular genetics, heredity, taxonomy, and evolution. More curricular reinforcement is given as students work to understand the difficult vocabulary and concepts of biology. **The curriculum in this class is designed specifically to prepare students for the Biology MCAS test.**
Lower School/Upper School Options

**Practical Science (Grades 9-12) 5 credits**
This course provides a general overview of various living organisms and their structures, and better exposes the student to concepts they may find on the MCAS Biology test. The areas of study include: scientific methods, analyzing experimental design, characteristics of living things, animal and plant cells and their functions, photosynthesis, cellular respiration, cell division, digestive system, ecology, and genetics.

**Functional Science (Grades 9-12) 5 credits**
This course provides general entry points to life science concepts. Students will be exposed to concepts that will be used for upcoming MCAS portfolios. The following areas are targeted for discussion: scientific methods, measurement, needs of living things, cell organelles and their functions, digestive system, plants, plants structures and functions, photosynthesis and cellular respiration, and various ecological concepts. The pace of the discussion will dictate the topics covered.

Upper School Program

**Chemistry (H, Grades 11) 5 credits**
This course is an in-depth, fast-paced study of chemistry as an experimental science for the highly motivated student or science major. Major concepts such as atomic structure, bonding, reactions, gases, acids/bases, and kinetics will be discussed in great detail in a lecture setting and then reinforced with laboratory work. Students will complete a summer reading and writing assignment as stated in the Honors Chemistry Summer letter, which can be accessed online on the Science Department web page. A requirement of the class is the memorization of ions and formulas necessary for the study of chemistry. An Individual Experimental Research Project is REQUIRED for this course, due the Monday before April vacation. No late projects will be accepted.

**Chemistry (CPA, Grades 11) 5 credits**
This course is an in-depth study of chemistry as an experimental science for the college bound student. Major concepts such as atomic structure, bonding, reactions, gases, and acids/bases are covered. A requirement of the class is the memorization of ions and formulas necessary for the study of chemistry. Course work as well as laboratory work will be performed to reinforce key concepts to better the students’ understanding. Over the course of the year, skills and techniques in handling materials, apparatus, and concepts will be developed. Emphasis is on the application of chemical concepts using labs, demonstrations, hands-on activities, and basic mathematical calculations.

**Chemistry (CP, Grades 11) 5 credits**
This CP level course is taught from a more conceptual view of chemistry with the amount and level of mathematics required minimized. Core topics are taught using real-world examples and applications to put the importance of chemistry into perspective for the student. Major concepts such as atomic structure, bonding, reactions, gases, and acids/bases are covered. Course work, as well as laboratory work, will be performed to reinforce key concepts to better the students’ understanding. Over the course of the year, skills and techniques in handling materials, apparatus, and concepts will be developed. Emphasis is on the application of chemical concepts using labs, demonstrations, hands-on activities, and basic mathematical calculations.
**Topics in Physics (CP, Grade 11) 5 credits**
This course will not only complete a three-year sequence in science required for graduation, it is also designed to teach the Massachusetts State Framework in Physics. This course provides an investigation of matter and energy. Laboratory investigations, demonstrations, and discussions include the basic physical concepts in motion and forces, conservation of energy and momentum, thermodynamics (heat and heat transfer), waves, and electromagnetism. This program includes substantial hands-on laboratory experiences, which allow students to make observations, raise questions, and formulate hypotheses; design and conduct scientific investigations; analyze and interpret results of those investigations; and communicate and apply their findings. This course boosts students’ mathematical skills as they construct and use tables and graphs to interpret data sets, solve simple algebraic equations, perform basic statistical procedures to analyze data, convert units, use scientific notation, determine the correct number of significant figures, and determine percent error from experimental and accepted values. Multiple instructional strategies will be explored to help students understand the concepts of Physics. Mathematical applications of physics will be minimized.

**Senior Science Electives**

**Anatomy and Physiology (H/CPA) 5 credits**
This course is designed to give students an understanding of the basic structure and functions of the human systems. Students preparing for health-related careers and those interested in studying the principles of biology using the human species as an example will find this course valuable. Demonstrations and experiments are used to illustrate the principles and concepts of the course, including the problems of disease, nutrition, and heredity. Independent literature and electronic research is required each term. Students will dissect a sheep heart and a fetal pig.

**Engineering Physics Projects (CP) 5 credits**
This course aims to expose students to introductory college level engineering topics and develop in them an understanding of the physics principles that are involved in several engineering disciplines, such as civil and structural engineering, mechanical engineering, electrical engineering, and aerospace engineering. Students will learn physics and engineering theory and apply that knowledge through hands-on, project-based learning. Students will use the engineering design process to define a design problem, research, prototype, build, test, and redesign projects that demonstrate the physics and engineering principles learned throughout the course. This course will explore a variety of topics, including metric measurement, technical engineering drawing, statics, Newton’s laws, simple machines, energy, electricity, hydraulics and pneumatics, civil and architectural design, astronomy, and rocket design.

**Note to students who plan to play sports in college:** The NCAA may not accept this class as a core course requirement.

**Environmental Science (CPA) 5 credits**
This course immerses students in the physical, biological, and earth systems sciences that shape our world to help them develop an understanding of the environment. Scientific concepts, principles, and modern science practices allow students to analyze environmental issues, both natural and human induced, and to engage in evidence-based decision-making in real-world contexts. This course will explore a variety of topics, including matter and energy transformation, properties of Earth materials, climate and weather, biodiversity, environmental systems, biomes, populations, soil, rocks, and glaciation. Classes regularly go outside for practical labs in all weather conditions.

**Environmental Issues (CP) 2½ credits (First semester)**
This course aims to develop an understanding of environmental problems and the laws that govern these issues. Students will also study the effects of growth and development on their environment and on the quality of life, our land, air, and water resources. These problems are studied in a variety of ways in the classroom, in the laboratory, in the field, and through project work.
Natural History of New England (CPA/CP) 2½ credits (Second semester)
This course meets as a combined CPA/CP class and is a general survey course designed to acquaint the student with the natural history of New England. This includes studies of soil and rock formation, plants, animals and the ecology of the area. **Note to students who plan to play sports in college:** The NCAA may not accept this class as a core course requirement.

Modern Physics (H) 5 credits
Lasers, quantum mechanics and the nature of light and gravity, black holes, exotic sub-nuclear particles, high-temperature superconductivity and the "history of the future of the universe" are some of the topics that will be investigated in this physics course that highlights the physics of the past 100 years. This course serves as a natural follow-up to the physics course taken during freshman year. It is intended to be a more rigorous treatment of topics in mechanics, properties of matter, an introduction to thermodynamics, wave theory, electromagnetic interactions, and modern physics (relativity, atomic, nuclear, sub-nuclear, quantum etc.) with an emphasis on mathematical techniques in problem solving and data analysis. Labs will be done on a regular basis when possible. Computers will also be used in the data collection and analysis process. This course will provide a strong foundation for those students planning to major in physics or engineering in college.

Senior Physics (CPA) 5 credits
This course builds on the science and mathematical skills obtained during the first three years of high school and will serve as a preparation for an introductory college Physics course. The goal for the course is to provide a deeper understanding of the physics concepts learned in Freshman Physics. The additional topics covered include rotational mechanics, wave theory, electricity and magnetism, optics and thermodynamics. This class should be considered by students planning to major in any math, science or engineering program. Group and individual projects are a major component of this course.

**Advanced Placement Courses**

Advanced Placement Biology (AP) 7½ credits
Advanced Placement Biology is designed to be the equivalent of a college introductory biology course usually taken by students majoring in the sciences during their first year of college. Students who are successful in this course may have the opportunity, as college freshmen, to undertake upper-level courses in biology or to register for courses for which biology is a prerequisite; students may also fulfill a basic requirement for a college laboratory science course. AP Biology is designed to be taken by students after the successful completion of a first course in high school biology and high school chemistry.

Advanced Placement Chemistry (AP) 7½ credits
This course is designed to be the equivalent of a 1st year college general chemistry course and follows the College Board’s AP Chemistry syllabus. This course presents a rigorous treatment of the following concepts: the nature of matter, gas laws, thermodynamics, stoichiometry, bonding, chemical kinetics, and chemical equilibrium. Laboratory activities involve a variety of techniques and methods, including precision instrumental work, as well as qualitative analysis of unknowns. Students will be required to do extensive writing, and to keep a thorough and accurate laboratory notebook.

Advanced Placement Environmental Science (AP) 5 credits
The AP Environmental Science course is designed to be the equivalent of a one-semester, introductory college course in environmental science. The goal of the course is to provide students with the scientific principles, concepts and methodologies required to understand the interrelationships of the natural world. Students will be able to identify and analyze environmental problems both natural and human-made, evaluate the relative risks associated with these problems, and examine alternative solutions for resolving and/or preventing them. AP Environmental Science promotes the development of citizens who could make informed, knowledgeable decisions concerning environmental issues. AP Environmental Science is designed to be taken by students after the successful completion of a first course in high school biology and high school chemistry.