

Science

GRADE 9	GRADE 10	GRADE 11	GRADE 12
Biology (H)	Chemistry (Pre-AP)	AP Chemistry (AP) AP Environmental Science (AP) Physics (H) Anatomy & Physiology (H)	AP Chemistry (AP) Biotech & Media Preparation (DE) Physics (H) Anatomy & Physiology (H)
Biology (CP4)	Chemistry (CP4) Environmental Science (CP4)	Chemistry (CP4) Physics (CP4) Anatomy & Physiology (CP4)	Chemistry (CP4) Physics (CP4) Anatomy & Physiology (CP4) Environmental Science (CP4) Zoology & Botany (CP4)
Biology, Pt I (CP2)	Biology, Part II (CP2) Environmental Science (CP2)	Anatomy & Physiology (CP2) Applied Chemistry (CP2) Applied Physics (CP2)	Anatomy & Physiology (CP2) Applied Chemistry (CP2) Applied Physics (CP2) Environmental Science (CP2)

**Chart is organized by level.*

GRADE 9 SCIENCE COURSE OFFERINGS

Course descriptions are organized by course/level

Beginning with the Class of 2021, all students will be required to successfully complete Chemistry or Physics in order to meet graduation requirements.

Biology (H) (2 periods/full year)

1.0 credit

Prerequisite: **Grade 9 placement test scores and teacher recommendation**

This honors course is a survey of the fundamental concepts of the biological sciences. Topics covered will include simple organisms, cell structure and function, classification, evolution, genetics, heredity, biotechnology, basic human anatomy & physiology. It stresses conceptual development, develops science inquiry skills, requires experimental design, critical thinking and data analysis and encourages creative writing and design. Emphasis is placed on direct student involvement through activities and the completion of an independent research project. This is a laboratory science course and should be taken by students with college aspirations. Students will be eligible to take the Biology MCAS exam at the end of this course.

Biology (CP4) (2 periods/full year)

1.0 credit

Prerequisite: **Grade 9 placement test scores and teacher recommendation**

This course is a survey of the fundamental concepts of the biological sciences. Topics covered will include simple organisms, cell structure and function, classification, evolution, chemistry of life, ecology, biodiversity, genetics, heredity, biotechnology, and basic human anatomy & physiology. It stresses conceptual development, develops science inquiry skills, requires experimental design, critical thinking and data analysis and encourages creative writing and design. Emphasis is placed on direct student involvement through activities. This is a laboratory science course. Students will be eligible to take the Biology MCAS exam at the end of this course.

Biology Part I (CP2) (2 periods/full year)

1.0 credit

Prerequisite: **Grade 9 placement test scores and teacher recommendation**

This grade 9 Biology Part I (CP2) course is the first component of a two-year Biology program. Topics from the Massachusetts State Frameworks (10/06) Standards 1, 2, 5, 6 will be covered. These include: Chemistry of Life, Cell Biology, Evolution, Biodiversity, and Ecology. This is a laboratory science course. It stresses conceptual development, science inquiry skills, requires experimental design, critical thinking and data analysis. Students will be eligible to take the Biology MCAS exam once they complete Biology Part II at the end of their sophomore year.

GRADE 10 SCIENCE COURSE OFFERINGS

Chemistry (Pre-AP) (2 periods/full year) 1.0 credit
Prerequisite: **Successful completion of Algebra II**
Recommendation: **C+ or better in Algebra II**

This Pre-AP laboratory course includes topics in the fundamental nature of matter and how it reacts. Topics include solutions, acids, bases, chemical reactions, formulas and equations, bonding, atomic structure, the mole, periodicity, nomenclature, and gas laws. Additional topics in thermo chemistry, nuclear and organic will be explored. It stresses conceptual development, develops science inquiry skills, and requires experimental design, critical thinking and data analysis. Strong Algebra skills are recommended for this course. Emphasis is placed on direct student involvement through hands-on activities, labs and the completion of independent research projects.

Chemistry (CP4) (2 periods/full year) 1.0 credit
Prerequisites: **Successful completion of Algebra I (CP4)**
Recommendation: **Student earns a 70 or better in Algebra 1 (CP4)**

This college-preparatory laboratory course includes topics in the fundamental nature of matter and how it reacts. Topics include solutions, acids, bases, chemical reactions, formulas and equations, bonding, molecular structure, the mole, periodicity, and nomenclature. It stresses conceptual development, develops science inquiry skills, requires experimental design, critical thinking and data analysis. Strong Algebra skills are recommended for this course. Emphasis is placed on direct student involvement through activities and the completion of an independent research project.

Environmental Science (CP4) (2 periods/full year) 1.0 credit
Prerequisite: **Successful completion of Biology**

Environmental Science engages students in the physical, biological, and earth systems that shape our environment. Scientific concepts, principles and modern science practices allow students to analyze environmental issues, both natural and human induced, and engage in evidence-based decision making in real world contexts. Included this year is a special focus on aquatic ecology. This is a laboratory science course. ***Note - All students are required to successfully complete Chemistry or Physics in order to meet graduation requirements.**

Environmental Science (CP2) (2 periods/full year) 1.0 credit
Prerequisite: **Successful completion of Biology**

Environmental Science engages students in the physical, biological, and earth systems that shape our environment. Scientific concepts, principles and modern science practices allow students to analyze environmental issues, both natural and human induced, and engage in evidence-based decision making in real world contexts. Included this year is a special focus on aquatic ecology. This is laboratory science course. ***Note - All students are required to successfully complete Chemistry or Physics in order to meet graduation requirements.**

Biology Part II (CP2) (2 periods/full year) 1.0 credit
This grade 10 Biology Part II (CP2) course is the second component of a two-year Biology (CP2) program. Topics from the Massachusetts State Frameworks include Cell Biology, Genetics, and Anatomy & Physiology. Students will also be introduced to significant figures, calculating percent error, SI units, and Celsius scale. This is a laboratory science course. It stresses conceptual development, science inquiry skills, requires experimental design, critical thinking and data analysis. Students will be eligible to take the Biology MCAS exam at the end of this course.

GRADE 11 SCIENCE COURSE OFFERINGS

AP Chemistry (Advanced Placement) (2 periods/full year) 1.0 credit
Required: **Successful Completion of Chemistry (CP4 or Pre-AP)**
Recommendation: **Completion of, or currently enrolled in, Algebra II**

The AP Chemistry course provides students with a lab based college level foundation to support future advanced course work in chemistry. Through inquiry-based learning, students develop critical thinking and reasoning skills. Students cultivate their understanding of chemistry and science practices as they explore topics such as: atomic structure, intermolecular forces and bonding, chemical reactions, kinetics, thermodynamics, and equilibrium. Students will be required to take and pay for the AP Chemistry exam at the end of the year. Students passing the AP exam with a score of 3-5 receive college credit at most universities.

Chemistry (CP4) (2 periods/full year) 1.0 credit
Prerequisites: **Successful completion of Algebra I (CP4)**
Recommendation: **Student earns a 70 or better in Algebra 1 (CP4)**

This college-prep laboratory course includes topics in the fundamental nature of matter and how it reacts. Topics include solutions, acids, bases, chemical reactions, formulas and equations, bonding, molecular structure, the mole, periodicity, and nomenclature. It stresses conceptual development, develops science inquiry skills, requires experimental design, critical thinking and data analysis. Emphasis is placed on direct student involvement through activities and the completion of an independent research project. This course is recommended for college bound students. This course prepares students for a four-year college program. Strong Algebra skills are recommended for this course.

Applied Chemistry (CP2) (2 periods/full year) 1.0 credit
Prerequisite: **Successful completion of Biology (CP2)**

This course covers traditional topics in chemistry such as the study of matter, acid bases, elements, compounds and mixtures. It is intended to enhance the chemistry background for those students who will be working in trades dealing with the health industry and chemicals. This is a laboratory course, but it is not intended for students who plan to major in a science-related field in college. For those students who will be entering college and pursuing college degrees in science and science-related fields please see **Chemistry (CP4)**.

Physics (H) (2 periods/full year) 1.0 credit
Prerequisite: **Successful completion of Algebra I or II (H)**
Recommendation: **Grade of 70 or better in Algebra I or II (H)**

This course covers the traditional Physics topics of matter and energy using the study of motion and force in one, two, and three dimensions. Additionally, investigations into the nature of heat, sound and vibration, and light are pursued. The course emphasizes a conceptual development of topics through examples, problem solving, independent research, and laboratory investigations. A strong background in algebra is essential and an introduction to basic trigonometry is helpful. This course qualifies as a lab science.

Physics (CP4) (2 periods/full year) 1.0 credit
Prerequisite: **Successful completion of Algebra I (CP4)**

This course covers the traditional Physics topics of matter and energy. The course emphasizes a conceptual development of topics through examples and problem solving. A strong background in algebra is essential and an introduction to basic trigonometry is helpful. This course qualifies as a lab science course.

Applied Physics (CP2) (2 periods/full year) 1.0 credit
Prerequisite: **Successful completion of Algebra I (CP2)**

This is a laboratory-oriented applied physics course. The emphasis is on practical applications. Each concept (force, momentum, energy, power, etc.) is explored from a "systems" approach. Videotapes introduce the concept and then class work and laboratories complete the investigations of mechanical, fluid, electrical and thermal systems for each topic. The labs utilize current trade and industry equipment and techniques. This course qualifies as a lab science course.

Anatomy & Physiology (H) (2 periods/full year) 1.0 credit
Prerequisites: **Successful completion of Biology and teacher recommendation**

This honors course in human anatomy & physiology will cover topics including the chemical and cellular basis of human body systems. Students will work at an accelerated pace while studying the structure and function of the muscular, digestive, skeletal, endocrine reproductive, cardiovascular, respiratory, excretory, lymphatic, and nervous systems. Theoretical concepts will be modeled in lab through hands-on experiments, computer-assisted exercises, models, microscopy, as well as dissection. This is a laboratory science course.

Anatomy & Physiology (CP4) (2 periods/full year) 1.0 credit
Prerequisites: **Successful completion of Biology and teacher recommendation**
**Please refer to grade 9 and 10 science course offerings for course description information*

Anatomy & Physiology (CP2) (2 periods/full year) 1.0 credit
Prerequisite: **Successful completion of Biology**

This is an introductory course in human anatomy & physiology. Topics in this course include the chemical and cellular basis of human body systems. Focus is on an in-depth study of the structure and function of the muscular, digestive, skeletal, digestive, endocrine, reproductive, cardiovascular, respiratory, excretory, lymphatic, and nervous systems. Theoretical concepts will be modeled in lab through hands-on experiments, computer-assisted exercises, models, microscopy, as well as dissection. This is a laboratory science course.

AP Environmental Science (Advanced Placement) (2 periods/full year) 1.0 credit
Prerequisite: 2 years of high school science (1 year of life science, 1 year of physical science); Algebra

This AP course is designed to be the equivalent of an introductory college course in environmental science, through which students engage with the scientific principles, concepts, and methodologies required to understand the interrelationships of the natural world. The course requires that students identify and analyze natural and human-made environmental problems, evaluate the relative risks associated with these problems, and examine alternative solutions for resolving or preventing them. Environmental Science is interdisciplinary, embracing topics from geology, biology, environmental studies, environmental science, chemistry, and geography. Students will be required to take and pay for the AP Environmental Science exam at the end of the year. Students passing the AP exam with a score of 3-5 receive college credit at most universities.

GRADE 12 SCIENCE COURSE OFFERINGS

AP Chemistry (Advanced Placement) (2 periods/full year) 1.0 credit
Required: **Successful Completion of Chemistry (CP4 or Pre-AP)**
Recommendation: **Completion of, or currently enrolled in, Algebra II**

The AP Chemistry course provides students with a lab based college level foundation to support future advanced course work in chemistry. Through inquiry-based learning, students develop critical thinking and reasoning skills. Students cultivate their understanding of chemistry and science practices as they explore topics such as: atomic structure, intermolecular forces and bonding, chemical reactions, kinetics, thermodynamics, and equilibrium. Students will be required to take and pay for the AP exam at the end of the year. Students passing the AP exam with a score of 3-5 receive college credit at most universities.

Chemistry (CP4) (2 periods/full year) 1.0 credit
Prerequisites: **Successful completion of Algebra I (CP4)**
Recommendation: **Student earns a 70 or better in Algebra 1 (CP4)**
**Please refer to grade 11 science course offerings for course description information*

Applied Chemistry (CP2) (2 periods/full year) 1.0 credit
Prerequisite: **Successful completion of Biology (CP2)**
**Please refer to grade 11 science course offerings for course description information*

Physics (H) (2 periods/full year) 1.0 credit
Prerequisite: **Successful completion of Algebra I or II (H)**
Recommendation: **Student earns 70 or better in Algebra I or II (H)**
**Please refer to grade 10 and 11 science course offerings for course description information*

Physics (CP4) (2 periods/full year) 1.0 credit
Prerequisite: **Successful completion of Algebra I (CP4)**
**Please refer to grade 10 and 11 science course offerings for course description information*

Applied Physics (CP2) (2 periods/full year) 1.0 credit
Prerequisite: **Successful completion of Algebra I (CP2)**
**Please refer to grade 10 and 11 science course offerings for course description information*

Introduction to Biotechnology I / Introduction to Biotechnology II 1.0 credit
(8 Dual Enrollment credits eligible; 2 periods/full year)
Prerequisite: Algebra II (CP4) and Biology (CP4) and Chemistry (CP4); Placement Test
Recommendation: 70% or higher in prerequisites

This course is designed to acquaint students with the diverse field of biotechnology. Topics will include a brief history of biotechnology, job opportunities in biotechnology, recombinant DNA and protein products, microbial biotechnology, plant biotechnology, medical biotechnology, DNA fingerprinting and forensic analysis. Current ethical issues such as stem cell research and cloning will also be discussed. Students will develop fundamental skills in the set-up of typical growth plates and media used in standard culturing of microorganisms or tissue culture as well as preparation of common solutions and reagents. In addition, students will develop fundamental skills in the use, maintenance, and calibration of common laboratory instruments like spectrophotometers and pH meters. Lab sessions will be hands-on experiences revolving around and applying the topics listed in the lab section of the syllabus. Principles of laboratory safety, documentation, and the use of computers in the lab will also be covered. The practical aspect of the course involves preparation of media for numerous biology classes currently offered in college. After successful completion of this course (B or better), students are eligible for 4 dual enrollment credits through MWCC: BTC101 Introduction to Biotechnology I and 4 dual enrollment credits through MWCC: BTC102 Introduction to Biotechnology II (for a total of 8 credits).

Anatomy & Physiology (H) (2 periods/full year) 1.0 credit
Prerequisite: **Successful completion of Biology**
**Please refer to grade 9 and 10 science course offerings for course description information*

Anatomy & Physiology (CP4) (2 periods/full year) 1.0 credit
Prerequisite: **Successful completion of Biology**
**Please refer to grade 9 and 10 science course offerings for course description information*

Anatomy & Physiology (CP2) (2 periods/full year) 1.0 credit
Prerequisite: **Successful completion of Biology**
**Please refer to grade 10 and 11 science course offerings for course description information*

Zoology & Botany (CP4) (2 period/full year) 1.0 credit
Prerequisite: **Successful completion of Biology**

Zoology is the study of animals. The curriculum examines the ecology, classification, structural characteristics, behavior, and life cycles of animals in each of the major invertebrate and vertebrate phyla. Activities center on microscopy, observation of prepared and living specimens, and research. This course is paired with Botany to give students an opportunity to study both plants and animals. Botany is the study of plants and ornithology is the study of birds. This course combines the two disciplines to examine the interactions between them and connections to habitat. Students will learn to recognize and identify native species of birds (25) and plants (25) using a classification key. The curriculum also examines morphology and taxonomic grouping. Construction of a herbarium is a major course project. Students must successfully complete this course to satisfy the full-year science requirement. This is a laboratory science course. Note – In some cases, this course sequence will be team taught with each teacher instructing one of the course topics.

Environmental Science (CP4) (2 periods/full year)

1.0 credit

Prerequisite: **Successful completion of Biology**

Environmental Science engages students in the physical, biological, and earth systems that shape our environment. Scientific concepts, principles and modern science practices allow students to analyze environmental issues, both natural and human induced, and engage in evidence-based decision making in real world contexts. Included this year is a special focus on aquatic ecology. This is laboratory science course. ***Note - All students are required to successfully complete Chemistry or Physics in order to meet graduation requirements.**

Environmental Science (CP2) (2 periods/full year)

1.0 credit

Prerequisite: **Successful completion of Biology**

**Please refer to grade 9 and 10 science course offerings for course description information*



~Coming in 2018 to Monty Tech's Science Department~

The Monty Tech Science Department has entered into a unique partnership with Project Lead The Way, a nationally recognized provider of rigorous and innovative Science, Technology, Engineering, Mathematics (STEM) education programs used in middle and high schools across the country. PLTW classes are nationally standardized project-based courses that prepare students for college-level work and culminate with a student assessment, which colleges and universities can use to determine if a student earns college credit.

In the fall of 2018, Monty Tech plans to offer the following two Project Lead the Way (PLTW) courses for students. These courses are aligned to the Massachusetts Next Generation Standards and the PLTW Standards and provide students an opportunity to earn college credits by taking the year-end assessment.

PLTW Principles of Biomedical Science

From the moment students walk into this classroom, they are immersed in the mysterious death of Anna. They are asked to investigate, document, and analyze evidence to solve the case. This course provides an introduction to biomedical science through exciting hands-on projects and problems. Students will investigate concepts of biology and medicine as they explore health conditions including heart disease, diabetes, sickle-cell disease, hypercholesterolemia, and infectious diseases. They will determine the factors that led to the death of a fictional woman as they sequentially piece together evidence found in her medical history and her autopsy report. Students will also investigate lifestyle choices and medical treatments that might have prolonged the woman's life and demonstrated how the development of disease is related to changes in human body systems. Students practice problem solving with structured activities and progress to open-ended projects and problems that require them to develop planning, documentation, communication and other professional skills.

PLTW Human Body Systems

Step inside the human body and explore the systems that help us move, protect us from disease or injury, and facilitate communication within the body and with the outside world. Students will solve a medical mystery, analyze a medical case file and diagnose disease, and design experiments to explore structure and function of the human body. Students will examine the interactions of the body systems as they explore identity, communication, power, movement, protection, and homeostasis. Students will design experiments, investigate the structure and functions of the human body, and use data acquisition software to monitor body functions such as muscle movement, reflex and voluntary action, and respiration. Exploring science in action, students build organs and tissues on a skeleton manikin, work through interesting real world cases, and often play the role of biomedical professionals to solve medical mysteries. Students practice problem solving with structured activities and progress to open-ended projects and problems that require them to develop planning, documentation, communication and other professional skills.