
SCIENCE

COURSE OFFERINGS

Grade 9

Physical Science - IMPACT	# 4209
Physical Science	# 4409
Academic Physical Science	# 4509
Honors Biology	# 4609

Grade 10

General Biology - IMPACT	# 4210
General Biology	# 4410
Academic Physical Science	# 4509
Academic Biology	# 4510
Honors Chemistry	# 4610

Grade 11, 12

Applied Science 1	# 4411
Applied Science 2	# 4414
Environmental Science	# 4451
Honors Environmental Science	# 4115
Earth Science and Astronomy	# 4461
Honors Earth Science and Astronomy	# 4462
Chemistry	# 4911
Honors Chemistry	# 4610
Honors Organic Chemistry	# 4811
AP Chemistry	# 4012
Honors Meteorology	# 4111
Concepts of Physics	# 4412
Honors Physics	# 4512
AP Physics B	# 4082
AP Physics C	# 4092
Biology 2	# 4711
Honors Anatomy & Physiology	# 4721
AP Biology	# 4011

PHYSICAL SCIENCE - IMPACT No. 4209
Full Year/Full Time
Grade 9 Phase I Credit 1.0

This course uses laboratory exercises, demonstrations, and other classroom experiences to help students learn about the physical world. It is designed for students whose scientific aptitude, motivation level, and basic academic skills are average to low average. Instructional modifications are made to help students deal with the scientific concepts.

Criteria for Selection -

This course is reserved for students in the IMPACT program.

PHYSICAL SCIENCE No. 4409
Full Year/Full Time
Grade 9 Phases I, II, III Credit 1.0

Students will use laboratory exercises, demonstrations and other classroom experiences to learn about the non-living physical world. Physical Science is a study of the nature and behavior of matter and energy. Scientific models are developed and used to explore and explain physical and chemical phenomena.

Criteria for Selection - None.

ACADEMIC PHYSICAL SCIENCE No. 4509
Full Year/Full Time
Grades 9, 10 Phases III, IV Credit 1.0

Academic Physical Science is designed for the student with higher mathematical ability than those who opt for the Physical Science course. In this course, students will observe, analyze and solve physical and chemical problems in nature by using the scientific method and through the development and application of mathematical formulas. Students should be capable of learning by inquiry and working cooperatively in small group and large group laboratory situations. In addition, students are required to complete several self-directed research activities throughout the year. This class meets five periods per week.

Criteria for Selection -

Students must meet three of the following four criteria:

1. 'A' in 8th grade Earth/Space Science.
2. Iowa test score (math subtests) at or above the 65th percentile.
3. 80% or above in Advanced Algebra 1 (or a higher math level course) **OR** 90% or above in Academic Algebra 1.
4. Recommendation of 8th grade teacher.

HONORS BIOLOGY No. 4609
Full Year/Full Time Honors Wt.
Grade 9 Phase IV Credit 1.5

This course is an in-depth approach to life science, with emphasis on cellular, molecular and environmental concepts. This phase requires a high level of reading and math computation skills, independence and maturity. Students will frequently work cooperatively in small group lab situa-

tions. Students will perform hands-on experiments and activities in areas such as biochemistry, genetics, evolution, microbiology and cell functions. This class meets seven/eight periods each week. Students should expect a higher degree of peer competition and an increase in work load commensurate with the level of the class.

Criteria for Selection -

Students must meet three of the following four criteria:

1. 'A' average in 8th grade science.
2. Iowa test score (math subtests) at or above the 80th percentile.
3. 85% or above in Advanced Algebra 1 (or a higher level math course) **OR** 95% or above in Academic Algebra 1.
4. Recommendation of 8th grade teacher.

GENERAL BIOLOGY - IMPACT No. 4210
Full Year/Full Time
Grade 10 Phase I Credit 1.0

This course includes the processes, structures, and functions of living organisms. Students will use an ecological approach to study the relationships of living things in their environment. Laboratory experiments and demonstrations will supplement classroom discussion.

Criteria for Selection -

This course is reserved for students in the IMPACT program.

GENERAL BIOLOGY No. 4410
Full Year/Full Time
Grade 10 Phases I, II Credit 1.0

This course includes the basic information needed for students to become biologically literate. Classroom discussions and demonstrations plus laboratory activities and use of various media will enhance the students' learning. Topics include living organisms, cell functions, heredity, microbes, plants, animals, and ecology with practical applications of each.

Criteria for Selection - None.

ACADEMIC BIOLOGY No. 4510
Full Year/Full Time
Grade 10 Phases III, IV Credit 1.5

This course is a traditional approach to life Science with labs and demonstrations supplementing text, lecture, and audio-visual materials. It provides a dual microscopic/macroscopic approach that covers life at all levels of biological organization. This class meets seven/eight periods each week.

Criteria for Selection -

1. 85% or higher in Physical Science (4409) or Academic Physical Science (4509).
2. Successful completion of Academic Geometry (3201) or Academic Algebra (3101).
3. Recommendation of science teacher.

HONORS CHEMISTRY **No. 4610**
Full Year/Full Time **Honors Wt.**
Grades 10, 11, 12 Phases III, IV **Credit 1.5**

Students will be introduced to a problem-oriented approach to chemistry that will prepare them for future academic challenges. This course explores the theoretical and mathematical aspects of chemistry. Class meets 7^{1/2} periods per week. It is geared toward the student who is math/science oriented.

Criteria for Selection -

For grade 10, 85% or higher in Honors Biology (4609) and 80% or higher in Honors Geometry (3201) or a higher level math course;

or 95% or higher in Academic Geometry (3102) and recommendation of Science Teacher.

For grade 11, 85% or higher in Honors Biology (4609) and 85% or higher in Academic Physical Science (4509) and 80% or higher in Integrated Math 2 (3622, 3722) and recommendation of Science Teacher;

or 90% or higher in Academic Biology (4510) and 80% or higher in Integrated Math 2 (3622, 3722) and recommendation of Science Teacher.

APPLIED SCIENCE 1 **No. 4411**
Full Year/Full Time
Grades 11, 12 Phase I **Credit 1.0**

This course is a part of a two year course sequence in which the student will study the four major branches of science. Basic concepts of general science as it applies to everyday living are offered. Units will cover physics, geological sciences, chemistry and biology on a semester basis. This course is designed with the intent to have the student learn about a topic in science and then apply it to an every day situation. The topics for Applied Science I will always be different from the topics in Applied Science II so that the student can earn two credits of science if desired (or need for graduation) at the Senior High.

Criteria for Selection -

Recommendation of Guidance Counselor or previous science teacher is required.

APPLIED SCIENCE 2 **No. 4414**
Full Year/Full Time
Grades 11, 12 Phase I **Credit 1.0**

This course is part of a two year course sequence in which the student will study the four major branches of science. Basic concepts of general science as it applies to everyday living are offered. Units will cover physics, geological sciences, chemistry and biology on a semester basis. This course is designed with the intent to have the student learn about a topic in science and then apply it to an every day situation. The topics for Applied Science I will always be different from the topics in Applied Science II so that the student can earn

two credits of science if desired (or need for graduation) at the Senior High.

Criteria for Selection -

Recommendation of Guidance Counselor or previous science teacher is required.

ENVIRONMENTAL SCIENCE **No. 4451**
Full Year/Full Time
Grades 11, 12 Phases II, III **Credit 1.0**

The goal of this course is to provide students with the scientific principles, concepts and methodologies required to understand the interrelationships of the natural world. This course concentrates on Pennsylvania environment and ecology, and is designed to meet the Pennsylvania standards in these areas. It is a hands on class in which students will learn through doing. Bird and frog calls, scat identification, soil sampling and analysis will be taught. The behaviors of various animals in the Integrated Pest Management section will be studied. Animals, including the Madagascar Hissing Cockroach and mice will be used and the students will handle and observe them in various activities. Agriculture, recycling, and sanitary landfills will be examined. The year will end with the building and ingestion of an edible landfill.

Criteria for Selection -

Successful completion of Physical Science (4409 or 4509) and Biology (4410 or 4510).

HONORS ENVIRONMENTAL SCIENCE **No. 4115**
Full Year/Full Time **Honors Wt.**
Grades 11, 12 Phases III, IV **Credit 1.0**

The Honors Environmental Science class is similar to the standard course, but is taught with more rigor and in more depth. Using a hands on approach, the students will examine the principals of agriculture, soils, bird and frog calls, scat identification, recycling and sanitary landfills. The use of the Madagascar Hissing Cockroach and mice, in various activities, will show how similar "pests" in the home, field, school and workplace can be handled without the use of toxic pesticides. The principles of IPM (Integrated Pest Management) will be dealt with in depth. The students will have the opportunity to participate in activities like finding out the types of materials thrown out in a day at the school that could be recycled, participating in Maple tree tapping to obtain Maple syrup, identifying winter trees, looking for life in a pond and in small plots of land on school premises. A project will also be required on such topics as the population census of a cemetery. Members of this course will be asked to participate in Creek Connections, and the Envriothon. The year will end with the study of landfills and the building and ingestion of an edible landfill.

Criteria for Selection -

1. Successful completion of Physical Science (4409 or 4509) and Biology (4410 or 4510).
2. It is recommended, but not necessary, that the student be enrolled in a Physics course.

EARTH SCIENCE AND ASTRONOMY **No. 4461**
Full Year/Full Time
Grades 11, 12 Phases II, III **Credit .1.0**

As the name of this course implies, students will be exposed to two major scientific disciplines during the school year. The astronomy portion of this course will explore our universe starting on earth with the celestial sphere, seasons, models of the universe and the governing laws; then space explorations and colonization; an overview of the solar system; and finally on to the stars, including their features and evolution. The earth science portion of this course will study the earth's geological processes, structure, surface features, geologic hazards and weather. Laboratory experiments, worksheets, field work, videos and class discussion will enhance the student's understanding and appreciation of our precious planet and our amazing universe!

Criteria for Selection -

1. Successful completion of Integrated Math 1 (3621) or Essentials of Integrated Math (Part 1) (3331,3531).
2. Successful completion of Physical Science (4409).

HONORS EARTH SCIENCE AND ASTRONOMY **No. 4462**
Full Year/Full Time **Honors Wt.**
Grades 11, 12 Phases III, IV **Credit .1.0**

Do you like looking up at the stars and planets? Do you wonder if there is anybody out there? Would you like to know when we will get to Mars and how we will survive there for 2 years? Do you stay up night worrying about asteroid collisions? Have you wondered about those tsunamis, earthquakes and volcanoes? Do you know just how hazardous the hillside housing developments and old mine tunnels in Wexford are? Then, this is the course for YOU!

In this course, students have the opportunity to apply laws and principles learned in the core sciences to understand how Earth's systems and the cosmos operate. Among the fascinating aspects of our universe studied will be stars and constellations; the solar system; space exploration and colonization. Some units discussed in the geological portion will include volcanoes and earthquakes; weathering and erosion; the weather; environmental and geological hazards and how to survive them. There will also be investigations into new technologies for studying space and for management of earth's resources. The analysis of some topics is more in-depth than in the regular Earth Science and Astronomy course (4461).

To accomplish all of this, you will see videos and slides, do computer research utilizing Global Information Systems, satellite imagery, NOAA and NASA websites; make power point presentations, do laboratory experiments, go on field trips, and perform hands-on data gathering and analysis outdoors - all of which will enhance the learning and help to make it **fun**.

Criteria for Selection -

1. Current enrollment in, or completion of Concepts of Physics (4412), Honors Physics (4512), AP Physics B (4082), or AP Physics C (4092).

ACADEMIC CHEMISTRY **No. 4911**
Full Year/Full Time
Grades 11, 12, Phases III **Credit 1.5**

Academic Chemistry is a college preparatory course that explores the fundamental principles of chemistry through classroom lecture, laboratory experimentation, and discussion. Solving various mathematical problems related to chemical concepts is an integral part of the course. Academic Chemistry meets 7/8 periods per week.

Criteria for Selection -

1. Successful completion of Integrated Math 1 (3621) or Essentials of Integrated Math Part 2 (3532, 3332).
2. Recommendation of Science Teacher.
3. Recommendation of Mathematics Teacher.

HONORS ORGANIC CHEMISTRY **No. 4811**
Full Year/Full Time **Honors Wt.**
Grades 11, 12, Phases III, IV **Credit 1.0**

This is a demanding lecture-oriented course that deals with the chemistry of carbon compounds, their structure, nomenclature, reaction mechanisms, and syntheses. It is roughly equivalent to one semester of college level organic chemistry. Students who intend to pursue a career in chemistry, medicine, pharmacy, biology, nursing, or veterinary medicine will find this course extremely beneficial.

Criteria for Selection -

1. 80% or higher in Honors Chemistry (4610) or 90% or higher in Chemistry (4911).
2. Completion of Integrated Math 2 (3622).
3. Recommendation of teacher.

AP CHEMISTRY **No. 4012**
Full Year/Full Time **A.P. Wt.**
Grades 11, 12 Phase IV **Credit 1.5**

This course is designed to meet the demands of the AP Chemistry syllabus as published by the College Board. The topics covered in detail include, but are not limited to, atomic theory and structure, chemical bonding and geometry, classes of chemical reactions, stoichiometry, equilibrium (acid/base, solubility, and complex ion), kinetics, thermodynamics, states of matter (solids, liquids, and gases), and buffers. The large number of objectives for the course and the highly analytical nature make it demanding. The course is the equivalent of two semesters of chemistry at the college level. With success in the class, the student has the opportunity to earn college credit by taking the AP Chemistry test at the end of the year. As with any AP class, the experience of having a college-level science class in high school will be invaluable, developing time-management and organization skills. AP Chemistry can be taken as either a junior or senior, but taking it as a junior will prepare the student for other advanced science courses as a senior.

Criteria for Selection -

1. 80% or higher in Honors Chemistry (4610).
2. Successful completion of Integrated Math 3 or Honors Integrated Math 3 or higher Math course.
3. Recommendation of teacher.

HONORS METEOROLOGY No. 4111
Full Year/Full Time Honors Wt.
Grades 11, 12 Phases III, IV Credit 1.0

Students who take this course investigate the structure of severe storm systems including super cell thunderstorms, hurricanes, and blizzards. They also explore and discuss ways to handle the dangers associated with them. Additionally, they become proficient in knowledge regarding weather basics including the layers of the atmosphere, energy exchanges, formation of clouds, types of precipitation, weather instruments, atmospheric optics, and forecasting techniques. Current topics such as climate change, global warming, the thinning of the ozone layer, and alternative energy sources will also be studied. This course is conceptually based, and uses only minimal mathematical skills.

Criteria for Selection -

1. Current enrollment in, or completion of, Concepts of Physics (4412), Honors Physics (4512), AP Physics B (4082), or AP Physics C (4092).

CONCEPTS OF PHYSICS No. 4412
Full Year/Full Time
Grade 11 or 12, Phase III Credit 1.0

This course is intended for college bound students who are interested in a non-science career. Students will study the following topics: classical mechanics, waves, sound, optics, and electrostatics, and magnetism. Although this class stresses concepts over computations, a basic knowledge of algebra, geometry and trigonometry is required.

Criteria for Selection -

1. Successful completion of Chemistry (4911) or Honors Chemistry (4610) or permission of teacher.
2. Successful completion of Integrated Math 2 (3622) or Essentials of Integrated Math (Part 3) (3533) or permission of the physics teacher.

HONORS PHYSICS No. 4512
Full Year/Full Time Honors Wt.
Grades 11, 12 Phases III, IV Credit 1.5

This course stresses the mathematical and conceptual development of the following topics: mechanics, electricity, magnetism, waves, sound and optics. Mathematical problem solving, including algebraic manipulation, systems of equations, trigonometric functions, logarithms, and graphical analysis are used extensively. Laboratory exercises are included to enhance the development of concepts and data analysis techniques. Honors physics is designed for the college bound student and for the student preparing for the Advanced Placement B and C level course. This course meets 7 1/2 periods each week.

Criteria for Selection -

1. Successful completion of Honors Chemistry (4610).
2. Co-requisites: Mathematics course at the level of Trigonometry (3612), Math 4/Trigonometry (3911), Pre-Calculus (3421) or above.

AP PHYSICS B No. 4082
Full Year/Full Time AP Wt.
Grades 11, 12 Phase IV Credit 1.5

This course is designed to meet the demands of the AP Physics B syllabus as published by the College Board. The topics covered include Classical Mechanics, Thermodynamics, Electricity and Magnetism, Light and Sound, and Modern Physics (including Quantum Theory and Relativity). The large number of objectives for the course and the highly analytical nature of the problem solving make it very demanding. This course is equivalent to a one-year terminal physics course at the college level. This course is valuable to the student in two ways. The experience of having taken a college-level science class in high school will be a tremendous help when the student is in college. Secondly, the student can earn college credit by taking the AP Physics test at the end of the year. This of course depends upon how well the student does on the test, and the college and major in which the student enrolls. Please contact the specific college or university you are interested in to find out its policy in this matter.

Mathematics, including trigonometry, geometry, and algebra will be used extensively in this course to solve problems and develop relationships between physical quantities. Although it is beneficial to have had Honors Physics or Concepts of Physics prior to AP Physics B, it is not required. In fact, highly talented juniors should consider this course so that other science electives can be scheduled during the senior year with increased flexibility.

Criteria for Selection -

1. Co-requisite: Math 5 (3912) or Pre-Calculus Mathematics (3421) or A.P. Calculus (3012 or 3022) or Honors Calculus (3422).
2. 80% or higher in Honors Chemistry (4610).
3. Recommendation of prior year's science teacher.

AP PHYSICS C No. 4092
Full Year/Full Time AP Wt.
Grade 12, Phase IV Credit 1.5

This course is designed to meet the objectives of the AP Physics C syllabus as published by the College Board. Students will be prepared to take both the Mechanics and Electricity/Magnetism AP Physics C exams. Mechanics is that part of physics dealing with motion and energy and the way objects behave when acted on by forces. The electricity and magnetism section of the course starts with electrostatics and the use of Gauss's Law to determine electric fields, moves through electrodynamics and finishes with a complete description of electromagnetic induction (including LRC circuits). Completing both sections of the course can be quite demanding. Fewer topics are covered than in AP Physics B, but topics are treated in greater depth. High-level mathematics, including calculus, is used to model relationships among physical quantities and to solve problems. Since physics is approached in a limited scope, it is highly recommended, although not required, that students successfully complete another physics course before taking this one, with AP Physics B as the recommended prerequisite.

This course will provide an outstanding preparation base for rigorous college science majors such as engineering, computer science, astrophysics, and pure sciences such as physics or chemistry. Please note that each college or university has its own policy about granting credit based on AP exam scores. Each student should investigate the requirements of the college program in which he or she is interested. Regardless of whether or not the student takes the AP exam (most do), the experience of taking this academically demanding, yet highly interesting class, is valuable as a stepping stone to higher levels of accomplishment at the university level.

Criteria for Selection -

1. 80% or higher in AP Chemistry (4012) or Honors Chemistry (4610).
2. 80% or higher in another physics course (4412, 4512).
3. Co-requisite: AP Calculus (3012 or 3022) or Honors Calculus (3422).
4. Recommendation of prior year's science teacher.

BIOLOGY 2 (HUMAN BIOLOGY) No. 4711
Full Year/Full Time
Grades 11, 12 Phase III **Credit 1.0**

Biology 2 (Human Biology) is intended for students who are interested in the structure, function, and disorders pertaining to the human body. This course will place emphasis on the body systems, and genetics as well as disorders affecting those systems. A considerable amount of time will be devoted to lab work (dissection), lectures, cooperative group learning, hands on activities and demonstrations. This course is recommended for any student interested in furthering the understanding of the human body.

Criteria for Selection -

1. Successful completion or current enrollment in Chemistry (4610, 4911).

HONORS ANATOMY & PHYSIOLOGY No. 4721
Full Year/Full Time **Honors Wt.**
Grade 11, 12, Phase III, IV **Credit 1.0**

This course is intended for college bound students who are interested in the structure and function of the human body. Considerable time is devoted to lecture, clinical, practical and laboratory applications. Students will explore areas such as An Introduction to Anatomy and Physiology, the Integumentary System, the Skeletal System, Articulations, the Muscular System, the Nervous System, the Senses and the Cardiovascular System. Dissection, anatomy lab and cadaver lab field trips are also provided in the course. Honors Anatomy and Physiology is recommended for any college bound student, especially those interested in a medical or science related field.

Criteria for Selection -

1. Successful completion of Honors Biology (4609) or Academic Biology (4510), or 80% or higher in General Biology (4410).
2. Successful completion of Chemistry with a 70% or higher.

AP BIOLOGY No. 4011
Full Year/Full Time **AP Wt.**
Grades 11, 12 Phase IV **Credit 1.5**

The AP Biology course is designed to be the equivalent of a college introductory biology course usually taken by biology majors during their first year of college. Textbooks and laboratory sessions are designed to cover the range and depths of college level biology and will provide students with the conceptual framework, factual knowledge, and analytical skills necessary to deal critically with the rapidly changing science of biology.

Criteria for Selection -

1. Successful Completion of Honors Biology (4609).
2. Successful completion of Chemistry (4610) or Academic Chemistry (4911).
3. Recommendation of teacher.

SCIENCE PHASE SEQUENCE CHART

*Needed for graduation - 3 science credits.
Students should consult with their teacher for the best option.*

PHASE	GRADE	COURSE	OPTIONS/ELECTIVES
I	9 ---	Physical Science Impact (4209)	Physical Science (4409)
	10 ---	General Biology Impact (4210)	General Biology (4410)
	11 ---	OR Applied Science 1 (4411) or Applied Science 2 (4414)	
	12 ---		
II	9 ---	Physical Science (4409)	
	10 ---	General Biology (4410)	
	11 or 12	Environmental Science (4451)	
		Earth Science and Astronomy (4461)	
III	9 ---	Physical Science (4409)	
	10 ---	Academic Biology (4510)	
	11 ---	Academic Chemistry (4911)	
	12 ---	Concepts of Physics (4412)	
	OR		
	9 ---	Academic Physical Science (4509)	
	10 ---	Academic Biology (4510)	
	11 ---	Academic Chemistry (4911) or Honors Chemistry (4610)	
	12 ---	Concepts of Physics (4412) or Honors Physics (4512)	
	OR		
	9 ---	Honors Biology (4609)	<i>NASH Only Electives:</i> Environmental Science (4451) Honors Environmental Science (4115) Earth Science and Astronomy (4461) Honors Earth Science and Astronomy (4462) Honors Organic Chemistry (4811) Biology 2 (4711) Honors Chemistry 2 (4421) AP Biology (4011) AP Chemistry (4012) Honors Anatomy & Physiology (4721) Honors Meteorology (4111) AP Physics B (4082) AP Physics C (4092)
	10 ---	Honors Chemistry (4610)	
	11 ---	Honors Physics (4512) and/or Science Elective	
	12 ---	Science Elective	
9 ---	Academic Physical Science (4509)		
10 ---	Academic Biology (4510)		
11 ---	Honors Chemistry (4610) or Academic Chemistry (4911)		
IV	12 ---	Honors Physics (4512) or Concepts of Physics (4412)	
	OR		
	9 ---	Honors Biology (4609)	
	10 ---	Honors Chemistry (4610)	
	11 ---	Honors Physics (4512) and/or Science Elective	
	12 ---	AP Physics B (4082) or AP Physics C (4092) and/or AP Biology (4011) and/or AP Chemistry (4012) and/or Science Elective	
			Honors Anatomy & Physiology (4721) Honors Environmental Science (4115) Honors Earth Science and Astronomy (4462) Honors Meteorology (4111) Honors Organic Chemistry (4811) Honors Chemistry 2 (4421) Honors Physics (4512) AP Biology (4011) AP Chemistry (4012) AP Physics B (4082) AP Physics C (4092)