Science

Science Department Course Offerings
2016-17

SUBJECT	GRADE 9	10	11	12	*CREDITS*
Biology (Academic)	X	X	X	X	6.0
Honors Biology	X	X			6.0
Conceptual Chemistry		X	X		6.0
Chemistry (Academic)		X	X		6.0
Honors Chemistry		X	X		6.0
Conceptual Physics			X	X	6.0
Physics (Academic)			X	X	6.0
Honors Physics			X	X	6.0
Advanced Placement Biology			X	X	7.0
Advanced Placement Chemistry			X	X	7.0
Advanced Placement Chemistry			X	X	10.0
Advanced Placement Environmental Science			X	X	6.0
Advanced Placement Physics			X	X	6.0
Anatomy & Physiology I for Health Science Careers			X		5.0
Anatomy & Physiology II for Health Science Careers				X	5.0
Dynamics for Health Care in Society			X		3.0
Astronomy			X	X	3.0
Astronomy			X	X	5.0
Human Anatomy and Physiology			X	X	5.0
Environmental Science		X	X	X	2.5
Forensics		X	X	X	2.5
Introduction to Organic Chemistry			X	X	3.0
Research in Molecular Biology and Bioinformatics			X	X	3.0

2.5 Credits - Semester Course
3.0 Credits – Full Year, Three Days per Cycle
5.0 Credits - Full Year
6.0 Credits – Full Year, 1 Lab Period per Cycle
7.0 Credits – Full Year, 2 Lab Periods per Cycle
10.0 Credits- Full Year, 5 Lab Periods per Cycle

Biology

Academic Biology (6 credits)
Honors Biology (6 credits)

AP Biology (7 credits)
AP Environmental Sciences (6 credits)

Chemistry

Conceptual Chemistry (6 credits)
Academic Chemistry (6 credits)
Honors Chemistry (6 credits)

AP Chemistry (7 or 10 credits)

Physics

Conceptual Physics (6 credits)
Physics (6 credits)
Honors Physics (6 credits)

AP Physics (6 credits)

Electives

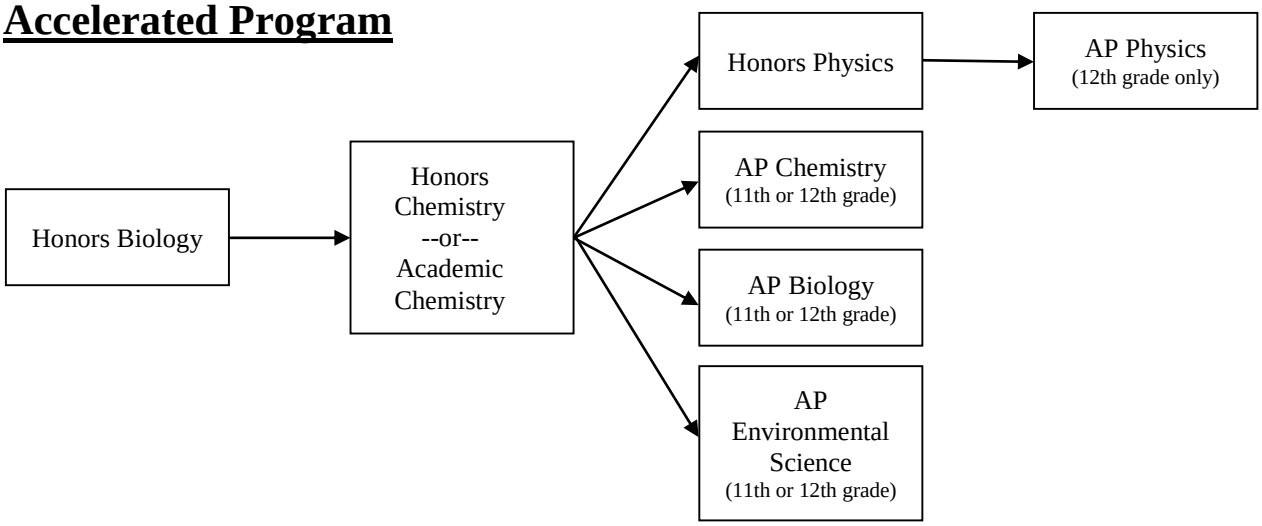
Anatomy & Physiology (5 credits)
Astronomy (3 or 5 credits)
Environmental Science (2.5 credits)
Forensics (2.5 credits)
Research in Molecular Biology & Bioinformatics (3 credits)
NEW COURSE: Introduction to Organic Chemistry *(3 credits)*

Biomedical Career Pathways Program
(2 year program)
Anatomy & Physiology I for Health Science Careers
(5 HS credits, 4 Rutgers Credits)
Anatomy & Physiology II for Health Science Careers
(5 HS credits, 4 Anatomy + 3 Medical terminology Rutgers Credits)
Dynamics for Health Care in Society
(3 HS credits, 3 Rutgers Credits)
Students will take Rutgers assessments and upon graduation, earn Rutgers college credits

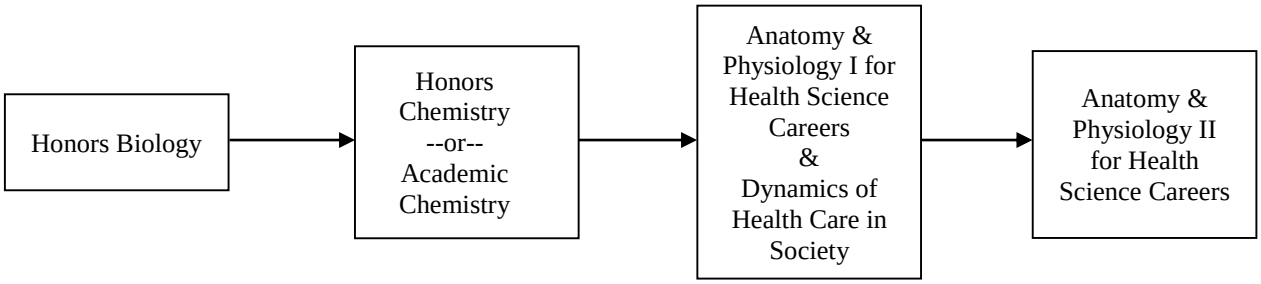
Piscataway High School
Common Science Course Sequences

The sequences below do not represent all possible course options available at each level.
Please refer to the Course Offerings Booklet for prerequisites and complete advisement information.
****Students are encouraged to move to more challenging sequences when appropriate.***

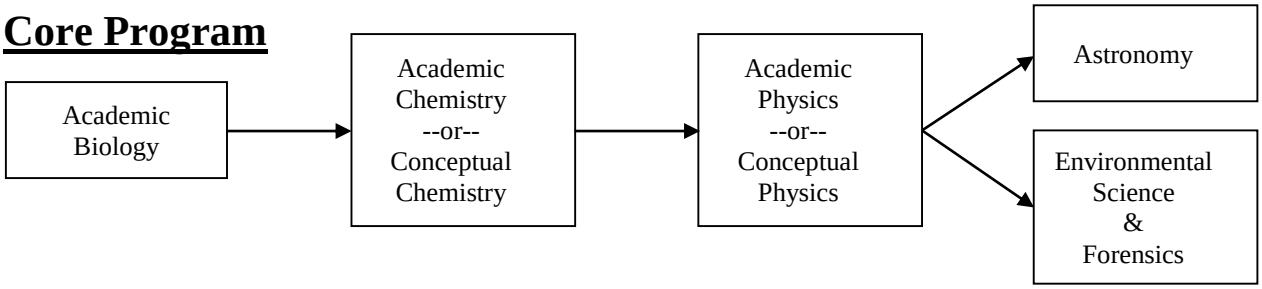
Accelerated Program



BioMedical Career Pathways Program



Core Program



Elective Course Offerings in Science

- Astronomy
- AP Biology
- AP Chemistry
- AP Environmental Science
- AP Physics
- Environmental Science
- Forensics
- Human Anatomy & Physiology
- Introduction to Organic Chemistry
- Research in Molecular Biology and Bioinformatics

Science

The Science Department at Piscataway High School is dedicated to providing learning opportunities that are designed to allow students to develop scientific literacy and problem solving skills through the process of inquiry. As the department moves forward with the implementation of Next *Generation of Science Standards, e*mphasis is placed on the *science and engineering practices. Student driven, h*ands-on experiences in the laboratory investigations provide opportunities to make observations, formulate and test hypothesis and develop scientific reasoning and inquiry skills as a way of understanding the natural world and solve problems. Students use technology and work cooperatively; develop attitudes and interests towards the goal of becoming lifelong learners in a global environment.

BIOLOGY (Academic)

Full Year Grades 9-12 6 credits

This Biology lab and lecture course consists of a basic introductory program that will lead to a greater understanding of the biological sciences. Students engage in laboratory exercises that encourage problem solving and decision making skills. Students will study five main themes to make sense of the complexity, diversity and interconnectedness of life on earth. These themes are: organization and development, matter and energy transformation, interdependence, heredity and reproduction and evolution and diversity. Students will take a state mandated test in May.

HONORS BIOLOGY

Full Year Grades 9 & 10 6 credits

Prerequisite: *Placement based upon 8th grade rubric and teacher recommendation*

The Honors Biology lab and lecture course is rigorous, intensified and accelerated program designed for those students who plan to take the maximum number of units of science in high school. All topics listed for Academic Biology will be studied at a greater depth with their emphasis on real life applications and regulation and coordination of life systems. Students will take a state mandated test in May.

ADVANCED PLACEMENT BIOLOGY

Full Year Grade 11-12 7 Credits

Prerequisite: *Successful completion of Biology and Chemistry. Recommendation of previous science teacher is needed.*

The rigorous Advanced Placement Biology lab and lecture course consists of an intensive study of evolution, cells, information coding and transfer, the diversity of organisms, homeostatic mechanisms and communication, as well as the interdependence of nature and the processes of science. This course is designed for the highly motivated and capable student who plans to enter a collegiate program developed to train him/her for entrance into any of the fields of applied biology (public health, sanitary science, medicine, dentistry, veterinary medicine, industrial research and development) or to engage in graduate work in any of the fields of biology. The serious study of this course will enable students to take the advanced placement exam in May.

CONCEPTUAL CHEMISTRY

Full Year Grades 10-12 6 credits

Prerequisite: *Successful completion of Biology I. Recommendation of previous science teacher is needed.*

This Chemistry course consists of a basic introductory program, intended for non-science and general education majors that will lead to a greater understanding of chemistry. Included in this program is the consideration of measurements in chemistry, problem solving, matter and its changes, formula writing, atomic structure, the Periodic Law, chemical bonds, stoichiometric relations, gas laws, solutions and ionization theory.

CHEMISTRY (Academic)

Full Year Grades 10-12 6 credits

Prerequisite: *Successful Completion of Algebra 1 and Academic or Honors Biology. Recommendation of previous science teacher is needed.*

Students study the composition of matter and the changes it undergoes in the formation of new products. Lectures, projects, and labs emphasize basic principles and laws, modern atomic theories, formula writing, stoichiometric relations, chemical calculations, and properties of the elements and their compounds. Emphasis is placed on problem solving, inquiry lab work and laboratory reports.

HONORS CHEMISTRY

Full year Grade 10-12 6 credits

Prerequisite: *Successful completion of Algebra 1 (with excellent grades; Geometry or Algebra 2 completed or taken concurrently). Recommendation of previous science teacher needed.*

The Honors Chemistry course is intended for science oriented students who plan on taking the maximum number of units of science in high school. The topics range from the purely theoretical to real world applications. Topics are dealt at a greater depth than that of academic chemistry. The course is rapidly paced and problem solving is stressed throughout. Laboratory work is closely aligned with the lecture material.

ADVANCED PLACEMENT CHEMISTRY

Full Year Grade 11-12 7 Credits

Prerequisite: *Chemistry, Biology, and Physics (Physics may be taken concurrently), completion of Algebra 2 or Honors Algebra 2; Recommendation of science teacher is needed.*

This is an advanced course in theoretical and practical chemistry for students who have successfully completed a first year Academic or Honors chemistry course. This is a college-level course that includes a study of kinetics, equilibrium, electro-chemistry, thermodynamics, quantum mechanics, descriptive chemistry, and some organic chemistry. Laboratory investigations are coupled with lecture concepts. In May, students will take the Chemistry Advanced Placement Exam administered by the College Boards.

CONCEPTUAL PHYSICS

Full year Grades 11-12 6 credits

Prerequisite: *Algebra 1, Geometry and recommendation of science teacher is needed.*

This Physics lab and lecture course consists of basic introductory program that will lead to greater understanding of how mathematical models are used to describe the physical universe. This course is designed for the following students: those who have taken Algebra 1 and have earned at least a C; students who might not go to college or have not made a decision about college yet; and students who are going to college but have experienced some difficulties in math. It is important to note that needed math concepts will be reviewed and explained. The following areas will be addressed: concepts of motion and classical mechanics, energy forms, wave mechanics, optics, light and electricity.

PHYSICS (Academic)

Full year Grades 11-12 6 credits

Prerequisite: *Academic Biology; completion of, or currently enrolled in Algebra 2. Excellent* grades in Geometry and Algebra 1 *and recommendation of science teacher is needed.*

Recommended for students who plan to major in science or engineering in college. This is a lab and lecture course that meets six periods per week. This foundational physics course will give students an understanding of the physical laws governing force and motion, heat, waves, electricity, and optics.

HONORS PHYSICS

Full year Grades 11-12 6 credits

Prerequisite: *Successful completion of Biology and Chemistry. Recommendation of previous science teacher is needed; completion of, or currently enrolled in Trigonometry or Precalculus.*

The honors physics course is intended for science oriented students who plan on taking the maximum number of science units in high school. This rigorous inquiry oriented high school physics lab course is quite demanding and rapidly paced. Problem solving is stressed. Using an applied mathematical approach, students will be taught fundamental concepts of motion, mechanics, fluid statics, fluid dynamics, thermodynamics, sound, light, wave motion, electricity, magnetism, and electromagnetic radiation.

ADVANCED PLACEMENT PHYSICS

Full Year Grade 11-12 6 Credits

Prerequisite: *Physics (academic or honors), Trigonometry, Biology, Chemistry, (AP Biology or AP Chemistry may be taken concurrently.); completion of or currently enrolled in Calculus. Recommendation of science teacher is needed.*

The second year physics program is intended to strengthen the background obtained by students who took the first year physics course. This course is taught at an accelerated pace in order to strictly follow the national advanced placement physics curriculum. Upon completion of this course students are expected to take the Physics "C" advanced placement exam.

SCIENCE ELECTIVES

ANATOMY AND PHYSIOLOGY I FOR HEALTH SCIENCE CAREERS

Full Year Grade 11-12 5 Credits

Prerequisite: *Students must attain a final year-end average of 80 for Academic level or 75 for Honors level of Biology and Chemistry. Additionally, students must have a passing grade on each of the science final exams. Approval from the Science Department Chair must be obtained for special circumstances.*

Anatomy and Physiology is the study of the structure and function of the human body. This course follows a sequential development of the major body systems in an organized and structured curriculum. The course is designed to give students a selective overview of human anatomical structure and an analysis of human physiological principles. Labs will include slide work, dissection of various animals and studies of the human skeleton. Computer simulated dissection will also be used. Terminology related to anatomy of the human body, functions of health and disease, and the use of language in processing medical/dental records and claim forms will be included. The minimum level of satisfactory performance in this course is 74 or better.

Upon successful completion of the course students will be eligible to take the Health Science Careers standardized exam to determine college credit**.** Upon graduation, students will earn 4 Rutgers credits pending the results of the assessments. Minimum passing standardized exam grade must be at least 65 before calculations of Rutgers transcript grade can be determined.

Clinical Shadowing: Students will be required to complete a minimum of 10 hours of shadowing with a practicing clinician of their choice each year they participate in the Rutgers program.

ANATOMY AND PHYSIOLOGY II FOR HEALTH SCIENCE CAREERS

Full Year Grade 12 5 Credits

Prerequisite: *Students must attain a passing grade in Anatomy & Physiology I for Health Science Careers. Additionally, students must attain a passing grade on Rutgers assessments for Anatomy I to be eligible for Rutgers credits for Anatomy II.*

Anatomy and Physiology II continues with the study of sequential development of the major body systems in an organized and structured curriculum. This course will prepare students for all other basic science and clinical courses. Coursework includes the study of Endocrine System, Lymphatic System, Blood and Cardiovascular System, Respiratory System, Digestive System, Urinary System, Water and Electrolyte, Male and Female Reproductive Systems. Labs include slide work, dissection of various animals and studies of the human skeleton. The course will also use computer simulated dissection. The minimum level of satisfactory performance in this course is 74 or better.

Upon successful completion of the course students will be eligible to take two Health Science Careers standardized exams: a) Anatomy and Physiology II, for 4 Rutgers credits and b) Medical terminology, for 3 Rutgers credits. Upon graduation, students will earn 7 Rutgers credits pending the results of the assessments. Minimum passing standardized exam grade must be at least 65 before calculations of Rutgers transcript grade can be determined.

Clinical Shadowing: Students will be required to complete a minimum of 10 hours of shadowing with a practicing clinician of their choice each year they participate in the Rutgers program.

DYNAMICS OF HEALTH CARE IN SOCIETY

Full year Grades 10-12 3 Credits

Prerequisite: *Students must attain a final year-end average of 80 for Academic level or 75 for Honors level of Biology and Chemistry. Additionally, students must have a passing grade on each of the science final exams. Approval from the Science Department Chair must be obtained for special circumstances.*

This course provides an orientation to health care services and their delivery. It presents an interdisciplinary perspective, focusing on process skills such as critical thinking, ethical reasoning, effective communication and ways to continue independent learning throughout life. The course shows how all health care providers acquire professional competence in dealing with the issues and problems they face as well as the role they play as informed consumers. The minimum level of satisfactory performance in this course is a 74 or better.

Upon successful completion of the course students will be eligible to take the Health Science Careers standardized exam to determine college credit**.** Students must attain a 74 or better on the standardized exam to earn college credits. Upon graduation, students will earn 3 Rutgers credits pending the results of the assessments. The grade listed on Rutgers transcript will be comprised of 100% of the Rutgers standardized exam grade.

ASTRONOMY

Full year Grades 11-12 3 or 5 Credits

This course consists of the study of various celestial objects and their movement. Some topics include: Kepler's and Newton's laws; types of telescopes and their use; the sun and moon; the various planets; stars; stellar evolution; galaxies; comets; cosmology; quasars; space travel; and the search for extraterrestrial life. The planetarium facility will be used when needed.

PLACEMENT ENVIRONMENTAL SCIENCE

Full Year Grade 10-12 6 Credits

Prerequisite: *Successful completion of one year of Biology, Chemistry and Algebra I as recommended by AP Boards. Recommendation of science teacher is needed.*

Environmental science is in part a new integration of old disciplines, and in part a new discipline of its own. It is expected that the following topics will be reviewed to varying degrees directly or indirectly: natural ecology, human adaptation, extinction of species, human populations, energy, agriculture, radioactive wastes, air pollution, water pollutions, noise, as well as social, legal, and economic aspects.

ENVIRONMENTAL SCIENCE

Semester Grade 11-12 2.5 Credits

Prerequisite: *Successful completion of one year of Biology*

The goal of this course is to provide students with the social and humanistic aspects of science. Major content areas to be studied include: ecology of natural systems; human adaptation to environmental change; extinction of species; human population growth; energy-resources; pollution; agricultural systems; control of pests and weeds; solid waste; and the social, legal, and economic aspects of environmental degradation.

FORENSICS

Semester Grade 10-12 2.5 Credits

Prerequisite: *Successful completion of one year of Biology*

This semester elective will expose students to the processing of evidence and crime solving. Among the topics included are: crime scene safety and management; fingerprinting; fiber and hair analysis; DNA fingerprinting; ballistics; serology; explosives; arson; forensic pathology; and the collection of physical and trace evidence. By stepping into the role of the forensic scientist, the students will learn and apply numerous scientific strategies and skills. Students will have a hands-on opportunity to study this exciting field, thus exposing them to possible careers in criminal justice.

HUMAN ANATOMY AND PHYSIOLOGY

Full Year Grade 11-12 5 Credits

Prerequisite: *Successful completion of one year of Biology with a minimum grade of 70*

This exciting elective is a combination lab and lecture course that explores the anatomy and physiology of the human body. The structure of the various human body systems will be studied and the function of each system will be explored. This is an interesting and relevant course where students will have the opportunity to study about themselves. Students considering a career in nursing, medicine, teaching, public health, dentistry, or veterinary medicine will enjoy this course.

INTRODUCTION TO ORGANIC CHEMISTRY

Full Year Grade 11-12 3 Credits

Prerequisite: *Students must attain a final year-end average of 85 for Academic level or 80 for Honors level of Biology and Chemistry.*

This is a full year elective course designed for high school students interested in studying chemistry beyond the first year requirement and for students interested in pursuing a college education in either the biological or chemical sciences. It is suggested that this course be taken concurrently with AP Chemistry or AP Biology. Built as an exposure to the study of organic chemistry, this course will focus on carbon and its properties as it impacts the natural and man-made carbon based products. Topics included will be naming organic compounds, organic reactions and analytical laboratory techniques such as synthesis, separation, identification, and quantification of both natural and man-made products. Interdisciplinary connections will be made so that students begin to appreciate the many facets of our world at a molecular level.

RESEARCH IN MOLECULAR BIOLOGY AND BIOINFORMATICS

Full Year Grade 11-12 3 Credits

Prerequisite: *Successful completion of one year of Biology and Chemistry*

The goal of this course is to provide students with the tools needed for an academic and professional career using modern biological and laboratory techniques. The course will operate under the simple premise that students learn science by doing science. Students will participate in authentic collegiate level research. As their knowledge of these disciplines increases, students will be able to become more independent in the application of various techniques in order to conduct novel research.