

# SCIENCE DEPARTMENT

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Since scientific knowledge has become increasingly important in the world's social, material, and technological development, the Science Department feels it is essential to help students understand their surroundings and aid them to meet their vocational, as well as occupational, needs.

## SCIENCE at a Glance

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| Course                             | Grade      | Credit |
|------------------------------------|------------|--------|
| Physics for Freshmen*              | 9          | 1      |
| Introduction to Biology (W)        | 9, 10      | 1      |
| Biology (w)                        | All        | 1      |
| Biology Honors (w)                 | 9          | 1      |
| AP Biology (W)                     | 11, 12     | 1      |
| Chemistry (W)                      | 10, 11     | 1      |
| Chemistry Honors                   | 10,11,12   | 1      |
| AP Chemistry (W)                   | 11, 12     | 2      |
| Physical Chemistry                 |            |        |
| Earth Science                      | 11, 12     | 1      |
| Earth Science Honors               | 10, 11, 12 | 1      |
| Physics (w)                        | 11, 12     | 1      |
| Physics Honors                     | 11, 12     | 1      |
| Principles of Technology           | 11, 12     | 1      |
| AP Physics C                       | 12         | 1      |
| Advanced Physics                   |            |        |
| AP Environmental Science           | 12         | 1      |
| Physiology                         | 12         | 1      |
| Astronomy and Space Science (W)    | 12         | 1      |
| Astronomy and Space Science Honors | 11, 12     | 1      |

|  |          |          |
|--|----------|----------|
| Engineering & Design*  | 10,11,12 | 0.5      |
| Forensic Science (W)   | 12       | 1        |
| Geology  | 11, 12   | 0.5      |
| Geophysical & Astrophysical Sciences*                                  | 12       | 1        |
| Human Genetics*  | 11,12    | 0.5      |
| Meteorology  | 11, 12   | 0.5      |
| Anatomy/Physiology   | 11,12    | 0.5      |
| Physical Chemistry*  | 11,12    | 0.5      |
| Research Mentorship Phase I*   | 9,10     | 0.25     |
| Mentorship Program   | 11,12    | 3.5      |
| Research Mentorship Phase I*<br><i>for Graduation with Distinction</i> | 9,10     | 0.5      |
| Independent Study  | 11,12    | 0.5 to 1 |
| Anatomy/Physiology   | 11,12    | 0.5      |

\*These courses are only offered at the Mathematics and Science Academy.

## SCIENCE Course

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### Physics for Freshmen

**PS10X**

Grade 9

**PS10Y**

1 credit

No Prerequisite

Year course

Physics is the study of the fundamental behavior of the physical universe on both large and small scales. This course examines topics involving motion, momentum, energy, wave, and particle behavior using principles and strategies of inquiry. Particular emphasis is placed on physics in the modern era, studying the impact of physics and technology on our society, and the application of data analysis strategies and tools to the study of real-world data.

### Introduction to Biology

**S078**

Grade 9, 10

No Prerequisite

1 credit

Introduction to Biology is a one year course designed to introduce basic biological principles. Focus is on reading comprehension and organization and scientific information. General biological principals such as: cells, genetics, kingdoms, and living things are covered and discussed.

**Biology****S178 S169 ESL**

Grade 9, 10, 11, 12

**S118** (Category | Grade Weighting)

No Prerequisite

1 credit

Year course

Biology is a one-year course, which deals with the study of living things and attempts to develop understandings of the basic biological principles. Emphasis is placed upon the chemical and physical basis of life, the continuity of life, the fundamental life processes, evolution of life, and the interdependence of living things. In addition to reading for information and class discussions, emphasis is placed on laboratory experiences.

**Biology Honors****S172**

Grade 9

**PS30X**

1 credit

**PS30Y**

Prerequisite: Department Recommendation

Year course

This course deals with the study of living things and attempts to develop understandings of basic biological principles. Emphasis is placed upon the chemical and physical basis of life, the continuity of life, the fundamental life processes, evolution of life, and the interdependence of living things and the environment. The program will be heavily oriented toward laboratory investigation and critical thinking skills. Students should have above average abilities in reading, science, and critical thinking skills to be enrolled in this course.

**AP Biology****S173**

Grade 11, 12

Prerequisite: Physics suggested, Biology, and Chemistry (3.56 GPA)

1 credit

or Biology Honors and Chemistry Honors or Department Recommendation

Year course

This course provides an opportunity for students to pursue and receive credit for college level course work through national testing. The class is designed to be the equivalent of the general biology course taken during the freshman college year. Topics include: chemistry of life, cells, cellular energetic, heredity, molecular genetics, and evolutionary biology, diversity of organisms, structure and function of plants, animals, and ecology.

**Chemistry****S181**

Grade 10, 11

Prerequisite: 2.0 GPA or better

1 credit

This course studies principals of atomic and molecular structure, bonding, stoichiometry, states of matter, kinetic molecular theory, and solutions. Corresponding laboratory experiments include volumetric and gravimetric analyses, a qualitative study of reactions, visible spectrophotometry, and problem-based analyses. It's intended for all students whose majors require general chemistry, including science majors and pre-professional. The course also satisfies a general education laboratory science requirement for students with previous chemistry experience.

**Chemistry Honors****S182**

Grade 10, 11, 12

**PS20X**

1 credit

**PS20Y**

Prerequisite: Algebra

Biology (grade of B or better)

better) Recommendation of Dept. Chairperson

Year course

This course is the study of the composition of substances and the changes they undergo. Chemistry Honors emphasizes the strategies and techniques of scientific investigation, problem solving, and critical thinking. This is accomplished through extensive use of demonstrations, classroom discussions, laboratory investigations, textbook materials, and computer assisted instruction. Topics are covered at a faster pace with in-depth quantitative reasoning used as the focus for each topic of study. Independent student projects and scientific investigations are course requirements.

**AP Chemistry****S179**

Grade 9

Prerequisite: An in regular science or A/B

2 credits

in Honors Science

Year course

This is an advanced placement course designed to prepare the student for the AP Chemistry exam. The course covers the equivalent of one full year of college level General Chemistry, comparable to the first year course at the college or university. The course is a rigorous math-based course, with a strong laboratory component. It is intended for students who have demonstrated a willingness to commit considerable time to studying and completing assignments outside of class, and who have successfully completed a prior course in chemistry during high school. The course will develop the student's ability to incorporate mathematical skills in the solution of chemistry problems, both through the use of textbook problems and laboratory activities

**Physical Chemistry****PS42X**

Grade 11, 12

**PS42Y**

1 credit

Prerequisite: Chemistry

This course examines chemistry using advanced analysis techniques to understand the interactions between atoms and molecules. Particular emphasis is given to the gas laws, chemical signature identification, and other advanced applications.

**Earth Science****S188**

Grade 11, 12

Prerequisite: 3<sup>rd</sup> or 4<sup>th</sup> year of high school or

1 credit

Department recommendation

Year course

This course provides the students with an understanding of the Earth. The topics of study include astronomy, weather, pollution, oceanography, maps and globes, rocks and minerals, glaciers, earthquakes, volcanoes, fossils and geologic time. Problem solving strategies and the scientific method are stressed.

**Earth Science Honors**

**S288** Grade 11, 12  
 Prerequisite: Two years of science 1 credit  
 Year course

This course provides the students with an understanding of the earth. The topics of study include astronomy, meteorology, oceanography, and geology. The student will study the interrelationships between the various branches of Earth Science. Lab work is a large part of this course. Problem-solving strategies, graphing and the scientific methods will be stressed.

**Physics**

**S184** Grade 11, 12  
 Prerequisite: Biology and Algebra 1 credit  
 Year course

This course is designed for students following a sequence of courses in the general or college prep curricula. Successful completion will provide a laboratory science credit for those wishing to attend college. It is intended for students who are interested in broadening their science background without placing the same emphasis on mathematics as would be done in the Physics Honors program. The course itself will be laboratory oriented and include the study of topics relating to matter, energy, space, and time as they are experienced in everyday life.

**Physics Honors**

**S185** Grade 11, 12  
 Prerequisite: Biology Honors, 1 credit  
 Advanced Algebra and Trigonometry  
 (Concurrent enrollment in Adv. Algebra  
 and Trigonometry permitted) or  
 Department Recommendation  
 Year course

This course is designed for students typically following an honors sequence. The focus of the program is intended to emphasize the development of critical thinking and mathematical skills, and those skills associated with effective laboratory investigation. These skills will be developed through studying the relationships of matter, energy, space, and time as observed in nature with strong emphasis on laboratory work.

**Principles of Technology**

**T245** Grade 11, 12  
 Prerequisite: Minimum grad of C 1 credit  
 in two science classes  
 Year course

Students will study Physics principles and their applications. The topics of forces, vectors, fluids, heat, light, sound, mechanisms, optics, electricity, and electromagnetism are studied using robotics, hydraulics, pneumatics, holography, fiber optics, lasers, sensors, and motors. This course emphasizes the development of traditional Physics concepts and technical skills.

NOTE: This course may earn credit in Science. It may also fulfill an elective requirement in Applied Sciences.

**AP Physics C**

**S189** Grade 11, 12  
 Prerequisite: Biology Honors or 1 credit  
 Physics Honors (preferred, not required)  
 (Concurrent enrollment in Pre-Calculus or  
 Calculus) or Department Recommendation  
 Year course

This course provides the opportunity to study topics normally covered in a first year college physics program. One semester is devoted to mechanics where students learn applications and problem-solving techniques in Kinematics, Newton's Laws of Motion, work, energy, and power, system of particles, linear momentum, rotation, oscillations, and gravitation.

The second semester is devoted to electricity and magnetism. Students learn to analyze and apply concepts in electrostatics, electric circuits, magnetostatics, and electromagnetism. The use of calculus in problem solving and in derivations is expected to increase as the course progresses.

AP students are encouraged to take the AP Physics examination in the spring for the potential earning of college credit and advanced college placement. (This course is offered at East for East and West students. Transportation is provided.)

**Advanced Physics**

**PS41X** Grade 11, 12  
**PS41Y** 1 credit  
 Prerequisite: Physics  
 Year course

This course is designed for students who successfully completed the study of Freshmen Physics and are interested in further investigation and understanding of the scientific processes and theories designed to provide answers to the questioning mind. Students will have the opportunity to use modern technology which has its basis in physics. The intended outcome of this course is the development of an ability to think in a critical manner using both concrete and abstract examples from physics as models

**AP Environmental Science**

**S177** Grade 12  
 Prerequisite: Senior standing 1 credit  
 Department recommendation  
 Year course

This course is designed to provide students with the scientific principles, concepts, and methodologies required to understand the inter-relationships of the natural world, to identify and analyze environmental problems both natural and human-made, and to evaluate the relative risks associated with these problems while examining alternative solutions for resolving and/or preventing them. (This course is offered at East for East and West students and through Distance Learning. Transportation is provided.)

**Physiology**

**S187** Grade 12  
Prerequisite: Senior standing 1 credit  
or Department Recommendation Year course

This course refines the basic concepts introduced in Biology and concentrates on the areas of human anatomy and physiology. Major emphasis is placed upon laboratory experiences and demonstrations with various organisms to investigate the structures and functions of the human body. Laboratory skills and relevant technical vocabulary associated with biological and medical professions are stressors.

**Astronomy and Space Science**

**S191** Grade 11, 12  
Prerequisite: Minimum grade of C in two 1 credit  
Mathematics courses  
Year course

This is a course dealing with the study of observational astronomy, stars, planets, solar systems, and the human exploration of space. Topics to be studied include forces and gravity, molecular spectroscopy, optics and telescope design, planetary and solar system formation as well as stellar evolution. Basic qualitative and computer skills will be learned and reinforced through the computer lab component of this course.

**Astronomy & Space Science Honors**

**S192** Grade 11, 12  
Prerequisite: Concurrent enrollment in 1 credit  
or successful completion  
of chemistry and geometry  
Year course

This course will introduce students to Astronomy and Space Science while emphasizing application of concepts of physics and mathematics. Topics to be studied are celestial coordinate systems; optics and telescope design; sun and solar system; stars and stellar evolution; galaxies and modern cosmology; and, the physics of space flight and exploration. Basic quantitative laboratory, computer, and observational techniques relevant to astronomy are included. Student use of computer and other technology is a major component of this course.

**Engineering & Design**

**PS21X** Grade 9, 10, 11, 12  
**PS21X** 0.50 credit  
Prerequisite: Physics  
Year course

This course examines the principles and applications of computer-aided design to solve various problems of design and engineering. Structural design and robotics engineering are two areas of particular emphasis.

**Forensic Science**

**S193** Grade 12  
Prerequisite: Chemistry, Geometry, 1 credit  
Trigonometry  
Year course

This course will investigate the history of forensic science, methods of investigating a crime scene, types of evidence, analysis of fingerprints, hair, fibers, drugs, glass, soil, and blood. In addition we will study agencies that offer forensics services, typical forensic labs and careers in forensic science. The class will rely heavily on labs, text readings of forensic journal articles and videos.

**Geology**

**S194 (S794 Sem. 2)** Grade 11, 12  
Prerequisite: Two years of science 0.5 credit  
Semester course; offered both semesters

In this course the student will study rocks and minerals, plate tectonics, erosion, and the earth's history. The student will learn how the earth has changed since its creation and study the forces that caused those changes. This course is designed to be hands-on and includes extensive lab and computer work. Problem-solving strategies and the scientific method will be stressed.

**Geophysical & Astrophysical Sciences**

**P43X** Grade 12  
**P43Y** 0.5 credit  
Prerequisite:  
Year course

This course uses the principals and strategies of inquiry to examine the physics of geological and meteorological process and their impact on the earth as a system. The underlying physical process at work on longer scale of the universe, including planetary studies, stellar and galactic evolution and relativity will also be studied.

**Human Genetics**

**PS32X** Grade 11, 12  
**PS32Y** 0.5 credit  
Prerequisite: Biology  
Year course

This course presents science and society about our species as well as a set of important ethical questions to examine the use of this knowledge wisely. This course analyzes the impact of this project from the perspective of biology, medicine, ethics, and society.

**Meteorology**

**S195 (S795Sem. 2)** Grade 11, 12  
Prerequisite: Two years of science 0.5 credit  
Semester course; offered both semesters

In this course, students study the earth's atmosphere. The complex relationship between the ground and the atmosphere that produces the weather will be paramount. The class will study everyday weather conditions and severe storms, as well as learn to read weather maps and make predictions for future.

# SCIENCE

## Anatomy/Physiology

**PS31X**

Grade 11, 12

**PS31Y**

1 credit

Prerequisite:

Year course

This course uses body structures of humans and animals to examine the systems necessary for the growth and maintenance of life. Particular emphasis is on the evolutionary sequence of organs, tissues, cells, and functions in order to better understand homology and the role of evolution in the development of life.

## Research Core I

**PR30X**

Grade 11

**PR30Y**

1.0 credit

No prerequisite:

Year course

Research and inquiry are core tenets of the Academy program. Students will explore ill structural real world programs of their choice using qualitative and quantitative methods. Final assessments will be the presentation of a poster at the annual Research Symposium.

## Research Mentorship Phase I (with Distinction)

**PR40X**

Grade 9, 10

**PR40Y**

0.5 credit

Year course

Research and inquiry are central foci of the work at the Proviso Mathematics and Science Academy. Students will work alongside scientists and other professionals to engage in meaningful, real-world efforts. Students may very well engage in research efforts that follow personal interests.

## Research Mentorship

**PR40X**

Grade 12

**PR40Y**

2.5 credit

Prerequisite:

Year course

The Mentorship Program places student's in the community with doctors, scientist, lawyers, teachers and many other professionals. They will be engaged in authentic world that contributes to the knowledge base. Find assessment will be the public defense at their world at the annual Research Symposium.

## Independent Study in Science

**S501**

Grade 11, 12

Prerequisite: Departmental approval

0.5 credit

One or two semester course

Independent study must be appropriately designed and approved. The course will cover the knowledge and skills identified by the student working in cooperation with the selected faculty member. See Independent Study under the Alternative School Center and Innovative Programs.

## State and National Science Standards

The state and national standards in science require students to be proficient in at least two areas of science: Life and Physical. Students at Proviso must earn at least 1.0 credit in a biological science and 1.0 credit in a physical science. Students should note the courses listed below in each of these science areas and select the courses that interest them

| LIFE SCIENCES  |                 | PHYSICAL SCIENCES        |              |
|----------------|-----------------|--------------------------|--------------|
| Biology        | (9, 10, 11, 12) | Chemistry                | (10, 11, 12) |
| Biology Honors | (9, 10, 11, 12) | Chemistry Honors         | (10, 11, 12) |
| AP Biology     | (11, 12)        | AP Chemistry             | (11, 12)     |
| Physiology     | (12)            | Physics                  | (9, 11, 12)  |
|                |                 | Physics Honors           | (11, 12)     |
|                |                 | AP Physics               | (12)         |
|                |                 | Principles of Technology | (11, 12)     |