SCIENCE

To graduate from high school, students are required to have one year of physical science and one year of life science. The student whose plans include a 4-year college generally takes courses in **biology, chemistry, physics** and a 4th year elective. Those students who have an interest in scientific careers such as mathematics, engineering, medicine, and the sciences often elect to take the honors and advanced placement courses. **All the science courses are college preparatory classes and are UC approved.**

The science department measures a student's success by performances on homework, projects, lab reports, quizzes and exams. Criteria for evaluating work based on the District ESLRs involve the effective integration of knowledge, critical and creative thinking in the areas of problem identification, procedure, data collection, analysis and conclusions. Students may also be evaluated on their oral and written communication skills.

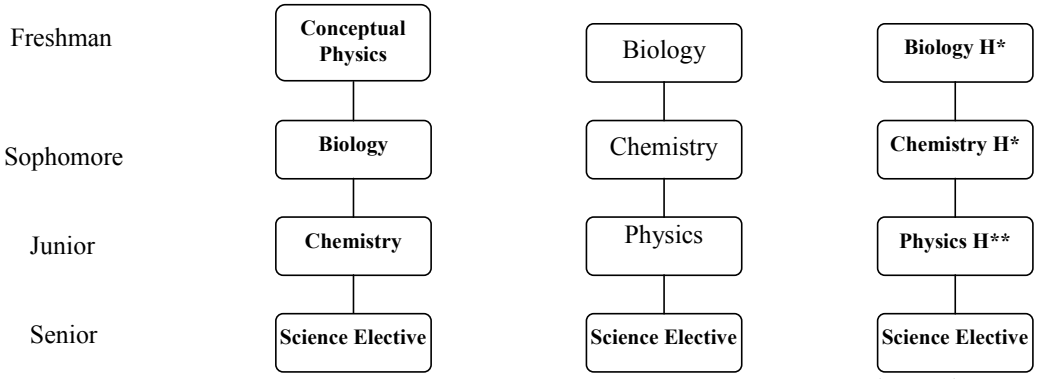
Teachers recommend courses for each student based on their performance in their current science class as well as performance in a student's math course. A student is expected to attempt the course they choose for at least six weeks. At the six-week progress period, students earning a C- or below in the class despite putting in their best effort can request a lane change. Such changes are contingent on class size, must be approved by the IS and both teachers and can only be made before the specified deadlines. *Students carry over their grade at the time to the new lane.*

We cannot accommodate any change of teacher requests based on preference, teaching or learning style for obvious reasons, with 1900 students in the school, if we would, we'd never be able to setup a feasible schedule.

PALY SCIENCE FLOW CHART
TYPICAL PATHWAYS

We strongly encourage all students take four years of science, including the three core science classes: Biology, Chemistry and Physics.

Please keep in mind that a student's maturity will change at different rates and while she could be in the grade-level science class one year, she could be ready for the accelerated class the next.



* Does not receive weighted credit because it is primarily a 9th or 10th grade class.
** Awaiting UCOP approval for weighted credit.
Science Electives: Please check the catalog for pre-requisites for each course

Geology (d)	**Marine Biology (d)**	**Biotechnology (d)**	**Astronomy (g)**
AP Biology	**AP Chemistry**	**AP Environmental Science**	**AP Physics C**

9TH GRADE CORE SCIENCE OFFERINGS

▶ Conceptual Physics

3254 Conceptual Physics Year 9-10

Prerequisite: This class is intended for freshman students who are concurrently enrolled in Algebra 1, 1.1 or 1.2.

Conceptual Physics is intended to meet the needs of those students who are still developing their basic algebraic skills in a first-year algebra course. It provides a rudimentary introduction to the fundamental principles of physics and how they apply to our daily lives. Topics covered include motion, forces, energy, waves, optics, electricity, and magnetism. Primary emphasis is placed on developing a conceptual understanding of topics, though simple mathematical formulas will be introduced and used to augment their understanding of how nature works. In such cases, use of these formulas will support the development of algebraic skills and provide reinforcement for material covered in introductory algebra courses. *This course meets the UC "d" requirement.*

▶ Biology

3130 Biology Year 9-10

Prerequisite: Freshmen in Biology should be enrolled in Algebra 1A or higher math. Freshmen in Algebra 1 are recommended to take Conceptual Physics as freshmen, Biology as sophomores, Chemistry as juniors and an elective science as seniors.

The concepts of Biology will be studied through a thematic approach. Some of the themes are genetics, conservation biology and analysis of human systems. Students will learn basic knowledge and laboratory skills as a foundation for further studies in science. *This course meets the UC "d" requirement and will qualify students for AP science classes at Paly.*

▶ Biology H

3131 Biology H Year 9-10

Prerequisite: A's in middle school classes; Freshmen should be enrolled in at least Geometry/Alg 2A or higher and have a desire to be challenged at an accelerated level.

Biology H is an accelerated college prep biology course that presumes retention of concepts learned in middle school life science. This varies from Biology in the depth and breadth of coverage and the application of mathematics. Critical thinking skills, analytical skills, and application of concepts will be emphasized. Students should have a high motivation, be able to learn independently, and have an interest in understanding biology concepts at a new and higher level. This course meets the UC "d" requirement. *PLEASE NOTE: 9th and 10th grade courses are not eligible to receive weighted credit from CSU/UC therefore, this course will NOT count as a weighted course for UC or CSU purposes.*

PREDICTORS FOR SUCCESS IN EACH SCIENCE COURSE – 9TH GRADE			
Predictor	**Conceptual Physics**	**Biology**	**Biology H**
Commitment to hours of required homework per week	1-2 Hours	2-3 Hours	3-5 hours
Prior grades in core subjects of math, sciences, social sciences, and English	Successful Completion	A's & B's	A's
Degree of independent learning and academic responsibility	Requires Guidance	Limited guidance needed	Self-motivated

NOTE: A student who is struggling to earn a C- in Biology H can request a transfer at the 6 week progress note period. Transfers must be approved by the teacher and IS and will depend on whether room permits. A students current grade will carry over to their new class.

- Conceptual Physics is a college prep course, meets the physical science graduation requirement, and is paced at grade level (meets UC "d" requirement).
- Biology is a college prep biology course and is paced at grade level (meets UC "d" requirement).
- Biology H is a college prep biology course and is paced above grade level (meets UC "d" requirement).

The following outcomes/ESLRs can be addressed through each 9th grade science course:

- ESLRs: 1, 2, 3, 5, 6, 7

10TH AND 11TH GRADE CORE SCIENCE OFFERINGS

▶ Chemistry

3624 Chemistry Year 10-12

Prerequisite: In order to take Chemistry as a sophomore the student must have the following: Successful completion of Biology (a grade of "C" or higher is strongly recommended), successful completion of Algebra 1A with a grade of "C+" or higher (by the end of the current school year), concurrent enrollment in Geometry or Geometry A and science teacher recommendation. It is strongly recommended that Algebra 1 students enroll in chemistry as a junior or senior.

In order to take Chemistry as a junior, the student must have the following: Successful completion of Biology 1A, successful completion of Algebra 1 and successful completion or concurrent enrollment in Geometry or Geometry A.

Chemistry is a college prep course that introduces students to the study of the structure and properties of matter and the changes that matter undergoes. It emphasizes the development of chemical principles and theories on the basis of experimental data and includes many laboratory experiments and demonstrations. The quantitative aspects of chemistry are thoroughly covered in this course. Some topics covered in this course include atomic structure, chemical nomenclature, stiochiometry, gas laws, solids, liquids, and solutions, chemical bonding, reaction rates, acid-base chemistry, oxidation-reduction and electrochemistry. *This course meets the "d" requirement for UC/CSU.*

▶ Chemistry Honors

3625 Chemistry H Year 10-12

Prerequisite: Completion of Biology with a grade of "A." Completion of Biology H with a grade of "B" or better. Completion of Geometry (a grade of "A" is strongly recommended) or completion of Algebra1A/Geometry A or Geometry/Alg 2 (with grades of "A or B") and concurrent enrollment in Algebra 2 or higher math.

Chemistry Honors is challenging college prep course that presents chemistry in greater depth and breadth than Chemistry. This is a yearlong study and an analysis of the chemical phenomena of our world. After taking this course, students should be prepared to take the SAT II in chemistry. The course takes a very quantitative and experiential learning approach through lab experiments and exercises. Problem solving techniques will be stressed with emphasis on analysis. The major topics discussed are: Moles and stoichiometry, Gases and States of Matter, Intermolecular Forces, Atomic Structure and Theories, Bonding, Thermochemistry, Equilibrium, Acid Base theory and equilibrium, Oxidation-Reduction and Electrochemistry, and Nuclear Chemistry. This course meets the "d" requirement for UC/CSU

PLEASE NOTE: *9th and 10th grade courses are not eligible to receive weighted credit from CSU/UC therefore, this course will NOT count as a weighted course for UC or CSU purposes starting in the 2013-2014 school year.*

Predictor	Chemistry	Chemistry Honors
Previous Mathematics courses	Completion of: Algebra 1A (C+ or better) or Alg 1A/GeomA (C or better) Algebra 1 (B or better)	Completion of: Geometry (A), Alg 1A/GeomA (B+ or A) or Geo/Alg 2 (B or better) Concurrent enrollment in Alg 2/Trig A or higher
Previous Biology Course	Biology (C)	Biology (A) Biology H (B or better)
Degree of independent learning and academic responsibility	Limited Guidance Needed	Self-Motivated
Commitment to hours of required homework per week	2-3 hours per week	3-5 hours per week

NOTE: Chemistry and Chemistry Honors will cover parallel topics only through the first six weeks. A student who is struggling to earn a C- in Chemistry H can request a transfer at the 6 week progress note period. Transfers must be approved by the teacher and IS and will depend on whether room permits. A student's current grade will carry over to their new class.

▶ Physics

3820 Physics Year 10-12

Prerequisite: Successful completion of a year of high school science algebra, and teacher recommendation. (Student in IAC or higher math should register for Physics H). Previous completion or concurrent enrollment in Algebra 2 or higher strongly recommended.

Physics is intended to meet the needs of those students who are comfortable with their basic algebraic skills and are currently developing their skills in a second-year algebra course. Like Conceptual Physics, it provides an introduction to the fundamental principles of physics and how they apply to our daily lives. Topics covered include motion, forces, energy, waves, optics, electricity, and magnetism - and may also include lesser amounts of thermodynamics, modern physics, and astrophysics. Emphasis is placed on developing an understanding that is rooted in both a conceptual and mathematical foundation. Basic algebraic skills will be applied regularly to solve every-day real-world problems in physics. Developing such problem solving skills is an emphasis of this course and will support the material covered in second-year algebra courses. *This course meets the "d" requirement for UC/CSU.*

▶ Physics H

3821 Physics H Year 11-12

Prerequisite: Concurrent enrollment in IAC or higher

Physics H is intended to prepare students interested in fields of study that could require them to take engineering-level physics in college. Such students are expected to have strong skills in algebraic and trigonometric problem solving. Like the other Physics courses, it provides an introduction to the fundamental principles of physics and how they apply to our daily lives. Topics covered include motion, forces, energy, waves, optics, electricity, and magnetism - and may also include thermodynamics, modern physics, and astrophysics. Theory will be understood through mathematical calculations and problem solving as well as the development of conceptual understanding. Mathematical problem-solving utilizing second-year algebra, geometry, and trigonometry will be extensively applied throughout the course. *This course meets the "d" requirement for UC/CSU. It is pending approval of UCOP for weighted credit.*

Predictor	Conceptual Physics	Physics	Physics Honors
Previous Mathematics courses	Middle school math. Concurrent enrollment in Algebra 1.1 or Algebra 1.	Concurrent enrollment in Algebra 2 or Algebra 2/TrigA.	Concurrent enrollment in IAC, Analysis or higher.
Degree of independent learning	Structured guidance	Limited Guidance Needed	Self-Motivated
Commitment to hours of required homework per week	1-2 hours per week	2-3 hours per week	3-5 hours per week

NOTE: Physics and Physics Honors will cover parallel topics only through the first six weeks. A student who is struggling to earn a C- in Physics H can request a transfer at the 6 week progress note period. Transfers must be approved by the teacher and IS and will depend on whether room permits. A student's current grade will carry over to their new class.

11TH AND 12TH GRADE SCIENCE ELECTIVE OFFERINGS

▶ Astronomy

3281 Astronomy Year 11-12

Prerequisite: Successful completion of Biology and Chemistry or Physics.

Astronomy is an elective course open to all students who meet the prerequisites. It parallels first-year astronomy courses offered at the college level. Three major aspects of astronomy form the focus for the course.

1. The history and development of astronomical understanding including the discovery and applications of physical laws that govern observed behavior in the cosmos.
2. The structure and evolution of astronomical systems, including the solar system, stars, galaxies and the universe as a whole.
3. The tools and techniques used to study the cosmos including telescopes, spectral analysis and interpretation of observed phenomena.

Current astronomical happenings and theories will be explored in multiple ways, including study of the sky with telescope and naked eye observations, use of modern analysis techniques, applications of astronomical knowledge to space exploration and the search for extra-terrestrial life. *This course meets the "g" requirement for UC/CSU.*

The following Outcomes/ESLRs can be addressed through this course:

- ESLRs: 1-7
- Homework Estimate: 1-2 hour per week

▶ Biotechnology: Theory and Practices

3955 Bio Tech Year 11-12

Prerequisite: Successful completion of Biology or higher. Successful completion of Chemistry or Chemistry H with a grade of "C" or higher. Concurrent enrollment in or prior completion of Physics is strongly recommended.

Biotechnology is an advanced course in biology that will be laboratory focused. The course will cover topics such as bacterial genetics, recombinant DNA, and protein expression and analysis as well as societal issues arising from this new technology. It will focus on beginning skills useful in the biotechnology industry. This course can be taken for CTE credit. *This course meets the "d" requirement for UC/CSU.*

▶ AP Biology

3139 AP Biology Year 11-12

Prerequisite: Successful completion of Biology and Chemistry and departmental approval. *Concurrent enrollment in or prior completion of Physics is strongly recommended.*

AP Biology is the second year of Biology. It is an introductory college level course, which provides an opportunity for students to look at various biological concepts in depth. New discoveries and their relevance to our every day lives are a significant component of the AP Biology course; one example is the laboratory work with DNA. Students will be prepared to take the AP Biology exam at the end of this course. *This course meets the "d" requirement for UC/CSU.*

▶ AP Chemistry

3609 AP Chemistry Year 11-12

Prerequisite: Successful completion of Chemistry. Alg2/TrigA or higher with grade of A or B. *Concurrent enrollment in or prior completion of Physics is strongly recommended.*

This course is a second year of chemistry and the first year of inorganic/general college chemistry including a demanding laboratory component. This yearlong study prepares students for the AP Chemistry Exam but it uncovers and discusses all of the topics in a general college chemistry course. The topics are: stoichiometry, solutions and solution stoichiometry, atomic structure and theory, periodic properties, bonding and bonding theories, gases, solids, liquids, and intermolecular forces, kinetics and equilibrium, acid base equilibrium, thermodynamics, electrochemistry, and some organic and nuclear chemistry. Problem solving and quantitative analysis are at college level and are an integral part of the course. *This course meets the "d" requirement for UC/CSU.*

▶ Geology

3710 Geology Year 11-12

Prerequisite: Successful completion of Biology AND a physical science course (Integrated Science, Foundations of Chemistry & Physics, Conceptual Physics, Chemistry or Physics)

Earth System Science studies planet Earth as one unified system. Fall semester focuses on rocks, minerals, plate tectonics, earthquakes, volcanoes, and the Earth's place in our solar system. Spring semester address hydrology, oceanography, climate and weather. *This course meets the "d" requirement for UC/CSU.*

▶ AP Environmental Science

3279 AP Environmental Science Year 11-12

Prerequisite: Successful completion of Biology and Chemistry, with a grade of "B" or higher, and teacher approval. *Concurrent enrollment in or completion of Physics is strongly recommended. Juniors taking Algebra 2 are encouraged to wait until their senior year to take APES.*

This college level course explains the scientific principles behind environmental problems and issues. The goal is, "to provide students with the scientific principles, concepts, and methodologies required to understand the interrelationships 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 and examine alternative solutions for resolving and/or preventing them". This course covers more topics in greater depth than Environmental Science. The treatment of topics in this course is much more mathematical; the difference is especially pronounced in the lab and the field portions of the course. *This course meets the "d" requirement for UC/CSU.*

▶ Marine Biology

3168 Marine Biology Year 11-12

Prerequisite: Completion of Biology and a physical science course (Integrated Science, Foundations of Science, Conceptual Physics, Chemistry or Physics).

Marine Biology is a second-year biology course that builds upon and extends biological concepts developed during the first year. Students will take an in-depth look at the features of the ocean and the variety of plant and animal life that lives within. They will investigate how life in the ocean is interconnected and the impact that humans have on that system.

This course meets the UC "d" requirement.

▶ AP Physics C

3859 AP Physics C Year 11-12

Prerequisite: Successful completion of Physics Honors at Paly with a grade of "A"; concurrent enrollment in BC Calculus.

Those students not meeting these requirements may enroll only with the consent of the instructor.

This course is the second year of physics and is equivalent to the introductory course for a Physics or Engineering major in a typical university. It is the second year of physics and incorporates calculus in the development of theory as well as in problem solving. AP Physics will include only Mechanics and Electricity and Magnetism. The main emphasis will be on application of concepts and advanced problem solving. The course will prepare students to take the AP Physics C test. *This course meets the "d" requirement for UC/CSU.*

▶ Science Research Projects H

3549 Sci Proj H Year 11-12

Prerequisite: Completion of Physics, Chemistry and Biology (or concurrent enrollment in the third year of science) with grades of "A" or with Science Teacher's recommendation. Applications to this course will be available in the Science Department on February 1st. Due date for all applications is March 30th.

This course allows students to participate in actual scientific research by working with a mentor from the scientific community. Students who register for this course are expected to commit to their mentor for the entire school year. Students spend 5 or more hours a week at the work site of their mentors, write a scientific abstract and a technical paper and give an oral presentation. In order to best prepare for this opportunity, there will be a meeting sometime in the spring which outlines expectations and procedures for finding and working with a mentor. Students will be required to turn in time cards weekly, create a resume, and attend meetings Fridays during lunch. *This course meets the "g" requirement for UC/CSU. This course meets CTE graduation requirements*