

# SCIENCE

To graduate from high school students are required to have one year of physical science and one year of life science. Students whose plans include college are strongly encouraged to take courses in biology, chemistry, and physics. Students who have an interest in scientific careers such as mathematics, engineering, medicine, and the sciences often elect to take the honors, accelerated, and advanced placement courses. All biology, chemistry, physics and biotechnology courses fulfill the University of California laboratory science requirement. Chemistry I and Physics I are less mathematical in nature. Astronomy and Environmental science courses meet the California State University science requirements but not UC laboratory science requirement.

<b>3108</b>	<b>Biology I</b>	<b>9</b>
<b>3115</b>	<b>Biology IA</b>	<b>9</b>
<b>3109</b>	<b>Biology IAC</b>	<b>9</b>

In all three biology courses topics include cell biology, genetics, evolution, biodiversity ecology, life processes, reproduction and contemporary advances and issues in cellular biology and biotechnology. Topics will be developed through laboratory exercises, discussions, lectures, demonstrations, information research projects, and field trips. Scientific skills and methods are emphasized.

Biology courses will vary in depth of coverage of each topic, degree of independent learning, and amount of homework required. The following table shows predictors for success:

<b>PREDICTORS FOR SUCCESS IN EACH BIOLOGY COURSE</b>			
<b>Predictor</b>	<b>Biology I</b>	<b>Biology IA</b>	<b>Biology IAC</b>
<b>Commitment to hours of required homework per week</b>	2 Hours	2-3 Hours	3-5 Hours
<b>Prior grades in core subjects of math, sciences, social sciences, and English</b>	Successful Completion	A's and B's	Mostly A's
<b>Degree of independent learning and academic responsibility</b>	Requires guidance	Moderate guidance needed	Self-motivated

- Biology I is a college prep biology course and is paced at grade level.
- Biology IA is an advanced college prep biology course and is paced at high grade level, providing preparation for honors and advanced placement classes.
- Biology IAC is an accelerated college prep biology course and is paced above grade level, providing preparation for honors and advanced placement courses.

**The following outcomes/ESLRs can be addressed through each Biology course:**

- ESLRs: 1, 2, 3, 5, 6, 7
- Homework Estimate: Biology I is 2 hours per week  
                                   Biology IA is 2-3 hours per week  
                                   Biology IAC is 3-5 hours per week

**COLLEGE BIOLOGY AP****3139 COLBIOL AP****Year****11-12**

**Prerequisite:** All students must complete an application in order to enroll. Applicants who have satisfied the following prerequisites are guaranteed enrollment:

1. Bio I (A) or Bio IA (B+) or Bio IAC (B-) and
2. Chem I (B+) or Chem H (C)

Consent of the instructor is required for all applicants who have not met the prerequisites.

This course meets graduation, University of California and California State University laboratory science requirements.

AP College Biology is designed to provide a survey of biological knowledge at an introductory college level. Because successful completion of the curriculum will enable students to take the College Board Advanced Placement Examination, the course follows the outline recommended by the College Board, covering the general content areas of: (1) Molecular and Cellular Biology; (2) Genetics and Evolution; and (3) Organisms and Populations.

The course focuses on developing the ability to integrate content information from multiple units, utilizing several common themes: (1) relationships between structure and function; (2) acquisition, transformation and use of energy; and (3) adaptation leading to evolutionary fitness. Heavy emphasis is placed on understanding the connection between experimentation and scientific discovery. Both hands-on laboratory activities and scientific readings are used to show how biological information is gained, interpreted, and applied. Required homework includes extensive reading, regular written lab reports, occasional group projects, and a year-end independent research project.

**The following outcomes/ESLRs can be addressed through this course:**

- ESLRs: 1, 2, 3, 4, 5, 6, 7
- Homework Estimate: 5-8 hours per week

**CHEMISTRY / ENVIRONMENTAL SCIENCE**

All chemistry and environmental science courses meet the physical science graduation requirement and a California State University laboratory science requirement. Chemistry I and Chemistry IH both meet University of California lab science requirements. Both Chemistry courses cover the same fundamental concepts but differ in the degree of analysis, quantitative understanding and independent thinking required of students. Environmental science offers a non-quantitative alternative for students who do not plan to enroll in advanced science classes in their junior and senior year. The following table shows predictors for success in these courses:

<b>Predictor</b>	<b>Environmental Science</b>	<b>Chemistry I</b>	<b>Chemistry H</b>
Previous Mathematics courses	Successful completion of Algebra I	Completion of: Algebra I (B or better), Algebra IA (C+ or better), or Alg IA/GeomA (C)	Completion of: Alg IA (A) or Alg IA/GeomA (B+ or A) or Geo/Alg 2 Adv (B or A)
Previous Biology Course	Successful completion of any biology course	Biology IA (C+) Bio I (B-) or Bio IAC (C or better)	Biology IA (A) Biology IAC (B+ or A)
Degree of independent learning and academic responsibility	Requires structure and 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

## **INTRO TO ENVIRONMENTAL SCIENCE**

**3278 ENVIRO SCI**                      **Year**                      **10-12**

**Prerequisite:** Completion of Biology. Completion of Algebra I.

This course meets graduation and California State University laboratory science requirements. It also satisfies University of California "G" elective requirement.

Environmental Science is an elective course that is open to all students. Students will learn science concepts while applying them to real issues. The first semester of the course will focus on a study of our environment including the atmosphere, the oceans, soil and soil dynamics and internal earth processes. The second semester will apply these concepts to global issues including land and water use, pollution, energy resources and global change. This is a hands-on course and much of the curriculum will be project based.

**The following outcomes/ESLRs can be addressed through this course:**

- ESLRs: 1, 2, 3, 4, 5, 6, 7
- Homework Estimate: 1-2 hours per week

## **CHEMISTRY 1**

**3610 CHEMIST I**                      **Year**                      **10-12**

**Prerequisite:** Completion of Biology I (B- or better) Biology IA (C+), Biology IAC (C) or the equivalent. Completion of Algebra I (B or better), Algebra IA (C+), Alg IA/Geom A (C) or Geo/Alg 2 Adv. (pass). (Students who are earning an A or B in Alg IA/Geom A or a B or better in Geo/Alg 2 Adv. Should consider Chemistry 1H). Concurrent enrollment in Geometry I, Geometry A, or Alg 2/Pre-Calculus H. Consent of department required for exceptions.

This course meets graduation, University of California and California State University laboratory science requirements.

Chemistry I is intended for students who would have difficulty with the quantitative aspects of the Chemistry 1H course, but who want to study the fundamental concepts of chemistry. Topics covered include atomic structure, chemical nomenclature, stoichiometry, gas laws, states of matter, bonding, periodic properties of elements, solutions chemistry, kinetics of reactions, chemical equilibrium acid-base reactions, oxidation reduction reactions and nuclear chemistry. (*Note: same topics as Chem H*).

The course includes many laboratory experiments and demonstrations. Students learn how to work safely in the laboratory, how to perform basic laboratory operations, how to organize and interpret data, how to draw conclusions from experimental results.

**The following outcomes/ESLRs can be addressed through this course:**

- ESLRs: 1, 2, 3, 4, 5, 6, 7
- Homework Estimate: 2-3 hours per week

## **CHEMISTRY 1H**

**3619 CHEMIST 1H**                      **Year**                      **10-12**

**Prerequisite:** Completion of Biology IAC (grade A or B+) or Biology IA (grade A) or the equivalent or Biology I (grade A and teacher recommendation). Completion of Algebra IA (grade of A). Alg IA/Geom A (grade of B+ or better) or Geo/Alg 2 Adv (Grade of B or better) or concurrent enrollment in Alg2/Pre-Calculus H or Trig/Anlt H.

This course meets graduation, University of California and California State University laboratory science requirements.

Chemistry 1H introduces students to the study of the structure and properties of matter and the changes that matter undergo. It emphasizes the development of chemical principles and theories on the basis of experimental data, and includes many laboratory experiments and demonstrations. The

quantitative study of chemistry requires both strong analytical skills and the ability to apply concepts to laboratory results. Topics covered include: atomic structures, chemical nomenclature, stoichiometry, gas laws, states of matter, bonding, periodic properties of elements, solutions chemistry, kinetics of reactions, chemical equilibrium (with an emphasis on solubility), acid base reactions, oxidation-reduction and nuclear chemistry. As preparation for those students taking College Biology AP the course will conclude with an application of chemical principles to organic chemistry. Students carry out an independent project in the second semester.

**The following outcomes/ESLRs can be addressed through this course:**

- ESLRs: 1, 2, 3, 4, 5, 6, 7
- Homework Estimate: 5 hours per week

## **COLLEGE CHEMISTRY AP**

**3609 COLCHEM AP** Year **11-12**

**Prerequisite:** All students must complete an application in order to enroll. Applicants who have satisfied the following prerequisites are guaranteed enrollment:

1. Chemistry I (grade of A) OR Chemistry Honors (grade of B or better).
2. Algebra 2/Trig H (grade of B or better) OR Trig/Analy H (grade of B or better) OR Analysis H (grade of B or better) OR Pre-Calculus (grade of A).

This course meets graduation, University of California and California State University laboratory science requirements.

AP College Chemistry is designed to provide a survey of chemistry at an introductory college level. Because successful completion of the curriculum will enable students to take the College Board Advanced Placement Examination, the course follows the outline recommended by the College Board, covering the general content areas of: structure of matter, states of matter, descriptive chemistry and chemical reactions. It includes an extensive lab component that is comparable to college level chemistry course and requires additional lab time outside of class. AP College Chemistry differs from Chemistry Honors in the depth of coverage of each topic, the amount of time in the chemistry lab and the inclusion of enrichment topics in chemistry.

**The following outcomes/ESLRs can be addressed through this course:**

- ESLRs: 1, 2, 3, 4, 5, 6, 7
- Homework Estimate: 8 hours per week

## **PHYSICS**

All physics courses meet the physical science graduation, University of California Lab Science and California State University laboratory science requirements. All physics courses cover mechanics and electromagnetism. With the exception of AP Physics (C), all courses also include optics and modern physics. Additional emphasis may be placed on thermodynamics, astronomy, and other physics-related or interdisciplinary topics at the discretion of the instructor. Within each topic basic concepts are developed and applications to daily life are explored.

## **CONCEPTUAL PHYSICS**

**3810 PHYSICS I** Year **10-12**

**Prerequisite:** Algebra I (B- or better) or Alg IA (C or better), Algebra IA/GeomA (C). Biology IA (C+) Bio I (B-) or Bio IAC (C or better).

This course meets graduation, University of California and California State University laboratory science requirements.

The goal of Physics I is to develop a conceptual understanding of the fundamental principles of physics. Students will explore these concepts in the laboratory and will apply them in problem solving situations

and to explain physical phenomena in their daily lives. Included are all of the topics listed above with emphasis at a basic level on mathematical descriptions of physical phenomena. Students will apply their knowledge of geometry and first year introductory algebra.

**The following outcomes/ESLRs can be addressed through this course:**

- ESLRs: 1, 2, 4, 5, 6, 7
- Homework Estimate: 2-3 hours per week

### **PHYSICS 1A**

**3818 PHYSICS 1A**                      **Year**                      **11-12**

**Prerequisite:** Completion Bio 1 (A), Bio 1A (B) or Bio AC (C) AND one of the following math sequences: Alg 1A (A) and Geometry (A) and Algebra 2 (B) OR Alg 1A/GeomA (B) and Alg 2/Trig H (B) OR Trig/Anlt H (C)

This course meets graduation, University of California and California State University laboratory science requirements.

This course is designed for students who are planning to pursue a university degree and who are strong in mathematics. Traditional physics concepts are studied with an emphasis on developing concepts, building mathematical models to describe physical phenomena, and problem solving. Students in this course will use the skills they develop in second-year algebra, geometry, and trigonometry.

**The following outcomes/ESLRs can be addressed through this course:**

- ESLRs: 1, 2, 3, 4, 5, 6, 7
- Homework Estimate: 2-3 hours per week

### **COLLEGE PHYSICS AP (B)**

**3869 COLPHYSAPB**                      **Year**                      **11-12**

**Prerequisite:** All students must complete an application in order to enroll. Completion of Algebra 2/Pre-Calculus Honors, or IAC (B+ or A) or Trig Anlt H (B). Concurrent enrollment in AB Calculus, Analysis Honors, or Pre-Calculus is strongly recommended, as is completion of a course in chemistry (with grade of A or strong B).

This course meets graduation, University of California and California State University laboratory science requirements.

This course is an introductory survey course in physics with an emphasis on laboratory work and problem solving. It is equivalent to a full year of an algebra/trig-based college physics sequence. The course is designed for students who are planning to pursue a university degree and who are strong in mathematics. Topics include: mechanics, thermodynamics, fluids, optics, nuclear physics, electricity and magnetism. This course prepares students to take the Advanced Placement Physics B exam in the spring.

**The following outcomes/ESLRs can be addressed through this course:**

- ESLRs: 1, 2, 3, 4, 5, 6, 7
- Homework Estimate: 4-6 hours per week

### **COLLEGE PHYSICS AP (C)**

**3879 COLPHYSAPC**                      **Year**                      **11-12**

**Prerequisite:** All students must complete an application in order to enroll. Completion of or concurrent enrollment in BC Calculus or completion of AB Calculus. A course in chemistry is strongly recommended. Prior experience with physics is suggested. Students should have A or strong B grades in prior math and science courses. Consent of department required for exceptions.

This course meets graduation, University of California and California State University laboratory science requirements.

AP Physics C is an advanced physics course equivalent to the course taken by physics majors and engineers at most universities, taught with calculus. It concentrates on Mechanics and Electricity and Magnetism, two semesters of the usual college curriculum. Students with particular strengths in math and science, and students with a serious intent to major in science or engineering should consider this course. The course prepares students to take the Advanced Placement examinations in Mechanics and/or Electricity and Magnetism.

**The following outcomes/ESLRs can be addressed through this course:**

- ESLRs: 1, 6, 7
- Homework Estimate: 4-7 hours per week

## **SCIENCE ELECTIVES**

### **ASTRONOMY**

**3281 ASTRONOMY**                      **Year**                      **11-12**

**Prerequisite:** Biology I or higher (pass). Consent of department required for exceptions.

This course meets graduation and California State University laboratory science requirements. Also satisfies University of California "G" elective.

Astronomy is an elective course open to all students that parallels the first year astronomy course 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 the physical laws that govern observed behavior in the cosmos; 2) the structure and evolution of astronomical systems, including the solar systems, stars, galaxies, and the universe as a whole; 3) the tools and techniques used to study the cosmos, including a study of 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 telescopes and naked eye observations, use of modern analysis techniques, applications of astronomical knowledge to space exploration and the search for extra-terrestrial life, and Internet research.

**The Following Outcomes/ESLRs can be Addressed through this Course:**

- ESLRs: 1, 2, 3, 4, 5, 6, 7
- Homework Estimate: 1-2 hours per week

### **BIOTECHNOLOGY: THEORY & PRACTICES (ROP)/SCIENCE**

**3955 BIO TECH**                      **Year**                      **11-12**

**Prerequisite:** Successful completion of Biology; and Chemistry or permission of instructor. Strongly recommended: concurrent enrollment in Physics, Astronomy, or AP Biology or AP Chem.

This course satisfies University of California entrance "d" requirements for science; satisfies high school graduation requirement for Career Technical Education (CTE).

This course will introduce students to the theoretical aspects of Biotechnology (Cell Biology, Microbiology, Molecular Biology, Immunology) and societal issues arising from this new technology. Hands on laboratory activities will reinforce theoretical information and teach lab safety, data analysis, the scientific method, and related computer skills. This course will include topical speakers from biotechnology industry and research and field trips to visit nearby biotech industry sites and labs. (See cross listing in Career Technical Education Department.)

**The following outcomes/ESLRs can be addressed through this course:**

- ESLRs: 1, 2, 3, 4, 5, 6, 7
- Homework Estimate: 3 hours per week (extra 1 hour per week during project time)

## **DIGITAL ELECTRONICS**

**3246 DIG ELCT (CTE Credit) Year 9-12**

**3247 DIG ELCT Year 9-12**

**Prerequisite:** College Preparatory Mathematics (any) is a co-requisite

This course in applied logic encompasses the application of electronic circuits and devices. Students use computer simulation software to design and test digital circuitry prior to the construction of actual circuits and devices. Students will learn the theory as well as the process behind circuit modeling/design and building. Emphasis is placed on project-based and collaborative learning, and will prepare students for the type of thinking and skills required in the electronics and electrical engineering industry. This course closely follows the Project Lead The Way pre-engineering curriculum. The only prerequisite is an interest in the subject and concurrent enrollment in any college preparatory math.

Homework Estimate: 2 hours per week