

## Loyola Science Department Curriculum Sequence

| <i>Freshmen</i> |   | <i>Sophomores</i>   |   | <i>Juniors</i>                       |   | <i>Seniors</i>  |
|-----------------|---|---------------------|---|--------------------------------------|---|---|
| PHYSICS         | → | CHEMISTRY<br>H-CHEM | → | BIOLOGY<br>AP BIO<br>APES<br>AP Chem | → | ELECTIVES<br>AP BIO<br>AP CHEM<br>AP ES<br>AP PHYSICS |

### Science Course Descriptions

#### PHYSICS

OPEN TO FRESHMEN

Physics is an introductory, year-long laboratory course in which students study energy and motion, sound, optics, electricity and magnetism. Physics is the study of the fundamental laws of nature and the search to understand the interactions between matter and energy. This course will examine concepts of mechanics; properties of matter; heat; waves; electricity and magnetism; light; atomic and nuclear physics; and relativity through an inquiry-based curriculum, facilitation of the teacher, projects, cooperative learning, the use of demonstrations, computer simulations, laboratory activities and lectures. Although general physics is not a rigorously mathematical course, students are expected to have a working knowledge of the fundamental principles of algebra. Laboratory work is an important component used to aid the student with his understanding of the physical world.

#### CHEMISTRY

OPEN TO ALL SOPHOMORES

PREREQUISITE: NONE, PHYSICS RECOMMENDED

General Chemistry is a year-long laboratory course in which students study the structure and behavior of matter. Laboratory experimentation is a key ingredient in this course. Topics include: atomic and molecular structure, stoichiometry, gases, chemical reactions, chemical bonding, liquids and solids, solutions, equilibrium, acids and bases, electrochemistry, and nuclear chemistry. This course provides a fundamental

foundation of the knowledge required for further study in the sciences.

#### CHEMISTRY - HONORS

OPEN TO SOPHOMORES

PREREQUISITE: HIGH ACHIEVEMENT IN MATH AND RECOMMENDATION OF SCIENCE DEPARTMENT

The purpose of this year-long course is to expose students of high motivation and strong mathematical ability to various topics in general inorganic and physical chemistry, along with some rudimentary organic chemistry. This course is paced aggressively and rigorously. Theoretical concepts will be covered in greater detail. A major goal of this course is to teach students to solve problems at an advanced level, no matter what the subject matter. The lectures and laboratories are integrated in order to provide maximum coverage of the course material. Students will have the opportunity to explore chemistry through inquiry, cooperative learning, and independent study methods appropriate to the college preparatory level. The ultimate goal of this course is to prepare students for matriculation into introductory chemistry courses at the university level.

#### CHEMISTRY - ADVANCED PLACEMENT

OPEN TO JUNIORS, AND SENIORS

PREREQUISITE: SUCCESSFUL COMPLETION OF A YEAR OF CHEMISTRY; HIGH ACHIEVEMENT IN MATH AND RECOMMENDATION OF SCIENCE DEPARTMENT

The AP Chemistry course is designed to be the equivalent of the general chemistry course usually taken during the freshman year in college. Students in this course will attain a depth of understanding of fundamental chemical properties and a reasonable competence in dealing with chemical problems. Primary emphasis will be on the development of the student's ability to think critically and scientifically, and express ideas, both orally and in writing, with clarity and logic. In addition, college-level laboratory experiments will serve to supplement instructional lectures. Students will be required to attend supplementary laboratory activities every week, to be held before school on the days in which the class meets during the first hour.

#### **BIOLOGY:**

OPEN TO JUNIORS

PREREQUISITE: CHEMISTRY or APES

Biology offers a study of the nature of science as inquiry, as well as the major concepts in biology, including ecology, genetics, and comparative anatomy. Emphasis is placed on biological processes at the molecular level. Most laboratories are investigative in nature. Biology is a full year laboratory course that studies living things through scientific investigation. Among the topics included are use of the microscope, the diversity of life on the planet, cell structure and function, evolution and natural selection, molecular biology, genetics, reproduction, circulation, respiration, digestion and immune response. Students will dissect frogs and fetal pigs in this course.

#### **BIOLOGY - ADVANCED PLACEMENT**

OPEN TO JUNIORS AND SENIORS

PREREQUISITE: HIGH ACHIEVEMENT IN SCIENCE, MATH AND RECOMMENDATION OF SCIENCE DEPARTMENT

AP Biology is a college level course in the scientific study of life. Students will explore the structure and scale of life, the diversity and unity of biological organisms and systems, evolution, the

mechanisms of molecular genetics and heredity, major functional systems in plants and animals, use of energy by organisms and ecology. Lab activities include molecular analysis of DNA fragments through electrophoresis, separation of chlorophyll pigments, the study of habitat selection of brine shrimp, and effects of dissolved oxygen and aquatic productivity. It will prepare students for the national AP test for college credit.

#### **ENVIRONMENTAL SCIENCE - ADVANCED PLACEMENT**

OPEN TO JUNIORS AND SENIORS

PREREQUISITE: HIGH ACHIEVEMENT IN SCIENCE AND RECOMMENDATION OF SCIENCE DEPARTMENT

Advanced Placement Environmental Science is an integrated science course taught at the first-year college level. This class requires dedicated, highly self-motivated learners who have the ability and study skills to work independently. The AP Environmental Science course is designed to be the equivalent of a one-semester, introductory college course in environmental science. Unlike most other college introductory-level science courses, environmental science is offered from a wide variety of departments including geology, biology, environmental studies, environmental science, chemistry and geography. The APES course is a rigorous science course that emphasizes scientific principles and analysis while also touching on the sociological and political perspectives. The course is intended to enable students to undertake, as first year-college students, a more advanced study of topics in environmental science or alternatively, to fulfill a basic requirement for a laboratory science and thus free time for taking other courses. Many of the sections or this course are "team-taught."

#### **PHYSICS - ADVANCED PLACEMENT**

OPEN TO SENIORS

PREREQUISITE: HIGH ACHIEVEMENT IN SCIENCE, MATH AND RECOMMENDATION OF SCIENCE DEPARTMENT

AP Physics is an introductory, college level course in the scientific study of Physics. Students will explore the concepts of motion, inertia, conservation of energy, conservation of linear and angular momentum, simple harmonic motion, and Newton's laws of gravitation, electric fields, electric circuits, and magnetic fields. Lab activities include the determination of the acceleration due to gravity, the study of linear and angular momentum, collisions in one dimension, and simple harmonic motion, and electric circuit analysis. For AP Physics C students must have completed Chemistry and must be concurrently enrolled in either AP Calculus or Honors Precalculus. Students are admitted to the course only with the permission of the instructor.

## **PHYSICS**

OPEN TO SENIORS

PREREQUISITE: TWO YEARS OF SCIENCE AND MATH

Senior-level Physics develops knowledge of the underlying laws, theories, principles, and concepts governing physics today and to apply this knowledge towards solving problems in a scientific manner. Students develop an ability to handle, construct, and use materials and equipment in a productive and safe manner, and to develop the ability to measure, organize, and communicate scientific information by employing the scientific inquiry method.

## **GEOLOGY - HONORS**

OPEN TO SENIORS

PREREQUISITE: HIGH ACHIEVEMENT IN SCIENCE AND RECOMMENDATION OF SCIENCE DEPARTMENT

Honors Geology is a college level course which provides 4 semester of units of college credit. No AP exam is required to receive this credit. The course seeks to explore a broad range of geologic processes by conducting over forty labs. Additionally, students are required to participate in several field trips to local mountains and beaches, the San

Andreas Fault and several mines. Major topics include: rocks and minerals, volcanoes, weathering and erosion, groundwater, rivers and lakes, caves, glaciers, deserts, oceans, earthquakes, plate tectonics and planetary geology. Prerequisites include at least a B grade in either Chemistry or Earth Science and prior approval of the instructor.

## **OCEANOGRAPHY**

OPEN TO SENIORS

PREREQUISITE: TWO YEARS OF SCIENCE AND MATH AND PERMISSION OF INSTRUCTOR

Oceanography is a yearlong laboratory course that explores the world's oceans. The class investigates many aspects within the ocean including ocean creation, marine provinces, physical properties of water and seawater, waves, tides, and marine biology. There are many laboratory activities incorporated throughout the year. Precise lab work is critical, and will count for a major portion of the overall grade.

## **ANATOMY & PHYSIOLOGY**

OPEN TO SENIORS

PREREQUISITE: TWO YEARS OF SCIENCE AND MATH AND PERMISSION OF INSTRUCTOR

This course will be based upon an introductory college level Anatomy & Physiology class. It will be based primarily on the "systems" approach that much of life science has adopted as a result of curriculum changes which began in medical school courses. This approach as it will be adopted here places emphasis upon an entire organ system of the body, and it proposes to integrate the learning of both the anatomy and physiology of that system. This method of presentation, while it may provide a greater challenge to the instructor, will retain the attention of the student longer, and provide a more concomitant learning atmosphere. Many concepts covered in Biology will be seen again in this course, but there will not be time to reteach these ideas, and therefore, if students do not have a comfortable working knowledge of these concepts they will be burdened. Also upon the discussion of physiological actions and mechanisms some basic chemical and physical principles will be touched upon and

integrated. However, they should not present a burden to a student that has not completed a physics course, or one that did not excel from an analytical point of view in chemistry. There will be tremendous emphasis placed upon visual aid and representation throughout all aspects of the course. Also, through a combination of hands-on laboratory exercises, class discussion, current events, and projects relating to the human body and medicine, they will be challenged to look at the function and dysfunction of the human body from a myriad of sources. One of the important sources will be each other as students in group projects or presentations. Simply, students will gain a greater appreciation of the complexity and beauty of the human body and respect for its Creator.