

SCIENCE

The science curriculum at St. Mark's is an integrated, intensive laboratory-oriented program. Skills in critical thinking, reading, and drawing conclusions are drawn on from other disciplines, utilized and extended. A wonderful facility complements the program formulated below. Students make regular visits to the three-climate greenhouse, the aviary, the planetarium, and the observatory.

LOWER SCHOOL

The Lower School Science curriculum provides the boys with the foundations for observing, communicating, measuring, comparing, describing, classifying, predicting, collecting data, and interpreting data. It is built to foster curiosity, inventiveness, persistence, and enthusiasm. We want the boys to learn by doing and reflecting. We use materials from a variety of programs to explore the life, earth and space, and physical sciences. In first grade, we look at physical objects and their properties; life cycles, habitats and the classification of plants and animals; the sun and its effect on earth; and rocks, volcanoes, and earthquakes. Our second-grade curriculum covers interactions and systems; air, water, and ground pollution; and animals and endangered species. In third grade we formally discuss the use of scientific method. We study light, sound, simple machines, the senses, nutrition and the digestive system, invertebrates, vertebrates, the skeletal system, and conservation of earth's resources. Our fourth-grade curriculum covers an in-depth look at planet earth from its core to the crust. We work with the basic features of matter and motion. In the life science area, fourth graders study the respiratory and circulatory systems of the human body. Fourth graders also learn basic laboratory techniques. In the Lower School we use our planetarium as a primary tool in our study of astronomy.

MIDDLE SCHOOL

The Middle School Science curriculum is a series of laboratory-oriented disciplines which attempts to bring students and science together in such a manner that each student will gain knowledge and a sense of confidence about his environment. He will be able to analyze unfamiliar situations, consider alternatives, and then decide on a course of action. In this way, students will ultimately learn on their own initiative and develop an active interest in the learning process. There is a balance between the physical and biological sciences, and between the descriptive and more quantitative aspects of science. The Middle School science courses described are required at the indicated grade levels.

UPPER SCHOOL

The Upper School Science curriculum offers a program of studies by which students will gain a basic knowledge of modern scientific principles and ideas, and an understanding of the methods and significance of science in contemporary society. There is a three-year laboratory science graduation requirement, and all students must take biology. Students are, of course, encouraged to continue their study of science beyond the three-year requirement. A variety of courses in biology, chemistry, physics, astronomy, geology, environmental science, DNA science, and engineering comprise the basic science curriculum. Students who have the full complement of basic courses may qualify for advanced placement courses in biology, chemistry, and physics and environmental science. There are some other courses which will appeal to students according to the individual descriptions below. There are special activities sponsored by the science department which include JETS competitions, the Astronomy Club, U.S. First, Model Airplane Club, Rocket Club, Garden Club, and other special project clubs.

SCIENCE 5: PHYSICAL SCIENCE (205) GRADE 5

Full Year

Science 5 builds on the skills and processes developed in the Lower School science sequence. Concepts of hypothesis formation and testing, classification, and observation are developed through class work, investigations, and work on special projects. Students investigate topics in mechanics, electricity and chemistry. An in-depth study of robotics allows students to apply their science and LOGO programming skills in design & construction of a variety of devices. The development of an interest in science is stressed in approaching each topic. Separate units in sex education and drug education are presented during the year. Math and language skills are reinforced and developed in each unit.

SCIENCE 6: LIFE SCIENCE (206) GRADE 6

Full Year

Science 6 is a full year course which deals exclusively with living things. In this introductory biology course students learn how the systems of the human body work, the diversity of living things, some basic ecology, genetics, and principles of health and disease. There is a unit on green plants with special projects in the greenhouse. Lab experiences applying to all concepts are integral parts of this course.

SCIENCE 7: EARTH & SPACE SCIENCE (207) GRADE 7

Full Year

Science 7 is an introduction to the basics of geology, astronomy, and meteorology. The topics include rocks, minerals, and mining; as well as landforms, maps, the universe, space exploration, the solar system, and the elements of weather. A variety of activities enhances these studies.

**SCIENCE 8:
PHYSICS/CHEMISTRY
(208) GRADE 8**

Full Year

Science 8 is an introductory course in physical science. The basic concepts of physics and chemistry are presented and applied to problem-solving and laboratory work. In the lab, the student's ability to hypothesize, make careful measurements, and present his results in a clearly written manner is stressed. The student will spend approximately half his time working in the lab. Each trimester concludes with a final project which incorporates many of the concepts studied. These projects are prepared at home.

**BIOLOGY
(209) GRADES 9-11**

Full Year

This course covers in depth the basic biological concepts as they apply to both plants and animals. Emphasis is given to the major biological themes including: cellular structure and function, molecular biology, metabolism, genetics, evolution, survey of plant and animal phyla, and human anatomy and physiology. Laboratory investigations, outside readings, and projects supplement an intense course of study. Class discussions focus on recent developments in biological science. Students successfully completing this course are strongly urged to take the June Biology SAT II (Achievement Exam) offered by the College Entrance Examination Board.

**⌘ AP BIOLOGY
(219) GRADES 11-12**

Full Year

This course is intended for those students seeking advanced placement. It is the equivalent of a college freshman course in biology. The course meets six periods per week and features a biochemical approach to the study of life functions. Emphasis is on the basic principles as they apply to both plants and animals. Laboratory work is an integral part of the course with specific

mandatory lab investigations. To acquaint students with procedures used by the College Entrance Examination Board, teacher-made tests include both objective and essay questions. Students are expected to take the Advanced Placement Examination and pay the required fee. The text is *Biology* by Neil Campbell, 4th edition. **Prerequisites:** Biology, Chemistry, and Physics. (Honors grades in Biology and Chemistry). If all other prerequisites have been satisfied, students may take Physics concurrently with A.P. Biology.

**CHEMISTRY
(220) GRADES 10-12**

Full Year

This course covers the major topics in the study of college preparatory inorganic chemistry. The student is asked to share in the excitement of discovery. The course is laboratory oriented. Theory and mathematical concepts are highly stressed. Non-senior students successfully completing this course are urged to take the June Chemistry SAT II (Achievement Test) offered by the CEEB. **Prerequisites:** Biology and Algebra I.

**● APPLIED CHEMISTRY
(210) GRADES 10-12**

Full Year

This is a descriptive, less quantitative year-long course based on the curriculum established by the American Chemical Society. The primary focus is on the application and impact of chemistry in the areas of environmental science, industry, and human ecology. The format will combine both lectures and labs, and the class will meet six periods per week. **Prerequisite:** Biology. **Limitations:** Department Chair approval required.

**⌘ AP CHEMISTRY
(230) GRADES 11-12**

Full Year

This course emphasizes the mathematical and the theoretical aspects of inor-

ganic and organic chemistry at the freshman college level. Laboratory work includes college first-year experiments in inorganic chemistry. Students enrolled in this class are expected to take the Advanced Placement Chemistry examination in May. **Prerequisites:** Algebra II, Biology, Chemistry, and Physics or Physics concurrently with A.P. Chemistry.

**PHYSICS
(221) GRADES 11-12**

Full Year

This course is a special sequence of integrated studies designed to give an in-depth exposure to the three basic descriptions of physical phenomena: particle behavior, wave behavior, and quantum behavior. **Prerequisites:** Algebra II.

**● MULTIMEDIA ENGINEERING
(213) GRADES 11-12**

Full Year

This course covers engineering principles, along with the fundamental math and science concepts which are enabling the Information Age. Working with the support of SMU engineering professors and TI engineers, the course will focus on three of the most important areas of modern technology and engineering: (1) exploration and analysis of the various processes of digitizing, compressing, storing, transporting, and displaying information or media from various sources such as music, images, movies, and text; (2) introducing the basic physical building blocks and components of modern multimedia and information systems; and (3) developing the necessary skills for implementing key technologies on computer hardware through easy-to-use advanced software design tools.

Students who successfully complete this course will have a deeper understanding of engineering in the era of modern high-technology. They will also have an appreciation of the role and relevance of math and science in technology, along with first-hand experience with digital media, computers, and communications systems.

Prerequisites: Algebra II, two previous years of lab science. **Limitations:** Teacher approval required.

☼ **AP PHYSICS B**
(271) **GRADE 12**

Full Year

This course involves the study of the full spectrum of topics presented in College-level Physics. The content includes mechanics, thermodynamics, waves and sound, electricity, magnetism, optics, and modern physics. It features problem-solving in both the theoretical and practical, with emphasis on laboratory procedures which are entirely student initiated and directed in a project format. The mathematics level required is algebra and trigonometry, with students currently enrolled in calculus. Students taking this course are expected to take the AP Physics B exam in May. **Prerequisites:** Physics, concurrently enrolled in calculus.

☼ **AP PHYSICS C**
(272) **GRADE 12**

Full Year

The AP Physics C course is designed with the future scientist in mind. Classical and relativistic mechanics are studied in the first half of the year, followed by electricity, magnetism, and electromagnetism in the second half. The work load demands that only students interested in a career in science or engineering sign up for the course. Since mathematics is the language of science, the AP Physics C course speaks most fluently in calculus. Therefore, not only is previous success in physics a must, but the student must also have a strong mathematics background. By the end of the school year, a diligent student will do very well on the AP Physics C exam, and have a firm foundation of understanding of the physical world around him. **Prerequisites:** Physics and concurrent enrollment in AP Calculus BC, or concurrent enrollment in AP Calculus AB with Science Department Chair approval.

● **ASTRONOMY**
(241) **GRADES 11-12**

2 Trimesters: 1st & 2nd only

This two-trimester course is an introduction to the fundamentals of astronomy. It includes lectures, discussions, planetarium programs, evening observation sessions, and labs.

● **GEOLOGY**
(240) **GRADES 11-12**

3rd Trimester only

This one-trimester course is an introduction to the principles of physical and historical geology. It includes laboratory examination of fossils, rocks, and minerals, as well as field trips and laboratory map exercises.

● **DNA SCIENCE**
(229) **GRADES 11-12**

2 Trimesters: 1st & 2nd only

This is an elective offered in the first two trimesters. It will be primarily a laboratory course of cumulative investigations that presupposes no prior experience on the part of the student. The laboratory experiments cover the basic techniques of sterile bacterial culturing, DNA restriction digest and ligation, rapid colony transformation, purification and identification of plasmid DNA, recombination of antibiotic resistance genes, replica plating, and purification and identification of recombinant DNA. The course will include student preparation of reagents, flow charts to help in the scheduling of experiments, and the analysis of results. The students will keep a daily journal of record much like a "bench scientist." Students enrolling in this course must be self-directed, highly motivated, and able to work independently. **Prerequisites:** Biology, Chemistry. **Limitations:** Department Chair approval required.

● ☼ **AP PRINCIPALS OF ENVIRONMENTAL SCIENCE**
(252) **GRADES 11-12**

Full Year

This course will thoroughly explore the fundamentals of environmental science such as population dynamics, ecosystem interdependence, and renewable energy sources. Students will investigate various topics through lab experiments, problem solving exercises, lectures, and field trips. Skills will be developed in specific techniques and procedures (such as collecting and analyzing water sample data from a real study). Experience with a local field study will help students gain awareness of the importance of confounding variables that exist in the "real world." Recent historical case studies of ecologically significant phenomena will also be examined. Special emphasis will be put on the role of human encroachment into threatened ecosystems. Students are expected to take the Advanced Placement Examination in May. The text is *Living in the Environment* by G. Tyler Miller. **Prerequisites:** Biology, Chemistry.