

## Science Courses 2019-2020

### **Advanced Placement Biology**

Advanced Placement Biology is designed to be the equivalent of the two-semester College Biology course required of pre med and other life science majors. Students will gain a thorough understanding of biological systems and receive hands on practice in cutting edge technology. Some of the areas of emphasis include human anatomy and physiology, molecular biology, genetics, cytology, thermodynamics, evolution, gene therapy and recombinant DNA technology. Laboratory work deals with the advanced application of biological procedures and techniques. These protocols range from inserting genes into bacteria to genetic examination of fruit flies. Several molecular biology experiments are performed by students on field trips to the Cold Spring Harbor Laboratories. All students take the Advanced Placement Examination at the conclusion of this course.

*Prerequisite(s): Chemistry*

*Grade(s): 11, 12*

*Credit: 1*

*Meets: 7.5 periods weekly*

### **Advanced Placement Chemistry**

The Advanced Placement Chemistry course is designed to be the equivalent of the General Chemistry course usually taken during the first year of college. The course stresses the development of student abilities to think clearly and logically and to express their ideas orally and in written form. Topics include structure of matter, kinetic theory of gases, chemical equilibria, chemical kinetics, the basic concepts of thermodynamics, and descriptive chemistry. Laboratory work is an important component of the course requirement. Students must have successfully completed Regents Chemistry to manage this level of study. All students take the Advanced Placement Examination at the conclusion of the course.

*Prerequisite(s): Regents Chemistry, Algebra 2*

*Grade(s): 11, 12*

*Credit: 1*

*Meets: 7.5 periods weekly*

### **Advanced Placement Environmental Science**

Advanced Placement Environmental Science is designed to be the equivalent of an introductory college course in Environmental Science. Environmental science is the study of the natural sciences in an interdisciplinary context that always includes people and how they influence the system. It includes many aspects of biology, earth science, fundamental principles of chemistry and physics. This course will

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 man-made, to evaluate the relative risks associated with these problems, and to examine alternative solutions for resolving and/or preventing them. Topics include scientific analysis, interdependence of earth systems, human population dynamics, renewable and nonrenewable resources, environmental quality, global changes and their consequences, environment and society. Field and laboratory investigations are an integral part of curriculum. All students take the Advanced Placement Examination at the conclusion of the course.

*Prerequisite(s): Regents Chemistry*

*Grades: 11, 12*

*Credit: 1*

*Meets: 7.5 periods weekly*

### **Advanced Placement Physics I**

Advanced Placement Physics I is the equivalent to a first-semester college course in algebra-based physics. The course covers Newtonian mechanics (including rotational dynamics and angular momentum); work, energy, and power; and mechanical waves and sound. It will also introduce electric circuits. College credits may be earned based upon the score achieved on the AP Exam. AP Physics covers more topics than Regents Physics and moves at a faster pace. Subject matter is treated in a highly mathematical and conceptual manner and is discussed in greater depth than in the Regents course. Successful completion of the laboratory assignments is a requirement for admission to the Regents. All students enrolled in AP Physics will be required to take the AP Exam in May in addition to the Regents Exam in June.

*Prerequisite(s): Regents Chemistry and Algebra 2 (Precalculus may be taken concurrently)*

*Grade(s): 11, 12*

*Credit: 1*

*Meets: 10 periods weekly*

### **Advanced Placement Physics II**

An algebra-based, introductory college-level physics course that explores topics such as fluid statics and dynamics; thermodynamics with kinetic theory; PV diagrams and probability; electrostatics; electrical circuits with capacitors; magnetic fields; electromagnetism; physical and geometric optics; and quantum, atomic, and nuclear physics. Through inquiry-based learning, students will develop

scientific critical thinking and reasoning skills. All students enrolled in AP Physics 2 will be required to take the AP Exam in May.

*Prerequisite(s): AP Physics I*

*Grade(s): 11, 12*

*Credit: 1*

*Meets: 7.5 periods weekly*

### **Advanced Placement Physics C: Mechanics**

This is a calculus-based physics course that is equivalent to a semester of college-level work in mechanics. Instruction and laboratory experiences will be provided in the following content areas: kinematics; Newton's laws of motion; work, energy, and power; systems of particles and linear momentum; circular motion and rotation; and oscillations and gravitation. AP Physics C is intended to enhance and extend many of the topics and lab activities that the students experienced in their first physics course while providing the opportunity to earn college credit. Since much of it involves the use of introductory differential and integral calculus, it is strongly recommended that the students take an AP calculus BC course either prior to, or concurrently with, AP Physics C. All Students will take the AP examination as the conclusion of this course.

*Prerequisite(s): AP Physics I, BC Calculus (may be taken concurrently)*

*Grade(s): 12*

*Credit: 1*

*Meets: 7.5 periods weekly*

### **Anatomy & Physiology**

This is a comprehensive course devoted to the study of the structure and function of the human body. In addition to learning how our bodies normally work, we will study the many diseases and disorders with each system. This course is intended to prepare students for college biology or pre-profession, including medicine, veterinary medicine, physical and occupational therapies, nursing, cancer research, biotechnology, and molecular biology. A substantial portion of this course will be devoted to meaningful, hands-on laboratory experiences that include dissecting the fetal pig.

*Prerequisite(s): Living Environment*

*Grade(s): 11, 12*

*Credit: 1*

*Meets: 5 periods weekly*

## **Astronomy**

Astronomy is an introductory class that is modeled after an early college elective course in the Earth and Space Sciences, designed for students with a natural curiosity for understanding what we observe in our night sky and beyond, as well as what we experience below our feet. This course explores a broad range of topics including the history of space exploration, understanding Earth's geological processes, the fate of the sun, Einstein's theory of special relativity, black holes, and the roles of dark matter and energy in the formation of the universe. Students will be introduced to present theories about the composition, formation, and evolution of moons, planets, stars, galaxies, and the universe. Learnings will benefit students in their recognition, conceptualization and appreciation of our cosmic place in time and space, enhancing the quality of their lives while preparing them for a lower-level college curriculum in the natural and physical sciences.

*Prerequisite(s): Regents Chemistry*

*Grade(s): 11, 12*

*Credit: 1*

*Meets: 5 periods weekly.*

## **Discrete Chemistry**

Discrete Chemistry is an activity, project and laboratory based physical setting course for students interested in completing their science requirements but may not become science majors in college. Students will develop and use knowledge of matter and its chemical properties to make informed decisions about the application of Science and Technology to enhance the quality of their lives. Students take advantage of a valuable chemistry curriculum that will benefit them in their everyday lives as well as in their college years.

*Prerequisite(s): Living Environment*

*Grade(s): 11, 12*

*Credit: 1*

*Meets: 5 periods weekly*

## **Forensics**

Forensic Science is a unique and interesting forum to incorporate many different areas of science with real world technology and the criminal justice system. This challenging course will expose students to many new technological advances in forensic medicine and crime solving techniques like DNA Fingerprinting, serology, toxicology, and organic analysis intertwined with "tried and true" scientific processes. This hands-on course will focus on scientific inquiry, logical thinking skills and problem solving procedures to understand how science can be

crucial in solving crimes and how this information is gathered and used in a court of law. This course will combine many types of teaching strategies including scientific inquiry, hands-on laboratories, use of the Internet and libraries for research papers, field trips, guest speakers, and "murder mystery" scenarios that encourage students to utilize their knowledge learned in class to "solve a crime."

*Prerequisite(s): Chemistry or Discrete Chemistry*

*Grade(s): 12*

*Credit: 1*

*Meets: 7.5 periods weekly*

### **Introduction to Research 9**

Introduction to Research seeks to accomplish two objectives. One objective is to provide 9th graders with a sense of what it means to participate in the high school research program that begins in the 10th grade in either science or social science. The second objective is to teach 9th graders the basic skills in research and presentation, both written and oral, which are fundamental to academic success in high school, college and beyond. Those skills include: 1. How to evaluate the validity of websites. 2. How to utilize the High School Library's electronic databases. 3. How to build a bibliography. 4. How to write a science or social science research paper. 5. How to make an effective oral presentation. 6. How to use a spreadsheet program to create charts and graphs.

*Prerequisite(s): None*

*Grade(s): 9*

*Credit: .5*

*Meets: 5 periods weekly*

### **Regents Living Environment**

This course prepares students for the New York State Living Environment assessment. Students develop positive scientific attitudes, utilize inquiry skills, and develop an understanding of the basic concepts of modern biological science. Molecular genetics, ecological relationships and environmental issues are emphasized to prepare students to better understand the latest trends in the life and medical sciences. Laboratory work is a major part of the course. Successful completion of laboratory assignments is required for admission to the Regents examination. All students take the Living Environment Regents exam at the end of the course.

*Prerequisite(s): Earth Science*

*Grade(s): 9, 10, 11, 12*

*Credit: 1*

*Meets: 7.5 periods weekly*

### **Physical Setting/Chemistry**

In this course students learn how to observe and describe experiences, to organize facts, to generalize relationships, and to predict future experiences. They gain a modern view of the fundamental concepts of chemistry. This includes a thorough understanding of the following topics: matter and energy, atomic structure, bonding, the periodic table, the mathematics of chemistry, kinetics and equilibrium, acids and bases, redox and electrochemistry, organic chemistry, applications of chemical principles, and nuclear chemistry. Laboratory work is a major part of the course. Successful completion of laboratory assignments is required for admission to the Regents Examination. All students take the Physical Setting: Chemistry Regents Examination at the end of the course.

*Prerequisite(s): Integrated Algebra and Living Environment*

*Grades: 10, 11, 12*

*Credit: 1*

*Meets: 7.5 periods weekly*

### **Physical Setting/Earth Science**

This course marks the beginning of the Regents Science sequence and will prepare students for the physical setting-earth science assessment. In addition to the regular daily class period, students meet for an additional laboratory period every other day. Regents Earth Science is an inter-disciplinary course that builds on the background in science acquired in the earlier grades. Matter, energy, space and time are put into perspective through an inquiry-centered study of the student's environment on Earth. This framework attempts to relate all areas of science. Biology, chemistry, mathematics and physics are basic to understanding the processes that affect our planet and the universe. Astronomy, geology, meteorology and oceanography are strongly interwoven throughout the course. Laboratory activities form the core of this curriculum. Successful completion of laboratory assignments is required for admission to the Regents Examination. All students take the Physical Setting/Earth Science Regents exam at the conclusion of course.

*Prerequisite(s): None*

*Grade(s): 9, 10, 11, 12*

*Credit: 1*

*Meets: 7.5 periods weekly*

### **Regents Physical Setting/Physics**

The students use scientific measurement to investigate mechanics, transfer of energy by wave motion, electricity, magnetism and nuclear energy. Through

extensive lab work, the students refine their understanding of the real world. Through discussions and problem solving, students develop patterns and habits of logical thinking. Laboratory work is a major component of the course. Successful completion of laboratory assignments is required for admission to the Regents Examination. All students take the Physical Setting/Physics Regents examination at the end of the course.

*Prerequisite: Chemistry*

*Grade(s): 11, 12*

*Credit: 1*

*Meets: 7.5 periods weekly*

### **10th Grade Beginning Research Course in Science**

The student will opt for a Beginning Research Course in the sciences, or social sciences. The instructional component of the course will focus on research methods and practices including, but not limited to such topics as: literature searches, bibliography development, choosing a research question, developing hypotheses, research paradigms, data collection, data analysis, communication of results, written abstracts, experimentation, scientific projects, presentations, and “hands-on” research completed in house, at university, hospital, government lab etc. The hands-on component of the course will involve the development of projects suitable for entry into a variety of competitions. This course is a prerequisite for remaining in the Research Program. Students shall also enter non-data driven competitions, fairs, or projects including but not limited to, the DUPONT Challenge, Toshiba ExploraVision, Young Naturalist Competition, MIT Think, Protein Challenge, Brain Bee and the National Science Bowl.

*Prerequisite(s): None*

*Grade(s): 10*

*Credit: 1*

*Meets: 5 periods weekly*

### **11th Grade Intermediate Research Course in Science**

The instructional component of the eleventh grade course would focus on: advanced research design, advanced data analysis and statistics, and research ethics. The hands-on component will be geared toward the design and execution of a project idea for investigation by the student, and hopefully lead to an "Intel level" research project. As appropriate, time will also be spent in the establishment of connections between students and professional mentors who will assist in the guidance of students as they perform their research. Eleventh grade students will be required to enter their research projects in a minimum of four research fairs and contests. The Intermediate Research Course and university level research during

the summer between 11th and 12th grades are prerequisites for continuing in the Research Program.

*Prerequisite(s): Science Research 10*

*Grade(s): 11*

*Credit: 1*

*Meets: 5 periods weekly*

### **12th Grade Advanced Research Course in Science**

In Senior Year, students will complete their research projects, then write their research papers and prepare presentation materials. They will enter the senior level contests appropriate to their area of study, such as the Siemens Competition, the Intel Science Talent Search, SUNY Stony Brook's Junior Science and Humanities Symposium, Long Island Science and Engineering Fair, Long Island Science Congress, Manhattanville College Science Competition/Fair, Research Association Invitational, New York State Science and Engineering Fair, and the International Sustainable World-Energy, Engineering, and Environmental Project. Fall Semester.

*Prerequisite(s): Science Research 11*

*Grade(s): 12*

*Credit: 0.5*

*Meets: 5 periods weekly*