

## **SCIENCE DEPARTMENT**

Students are required to take three science credits for graduation. One must be biology; another must be a physical science; the third is an elective. Students are encouraged to take additional science courses as electives in order to achieve a well-rounded educational experience.

### **POSSIBLE SCIENCE SEQUENCES**

**9<sup>th</sup> Grade**

**10<sup>th</sup> Grade**

**11<sup>th</sup> Grade**

**12<sup>th</sup> Grade**

#### **Highly Rigorous College Preparatory Science Program**

(Take 2 science classes a year in order to complete all four AP<sup>®</sup> science classes)

H Biology	→	H Physics	→	AP <sup>®</sup> Biology (DP)	→	AP <sup>®</sup> Environmental
APEX Biology		AP <sup>®</sup> Chemistry (DP)		AP <sup>®</sup> Physics B or C		Elective Courses ***
H Chemistry**		AP <sup>®</sup> Environmental		AP <sup>®</sup> Environmental		Science Internships
		AP <sup>®</sup> Physics B		Elective Courses***		
		Elective Courses***				

#### **Rigorous College Preparatory Science Program**

(Take 2 science classes some years in order to complete two AP<sup>®</sup> science classes)

H Biology	→	H Chemistry	→	H Physics	→	AP <sup>®</sup> Sciences
APEX Biology		Elective Courses***		AP <sup>®</sup> Sciences		Elective Courses***
				Elective Courses***		

#### **College Preparatory Science Program**

(Take one science class per year including one AP<sup>®</sup> science class)

H Matter & Energy	→	H Biology	→	H Chemistry	→	AP <sup>®</sup> Sciences
				Elective Courses***		Elective Courses***

#### **Basic Preparatory Science Program**

Matter & Energy	→	Biology	→	Environmental Science	→	Elective Courses***
				Horticulture		
				Forensics#		
				Astronomy		

#### **Elective Course Options Available After Completing the Following:**

##### **After Biology:**

Anatomy & Physiology\*#  
Astronomy  
Environmental Science  
Forensics#  
Horticulture  
AP<sup>®</sup> Physics B  
H Physics\*

##### **After Chemistry:**

AP<sup>®</sup> Biology (DP)\*  
AP<sup>®</sup> Chemistry (DP)  
AP<sup>®</sup> Environmental\*  
Molecular Biology\*#  
H Physics\*/Physics  
Research Design #  
AP<sup>®</sup> Physics B

##### **After Physics:**

AP<sup>®</sup> Physics C

\* can be taken concurrently with Honors Chemistry

\*\* must be taken with Honors Biology

\*\*\* Elective courses

# receive honors credit

**MATTER & ENERGY A/B****374900/375000****MATTER & ENERGY A,/B HONORS****376400/376500**

Matter and Energy A and B develop skills and concepts related to Physics and Chemistry. Topics in motion, force, forms of energy, transformation of energy and magnetic and electrical forces are taught in semester A. In Semester B, topics in properties of matter, physical changes, solutions and their properties, chemical changes and bonding as well as chemical and nuclear reactions are taught. Both courses give the student an excellent foundation to pursue courses in Physics, Chemistry as well as Biology.

**BIOLOGY A/B****363100/363200****BIOLOGY A/B, APEX****362122/362222****BIOLOGY A/B, HONORS****362100/362200**

Biology A includes the study of ecology, cell biology, biochemistry, energetics (including photosynthesis, respiration and enzyme mediated reactions) and nucleic acids and protein synthesis. Biology B topics include the study of inheritance, applied genetics, evolution, classification and diversity of life. This course prepares students to take the High School Assessment test.

**CHEMISTRY A/B****372100/372200****CHEMISTRY A/B, HONORS****371100/371200**

Chemistry A topics include organization and classification of matter, atomic theory, formula writing, reactions, stoichiometry, atomic structure and the Periodic Table of Elements. Chemistry B topics include bonding, kinetic molecular theory, solutions, acids and bases, and thermodynamics.

*Co-requisite:* Geometry

**PHYSICS A/B****383100/383200****PHYSICS A/B, HONORS****382100/382200**

Physics A is the study of the physical world and its behavior. Topics taught include kinematics, force, momentum and energy. Physics B teaches thermal energy, electrostatics, circuits, magnetism, waves and optics and modern physics.

*Prerequisite:* Geometry

**ASTRONOMY A/B****385600/385700**

This elective science course focuses on our Solar System and planetary astronomy. Astronomy A includes: the Earth, the Moon, the Sun, the other planets, and additional bodies such as moons, asteroids, and comets. Astronomy B includes: cosmology, stars, nebulae, pulsars, black holes, galaxies, quasars, and the Big Bang theory. Evening observing sessions with telescopes, and visits to an observatory and or planetarium may be included. Either semester may precede the other or semesters taken independently.

**ENVIRONMENTAL SCIENCE A/B****366100/366200**

Environmental Science A and B explore the ever-changing relationship between living things and their environment. The effects of human activity on the environment are given special attention. Environmental Science A explores the nature of ecosystems, such as the environmental history of the Great Lakes, energy flow from plants to animals and other living things, cycles of nutrients, world population, organization of biological communities, and the effects of pollution. In Environmental Science B, students study such topics as urban and non-urban land use, water use, nonrenewable resources, energy resources, food resources and the effects of an increasing human population.

**HORTICULTURAL SCIENCE A/B****367100/367200**

Horticulture Science teaches students techniques for the care and culture of plant life in the home, business, and community. Attention is given to plant propagation, identification, genetics, behavior, and requirements. Laboratory work is adjusted to utilize the indoor greenhouse as well as maintenance of school flowerbeds. Horticultural Science A includes careers in horticulture, plant structure and behavior, conditions affecting plant growth, plant propagation, control of disease, weeds and pests, and greenhouse management. Horticultural Science B includes plant identification, soils and their preparation, crop plants, management of lawns, and landscaping.

**ADVANCED (HONORS) LEVEL COURSES****ANATOMY AND PHYSIOLOGY A/B****376100/376200**

This advanced level course is intended for students who have succeeded in biology and who wish to study in greater detail how the human body works. Anatomy and Physiology is an honors level course that focuses on two main ideas. One, form relates to function (for example, how the structure of the human hand enables it to perform many tasks) and two, chemistry helps explain how living things work. Semester A begins with an introduction to anatomical terms, then a review of cells and their organelles. This is followed by a unit on histology (tissues) and how their structure relates to their function. The body systems taught in semester A include the integument system, the skeletal system and joints, and the nervous system. Semester B completes the study of human body systems. Topics include the muscular, digestive, circulatory, respiratory and reproductive systems. Dissection is a course requirement.

*Prerequisite:* Successful completion of biology and either completion of chemistry or concurrent enrollment in chemistry.

**MOLECULAR BIOLOGY, A/B****365700/365800**

This honors course is intended for advanced students who have succeeded in biology and who wish to study advanced concepts and theories of molecular genetics in greater detail. A molecular understanding of gene expression and recombinant DNA technology is emphasized, and resulting issues from the Human Genome Project, gene therapy, and bioethics are discussed. The course provides practical training for biological research. In semester A, students learn the concepts and techniques that will be used during the second semester, where students will conduct original research in conjunction with Rutgers University.

*Prerequisite:* Attainment of the objectives of Biology and either completion of Chemistry or concurrent enrollment in Chemistry A/B

**EXECUTIVE HIGH SCHOOL INTERNSHIP**

See [www.walterjohnson.com/coursebook/internship](http://www.walterjohnson.com/coursebook/internship) for information.

**FORENSIC SCIENCE A/B****386400/386500**

This course focuses on forensic science and modern crime scene investigation techniques. Forensic Science A includes the topics of forensic science history, crime scene investigation and evidence collection, forensic entomology, serology, pathology, anthropology and odontology. Forensic Science B explores the topics of trace evidence, DNA analysis, toxicology, fingerprint collection and analysis, and firearms, ballistics and explosives. Either semester may precede the other or semesters may be taken independently.

*Prerequisite:* Successful completion of Biology

**RESEARCH DESIGN A/B****388400**

This course is designed to prepare students to conduct research projects independently, including those projects related to a science internship, scientific competition, or senior projects. Students work in groups and individually to increase their scientific, creative, analytic and communication abilities. Topics include the scientific research process, conducting background research, evaluating scientific research papers, and designing, implementing and presenting original research project proposals.

## **AP® COURSES**

### **AP® BIOLOGY A/B**

**Double Pd 365100/365200**

Topics in AP® Biology are selected from the Advanced Placement® curriculum. This is a college level course and students may elect to take the Advanced Placement® examination in order to qualify for college credit or advanced standing. AP® Biology emphasizes laboratory work in all areas of the curriculum. This is a double-period class. AP® Biology A includes biochemistry, the behavior of cells, cellular energetics, heredity, molecular genetics, and evolutionary biology. AP® Biology B includes the diversity of organisms, structure, and function of plants and animals, behavior of organisms, and ecology. Students will be prepared to take the AP Biology exam in May.

Prerequisite: Attainment of objectives for Biology and one of the following: completion of Chemistry or concurrent enrollment in Chemistry. AP® Biology A is a pre-requisite for AP® Biology B

### **AP® CHEMISTRY A/B**

**Double Pd 375100/375200**

AP® Chemistry is for students with a strong interest in chemistry and related fields, such as engineering. Topics are selected from the Advanced Placement® curriculum and are taught at a college level. Students may elect to take the Advanced Placement® examination in order to qualify for college credit or advanced standing. AP® Chemistry emphasizes laboratory methods and handling data using statistics. This is a double-period class. AP® Chemistry A covers topics in atomic theory, stoichiometry, gas laws, thermodynamics, reaction rates, acids/bases, and solutions. Students in AP® Chemistry B explore types of chemical reactions, chemical equations, reaction rates, equilibrium systems, and principles of chemical reactions. Students will be prepared to take the AP Chemistry exam in May.

Prerequisite: Attainment of objectives for Biology, Chemistry, and Algebra II.

AP® Chemistry A is a prerequisite for AP® Chemistry B

### **AP® ENVIRONMENTAL SCIENCE A/B**

**365900/366000**

This course is based on the course outline designed by the College Board. It provides 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, to evaluate the relative risks associated with these problems, and to examine alternative solutions for resolving and/or preventing them. Laboratory and field investigation complement the classroom portion of the program, providing opportunities to test concepts and principles that are introduced in the classroom. Fieldwork, along with an investigation and research of greenhouse ecosystems, allows students to explore specific problems in ways that are challenging, realistic, and relevant to their lives. Students may elect to take the Advanced Placement® Environmental Science exam in order to qualify for college credit or advanced standing. Students will be prepared to take the AP Environmental Science exam in May.

Prerequisite: Attainment of the objectives of Biology. Completion of Chemistry or concurrent enrollment in Chemistry A/B

**AP® PHYSICS B A/B****383700/383800**

This course is for highly motivated students with interest in the physical sciences. Physics B provides a foundation in physics for students who intend to major in the life sciences, pre-medicine, and some applied sciences in college. Students should have knowledge of algebra, geometry and basic trigonometry. Topics include Newtonian mechanical, thermal physics, electricity and magnetism, waves and optics and atomic and nuclear physics. Students are prepared to take the Advanced Placement Physics B examination at the end of this course.

Prerequisite: Completion or concurrent enrollment in Precalculus.

**AP® PHYSICS B A/B (Double period)****385100/385200**

This is a double-credit course that meets for two periods each day. This course has the same objectives, curriculum, materials, and activities as AP Physics B A/B, but with more support to meet the objectives of this challenging course. Students may not earn credit for both single- and double-period AP Physics.

Prerequisite: Completion or concurrent enrollment in Precalculus.

**AP® PHYSICS C A/B****383900/384000**

This course is for highly motivated students with interest in majoring in the physical sciences or engineering. Students use calculus in problem solving and in derivations as they study Newtonian mechanics, electricity, and magnetism. Students will be prepared to take both of the Advanced Placement® Physics C examinations (Mechanics as well as Electricity and Magnetism) at the end of this course.

Prerequisite: Attainment of the outcomes of Physics A/B or Honors Physics A/B or AP Physics B and Pre-calculus A/B and concurrent enrollment in or completion of Calculus.