

# Science

## Suggested Course Sequence

## Elective Offerings

50

Grade 9

**Biology  
Studies**

**Biology  
Honors/Pre IB,  
Advanced, Academic**

**Anatomy & Physiology *Adv***

**Biology: DNA\* *Adv***

**Biology *IB/AP***

**Biological Themes *IB***

**Chemistry: Forensic Science\**Adv***

Grade 10

**Physical Science  
Studies**

**Chemistry  
Honors/Pre IB,  
Advanced, Academic**

**Chemistry *IB/AP***

**Chemical Themes *IB***

**Environmental Issues *Adv***

Grade 11

**Integrated Earth Systems  
Academic, Studies**

**Physics  
IB/Honors,  
Advanced, Academic**

**Environmental Science *IB/AP***

**Forensic Science\* Stud/Acad**

**Physics Themes *IB***

**Physics “B” *AP***

**Physics “C” *AP***

# SCIENCE

The primary goal of the science curriculum is the development of individuals who are competent as self-fulfilling individuals, as citizens, and as workers in a world that is safe for all.

In order to achieve this goal, the curriculum consists of courses and activities that are designed to meet the various needs of the student population. An inquiry process is utilized so those students will discover and interpret scientific knowledge and develop positive attitudes, interests and appreciation of science and the scientific community.

All students must complete three full-year courses in science as a requirement for graduation. Most students should complete no fewer than four years of science that should include the study of physics. Students who expect to complete college with a major in science, engineering, premedical, pre-dental, pre-veterinary science, or any science-related field are strongly urged to plan a program of studies that includes a minimum of five full-year courses. It is also advantageous for the science-oriented student to take one or more of the advanced placement courses (college level courses). Students should then plan their science and mathematical programs in conjunction with each other to make sure that their mathematical background is adequate at the time they plan to enroll in a particular science course.

## **Physical Science (Studies)**

6.0 credits

Prerequisite: Life Science (Studies)

This course is designed to provide students with insights into the nature of science and to provide the foundational concepts of chemistry and physics. These concepts are then related to current technologies. Throughout the course, the relationship between the process of science and the product of science is demonstrated. Most of the major topics in the course are developed through the laboratory setting.

## **Integrated Earth Systems (Academic, Studies)**

6.0 credits

Prerequisite: Physical Science (Studies)

This course uses a systems approach to investigate topics applied to the biological and physical sciences.

Specific topics include geosystems, astronomy, space technology, and environmental science.

The New Jersey core curriculum content standards for science reflect the belief that all students can and must learn enough science to assume their roles as concerned citizens, equipped with the necessary information and decision-making skills. This course will help prepare students in meeting the requirements contained in the High School Proficiency Assessment, (HSPA).

## **Biology (Studies)**

6.0 credits

Prerequisite: none

This course centers on the basic biological concepts of the living world. All major life processes are studied with particular emphasis on the biology of man and the ecology of earth. The interaction of man with his environment is dealt with in terms of his dependence and impact on his surroundings. This course offers laboratory experiences in its study.

## **Biology**

### **(Honors/Pre IB, Advanced, Academic)**

6.0 credits

Prerequisite: none

This course is designed to introduce students to the diversity and complexity of the living world around them and the interdependence and interrelationship that exists among all living organisms. A variety of approaches are used with a focus on the scientific method. These approaches include established laboratory investigations as well as opportunities to conduct investigations that are student-designed. Concepts studied include biochemistry, cell biology, taxonomy, physiology, genetics, ecology, homeostasis and disease. Connections are made between these biological concepts and students' lives.

## **Biology (IB/AP)**

6.0 credits

Prerequisite: Biology, Chemistry

This course follows a fundamental outline of biological topics that cover all-important biochemical, cellular, and organic processes contained in a standard first-year college course. The course is primarily designed for students whose major field of study after graduation from high school will be biologically oriented. The IB component will be committed to preparing students for the International Baccalaureate examination. Grades will be determined by internal school assessment and external evaluation by the IB organization.

## **Biological Themes (IB)**

6.0 credits

Prerequisite: AP/IB Biology and Chemistry

Biological Themes is a senior elective that will focus on a number of specialized topics of biology requiring a more in-depth study than that provided by the IB/AP Biology course. This laboratory-based course will, at the same time, fulfill the International Baccalaureate HL requirements as well as provide an opportunity for other interested students to pursue additional study in the area of biological science.

## **Biology: DNA (Advanced) WMC Only**

3.0 credits

Prerequisite: Biology, Chemistry

Biology: DNA is a half-year laboratory and activity-based elective available to juniors and seniors. It will focus on the structure and function of DNA and the critical roles it plays in our lives. Major topics include: DNA chemistry, Mendelian genetics, pedigree analysis, karyotype production and analysis, human genetic disorders, biotechnology and recombinant DNA technologies. Major laboratory investigations include Gel Electrophoresis, DNA Fingerprinting and Molecular Cloning.

## **Chemistry**

### **(Honors/Pre IB, Advanced, Academic)**

6.0 credits

Prerequisite: Biology and Algebra at the appropriate level

Emphasis is placed on experimentation and observation as the basis for knowledge of chemistry. The unifying principles of chemistry are developed in a logical way, with laboratory investigations providing a basis for this development. Major topics include: atoms and molecules-the building blocks of matter; the nature of the atom; chemical bonds and molecular structure; and the dynamics of chemical reactions.

## **Chemistry (IB/AP)**

6.0 credits

Prerequisites: Biology, Chemistry and Physics. Physics may be studied concurrently.

This course is designed to allow high school students to pursue college-level studies in chemistry. Topics studied are primarily inorganic in nature. This course was constructed for students whose major field of study after graduation from high school requires at least one course in chemistry. The IB component will be committed to preparing students for the International Baccalaureate examination. Grades for IB candidates

will be determined by internal school assessment and external evaluation by the IB organization.

## **Chemical Themes (IB)**

6.0 credits

Prerequisite: Biology and Chemistry AP/IB

Chemical Themes is a senior elective that will focus on a number of specialized topics of chemistry requiring a more in-depth study than that provided by the IB/AP Chemistry course. This laboratory-based course will, at the same time, fulfill the International Baccalaureate HL requirements as well as provide an opportunity for other interested students to pursue additional study in the area of chemical science.

## **Physics**

### **(IB/Honors, Advanced, Academic)**

6.0 credits

Prerequisite: Biology, Chemistry and Mathematics course at the appropriate level

This course is structured to build a strong scientific background in physics through a concentrated study of basic physical concepts. The study of these concepts and their applications to universal phenomena are stressed. Major topics include light and wave motion, mechanics, energy, electricity and magnetism, and modern physics. Emphasis is given to laboratory investigation as a means of developing these concepts. IB /Honors: *It is recommended that a student concurrently study at least a full year of Math Analysis 2.*

## **Physics Themes (IB)**

6.0 credits

Prerequisites: Biology, Chemistry and Physics

Co-requisite: Pre-Calculus

Physics Themes is a senior elective that will focus on a number of specialized topics of physics requiring more in-depth study. This laboratory-based course will, at the same time, fulfill the International Baccalaureate HL requirements as well as provide an opportunity for other interested students to pursue additional study in the area of physics.

## **Physics "B" (AP)**

6.0 credits

Prerequisites: Biology, Chemistry and Physics

Co-requisite: Pre-Calculus

This is a non-calculus based second year physics course intended for students with strong science and math interests. Topics included are quantum physics, relativity, waves, optics, and thermodynamics. The program of study follows that which is suggested by the College Entrance Examinations Board for Advanced Placement Physics "B". At the completion of this

course students may elect to take the AP Physics "B" test which is offered by the CEEB.

### **Physics "C" (AP)**

6.0 credits

Prerequisite: Biology, Chemistry, Physics and Calculus. Calculus may be studied concurrently.

This is a calculus based second year physics course intended for students who have a strong interest in science, engineering or mathematics. Topics included are Mechanics and Electricity and Magnetism. Laboratory experiences occur regularly. The program of study follows that which is suggested by the College Entrance Examinations Board for Advanced Placement Physics "C". At the completion of this course students may elect to take the AP Physics "C" examination which is offered by the CEEB.

### **Anatomy & Physiology (Advanced)**

6.0 credits

Prerequisites: Biology and Chemistry (physics recommended)

This course is designed as an in-depth study of the composition of the human body and its functions. All of the major systems and observable processes of the human body will be studied in the laboratory. The student should leave the course with an understanding and working knowledge of the relationships that exist between the structures of the human organism as well as their functions.

### **Environmental Issues (Advanced)**

5.0 credits

Prerequisites: Biology and Chemistry

This course examines the science of ecology and the impact which man has had on the global environment. Topics range from a global scale to a local scale. Issues include: ocean resources, solid waste, pesticide management, population, bio-diversity, toxic waste, energy strategies and land use planning. This course is interdisciplinary in nature with an emphasis placed on student involvement and current data. The decision-making process is examined in detail and the interface between the environment, the economy, society and government is an integral portion of the course.

### **Environmental Science (IB/AP)**

6.0 credits

Prerequisites: Biology, Chemistry or Physics concurrently

The goal of the IB/AP Environmental Science course is to 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 human-made, to evaluate the relative risks associated with these problems, and to examine alternative solutions for resolving and/or preventing them. Grades will be determined by internal school assessment and external evaluation by the IB organization. Preparation for both the AP and IB examination is stressed.

### **Chemistry: Forensic Science (Advanced) (WMC Only)**

2.5 credits

Prerequisites: Advanced or Honors Chemistry and Advanced or Honors Physics

This course combines principles of biology, chemistry, physics, and human psychology to investigate topics in forensic science and criminalistics. Specific topics include crime scene investigation, identification of a corpse, determination of the cause and time of death, analysis of genetic and other biological evidence, analysis of drug and other trace evidence, and the presentation of forensic evidence in a court of law.

Forensics places a strong emphasis on case studies, practical and investigative studies, laboratory and instrumental analyses, and decision-making skills; this emphasis will enable students to become more scientifically literate citizens.

### **Forensic Science (Studies/Academic) (WMC Only)**

2.5 credits

Prerequisites: Biology

This course introduces the field of forensic science and its application to everyday life. The major branches of science: biology, physics, and chemistry, will be incorporated through hands on activities and projects that explore the different analytical techniques used to solve crimes.

Students will learn to make unbiased observations and propose reasonable conclusions after assessing all aspects of a forensic problem. Science skills and scientific literacy are enhanced with an emphasis on deductive reasoning, critical thinking, problem solving, precise communication and collaborative teamwork. This course will also expose students to the career opportunities available in the field of science.