

Science Department Course Bulletin
School year 2020-21

The WJHS science department has put together this resource to help students with planning for their science courses. If you need more support with choosing the right class to help you be successful, reach out to your science teacher or counselor.

This document includes (*in order*):

- MCPS Graduation requirements
- Science department course recommendations – typical WJHS pathways
- What differentiates honors science courses from on-level science courses?
- Average weekly study hours (*by course*)
- Course descriptions

MCPS Graduation requirements

As of December of 2018, students are required to meet the following requirements for graduation:

- “In MCPS, graduation requirements will include three (3) credits in science (NGSS aligned) courses. One of which must be a life science and one must be a physical science. In addition, students will also be required to pass the Maryland Integrated Science Assessment (MISA), beginning in the 2023-24 school year.” All AP science classes are considered NGSS aligned.
- Students are encouraged to take additional science courses as electives in order to achieve a well-rounded science education.

Science Coursework (3-NGSS aligned courses) <i>Minimally you need three boxes checked</i>	MISA (Maryland Integrated Science Assessment)
<input type="checkbox"/> Life Science: Biology (required) <input type="checkbox"/> Physical Science <ul style="list-style-type: none"> <input type="checkbox"/> Chemistry <input type="checkbox"/> Physics <input type="checkbox"/> Any AP science class (<i>more information to follow</i>)	<input type="checkbox"/> The current MSDE regulation is for students to take the MISA test prior to graduation.

Science Department Course Recommendations - Typical WJHS pathways		
Current Grade level	Current class is...	Next Year Enroll In...
8 th grade	Math: earning C's <u>or</u> not in Algebra	Biology, NGSS
	Math: earning A/B's in: Algebra, Geometry, Algebra 2	Honors Biology
9 th grade	Biology	Honors Physical and Environmental Science
	H Biology	Honors Chemistry or Chemistry
10 th grade	Chemistry	Physics
	H Chemistry	H Physics
11 th grade	Electives	Electives

What differentiates honors science courses from on-level science courses?

When choosing your science classes consider the following information to make the appropriate course selections.

Science Course	What differentiates Honors From On-level?	Skills helpful to have for Honors <i>(honors classes will build on on-level skills)</i>	Relevant Indicators * (PARCC & Course Grades)	Recommended Math Courses with this science course
9th grade on-level Biology	-Level of scaffolding for writing tasks(i.e. - constructing arguments)	-Constructing scientific explanations with claim, evidence and reasoning.		N/A
9th grade Honors Biology	-Level of abstract thinking required to complete tasks (i.e. - developing and using a model)	-Developing and using scientific models for abstract phenomena	PARCC ELA score: 750 or higher A or B in English Class	N/A
10th grade on-level Chemistry	-Basic algebra for problem solving	-Solving for a variable -multiplying & dividing fractions -order of operations		Algebra 1 Geometry Honors Geometry * Algebra 2 2--Year Algebra 2
10th grade Honors Chemistry	-Honors covers additional content and moves at a faster pace -Honors assessments require application of knowledge -Honors assessments require more challenging mathematical problem solving	-Using exponents & scientific notations -Constructing graphs and finding the line of best fit. -Abstract thinking skills -Strong language acquisition skills -Transferring knowledge to unfamiliar contexts.	PARCC ELA Score: 770 or higher PARCC Alg 1: 770 or higher A or B in Honors math courses	Honors Algebra 2 Honors Precalculus

* These indicators are merely correlational and should not be considered strict cut-offs. Some students do not test well but perform well in the classroom setting.

Science Course	What differentiates Honors From On-level?	Skills helpful to have for Honors <i>(honors classes will build on on-level skills)</i>	Relevant Indicators * (PARCC & Course Grades)	Recommended Math Courses with this science course
11th grade on level Physics	-Basic algebra for problem solving	-Solving for a variable -multiplying & dividing fractions -order of operations		Algebra 2 2--Year Algebra 2 Honors Algebra 2 ** Pre-Calculus
11th grade Honors Physics	-Honors covers additional content and moves at a faster pace -Honors assessments require more distant transfer of knowledge -Honors assessments require more challenging mathematical problem solving	-Strong algebra skills, such as simplifying polynomial equations. -Strong geometry skills, such as finding angles and solving for volume and surface area. -Abstract thinking skills -Transferring knowledge to unfamiliar contexts.	PARCC Alg 1: 770 or higher A or B in Honors math courses	Honors Pre-Calculus AP Calculus AP Statistics IB Math

**Some students in these math courses tend to be successful in the Honors science course and should be considered on a case-by-case basis in a way that includes other indicators.

Average Weekly Study Hours
(please use this information to help you plan your schedule)

Average Study Hours By Science Course	
Course	
Weekly Study Hours	
Life Science (Biology) courses:	
NGSS Biology A/B	4 hours
APEX-REACH Biology A/B	5 hours
Honors Biology A/B	2-3 hours
Physical science courses:	
NGSS Chemistry A/B	3 hours
Honors Physical and Environmental Science	3 – 4 hours
Honors Chemistry A/B	4 - 5 hours
NGSS Physics A/B	2.5 hours
Honors Physics A/B	3 hours
Electives	
Course	
Weekly Study Hours	
Anatomy & Physiology A/B	3 - 5 hours
Astronomy	3 hours
Environmental Science A/B	1 hour
Forensic Science A/B	3 - 4 hours
Molecular Biology A/B	3 - 4 hours
AP Course offerings	
Course	
Weekly Study Hours	
AP Biology A/B	6 - 8 hours
AP Chemistry A/B	6 - 8 hours
AP Environmental Science	6 - 8 hours
AP Physics I A/B	6 - 8 hours
AP Physics C A/B	6 - 8 hours

DESCRIPTION OF SCIENCE COURSE OFFERINGS

Life Science (NGSS graduation requirement)

NGSS BIOLOGY A/B, HONORS
NGSS BIOLOGY APEX-REACH

3621/3622
362133/362233

Grades: 9, 10, 11, 12

This NGSS aligned course emphasizes the patterns, process, and relationships of living organisms. Students will use observations, experiments, hypotheses, tests, models, theory and technology to explore how life works. Core ideas include structures and processes in organisms, ecology, heredity, and evolution. There will be multiple opportunities for student to apply these ideas in developing solutions to authentic problem-based scenarios while also exploring career opportunities.

Physical Science (NGSS graduation requirement)

HONORS PHYSICAL and ENVIRONMENTAL SCIENCE A/B

3664/3665

Grade: 10

This NGSS aligned course emphasizes the study of physical sciences which includes physics, chemistry and environmental science. Through the use of laboratory investigations, students will explore the physical laws and theories at the macroscopic and microscopic levels. Topics of study will include Newton's Laws, the Law of thermodynamics, the Law of conservation for matter and energy, chemical reactions, atomic theory, plate tectonics, matter cycles of the biosphere, and the human impact on the environment.

NGSS CHEMISTRY A/B
CHEMISTRY A/B, HONORS

3721/3722
3711/3712

Grades: 9, 10, 11, 12

This NGSS aligned course emphasizes the study of matter through inquiry. Through the use of laboratory investigations, students will explore their world at the atomic level. Using data, evidence, and scientific modelling, students achieve a deeper understanding of changes in matter. Topics of study will include structures and properties of matter, weather and climate, chemical reactions, conservation of mass/energy, and relationships between Earth and human activity.

Pre-requisite: Successful completion of Algebra 1

Co-requisite: Minimum of Geometry

Recommended Minimum Co-requisite for Honors Chemistry: Honors Algebra II

NGSS PHYSICS A/B
PHYSICS A/B, HONORS

3831/3832
3821/3822

Grades: 10, 11, 12

This NGSS aligned course investigates physical laws and theories, relationships of physical phenomena, and the interrelationships of physics to other fields of human endeavor. Topics include traditional physics subjects (Newtonian mechanics: dynamics, momentum, energy; electricity and magnetism; waves) along with related subjects in earth science (plate tectonics; earthquake activity) and astronomy (solar evolution).

Prerequisite: Successful completion of Geometry

Description of Elective Science Course offerings

ASTRONOMY A/B

3856/3857

Grade: 12 only

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 may be taken independently.

ENVIRONMENTAL SCIENCE A/B

3661/3662

Grades: 11, 12

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.

Elective science courses: Honors level

ANATOMY AND PHYSIOLOGY, HONORS, A/B

3761/3762

Grades 11 and 12 only

This advanced level course is intended for students who have succeeded in biology and wish to study how the human body works in greater detail. 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, skeletal system and joints, and 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 or concurrent enrollment in Chemistry

FORENSIC SCIENCE, HONORS, A/B

3864/3865

Grades: 12 only

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, firearms, ballistics, and explosives. Either semester may precede the other or semesters may be taken independently.

Pre/Corequisite: Successful completion of Biology and either completion of or concurrent enrollment in Chemistry

Elective science courses: Honors level

MOLECULAR BIOLOGY, HONORS, A/B

3657/3658

Grades: 11 and 12 only

This honors course is intended for advanced students who have succeeded in biology and 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 also discussed. This course provides practical training for biological research. In semester A, students learn the concepts and techniques that will be used during the second semester, when students will conduct original research in conjunction with Rutgers University.

Prerequisite: Successful completion of Biology and either completion of or concurrent enrollment in Chemistry

Recommended: Successful completion of Chemistry

Additional information: meets APEX-REACH requirement for advance coursework

AP[®] COURSES (meets NGSS graduation requirement)

AP[®] BIOLOGY A/B (double period)

3651/3652

Grades: 11 and 12

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. This course is NGSS aligned.

Prerequisite: Successful completion of Honors Biology and Honors Chemistry;

Prerequisite: AP[®] Biology A is a prerequisite for AP[®] Biology B

AP[®] CHEMISTRY A/B (double period)

3751/3752

Grades: 10, 11, 12

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 analyzing data using statistics and logical reasoning. 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. This course is NGSS aligned.

Prerequisite: Successful completion of Honors Biology, Honors Chemistry, and Algebra II. A strong ability to apply mathematical concepts from previous math classes is essential to success.

Prerequisite: AP[®] Chemistry A is a prerequisite for AP[®] Chemistry B.

Recommended: Concurrent enrollment in Honors Pre-Calculus

AP[®] COURSES (meets NGSS graduation requirement)

AP[®] ENVIRONMENTAL SCIENCE A/B

3659/3660

Grades: 10, 11, 12

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 will be prepared to take the AP[®] Environmental Science exam in May. This course is NGSS aligned.

Prerequisite: Successful completion of Biology. AP[®] Environmental Science A is a prerequisite for AP[®] Environmental Science B.

Pre/Corequisite: Completion of or concurrent enrollment in Chemistry A/B.

AP[®] PHYSICS I A/B

3891/3892

Grades: 10, 11, 12

This course is an algebra-based physics course that is the equivalent of a first-semester college physics course. Students will learn Newtonian mechanics which includes rotational dynamics and angular momentum, work, energy, power and mechanical waves and sound, and electrical circuits. This course provides an excellent foundation for students who intend to major in the sciences. This course prepares students for the AP[®] Physics I test in May. This course is NGSS aligned.

Prerequisite: Geometry

Co-requisite: Algebra II

Recommended: Concurrent enrollment in Pre-calculus

AP[®] PHYSICS C A/B

3835/3836

Grades: 11, 12

This course is for highly motivated students with interest in majoring in the physical sciences or engineering. Students use calculus in problem solving and 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 & Magnetism) at the end of this course.

Prerequisite: Successful completion of Physics A/B, Hon Physics A/B or AP[®] Physics 1 & Pre-calculus A/B.

Pre/Corequisite: Concurrent enrollment in or completion of Calculus