

Georgia High School Graduation Requirements:
Preparing Students for Success

Part 10: Areas of Study: Science

Section 10.1 Requirements

Beginning in the 2008-2009 school year, all first-time ninth grade students will be required to successfully complete four units of science.

Four units of credit in science shall be required of all students, including one full unit of Biology; one unit of either Physical Science or Physics; one unit either Chemistry, Earth Systems, Environmental Science or an AP/IB course; and one additional science unit. The fourth science unit may be used to meet both the science and elective requirements, as described below. Any AP/IB science course may be substituted for the appropriate courses listed above.

Section 10.2 Course Sequence Information

Under the new graduation rule, all students will be required to successfully meet four science requirements. They are:

1. Biology (26.012)
2. Physical Science (40.011) or Physics (40.081)
3. Chemistry (40.051), Earth Systems (40.062), Environmental Science (26.061), or an AP/IB course.
4. A science requirement that may be met using identified courses from the academic sciences or elective areas as designated in the List of State Funded K-8 Subjects and 9-12 Courses (rules 160-4-2-.20 or 1604-2-.03)

The sequence of courses is not dictated by the rule. The order in which these courses should be taken is a local decision.

The fourth science course does not necessarily need to be taken in the student's fourth, or senior, year. It may be appropriate for the course to be taken in the student's sophomore or junior year if the course is part of the student's focused area of interest, program concentration or career pathway. Courses that are intended to be the final course in a pathway sequence are not recommended for students who have not taken the prerequisite courses.

- For example, students interested in a career in flight operations might be interested in taking Aviation Meteorology as an elective in their sophomore year. This course includes science inquiry, physical science, earth and space science, and is part of the Flight Operations Career Pathway.
- As another example, students working on a Plant Science/Horticulture Career Pathway (Agriculture Concentration) might want to take Botany or Ecology as academic science electives that enhance their career plans.

Section 10.3 Guidance for Fourth Science Requirement – REVISED 01/06/10

General Information about the Fourth Science

Under the new graduation rule, students who enter ninth grade in 2008-2009 and thereafter are required to complete four units of science. It is important to remember:

- **The fourth science course does not necessarily need to be taken in the student's fourth, or senior, year.**
- **The student's postsecondary plans should be discussed before fourth science courses are selected.**
- **Fourth science courses will count in the student's Hope Scholarship GPA calculation.**

Students have some flexibility in meeting the fourth science requirement for high school graduation. Courses can be selected from academic science courses or from approved career technology courses that meet science standards, listed below. Students focused on completion of a career pathway may use the approved courses to meet both the pathway AND the fourth science requirement.

In some cases, courses selected for the fourth science unit may be used to meet both the science and elective requirements, as illustrated in the examples below. Courses can be used to meet both science and elective requirements but they DO NOT earn two credits. Students cannot earn two credits for one course.

Board of Regents Information

The Board of Regents made changes in undergraduate admissions to require four units of science, rather than three, for students who graduate from Georgia high schools in 2012 or later.

The Board of Regents is in the process of identifying DOE courses that meet their admissions requirements for science. Students should consult their college for details about admissions. It is important that the student's postsecondary plans be discussed before a fourth science course is selected to assure that the student will meet the necessary admission requirements to the postsecondary institution of choice.

Some courses that meet BOR admission requirements are indicated with an asterisk (*) on the list below. Additional courses will be added by the BOR on subsequent updates.

Fourth Science Course List

The list below includes academic and CTAE courses that meet the fourth science requirement for graduation. Additional courses may be included on subsequent updates.

FOURTH SCIENCE COURSE OPTIONS

The following courses count towards satisfying the fourth science requirement and a CTAE pathway completion requirement and **have been approved** by the Board of Regents as a fourth science.

Course Number	Course Name	CTAE Pathway
01.46100	General Horticulture and Plant Science	Plant Science/Horticulture
02.42100	Animal Science Technology/Biotechnology	Agriscience
02.42200	Equine Science	Other GPS Agriculture Courses (9-12)
02.44100	Plant Science and Biotechnology	Agriscience
20.41710	Food & Nutrition Through the Lifespan	Nutrition & Food Science
20.41810	Food Science	Nutrition & Food Science
21.45100	Energy and Power Technology	Energy Systems
21.45700	Appropriate and Alternative Energy Technologies	Energy Systems
25.56800	Introduction to Biotechnology	Biotechnology Research and Development

The following courses count towards satisfying the fourth science requirement and a CTAE pathway completion requirement but **are not** recognized as a fourth science by Board of Regents.

Course Number	Course Name	CTAE Pathway
02.42400	Veterinary Science	Veterinary Science
02.47500	Biotechnology	Other GPS Agriculture Courses (9-12)
03.41100	Natural Resources Management	Other GPS Agriculture Courses (9-12)
03.45100	Forest Science	Forestry/Natural Resources
03.45300	Wildlife Management	
21.45200	Foundations of Electronics	Electronics
21.45300	Advanced AC and DC Circuits	Electronics
21.45400	Digital Electronics	Electronics
21.47200	Engineering Applications	Engineering
25.52100	Introduction to Healthcare Science	Diagnostic Services
25.52200	Application of Therapeutic Services	Therapeutic Services-Medical Services
25.56200	Concept of Emergency Medicine	Therapeutic Services-Emergency Services
25.56400	Emergency and Disaster Preparedness	Therapeutic Services-Emergency Services
25.58000	Principles of Physical Medicine	Physical Medicine
25.58100	Concepts of Physical Medicine	Physical Medicine
25.58200	Rehabilitation in Physical Medicine	Physical Medicine
47.46600	Aviation Meteorology	Flight Operations

Georgia Department of Education

The following courses count towards satisfying the fourth science requirement.

Course Number	Course Name
26.01300	Biology II
26.01400	Advanced Placement Biology
26.01500	Genetics
26.01800	International Baccalaureate Biology SL
26.01900	International Baccalaureate Biology HL
26.03100	Botany
26.05100	Microbiology
26.06100	Ecology
26.06110	Environmental Science
26.06200	Advance Placement Environmental Science
26.06400	Advance Genetics/DNA Research
26.07100	Zoology
26.07200	Entomology
26.07300	Human Anatomy and Physiology
26.06500	Epidemiology
40.02100	Astronomy
40.04100	Meteorology
40.05100	Chemistry I
40.05200	Chemistry II
40.05300	Advance Placement Chemistry
40.05500	International Baccalaureate Chemistry SL
40.05600	International Baccalaureate Chemistry HL
40.06300	Geology
40.06400	Earth Systems
40.07100	Oceanography
40.08100	Physics I
40.08200	Physics II
40.08300	Advanced Placement Physics B
40.08410	Advanced Placement Physics C: Mechanics
40.08420	Advanced Placement Physics C: Electricity and Magnetism
40.08500	International Baccalaureate Physics SL
40.08600	International Baccalaureate Physics HL
40.08900	Advanced Physics Principles/Robotics
40.09100	Advanced Scientific Internship
40.09210 *	Scientific Research I
40.09220 *	Scientific Research II
40.09230	Scientific Research III
40.09240	Scientific Research IV
40.09300	Forensic Science
40.09400	Chemical & Material Science Engineering
40.09500	International Baccalaureate Design Technology SL
40.09600	International Baccalaureate Design Technology HL
11.01600	Advanced Placement Computer Science A

* Indicates the course has not been approved as a four science by the Board of Regents.

Georgia Department of Education

Below are three scenarios to model how students can gain credit and meet requirements.

Student A takes the following courses in the areas of science and CTAE. Student A is taking the Engineering Career Pathway.

Science Requirement	Science Course	Requirement Met	Credit Awarded	CTAE Course	Requirement Met	Credit Awarded
1st Requirement	Biology	X	1	Foundations of Engineering and Technology	X	1
2nd Requirement	Physics	X	1	Engineering Concepts	X	1
3rd Requirement	Chemistry	X	1	<i>Engineering Applications</i>	X	0
4th Requirement	<i>Engineering Applications</i>	X	1	Research, Design, and Project Management	X	1
Totals		4	4		4	3

Student A has met the requirements for all four sciences and for the Engineering and Technology pathway utilizing *Engineering Applications*. This course met the requirements in both areas; however, only one credit was awarded to the student – in the area of science. No credit was awarded for Engineering Applications in the career pathway.

Note: The *Engineering Applications* course meets the high school fourth science graduation requirements for students enrolling in ninth grade for the first time in 2008-09 or later, but it does not meet Board of Regents science admission requirements for students who graduate from high school in 2012 or later.

Student B takes the following courses in the areas of science and CTAE. Student B is taking the Therapeutic Nursing Essentials Career Pathway.

Science Requirement	Science Course	Requirement Met	Credit Awarded	CTAE Course	Requirement Met	Credit Awarded
1st Requirement	Biology	X	1	Introduction to Health Science	X	1
2nd Requirement	Physical Science	X	1	Application of Therapeutic Services	X	1
3rd Requirement	Chemistry	X	1	Nursing Essentials	X	1
4th Requirement	<i>Human Anatomy & Physiology</i>	X	1	<i>Human Anatomy & Physiology</i>	Supports Area of Interest	0
Totals		4	4		3	3

Student B has met the requirements for all four sciences and for the Therapeutic Nursing Essentials Career Pathway. *Human Anatomy & Physiology* relates to the career pathway selected by the student.

Note: The *Human Anatomy & Physiology* course meets the high school fourth science graduation requirements for students enrolling in ninth grade for the first time in 2008-09 or later and also meets Board of Regents science admission requirements for students who graduate from high school in 2012 or later.

Student C takes the following courses in the areas of science and CTAE. Student C is taking the Agriscience Career Pathway.

Science Requirement	Science Course	Requirement Met	Credit Awarded	CTAE Course	Requirement Met	Credit Awarded
1st Requirement	Biology	X	1	Animal Science Technology/ Biotechnology	X	1
2nd Requirement	Physics	X	1	<i>Plant Science and Biotechnology</i>	X	0
3rd Requirement	Earth Systems	X	1	Basic Agricultural Science and Technology	X	1
4th Requirement	<i>Plant Science and Biotechnology</i>	X	1			
Totals		4	4	3		2

Student C has met the requirements for all four sciences and for the Agriscience Career Pathway utilizing *Plant Science and Biotechnology*. This course met the requirements in both areas; however, only one credit was awarded to the student – in the area of science. No credit was awarded in the career pathway. The student will now need one additional elective in their program of study in order to meet the 23 total credits needed for graduation.

OR

Student C takes the following courses in the areas of science and CTAE. Student C is taking the Agriscience Career Pathway.

Science Requirement	Science Course	Requirement Met	Credit Awarded	CTAE Course	Requirement Met	Credit Awarded
1st Requirement	Biology	X	1	Animal Science Technology/Biotechnology	X	1
2nd Requirement	Physics	X	1	Plant Science and Biotechnology	X	1
3rd Requirement	Environmental Science	X	1	Basic Agricultural Science and Technology	X	1
4th Requirement	<i>Botany</i>	X	1	<i>Botany</i>	Supports Area of Interest	0
Totals		4	4		3	3

Student C has met the requirements for all four sciences and for the Agriscience Career Pathway. Botany relates to the career pathway selected by the student.

Note: Both the *Plant Science and Biotechnology* and *Botany* courses meet the high school fourth science graduation requirements for students enrolling in ninth grade for the first time in 2008-09 or later and also meet Board of Regents science admission requirements for students who graduate from high school in 2012 or later.

Student D is not in a CTAE Pathway. Student D has chosen to take two years of Modern Language.

Science Requirement	Science Course	Requirement Met	Credit Awarded	Elective Course	Requirement Met	Credit Awarded
1st Requirement	Biology	X	1	French I	X	1
2nd Requirement	Physics	X	1	French II	X	1
3rd Requirement	Environmental Science	X	1	<i>Engineering Applications</i>	X	0
4th Requirement	<i>Engineering Applications</i>	X	1			
Totals		4	4		3	2

Student D has met the requirements for all four sciences and for the CTAE/Fine Arts/Modern Language category. *Engineering Applications* met the requirements in both areas; however, only one credit was awarded to the student in the area of science. No credit was awarded in the CTAE/Fine Arts/Modern Language category. The student will now need one additional elective in their program of study in order to meet the 23 total credits needed for graduation.

Note: The *Engineering Applications* course meets the high school fourth science graduation requirements for students enrolling in ninth grade for the first time in 2008-09 or later, but it does not meet Board of Regents science admission requirements for students who graduate from high school in 2012 or later.

In some cases, additional coursework in science may be required for admission at some postsecondary institutions. **The student’s postsecondary plans should be discussed before fourth science courses are selected. Consult with the postsecondary institution regarding their specific requirements for admission.**

Student E takes the following courses in the areas of science and CTAE. Student E is taking the Agriscience Career Pathway and plans to attend a university upon graduation.

Science Requirement	Science Course	AREAS OF STUDY (III) Science Requirement Met	(III) Science Credits Awarded/ Required	Courses for AREAS OF STUDY (V) and/or (VII)	AREAS OF STUDY (V) and/or (VII) Requirement Met	AREAS OF STUDY (V) and/or (VII) Credit Awarded/ Required
1st Requirement	Biology	X	1	<i>Animal Science Technology/ Biotech.*</i>	X	0
2nd Requirement	Physics	X	1	Plant Science and Biotechnology*	X	1
3rd Requirement	Environmental Science	X	1	Basic Agricultural Science and Technology*	X	1
4th Requirement	<i>Animal Science Tech./ Biotech.*</i>	X	1	French I	X	1
				French II	X	1
				Math Support I	X	1
				Music Appreciation I	X	1
				Botany		1
Totals		4 of 4	4 of 4		7 of 7	7 of 7

Student E has met the requirements for all four sciences and for the Agriscience Career Pathway utilizing *Animal Science Technology/ Biotechnology*. This course met the requirements in both areas; however, only one credit was awarded to the student. The student fulfilled requirements for both Areas of Study (V) and (VII) in their individual Education and Career Plan in order to meet the 23 total credits needed for graduation and university admission.

Note: The *Animal Science Technology/ Biotechnology* course meets the high school fourth science graduation requirements for students enrolling in ninth grade for the first time in 2008-09 or later and also meets Board of Regents science admission requirements for students who graduate from high school in 2012 or later.

Section 10.4 Frequently Asked Questions - Science

1. *Does a student taking a GaDOE identified CTAE pathway science course receive two credits?*

Students may receive credit for a course only once. Students may meet the requirements of two different areas in their program of study by taking courses identified in Appendix B. Students receive a science credit for courses used to meet the multiple requirement.

2. *Are science courses listed in a mandated sequence?*

No, science courses may be placed in a sequence by the LEAs to best meet the need of their students.

3. *Do students have to take Physics and Chemistry to get into college?*

No, colleges and universities typically require “a” physical science. Both courses are considered physical sciences. Some universities do have a requirement for one of the two, so it is in the best interest of the student to take at least one.

4. *Do all students have to take Physical Science since it is on the Georgia High School Graduation Test?*

No, the Georgia High School Graduation Test (GHSGT) will be altered to represent Biology and the physics portion of Physical Science. However, students not taking the Physical Science course must take the Physics course to be prepared for the GHSGT.

5. *Will the chemistry portion of Physical Science remain on the Georgia High School Graduation Test if everyone is not required to take it?*

No, physics concepts will be identified as critical for all students.

6. *Can students take courses from the first three requirements as their fourth year (i.e. courses not taken through the first three)?*

Yes, students wishing to focus in the area of science may take sequences such as, 1) Biology, Physical Science, Chemistry, and Physics; 2) Biology, Physics, Chemistry, and Environmental Science; or 3) Biology, Physics, Earth Systems, and Environmental Science.

7. *Are Earth Systems and Environmental Science courses for students not strong in science?*

No, all science courses are developed and defined by the Georgia Performance Standards as rigorous, high level courses. These courses are not to be used to “track” students in science.