

Science

Frequently Asked Questions

Last Revised: April 2, 2009

What changes have occurred in science as a result of the implementation of the new high school policy in 2009-2010?

- Students must take Biology, Chemistry OR Physics, and an additional laboratory science course to graduate. All science courses are expected to include active and/or laboratory learning experiences. [Minimum Rules and Regulations 0520-1-3-.05 c] It is recommended that these types of experiences occur approximately forty percent of the instructional time.
- Life Science will no longer be offered.
- Conceptual Physics or Physical World Concepts will be a ninth or tenth grade option. (See Science High School Sequence chart document at the Electronic Learning Center <http://www.tnelc.org/Science.html> for more information.)

How is the department responding to the concerns of school districts regarding “Conceptual Physics?”

In an effort to advance and support educational reform, the Department has issued notice concerning a change in the name of a new science course approved for implementation by the State Board of Education January 2008. The course previously titled "Conceptual Physics" will now be known as “Physical World Concepts”.

Physical World Concepts focuses on providing students with a conceptual foundation in physics and is comprehensive and sequential in its scope. This course is designed to provide a strong foundation for all students for taking higher level science courses, and serves as a solid foundation for success in Physics 3231, and AP Physics B & C. Taking "Physical World Concepts" will ensure that students pursuing STEM as a post-secondary major will have the necessary preparation for success in college work.

This course will count as a laboratory science course for high school graduation, but does meet the Physics or Chemistry requirement for graduation.

Features of Physical World Concepts include:

- A necessary first step in building a comprehensive foundation as a pre-requisite for learning physical, earth and life science concepts in subsequent high school courses.
- For college bound as well as students who do not have the necessary math background to be successful in a traditional physics course.
- Course content is sequenced, in a coherent manner to ensure deeper understanding of the content and associated mathematical relationships. Standards for Physical World Concepts include:
Inquiry
Mathematics
Technology and Engineering

Mechanics
Thermodynamics
Waves and Optics
Electricity and Magnetism
Nuclear Science

- Embedded Mathematics strand enables students to utilize mathematical skills in much greater depth, e.g. analyzing, interpreting, articulating, assimilating, modeling, demonstration.
- Instruction is inquiry-based and employs applications for technology and engineering.

Licensure and Training:

Endorsements required at this time for teaching Physical World Concepts are physics and/or chemistry. Only teachers who are currently certified to teach Physics and Chemistry are eligible to teach this course.

Professional development aimed at increasing the number of teachers who hold the chemistry and/or physics endorsement, and assisting properly endorsed teachers with pedagogical changes necessary to provide instruction for underclassmen are listed below.

- Dr. Sheila Pirkle pirkles@apsu.edu at APSU will conduct a summer program that targets Physics content for teachers seeking a Physics endorsement.
- For teachers who are currently certified to teach Physics and Chemistry, a two-week project will be offered through TMSTEC at MTSU to encourage teachers to apply a pedagogical approach that addresses student math skills needed to be successful in Physical World Concepts. The Project Director for High School STEM Redesign, Dr. Richard Audet raudet@mtsu.edu 615-898-5768 will be able to provide dates and details concerning this event.

For additional information about the Physical World Concepts course content or professional development opportunities for teaching this course, please contact Linda Jordan, K-12 Science Coordinator, 615-532-6285 Linda.K.Jordan@tn.gov

CTE Concerns:

Agriscience may count as a laboratory science credit required for high school graduation for students currently in high school, as well as students who are incoming 9th graders beginning with the 2009-10 school year.

Agriscience does not replace the Biology I requirement for students in either graduation grouping, nor does it replace the Physics requirement for students entering the 9th grade in 2009-10. Agriscience is currently accepted by University of Tennessee and Tennessee Board of Regents as one of the optional natural/physical science units required for college entrance. See the TBR and UT System school list of approved lab science courses.

Biology I and the Biology I course previously named Biology for Technology will be taught with the Biology I 3210 curriculum standards and be recorded with the same course number (3210). Biology instructors must have a Biology endorsement. Biology students will take the same end of course exam. If the course is taught with the previously named Biology for Technology contextual methodology approach, it will be designated with an internal fifth digit on the end of the course code to indicate compliance with CTE federal guidelines concerning training, class size, etc.

What endorsement is needed to teach Principles of Technology I and II?

.A teacher must be endorsed in Chemistry or Physics to teach Principles of Technology I.

Teachers who teach this course must hold proper endorsement and have attended the state-approved, five-day training. This course may satisfy a laboratory science credit required for graduation

A teacher must be endorsed in Chemistry or Physics to teach Principles of Technology II.

Teachers who teach this course must hold proper endorsement and have attended the Principles of Technology I state-approved, five-day training. This course satisfies one science credit required for graduation. The completion of Principles of Technology I and II is equivalent to Physics.

Related Concerns:

What is an Elective Focus/Program of Study?

These are interchangeable terms that relate the concept of a student completing at least three units in a related academic or CTE area. The State Board of Education’s “High School Policy” requires that all students, beginning with the 9th grade class of 2009-2010, complete an approved academic elective focus or a CTE program of study.

What are the approved areas of elective focus?

The elective focus may be CTE, science and math, humanities, fine arts, AP/IB, or other areas approved by the local board of education.

For an academic elective focus, what are the requirements?

For math and science, three additional math and/or science courses (electives) are required in addition to the four math and three science required courses.

Can high school courses taken in the middle school count toward an elective focus?

Courses taken in middle school may count toward the required core courses.

Can an AP course fulfill BOTH core requirements AND satisfy the requirement of an elective focus if a student elects to have an AP focus?

Yes. There are no AP courses in the core requirements as there are in the other focus areas. The State Board of Education has provided some examples of what focus areas might look like on the Executive Director’s blog: www.garynixon.wordpress.com

The intent was to let CORE subjects in AP and IB count to meet the AP or IB Elective Focus in order to encourage more students to take AP and IB courses. While the AP and IB elective focus courses may not be beyond or on top of the core courses the way we count them for a math and science elective focus, they truly are beyond or deeper than the content of the regular core classes they replace.

With regard to contextual academic courses (Technical Algebra, Technical Geometry, Communications for Life, and Principles of Technology I/II), are these courses acceptable by all of the following: TBR, UT system, and NCAA?

TBR and UT publish a list of courses approved for credit. NCAA requirements must be determined on a case by case basis. Communication for Life will be listed as English IV beginning in 2009-10 course codes document. (See list at the end of document.)

When using courses to substitute for required courses such as technical geometry, technical algebra, principles of technology I/II, economics, personal finance, lifetime wellness, PE, etc; how should these substitutions be adequately reflected on the transcript?

See above. Note that most of the contextual academic course titles will be changed in the 2009-10 course codes document to reflect its academic counterpart. The transcript may simply reflect the course that substitutes and not the course it substitutes for.

What are the criteria for graduating with distinction?

Students will be recognized as graduating with “distinction” by attaining a B average and completing at least one of the following:

- earn a nationally recognized industry certification
- participate in at least one of the Governor’s Schools
- participate in one of the state’s All State musical organizations
- be selected as a National Merit Finalist or Semi-Finalist
- attain a score of 31 or higher composite score on the ACT
- attain a score of 3 or higher on at least two advanced placement exams
- successfully complete the International Baccalaureate Diploma Programme
- earn 12 or more semester hours of transcribed postsecondary credit

Each local school board shall develop a policy prescribing how students graduating with “distinction” will be noted and recognized.

Is graduating with Honors determined solely on meeting ACT benchmarks or do local boards have options?

Students who score at or above all of the subject area readiness benchmarks on the ACT or equivalent score on the SAT will “graduate with Honors.” Local boards of education have the flexibility to go beyond “graduating with “Honors” by establishing an “Honors” program.

When will the rest of the EOCs be ready?

The answer is dependent on funding. The most likely sequence after Algebra I, English II, and Biology I is Algebra II and English III as college and career ready anchors in conjunction with English I and US History. Finally, Chemistry, Geometry, and Physics would be the last to come on line.

Students with qualifying disabilities as documented in the IEP are required to achieve at least Biology I and two other lab science credits. The required number of credits in science will be achieved through increased instructional time, appropriate methodologies, and accommodations and other differentiated instruction, as determined by the IEP team. Note: Only one additional lab course is needed if Biology IA and IB are taken for credit.

Students failing to earn a yearly grade of 70 or higher in a course that has an end-of-course test and whose disability adversely affects performance in that test will be allowed, through an approved process, to add to their end-of course assessment by demonstrating the state identified core knowledge and skills contained within that course through an alternative performance-based assessment. These assessments will be in place by the beginning of the 2009-2010 school year.

What online professional development is available from the state?

The Tennessee Department of Education has launched the Electronic Learning Center (ELC). This resource provides students, teachers, and parents educational resources any time and any where. The ELC can be accessed at www.TNelc.org. At the top of the page click iTunes. Scroll down and click on OPEN TDE on iTunes. If it doesn't open, you may be on the static page, click on the iTunes icon.

Also see Science Professional Development Opportunities at the following site at the Electronic Learning Center. <http://www.tnelc.org/Science.html>

**TENNESSEE HIGH SCHOOL COURSES WHICH MEET THE UNIVERSITY OF TENNESSEE
AND TENNESSEE BOARD OF REGENTS UNIVERSITY ADMISSIONS REQUIREMENTS**

Revised April 2006

CURRENT HIGH SCHOOL COURSES¹

<u>UT/TBR UNIT REQUIREMENTS</u>	<u>COURSES</u> <u>FULFILLING REQUIREMENTS</u>	<u>COURSES NOT</u> <u>FULFILLING REQUIREMENTS</u>
English (4 units required)	Applied Communications ² English I, II, III, IV	Business Communication Journalism Speech
Mathematics (3 units required)		
A. Algebra (2 units required)	Algebra I or Technical Algebra ³ Algebra II	Accounting I, II or III Applied Mathematics I and II
<u>and</u>		Arithmetic
1 additional unit	Geometry Advanced Algebra & Trigonometry Statistics Discrete Mathematics w/Statistics & Probability Pre-Calculus Calculus Technical Geometry ⁴	Business Math Computer Technology Math for Technology I Pre-Algebra Competency Mathematics Foundations I Foundations II
<u>or</u>		
B. Integrated Math Sequence (3 units required)	Integrated Mathematics I, II, III	
Natural/Physical Sciences (2 units required)		
<u>At least</u> 1 unit MUST BE from Group A	Group A: Biology I, II Life Science Chemistry I, II Earth Science Physics Principles of Technology I Principles of Technology II	Environmental Science (Non-AP)
Biology for Technology		

Group B:

Anatomy and Physiology
Ecology
Environmental Science (AP only)
Geology
Nutrition Science
Physical Science
Agriscience⁵

U. S. History (1 unit required)

U. S. History

Social Studies (1 unit required)

Ancient History
European History
Modern History
World Geography
World History

Anthropology
Civics
Contemporary Issues
Economics
Psychology
Sociology
U. S. Government

Foreign Language (2 units in same language required)

French
German
Japanese
Latin
Russian
Spanish
Other Languages

American Sign Language
Computer Language

Visual/Performing Arts (1 unit required)

Art History
Dance I, II, III or IV
General Music
Instrumental Music
Music History
Music Theory
Theatre Arts
Visual Arts

Commercial Art
Drafting
Industrial Arts
Public Speaking (Speech)
Physical Education Classes

¹ The courses listed on this chart are those currently approved by the State Board of Education for approved Tennessee high schools. In addition, a corresponding Advanced Placement (AP) course may be used to satisfy a particular unit requirement. Out-of-state students and graduates from home schools or non-approved high schools must meet the same requirements. Once admitted, students must remove any and all deficiencies in these requirements. Tennessee Community Colleges provide open admission to all high school graduates. However, students pursuing an Associate of Arts (A.A.) or Associate of Science (A.S.) degree must remove any high school unit deficiencies, for elective credit only, prior to graduation.

² This course may appear on the high school transcript as Applied Communications or as English III or English IV.

³ Formerly named Math for Technology I

⁴ In a pilot stage from Summer 2006 through Spring 2008. Course will be re-evaluated Summer of 2008.

⁵ Formerly named Science 1-A

High School Courses No Longer Offered

UT/TBR UNIT REQUIREMENTS

BUT - Still Meeting Admission Requirements

Mathematics

- Math IV (1 unit)
- Pre-Calculus (1/2)
- Probability & Statistics (1/2 credit)
- Trigonometry (1/2 unit)
- Unified Geometry (1 unit)

Natural/Physical Sciences

- Ecology and Conservation of Natural Resources
- General Science