GENERAL INSTITUTE REQUIREMENTS

Science Requirement

MIT expects its graduates to have an understanding and appreciation of the basic concepts and methods of the physical and biological sciences. These concepts and methods are needed in most degree programs at the Institute. More important, they are an essential part of the background that MIT graduates bring to their roles as professionals and as broadly educated citizens in a world strongly influenced by science and technology.

Students begin with six science core subjects in mathematics, physics, biology, and chemistry, and then add the Laboratory and Restricted Electives in Science and Technology (REST) Requirements. These requirements introduce basic elements of the scientific method: experimental foundations and techniques, mathematical analysis, and conceptual models for experimental facts. Important experimental as well as conceptual aspects are introduced by the chemistry and biology requirements and by the Laboratory Requirement. Mathematical methods common to much of science and technology are explored in the mathematics requirement. Basic concepts that underlie many physical phenomena are defined and elucidated in the physics and REST requirements.

In addition to a rigorous introduction to the sciences, these requirements are intended to stimulate and challenge each student to review critically their knowledge, and to explore alternative conceptual and mathematical formulations that may provide better explanations of natural phenomena or may lead to better applications of technology. The development of critical and constructive approaches to both theory and practice in science, engineering, and other professions is a central objective of the Institute's educational programs.

Biology

The Institute requirement in biology may be satisfied by one of five introductory subjects:

Biology (GIR)		
7.012	Introductory Biology	12
7.013	Introductory Biology	12
7.014	Introductory Biology	12
7.015	Introductory Biology	12
7.016	Introductory Biology	12

These five subjects cover the same core material, which includes the fundamental principles of biochemistry, genetics, molecular biology, and cell biology. In addition, each subject has its own distinctive material.

Chemistry

The Institute requirement in chemistry may be satisfied by taking one of the following:

Chemistry (GIR)		
3.091	Introduction to Solid-State Chemistry	12
5.111	Principles of Chemical Science	12
5.112	Principles of Chemical Science	12

Subject 3.091 is designed for students who are particularly interested in the chemistry of the solid state. Subjects 5.111 and 5.112 emphasize basic chemical principles and their applications. However, 5.112 is intended for students with a strong background in high school chemistry. The content of 5.111 and 5.112 is formally coordinated with more advanced subjects taught by the Department of Chemistry (e.g., 5.601 Thermodynamics I, 5.602 Thermodynamics II and Kinetics, and 5.12 Organic Chemistry I), although any one of the three GIR subjects (5.111, 5.112, or 3.091) may be used as the prerequisite for those more advanced subjects.

Mathematics

The Institute requires all students to complete single-variable calculus, denoted as Calculus I (GIR), and multivariable calculus, denoted as Calculus II (GIR).

Calculus I (GIR)		
18.01	Calculus	12
18.01A	Calculus	12
Calculus II (GIR)		
18.02	Calculus	12
18.02A	Calculus	12
18.022	Calculus	12

Students with advanced standing, advanced placement, or transfer credit for 18.01 may go directly into multivariable calculus. Two versions are offered in the fall term: 18.02, the basic version, and 18.022, a more theoretical version. Both 18.02 and 18.022 present calculus as it is used in science and engineering.

Students with a year of high school calculus may qualify for the accelerated sequence of 18.01A/18.02A, which covers the material in one and a half terms. See the subject descriptions for details about how each subject is taught within that timeframe.

Students with advanced placement, advanced standing, or transfer credit for 18.01 lose it if they take 18.01, and receive 3 units of elective credit if they take 18.01A.

More information on Calculus policies (*http://math.mit.edu/academics/undergrad/first/calculus.php*) is available on the Department of Mathematics website.

Physics

The Institute requirement in physics may be satisfied through several combinations of introductory physics subjects.

Physics I (GIR)		
8.01	Physics I	12
8.01L	Physics I	12
8.011	Physics I	12
8.012	Physics I	12
Physics II (GIR)		
8.02	Physics II	12
8.021	Physics II	12
8.022	Physics II	12

Most students find the sequence of 8.01 and 8.02 suited to their needs. The sequence of 8.012 and 8.022 covers essentially the same subject matter as 8.01 and 8.02, but is more advanced mathematically; calculus is used freely from the beginning of the term. Subject 8.01L is offered for students who have had little exposure to physics with calculus in high school; it covers the same material as 8.01, but is taught over a longer interval that begins in the fall and continues through the end of January (IAP (*https://catalog.mit.edu/mit/undergraduate-education/academic-research-options/independent-activities-period*)).

A student may combine a Physics I (GIR) subject in one sequence with a Physics II (GIR) subject in another to satisfy the requirement. However, under no circumstances may a student enroll in a Physics II (GIR) subject without having first received credit for a Physics I (GIR) subject.

Students who score a 5 on Parts I and II of the Physics C Advanced Placement test receive credit for 8.01. Students with advanced-placement or advanced-standing credit for 8.01 who elect to take 8.012 receive 6 units of elective credit in place of 8.01.