
Physical Sciences

(Chemistry and Physics)

The physical sciences (chemistry and physics) examine the physical world around us. Using the methods of the physical sciences, students learn about the composition, structure, properties, and reactions of matter, and the relationships between matter and energy.

Students are best able to build understanding of the physical sciences through hands-on exploration of the physical world. This *Framework* encourages repeated and increasingly sophisticated experiences that help students understand properties of matter, chemical reactions, forces and motion, and energy. The links between these concrete experiences and more abstract knowledge and representations are forged gradually. Over the course of their schooling, students develop more inclusive and generalizable explanations about physical and chemical interactions.

Tools play a key role in the study of the physical world, helping students to detect physical phenomena that are beyond the range of their senses. By using well-designed instruments and computer-based technologies, students can better explore physical phenomena in ways that support greater conceptual understanding.

- In **grades PreK–2**, students’ curiosity is engaged when they observe physical processes and sort objects by different criteria. During these activities, students learn basic concepts about how things are alike or different. As they push, pull, and transform objects by acting upon them, the students see the results of their actions and begin to understand how part of their world works. They continue to build understanding by telling stories about what they did and what they found out.

Learning standards for PreK–2 fall under the following three subtopics: *Observable Properties of Objects*; *States of Matter*; and *Position and Motion of Objects*.

- In **grades 3–5**, students’ growth in their understanding of ordinary things allows them to make the intellectual connections necessary to understand how the physical world works. Students are able to design simple comparative tests, carry out the tests, collect and record data, analyze results, and communicate their findings to others.

Learning standards for grades 3–5 fall under the following three subtopics: *Properties of Objects and Materials*; *States of Matter*; and *Forms of Energy* (including electrical, magnetic, sound, and light).

- In **grades 6–8**, students still need concrete, physical-world experiences to help them develop concepts associated with motion, mass, volume, and energy. As they learn to make accurate measurements using a variety of instruments, their experiments become more quantitative and their physical models more precise. Students in these grades are able to graph one measurement in relation to another, such as temperature change over time. They may collect data by using microcomputer- or calculator-based laboratories (MBL or CBL), and can learn to make sense immediately of graphical and other abstract representations essential to scientific understanding.

Learning standards for grades 6–8 fall under the following five subtopics: *Properties of Matter; Elements, Compounds, and Mixtures*; *Motion of Objects*; *Forms of Energy*; and *Heat Energy*.