




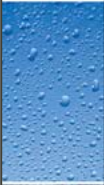


Physics Connections to Other Sciences

This section provides examples of how biology, chemistry, and Earth science relate to the concepts that students studied in this chapter. Students learn that different scientific disciplines approach the same concepts through different methods according to the phenomenon that is being investigated. For instance, the fact that each element has its own set of spectral lines relates to photosynthesis in biology, flame tests to detect the presence of specific metal ions are used in chemistry, and life on Mars is speculated in Earth science.

To understand different scientific phenomena presented in *Physics Connections to Other Sciences*, ask students to pick one concept that has been explored through the different science subjects in the student text and summarize their understanding of how a concept is utilized to understand different phenomena. Students can then be divided into groups to share information. Consider asking them to share the highlights of their discussion by presenting the important facts that are creatively displayed on a poster. Once students have presented their information, you can discuss as a class each group's presentation.


Chapter 8 Atoms on Display

Physics
Connections to Other Sciences

Here are some examples of how the concepts you studied in this chapter relate to other sciences.

Atomic Spectrums
Biology Photosynthesis in plants occurs when light of a particular frequency strikes the plant and raises an electron to a higher energy state. The energy that is absorbed in this way is used to form the molecules for building plant structures. Different plants will only absorb certain spectral lines.
Chemistry Flame tests are used in chemistry to detect the presence of certain metal ions based on each element's characteristic emission spectrum. In principle, any element can be identified by its unique spectral signature.
Earth Science The presence of specific gases in the atmosphere of planets gives clues to their composition and nature. For example, the spectral signature of methane gas on Mars gives rise to speculation of life on that planet.

Duality of Nature
Biology Euglena, a common single cell organism, exhibits characteristics of both plants and animals. Like a plant, Euglena has chloroplasts for producing its own food, but like an animal, Euglena will also ingest food for energy.
Chemistry Chemists rely on both the wave and particle aspects of electrons to understand bonding between atoms. Ionic bonding seems to rely on the transfer of an electron as a particle to another atom, while covalent bonding seems to share the wave function of an electron between atoms.
Earth Science Volcanoes both raise and lower the global temperature by two different mechanisms. The large amount of ash and other aerosols ejected into the atmosphere serves to block incoming radiation from the Sun, which lowers temperatures. However, the ejection of carbon dioxide and water vapor contributes to greenhouse gases, which raise temperatures.

Electrostatics
Biology Static electric charges often build up on the fur of animals such as cats, when the fur is rubbed. It is speculated that the fibers of spider webs may also be electrically charged, helping them ensnare their prey.
Chemistry Ionic bonding between charged ions of salts is responsible for the formation of salt crystals. The electrostatic attraction between polarized water molecules explains much of the behavior of water on the macroscopic level.
Earth Science Volcanic eruptions are often accompanied by static electric discharges (lightning) in the clouds of ash caused by the interaction of ash particles that are ejected from the volcano.

Quantization or Fundamental Building Blocks
Biology The basis for life, DNA, is composed of the fundamental building blocks of the organic bases, guanine, cytosine, adenine and thymine, connected to a phosphate-sugar backbone.
Chemistry The quantization of the subatomic particles of an atom determines the chemical characteristics of that element, as well as how it interacts with other elements.
Earth Science The crystals that are the fundamental building blocks of igneous rock such as quartz and feldspar, are composed of repeating units locked into a specific pattern.

Nuclear Radiation
Biology Radioactive elements and nuclear (gamma) radiation are used to treat numerous diseases. Radiation from sources in the environment (for example, radon gas) may lead to genetic mutations.
Chemistry Using radioactive isotopes as tags to follow the steps in chemical reactions has proven to be a valuable tool, particularly in areas of biochemistry where the pathways can become extremely complex.
Earth Science The half-life of certain radioactive elements is the basis for one of the primary arguments establishing the age of Earth as approximately 4.5 billion years.

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