

CHEMISTRY

The Structure and Properties of Atoms

Priority Standards

- **Obtain, evaluate, and communicate information** regarding the structure of the atom on the basis of experimental evidence.
- **Use mathematics and computational thinking** to relate the rates of change in quantities of radioactive isotopes through radioactive decay (alpha, beta, and positron) to ages of materials or persistence in the environment.
- **Construct an explanation** about how fusion can form new elements with greater or lesser nuclear stability.
- **Use** the periodic table as a **model** to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
- **Use models** to describe the changes in the composition of the nucleus of the atom during nuclear processes, and compare the energy released during nuclear processes to the energy released during chemical processes.

Supporting Standards

- **Analyze and interpret data** to identify patterns in the stability of isotopes and predict likely modes of radioactive decay.
- **Construct an explanation** of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.

The Structure and Properties of Molecules

Priority Standards

- **Analyze data** to predict the type of bonding most likely to occur between two elements using the patterns of reactivity on the periodic table.
- **Plan and carry out an investigation** to compare the properties of substances at the bulk scale and relate them to molecular structures.
- Evaluate **design solutions** where synthetic chemistry was used to solve a problem (cause and effect).

Supporting Standards

- **Engage in argument supported by evidence** that the functions of natural and designed macromolecules are related to their chemical structures.



Stability and Change in Chemical Systems

Priority Standards

- **Use mathematics and computational thinking** to analyze the distribution and proportion of particles in solution.
- **Analyze data** to identify patterns that assist in making predictions of the outcomes of simple chemical equations.
- **Plan and carry out an investigation** to observe the change in properties of substances in a chemical reaction to relate the macroscopically observed properties to the molecular level changes in bonds and the symbolic notation used in chemistry
- **Use mathematics and computational thinking** to support the observation that matter is conserved during chemical reactions and matter cycles.
- **Construct an explanation** using experimental evidence for how reaction conditions affect the rate of change of a reaction.
- **Construct an argument from evidence** about whether a simple chemical reaction absorbs or releases energy.
- **Design** a device that converts energy from one form into another to solve a problem.

Supporting Standards

- **Develop solutions** related to the management, conservation, and utilization of mineral resources (matter).
- **Design a solution** that would refine a chemical system by specifying a change in conditions that would produce increased or decreased amounts of a product at equilibrium.
- **Obtain, evaluate, and communicate information** regarding the effects of designed chemicals in a complex real-world system.
- **Develop an argument from evidence** to evaluate a proposed solution to societal energy demands based on prioritized criteria and trade-offs that account for a range of constraints that could include cost, safety, reliability, as well as possible social, cultural, and environmental impacts.

