

NATIONAL SCIENCE EDUCATION STANDARDS

Strong Medicine—Chemistry at the Pharmacy

GRADE	CATEGORY	SUB-CATEGORY	STANDARD
5-8	Physical Science	Properties And Changes Of Properties In Matter	A substance has characteristic properties, such as density, a boiling point, and solubility, all of which are independent of the amount of the sample. A mixture of substances often can be separated into the original substances using one or more of the characteristic properties.
5-8	Physical Science	Properties And Changes Of Properties In Matter	Substances react chemically in characteristic ways with other substances to form new substances (compounds) with different characteristic properties. In chemical reactions, the total mass is conserved. Substances often are placed in categories or groups if they react in similar ways; metals is an example of such a group.
5-8	Physical Science	Transfer Of Energy	In most chemical and nuclear reactions, energy is transferred into or out of a system. Heat, light, mechanical motion, or electricity might all be involved in such transfers.
5-8	Science as Inquiry	Abilities Necessary To Do Scientific Inquiry	Design and conduct a scientific investigation.
5-8	Science as Inquiry	Abilities Necessary To Do Scientific Inquiry	Develop descriptions, explanations, predictions, and models using evidence.
5-8	Science as Inquiry	Abilities Necessary To Do Scientific Inquiry	Identify questions that can be answered through scientific investigations.
5-8	Science as Inquiry	Abilities Necessary To Do Scientific Inquiry	Recognize and analyze alternative explanations and predictions.
5-8	Science as Inquiry	Abilities Necessary To Do Scientific Inquiry	Think critically and logically to make the relationships between evidence and explanations.
5-8	Science as Inquiry	Abilities Necessary To Do Scientific Inquiry	Use appropriate tools and techniques to gather and analyze, and interpret data.
5-8	Science as Inquiry	Abilities Necessary To Do Scientific Inquiry	Use mathematics in all aspects of scientific inquiry.

9-12	Life Science	The molecular Basis of Heredity	In all organisms, the instructions for specifying the characteristics of the organism are carried in DNA, a large polymer formed from subunits of four kinds (A, G, C, and T).
9-12	Physical Science	Chemical Reactions	A large number of important reactions involve the transfer of either electrons (oxidation/reduction reactions) or hydrogen ions (acid/base reactions) between reacting ions, molecules, or atoms.
9-12	Physical Science	Chemical Reactions	Catalysts, such as metal surfaces, accelerate chemical reactions. Chemical reactions in living systems are catalyzed by protein molecules called enzymes.
9-12	Physical Science	Chemical Reactions	Chemical reactions can take place in time periods ranging from the few femtoseconds (10^{-15} seconds) required for an atom to move a fraction of a chemical bond distance to geologic time scales of billions of years.
9-12	Physical Science	Chemical Reactions	Chemical reactions may release or consume energy.
9-12	Physical Science	Chemical Reactions	Chemical reactions occur all around us, for example in health care, cooking, cosmetics, and automobiles.
9-12	Physical Science	Motions and Forces	The electric force is a universal force that exists between any two charged objects.
9-12	Physical Science	Structure and Properties of Matter	Carbon atoms can bond to one another in chains, rings, and branching networks to form a variety of structures, including synthetic polymers, oils, and the large molecules essential to life.
9-12	Physical Science	Structure and Properties of Matter	Solids, liquids, and gases differ in the distances and angles between molecules or atoms and therefore the energy that binds them together.
9-12	Physical Science	Structure and Properties of Matter	The physical properties of compounds reflect the nature of the interactions among its molecules.
9-12	Science as Inquiry	Abilities Necessary To Do Scientific Inquiry	Design and conduct scientific investigations.
9-12	Science as Inquiry	Abilities Necessary To Do Scientific Inquiry	Formulate and revise scientific explanations and models using logic and evidence.
9-12	Science as Inquiry	Abilities Necessary To Do Scientific Inquiry	Identify questions and concepts that guide scientific investigations.

9-12	Science as Inquiry	Abilities Necessary To Do Scientific Inquiry	Recognize and analyze alternative explanations and models.
9-12	Science as Inquiry	Abilities Necessary To Do Scientific Inquiry	Use technology and mathematics to improve investigations and communications.