

9th Grade
Physical Science
Matter

Classification of matter - homogeneous and heterogeneous materials, elements, compounds, mixtures, solutions
Physical properties- weight, mass, states of matter, malleability of metals, hardness, shape
Chemical properties - periodic table, acidity, reactivity, atomic spectra, organic/inorganic

Structure of matter

Atoms, ions, molecules - atoms, ions, molecules as the basis for different substances
Macromolecules, crystals - polymers, shape/function of biological molecules, crystal structure
Subatomic particles - electrons, protons, neutrons

Energy and physical processes

Energy types, sources, conversions- potential and kinetic; chemical, nuclear, fossil fuels; hydroelectric power; changing one form of energy to another; energy and work, efficiency
Heat and temperature - temperature scales, heat as a form of energy, heat versus temperature
Wave phenomena - wave properties, types (e.g., IR, UV), wave interactions
Sound and vibration - transmission of sound, acoustics, harmonics
Light- nature of light, optics, luminosity, reflection, refraction
Electricity - static electricity, electrical fields, alternating/direct current, electrical circuits
Magnetism - magnets and their magnetic fields, magnetic properties

Physical transformation

Physical changes - gas laws, changes in states of matter, mixing
Explanations of physical changes - general explanations for boiling, freezing, dissolving, etc.
Kinetic theory – kinetic molecular theory
Quantum theory and fundamental particles - quantum nature of light, photoelectric effect

Chemical transformations

Chemical changes- definition of chemical change, types of reactions (e.g., displacement, acid-base, oxidation-reduction, etc.)
Explanations of chemical changes - ionic/covalent bonding, electron configurations, electronegativity
Rate of change and equilibrium - reagent concentrations, reaction conditions, dynamic equilibrium
Energy and chemical change - activation energy, exothermic and endothermic reactions
Organic and biochemical changes- types of organic compounds, organic reactions, biochemistry
Nuclear chemistry - fission, fusion, isotopes, half-life, mass/energy conversion
Electrochemistry - electrochemical cells/batteries, electrolysis, oxidation-reduction reactions

Forces and motion

Types of forces - gravitational force, friction, centripetal force
Time, space, and motion - measurement of time, types of motion (linear, rotational), describing motion (constant velocity, acceleration, and momentum), and reference frames for motion
Dynamics of motion - balanced and unbalanced forces, action/reaction, momentum and collisions
Relativity theory - mass/energy/velocity relationship, explaining the velocity of light, time frames while traveling at the speed of light
Fluid behavior - hydraulics, Bernoulli principle, pneumatics

History of science and technology

Famous scientists, classic experiments, historical development of scientific ideas, industrial revolution, classic inventions

Nature of science

Nature of scientific knowledge- scientific methods, knowledge subject to verification, knowledge subject to change
Science and other disciplines
Science and mathematics- explicit mathematics instruction in the science curriculum
Science and other disciplines - science curriculum incorporated with language arts, social studies, or the arts; examples include chemistry of painting, using art or music to represent or illustrate science concepts, studying the role of science in other cultures, writing stories as metaphors that illustrate science concepts