

English Language Proficiency Framework  
Connections  
for  
Physical Science

Spring 2009

## English Language Proficiency Framework

### Physical Science

Strand	Content Standard
Chemistry	
	1. Students shall demonstrate an understanding of matter’s composition and structure.
	2. Students shall demonstrate an understanding of the role of energy in chemistry.
	3. Students shall compare and contrast chemical reactions.
	4. Students shall classify organic compounds.
Physics	
	5. Students shall demonstrate an understanding of the role of energy in physics.
	6. Students shall demonstrate an understanding of the role of forces in physics.
	7. Students shall demonstrate an understanding of wave and particle motion.
	8. Students shall demonstrate an understanding of the role of electricity and magnetism in the physical world.
Nature of Science	
	9. Students shall demonstrate an understanding that science is a way of knowing.
	10. Students shall design and safely conduct a scientific inquiry to solve valid problems.
	11. Students shall demonstrate an understanding of historical trends in physical science.
	12. Students shall use mathematics, science equipment, and technology as tools to communicate and solve physical science problems.
	13. Students shall describe the connections between pure and applied science.
	14. Students shall describe various physical science careers and the training required for the selected career.

Strand 1: Chemistry

Students shall use scientific language to develop knowledge of the composition and structure of matter, the role of energy in chemistry, chemical reactions, and the classification of organic compounds.

- Students shall demonstrate an understanding of matter’s composition and structure.
- Students shall demonstrate an understanding of the role of energy in chemistry.
- Students shall compare and contrast chemical reactions.
- Students shall classify organic compounds.

	ELP Student Learning Expectation	Student Proficiency Levels					Connected Physical Science Student Learning Expectations
		Level 1	Level 2	Level 3	Level 4	Level 5	
Composition & Structure	ELPPS.1.HS.1 Use vocabulary related to the composition and structure of matter	Match vocabulary related to the composition and structure of matter to appropriate visuals, with support (e.g., rusty nail matched to chemical change)	Label visuals related to the composition and structure of matter, with support (e.g., grapes to raisins as an example of dehydration)	Create a graphic organizer to illustrate the composition and structure of matter, with limited support (e.g., Venn diagram comparing chemical and physical properties of matter)	Create a product using vocabulary related to the composition and structure of matter, with limited support (e.g., a foldable of atoms, ions, and isotopes)	Use vocabulary related to the composition and structure of matter (e.g., write a complete report on chemical and physical changes lab)	C.1.PS.1 C.1.PS.2 C.1.PS.3 C.1.PS.4 C.1.PS.5 C.1.PS.6 C.1.PS.7 C.1.PS.8 C.1.PS.9 C.1.PS.10 C.1.PS.11 C.1.PS.12 C.1.PS.13 C.1.PS.14
Role of Energy	ELPPS.1.HS.2 Use vocabulary related to the role of energy in chemistry	Match vocabulary related to the role of energy in chemistry to appropriate visuals, with support (e.g., visual of sun to nuclear fusion, visual of atomic bomb to nuclear fission)	Label visuals related to the role of energy in chemistry, with support (e.g., label graphs of data collected from endothermic and/or exothermic labs)	Create a graphic organizer illustrating the role of energy in chemistry, with limited support (e.g., Venn diagram to compare alpha particles, beta particles, and gamma rays)	Create product using vocabulary related to the role of energy in chemistry, with limited support (e.g., brochure promoting a certain type of energy)	Use vocabulary related to the role of energy in chemistry (e.g., write a complete report on an endothermic and exothermic lab)	C.2.PS.1 C.2.PS.2 C.2.PS.3 C.2.PS.4 C.2.PS.5 C.2.PS.6 C.2.PS.7

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Chemical Reactions	ELPPS.1.HS.3 Use vocabulary related to chemical reactions	Match vocabulary related to chemical reactions to appropriate visuals, with support (e.g., photosynthesis equation matched to synthesis reaction; respiration equation matched to decomposition reaction)	Label visuals related to chemical reactions, with support (e.g., label reactants and products in a chemical equation)	Create a graphic organizer to illustrate vocabulary related to chemical reactions, with limited support (e.g., concept mapping of observable evidences of chemical reactions)	Create a product using vocabulary related to chemical reactions, with limited support (e.g., create a mobile of factors that affect the rate of chemical reactions)	Use vocabulary related to chemical reactions (e.g., write complete lab report on combustion lab)	C.3.PS.1 C.3.PS.2 C.3.PS.3 C.3.PS.4 C.3.PS.5 C.3.PS.6 C.3.PS.7 C.3.PS.8 C.3.PS.9

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Organic Compounds	ELPPS.1.HS.4 Use vocabulary related to classifying organic compounds	Match vocabulary related to classifying organic compounds, with support (e.g., match specific organic compounds to their properties)	Label visuals related to classifying organic compounds, with support (e.g., label specific hydrocarbon as saturated or unsaturated)	Create a graphic organizer to illustrate vocabulary related to classifying organic compounds, with limited support (e.g., create a chart of organic compounds and their functions in the human body)	Create a product using vocabulary related to classifying organic compounds (e.g., in cooperative group, construct a game to identify organic compounds)	Use vocabulary related to classifying organic compounds (e.g., write complete lab report on a test for the presence of organic compounds)	C.4.PS.1 C.4.PS.2 C.4.PS.3 C.4.PS.4

**Vocabulary:** physical property, flammability, reactivity, density, buoyancy, viscosity, melting point, boiling point, chemical change, physical change, burning, evaporation, dehydration, electron, proton, neutron, sub-atomic, energy level, orbital, atom, ion, isotope, valence, chemical bond, ionic covalent metallic, polyatomic ion, mole, atomic mass unit (amu), chemistry, molar mass, compound, kinetic theory, phase, matter, heat, temperature, heating curve, solid, liquid, gas, triple point, heat of fusion, heat of vaporization, thermal expansion, , Boyle’s Law, Charles’ Law, endothermic, exothermic, reaction, energy, nuclear, fission, fusion, radioactive decay, alpha particles, beta particles, gamma rays, chemical equation, decomposition, synthesis, single, replacement, double, combustion, product, reactant, symbol, Law of Conservation of Mass, mole ratio, equation, activation energy, concentration, catalysts, surface area, pressure, precipitate, allotropes, isomer, organic, formula, structure, properties, functional groups, saturated, unsaturated, hydrocarbon, carbohydrate, lipid, protein, nucleic acid

Strand 2: Physics

Students shall use scientific language to develop knowledge of the role of energy and forces in physics, wave and particle motion, and the role of electricity and magnetism in the physical world.

- Students shall demonstrate an understanding of the role of energy in physics.
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- Students shall demonstrate an understanding of wave and particle motion.
- Students shall demonstrate an understanding of the role of electricity and magnetism in the physical world.

	ELP Student Learning Expectation	Student Proficiency Levels					Connected Physical Science Student Learning Expectations
		Level 1	Level 2	Level 3	Level 4	Level 5	
Role of Energy	ELPPS.2.HS.1 Use vocabulary related to the role of energy in physics	Match vocabulary related to the role of energy in physics to appropriate visuals, with support (e.g., thermometer matched to temperature)	Label visuals related to the role of energy in physics, with support (e.g., label parts of a change in a thermal energy equation)	Create a graphic organizer on the role of energy in physics, with limited support (e.g., concept map of thermal energy, heat, and temperature)	Create a product using vocabulary related to the role of energy in physics, with limited support (e.g., an accordion fold distinguishing among thermal energy, heat, and temperature)	Use vocabulary related to the role of energy in physics (e.g., write a complete lab report on a transfer of thermal energy lab)	P.5.PS.1 P.5.PS.2
Role of Forces	ELPPS.2.HS.2 Use vocabulary related to the role of forces in physics	Match vocabulary related to the role of forces in physics to appropriate visuals, with support (e.g., space shuttle launch matched to Newton's first law)	Label visuals related to the role of forces in physics, with support (e.g., label space shuttle launch as Newton's first law)	Create a graphic organizer to illustrate the role of forces in physics, with limited support (e.g., Venn diagram comparing speed, velocity, and acceleration)	Create a product using vocabulary related to forces in physics (e.g., in a cooperative group, create a video of the effects of forces on fluids)	Use vocabulary related to the role of forces in physics (e.g., write complete lab report on a motion graph lab)	P.6.PS.1 P.6.PS.2 P.6.PS.3 P.6.PS.4 P.6.PS.5 P.6.PS.6 P.6.PS.7 P.6.PS.8 P.6.PS.9 P.6.PS.10 P.6.PS.11 P.6.PS.12 P.6.PS.13 P.6.PS.14

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Wave & Particle Motion	ELPPS.2.HS.3 Use vocabulary related to wave and particle motion	Match vocabulary related to the role of electricity and magnetism in the physical world to appropriate visual, with support (e.g., picture of white light spectrum matched to diffraction)	Label visuals related to wave and particle motion, with support (e.g., label types of lenses such as convex or concave)	Create a graphic organizer to illustrate wave and particle motion, with limited support (e.g., T-chart showing uses of optics and sound)	Create a product using vocabulary related to wave and particle motion, with limited support (e.g., create a cartoon illustrating the formation of color by light and by pigments)	Use vocabulary related to wave and particle motion (e.g., write a complete lab report on an interference lab)	P.7.PS.1 P.7.PS.2 P.7.PS.3 P.7.PS.4 P.7.PS.5 P.7.PS.6 P.7.PS.7 P.7.PS.8 P.7.PS.9 P.7.PS.10 P.7.PS.11 P.7.PS.12

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Electricity & Magnetism	ELPPS.2.HS.4 Use vocabulary related to the role of electricity and magnetism in the physical world	Match vocabulary related to the role of electricity and magnetism in the physical world to appropriate visual, with support (e.g., $V = \text{voltage}$ , $I = \text{current}$ )	Label visuals related to the role of electricity and magnetism in the physical world, with support (e.g., label parts of equations when calculating voltage, current, and resistance)	Create a graphic organizer to illustrate the role of electricity and magnetism in the physical world, with limited support (e.g., concept map of current uses of electromagnets)	Create a product using vocabulary related to the role of electricity and magnetism in the physical world (e.g., in a cooperative group, create a podcast or wiki on current uses of electromagnets)	Use vocabulary related to the role of electricity and magnetism in the physical world (e.g., write a complete lab report on a lab testing transformers or electromagnets)	P.8.PS.1 P.8.PS.2 P.8.PS.3 P.8.PS.4 P.8.PS.5

**Vocabulary:** heat, temperature, mass, specific heat, force, motion, linear, projectile, rotational, reference point, speed, velocity, acceleration, distance, change, graph, Newton's three laws, Law of Conservation of Momentum, fluid, Archimedes' principle, Pascal's principle, Bernoulli's principle, energy, mechanical, potential, kinetic, chemical, thermal, sound, light, nuclear, gravitational, medium, diffraction, Doppler effect, wavelength, frequency, period, velocity, physical property, sound wave, perception, color, pigment, separation, white, diffraction, constructive, destructive, interference, reflect, image, concave, convex, plane, mirror, refract, lens, optics, voltage, current, resistance, schematic diagram, Ohm's Law, series, parallel, current, electrical power, electrical energy, electromagnet, transformer

Strand 3: Nature of Science

Students shall use language related to the nature of science to develop knowledge of scientific processes, tools, and safety; physical science theories; connections between pure and applied science; and physical science careers.

- Students shall demonstrate an understanding that science is a way of knowing.
- Students shall design and safely conduct a scientific inquiry to solve valid problems.
- Students shall demonstrate an understanding of historical trends in physical science.
- Students shall use mathematics, science equipment, and technology as tools to communicate and solve physical science problems.
- Students shall describe the connections between pure and applied science.
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	ELP Student Learning Expectation	Student Proficiency Levels					Connected Physical Science Student Learning Expectations
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Way of Knowing	ELPPS.3.HS.1 Use vocabulary related to the scientific process	Match vocabulary related to the scientific process to appropriate visual, with support (e.g., match a picture of a graph to the word “graph”)	Label visuals related to the scientific process, with support (e.g., label the parts of the scientific process, such as hypothesis and results, in a lab report)	Create a graphic organizer related to the scientific process, with limited support (e.g., concept map comparing hypotheses, theories, and laws)	Create a product using the vocabulary related to the scientific process, with limited support (e.g., create a commercial comparing hypotheses, theories, and laws)	Use vocabulary related to the scientific process (e.g., write a complete lab report on a test conducted for the presence of organic compounds)	NS.9.PS.1 NS.9.PS.2 NS.9.PS.3 NS.9.PS.4
Scientific Inquiry	ELPPS.3.HS.2 Use vocabulary related to designing and safely conducting a scientific inquiry	Match vocabulary related to designing and safely conducting a scientific inquiry, with support (e.g., match terms on index cards to the parts of a scientific experiment during a teacher demonstration)	Label visuals related to designing and safely conducting a scientific inquiry, with support (e.g., list terms such as control and independent variable as they occur during a teacher demonstration)	Create a graphic organizer related to designing and safely conducting scientific inquiry, with limited support (e.g., make a poster of lab safety)	Create a product using the vocabulary related to designing and safely conducting scientific inquiry, with limited support (e.g., give an oral presentation from data that has been gathered and analyzed)	Use vocabulary related to designing and safely conducting a scientific inquiry (e.g., write a complete lab report including safety procedures)	NS.10.PS.1 NS.10.PS.2 NS.10.PS.3 NS.10.PS.4 NS.10.PS.5 NS.10.PS.6

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Historical Trends	ELPPS.3.HS.3 Use vocabulary related to historical trends in physical science	Match vocabulary related to historical trends in physical science, with support (e.g., point to visual representing the development of atomic theory)	Label visuals related to historical trends in physical science, with support (e.g., label pictures related to historical events such as the atomic bomb)	Create a graphic organizer related to historical trend in physical science, with limited support (e.g., make a flow chart of the development of the periodic table)	Use vocabulary related to historical trends in physical science by writing a story, with limited support (e.g., write about what it would have been like to be with Thomas Edison when he developed the light bulb)	Use vocabulary related to historical trends in physical science (e.g., research a historical event in physical science and present findings during class presentation)	NS.11.PS.1 NS.11.PS.2 NS.11.PS.3 NS.11.PS.4 NS.11.PS.5 NS.11.PS.6
Tools	ELPPS.3.HS.4 Use vocabulary related to science equipment and technology	Match vocabulary related to science equipment, and technology, with support (e.g., match vocabulary terms to equipment or pictures of equipment)	Label visuals related to science equipment and technology, with support (e.g., label equipment or pictures of equipment)	Create a graphic organizer related to science equipment and technology, with limited support (e.g., create a slideshow of various equipment and its use)	Use vocabulary related to science equipment and technology, with limited support (e.g., teach a peer how to use appropriate mathematical calculations, figures, and tables)	Use vocabulary related to science equipment and technology (e.g., create a slideshow presentation on the use of particular types of science equipment)	NS.12.PS.1 NS.12.PS.2 NS.12.PS.3

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Pure & Applied	ELPPS.3.HS.5 Use vocabulary related to pure and applied science	Match vocabulary related to pure and applied science to appropriate visuals, with support (e.g., point to visuals representing applied science)	Label visuals related to pure and applied science, with support (e.g., write the terms pure or applied on various photos of scientific research or applications)	Create a graphic organizer related to pure and applied science, with limited support (e.g., Venn diagram comparing pure and applied science)	Create a product using vocabulary related to pure and applied science, with limited support (e.g., design a school recycling program)	Use vocabulary related to pure and applied science (e.g., write a letter to the editor about the impact of recycling)	NS.13.PS.1 NS.13.PS.2 NS.13.PS.3 NS.13.PS.4 NS.13.PS.5
Careers	ELPPS.3.HS.6 Use vocabulary related to physical science careers	Match vocabulary related to physical science careers to appropriate visuals, with support (e.g., photos of workers matched to appropriate job title)	Label visuals and related to physical science careers, with support (e.g., label photos of workers with appropriate job title)	Create a graphic organizer using vocabulary related to physical science careers, with limited support (e.g., concept map on requirements for becoming an engineer)	Create a product related to physical science careers, with limited support (e.g., brochure on how to train to be an engineer)	Use vocabulary related to physical science careers (e.g. write a letter to a science professional in the community asking questions about their career)	NS.14.PS.1

**Vocabulary:** hypothesis, theory, law, observations, evidence, conclusion, empirical data, peer review, verification, control, variable, dependent, independent, safety, bias, tables, charts, graphs, atomic theory, periodic table, balance, scale, calculator, computer, pure science, applied science, ethics, by-product disposal, resource, environmental, economic, political, career

Physical Science Glossary

Acceleration	The rate of change of velocity
Activation energy	The minimum energy required to transform the reactants into an activated complex
Allotropes	Structural variations of single elements
Alpha particle	A particle (helium nucleus) released during nuclear decay
Applied science	Knowing about science with a purpose
Archimedes' principle	The principle that an object immersed in a fluid is buoyed up by a force equal to the weight of the fluid displaced by the object
Atom	The smallest unit of an element that maintains the properties of that element
Average atomic mass	The weighted average of the atomic masses of the naturally occurring isotopes of an element
Atomic mass unit (amu)	One-twelfth the mass of the carbon-12 atom
Atomic theory	The body of knowledge concerning the existence of atoms and their characteristic structure
Bernoulli's principle	The pressure exerted by a fluid decreases as its velocity increases
Beta particle	A particle (electron or positron) released during nuclear decay
Boiling	The conversion of a liquid to a vapor within the liquid as well as at its surface; occurs when the equilibrium vapor pressure of the liquid equals the atmospheric pressure
Boiling point	The temperature at which the equilibrium vapor pressure of a liquid equals the atmospheric pressure
Boyle's law	The volume of a fixed mass of gas varies inversely with pressure at constant temperature
Buoyancy	The force with which a more dense fluid pushes a less dense substance upward
By-product disposal	Means of disposing unusable material from the production of a product
Carbohydrate	An energy-rich, organic compound made of the elements carbon, hydrogen, and oxygen
Catalyst	A substance that changes the rate of a chemical reaction without itself being permanently consumed
Charles's law	The volume of a fixed mass of gas at constant pressure varies directly with the Kelvin temperature
Chemical bond	A mutual electrical attraction between the nuclei and valence electrons of different atoms that binds the atoms together
Chemical change	A change in which one or more substances are converted into different substances
Chemical equation	A representation, with symbols and formulas, of the identities and relative amounts of the reactants and products in a chemical reaction
Chemical property	The ability of a substance to undergo a change that transforms it into a different substance
Chemical symbol	Usually 1 or 2 letter set of characters that are used to identify an element
Chemistry	The study of the composition, structure, and properties of matter and the changes it undergoes
Combustion	The burning of a substance in the presence of oxygen
Combustion reaction	A reaction in which a substance combines with oxygen, releasing a large amount of energy in the form of light and heat

Compound	A substance that is made from the atoms of two or more elements that are chemically bonded
Concave lens	A lens that is thinner in the center than at the edges
Concave mirror	A mirror with a surface that curves inward
Convex lens	A lens that is thicker in the center than at the edges
Convex mirror	A mirror with a surface that curves outward
Concentration	A measure of the amount of solute in a given amount of solvent or solution
Conservation of momentum	Momentum is neither created nor destroyed but conserved
Constructive interference	The interference that occurs when two waves combine to make a wave with a larger amplitude.
Controls	Standard for comparison that is often needed to draw a meaningful conclusion.
Covalent bond	A chemical bond resulting from the sharing of an electron pair between two atoms
Covalent compound	A compound held together by a covalent bond.
Current	The rate that electric charges move through a conductor
Decomposition reaction	A reaction in which a single compound produces two or more simpler substances
Dehydration	Process of removing water from a substance
Density	The ratio of mass to volume; or mass divided by volume
Destructive interference	Occurs at the point where a crest meets a trough
Diffraction	Bending of light waves around an object in its path.
Doppler effect	Decrease (or increase) in wavelength as the source and detector of waves move toward (or away from) each other
Double-replacement reaction	A reaction in which the ions of two compounds exchange places in an aqueous solution to form two new compounds
Electrical energy	The energy associated with electrical charges, whether moving or at rest
Electrical power	The rate at which electrical work is done
Electromagnet	Device in which a magnetic field is generated by an electric current
Electron	Subatomic particle of small mass and negative charge
Electron dot structure	An electron-configuration notation in which only the valence electrons of an atom of a particular element are shown, indicated by dots placed around the element's symbol
Element	A pure substance made of only one kind of atom
Energy	Capacity to do work or cause change
Energy level	Any of the possible energies an electron may have in an atom
Endothermic Reaction	A reaction that takes place with the absorption of heat

Exothermic reaction	A reaction that produces heat
Evaporation	The process by which particles escape from the surface of a non-boiling liquid and enter the gas state
Flammability	A chemical property that describes whether substances will react in the presence of oxygen and burn when exposed to a flame
Fullerenes	Spherical carbon compounds
Gamma rays	High-frequency electromagnetic waves (released during nuclear decay)
Gas	The state of matter in which a substance has neither definite volume nor definite shape
Heat	The energy transferred between samples of matter because of a difference in their temperature
Heat of fusion	The amount of heat energy required to melt one mole of solid at its melting point
Heat of vaporization	The amount of heat energy needed to vaporize one mole of liquid at its boiling point
Heating curve	A diagram (figure) showing the changes in the temperature of a substance as heat is transferred
Hydrocarbon	An organic chemical compound that is comprised only of carbon (C) and hydrogen (H) atoms
Hypothesis	A testable statement
Ion	An atom or group of bonded atoms with a charge (has a positive or negative charge)
Ionic bond	The chemical bond resulting from electrical attraction between large numbers of positive and negative ions (cations and anions)
Ionic compound	A compound composed of positive and negative ions (cations and anions) that are combined so that the numbers of positive and negative charges are equal
Isomers	Compounds that have the same molecular formula but different structures
Isotopes	Atoms of the same element that have different masses; same number of protons, different number of neutrons
Kinetic energy	Energy of an object due to its motion
Kinetic theory	A molecular theory based on the idea that molecular particles of matter are always in motion
Law	A descriptive generalization about how some aspect of the natural world behaves under stated circumstances, often stated in a form of a mathematical equation
Law of conservation of mass	The law stating that mass is neither created nor destroyed during ordinary chemical or physical reactions
Lewis electron dot structure	An electron-configuration notation in which only the valence electrons of an atom of a particular element are shown, indicated by dots placed around the element's symbol
Lipid	An energy-rich compound made of carbon, oxygen, and hydrogen; fats, oils, waxes, and cholesterol
Liquid	The state of matter in which the substance has a definite volume but an indefinite shape
Magnetism	The force of attraction or repulsion of magnetic materials
Matter	Anything that has mass and takes up space
Medium	The matter through which a wave travels
Melting point	The temperature at which a solid becomes a liquid
Metallic bond	A bond between two or more metal atoms in which the electrons are free to move around each nuclei
Model	An explanation of how phenomena occur and how data or events are related

Molar mass	The mass of one mole of a pure substance
Mole	The amount of a substance that contains as many particles as there are atoms in exactly 12 g of carbon-12; equals $6.02 \times 10^{23}$
Mole ratio	A conversion factor that relates the amounts in moles of any two substances involved in a chemical reaction
Motion	The state in which one object's distance from another is changing
Nucleic acid	A very large organic compound made up of carbon, oxygen, hydrogen, nitrogen and phosphorous;( e.g., DNA and RNA)
Nuclear fission	A process in which a very heavy nucleus splits into more-stable nuclei of intermediate mass
Nuclear fusion	A process by which two or more nuclei join together to form a heavier nucleus
Optics	Study of light
Orbital	A three-dimensional region around the nucleus that indicates the probable location of an electron
Organic compound	A covalently bonded compound containing carbon, excluding carbonates and oxides
Pascal's principle	The principle that applied pressure is transmitted undiminished throughout a fluid
Periodic table	A table with an arrangement of the elements in order of their atomic numbers so that elements with similar properties fall in the same column or group
Physics	The science that examines the fundamental laws relating matter and energy
Physical change	A change in a substance that does not involve a change in the identity of the substance
Physical property	A characteristic that can be observed or measured without changing the identity of the substance
Physical Science	The study of matter, energy, and the changes that matter and energy undergo
Plane mirror	A flat mirror that produces an upright, virtual image the same size as the object
Polyatomic ion	A charged group of covalently bonded atoms
Potential energy	Energy of an object due to its position; stored energy or energy of position.
Precipitate	A solid that is produced as a result of a chemical reaction in solution and that separates from the solution
Pressure	The force per unit area on a surface
Product	A substance that is formed by a chemical change
Projectile motion	Motion of objects moving in two dimensions under the influence of gravity
Protein	An organic compound that is a polymer made of amino acids
Radioactive decay	The spontaneous disintegration, or decay, of a nucleus into a slightly lighter and more stable nucleus, accompanied by emission of mass particles, electromagnetic radiation, or both
Reactant	A substance that reacts in a chemical change
Reactivity	The ability of a substance to combine chemically with another substance
Reference point	A place or object used for comparison to determine if an object is in motion
Resistance	Opposition to flow of electric current
Saturated hydrocarbon	An organic molecule that has utilized all of its bonding electrons to make single bonds to other atoms
Schematic diagram	A graphic representation of an electric circuit or apparatus, with standard symbols for the electrical devices
Scientific bias	Factors that affect the outcome of an investigation
Single-displacement reaction	A reaction in which one element replaces a similar element in a compound
Solid	The state of matter in which the substance has definite volume and definite shape

Sound	A disturbance that travels through a medium as a longitudinal wave
Speed	The scalar ratio of distance traveled to the time interval
Sub-atomic particles	Includes protons, neutrons, and electrons
Surface area	The amount of a substance exposed
Synthesis reaction	A reaction in which two or more substances combine to form a new compound
Temperature	A measure of the average kinetic energy of the particles in a sample of matter
Thermal energy	Total energy of a material's particles due to their movement or vibration
Thermal expansion	Moving apart of particles as their temperature rises
Theory	An explanation of a phenomenon; a broad generalization that explains a body of facts or phenomena
Transformer	Device used to transfer energy from one circuit to another circuit by mutual inductance across two coils
Unsaturated hydrocarbon	An organic molecule that contains double or triple bonds between certain atoms
Valence electron	An electron that is available to be lost, gained, or shared in the formation of chemical compounds
Variable	A factor that changes or is changed during an experiment
Velocity	A quantity describing both speed and direction
Viscosity	The resistance of a fluid to flow
Voltage	The difference in electrical potential between 2 places
Wave	Traveling disturbance in a field or medium
Wavelength	The distance between two successive crests, or two successive troughs, of a wave; the distance between corresponding points on adjacent waves
Wave speed	The speed at which a wave passes through a medium

# Appendix

### Suggested Physical Science Labs

Strand	Suggested Labs
Chemistry	chemical and physical properties chemical and physical changes states of matter/heating curve Boyle's and Charles' laws endothermic and exothermic chemical reaction evidence chemical reaction rate factors combustion carbon bonding tests for presence of organic compound
Physics	transfer of thermal energy motion graph lab Newton's first law Newton's third law Archimedes, Pascal, Bernoulli's laws energy conversion wave speed through mediums wave property light diffraction interference lab mirror image concave and convex lenses Ohm's law power through a circuit transformer electromagnets