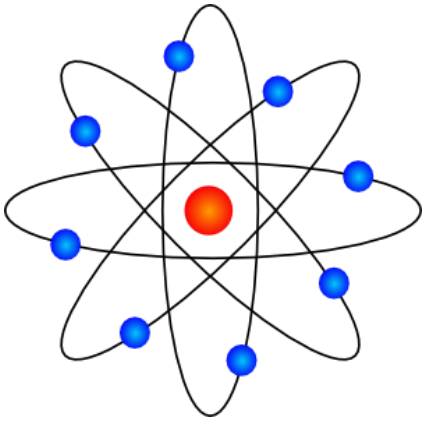
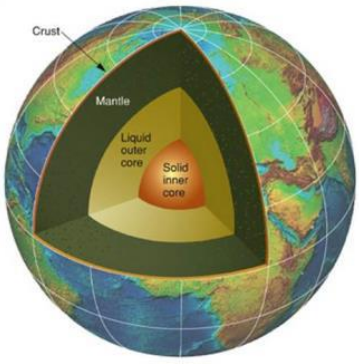
CURRICULUM GUIDE FOR SCIENCE

Clinton Public Schools





Clinton
PUBLIC SCHOOLS

Clinton Public Schools
Science Curriculum

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Approved by the Clinton Board of Education, July 20, 2015

Program

Foundations

MISSION STATEMENT

The mission of the Clinton Public Schools
is to prepare independent and collaborative learners
empowered to embrace the future.

DRIVING FORCES & UNIFYING PRINCIPLES

As a Professional Learning Community, we will:

1. Develop literacy in core disciplines to ensure quality learning experiences and achievement.

2. Embed the application of knowledge and skills in all learning experiences and new situations.

3. Develop and implement high-performing collaborative teams focused on improving teaching and learning.

4. Provide safe, high-quality learning environments that support the District's commitment to its educational mission.

K-12 District
Foundation Skills and Competencies

Preparing independent and collaborative learners empowered to embrace the future

The purpose for establishing a set of common learning competencies is the belief that all teaching and learning should be meaningful, relevant, and connected. Therefore, there should be a common thread to link all disciplines. The following K-12 Foundation Skills and Competencies are essential for all students to become independent and collaborative learners, and must be incorporated in all disciplines. The foundation competencies are not intended to limit any discipline; rather, they are intended to provide teachers, students, and the community with a set of common expectations that will enhance curriculum development and continuity of purpose, assist teachers in planning instruction and assessment, and improve student performance.

1. Reads a variety of literary, informational, and persuasive texts with understanding, and is able to analyze, interpret, evaluate text, and reads for enjoyment.
2. Uses appropriate forms of expressions and conventions of Standard English to communicate and develop thoughts, share ideas, influence and persuade, and create and entertain.
3. Applies understanding of a writing process (drafting, revising, editing, and rewriting) to improve writing.
4. Listens and views verbal and nonverbal presentations in order to analyze, clarify, follow directions, and ask and answer questions.
5. Applies computational skills, number sense and mathematical techniques to solve problems and judge reasonableness of results.
6. Delivers oral and visual presentations using standard conventions, forms of expression, coherent sequence of thoughts, suitable vocabulary, and tools appropriate for the purpose and audience.
7. Collects, organizes, and presents data using charts, tables, and graphs to interpret findings, defend or refute predictions, and draw conclusions.
8. Investigates and evaluates information and arguments from various sources and points of view applying prior knowledge, and inductive and deductive reasoning to establish a personal stance and defend a rationale.
9. Accesses a wide range of resources (print, non-print, and technological) to expand knowledge, conduct research, communicate information, create original works, and investigate complex problems.
10. Designs and applies techniques for investigating real-world issues and problems including; posing questions, hypothesizing, observing, collecting and analyzing data, and communicating findings.
11. Works collaboratively in a group to accomplish a goal by exchanging ideas, synthesizing information, investigating solutions to a problem, sharing workload and completing assigned tasks.

Characteristics of an Exemplary Curriculum

The following characteristics are provided to help guide work of the curriculum renewal teams for all disciplines. These characteristics are widely accepted and supported in curriculum development literature.

1. Meaningful:

   A meaningful curriculum establishes a clear set of expectations for what students need to know and demonstrate in order to be successful in today's complex world.

2. Coherent:

   A coherent curriculum provides opportunities at each level to learn and practice knowledge and skills, building on and expanding previous experiences and knowledge.

3. Articulated:

   An articulated curriculum ensures that learning at different grade levels is appropriately sequenced, maintaining connections and relationships between grade levels.

4. Aligned:

   An aligned curriculum connects the written curriculum, what is really taught, and assessment.

5. High standards for all:

   Curriculum recognizes and reflects the need for all students to perform well in order to gain knowledge and skills necessary to be successful.

6. Reasonable in Scope:

   The curriculum provides a framework that represents a set of expectations that can be accomplished and provides teachers and administrators with guidelines for making decisions about instruction.

Seif, E. (1998). Curriculum Renewal a Case Study. Alexandria, VA: ASCD.

DuFour, R. & Eaker, R. (1998). Professional Learning Communities at Work: Best Practices for Enhancing Student Achievement.

Science
Philosophy of Science

The study of science is critical for expanding and developing students' methods for understanding their world. Science provides opportunities to develop thinking and processing skills. The scientific method: observing, questioning, experimenting, analyzing, evaluating and communicating discoveries, is fundamental to scientific inquiry and literacy, and provides a framework for the science program.

We further believe that:

- Science literacy is essential for all.
- The ability to understand scientific concepts and processes is an important part of education and life.
- There is a fundamental body of content in science that must be incorporated into the curriculum.
- There should be an emphasis on process, experimentation and problem solving.
- Learning science is an active process.
- The study of science should connect to other disciplines.
- Students develop science competencies best when applied in meaningful and purposeful activities within and outside the classroom.
- Science should be fun.

Goals for Science

As a result of this K-12 Science Curriculum, students will:

1. Apply scientific methods of inquiry, problem-solving skills, and knowledge of science to become independent investigators about the natural world.
2. Explore the history and nature of science, and apply the knowledge and processes of science to make decisions.
3. Communicate scientific understandings and findings; develop conclusions from research, data, and observation.
4. Demonstrate an understanding of the interrelationships among science, technology, and human activity, and explore and explain the impact that the interrelationships have on society, the environment, and the future.
5. Demonstrate an understanding of the properties, structure, forms, changes, and interactions of matter and energy.
6. Demonstrate an understanding of the characteristics and structure of living organisms, life systems and processes, and interactions of living organisms with each other and with their environment.
7. Demonstrate an understanding of the processes and interdependence of the earth's systems and the structure and dynamics of the earth and other objects in space.

Curriculum

Structure

Overview of Science Curriculum and The Development Process

The Clinton Public Schools Science Curriculum is aligned with the Connecticut 2010 PK-8 Science Curriculum Standards and Assessment Expectations, and is informed by the Next Generation Science Standards (NGSS).

Unit development at each grade level and across the continuum of grades will incorporate design concepts that include a shift toward learning core science content within the context of science and engineering practices as applicable. These practices include:

NGSS Science and Engineering Practices *

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluation and communicating information

In addition, the science curriculum will help students develop deeper conceptual knowledge and understanding through an emphasis on the Crosscutting Concepts identified and outlined in the NGSS. Units of instruction will specifically identify one or more of the following concepts and allow students to explore the connections that exist across their core content topics and units of study. The crosscutting concepts serve to connect various science disciplines and assist students in studying science in a more interconnected manner. These concepts include:

NGSS Crosscutting Concepts *

1. Patterns
2. Cause & Effect
3. Scale, Proportion, and Quantity
4. Systems and System Models
5. Energy and Matter in Systems
6. Structure and Function
7. Stability and Change of Systems

** Further information may be found in the Appendix of this document and in the Next Generation Science Standards document (www.nsta.org), Appendix F-NGSS Science and Engineering Practices and Appendix G-NGSS Crosscutting Concepts.*

Science
District Frameworks

I. SCIENTIFIC INQUIRY AND SCIENCE AND TECHNOLOGY IN SOCIETY
(Process Skills of Inquiry, Science and Technology in Society)

1. Apply scientific methods of inquiry, problem-solving skills, and knowledge of science to become independent investigators about the natural world.
2. Explore the history and nature of science, and apply the knowledge and processes of science to make decisions.
3. Communicate scientific understandings and findings; develop conclusions from research, data, and observation.
4. Demonstrate an understanding of the interrelationships among science, technology, and human activity, and explore and explain the impact that the interrelationships have on society, the environment, and the future.

II. PHYSICAL SCIENCE
(Properties of Matter, Energy Transfer and Transformations, Forces and Motion)

5. Demonstrate an understanding of the properties, structure, forms, changes, and interactions of matter and energy.

III. LIFE SCIENCE
(Structure and Function, Heredity and Evolution, Matter and Energy in the Ecosystems)

6. Demonstrate an understanding of the characteristics and structure of living organisms, life systems and processes, and interactions of living organisms with each other and with their environment.

IV. EARTH SCIENCE
(The Changing Earth, Energy in the Earth's System, Earth in the Solar System)

7. Demonstrate an understanding of the processes and interdependence of the earth’s systems and the structure and dynamics of the earth and other objects in space.

Science Curriculum – Topics by Grade & Strand

Grade	Scientific Inquiry & Science and Technology in Society		
	Physical Science	**Life Science**	**Earth Science**
K	Properties of objects	Living things/shelters	Weather patterns
1	Position and motion of objects/ measuring tools	Needs of living things/ life cycle of butterfly	Sun and season (Position and motion of objects)
2	Properties of solids, liquids and gases	Food resources/ life cycle of plants	Properties of soils
3	States of matter/ conservation of materials	Adaptations	Properties of rocks and minerals
4	Simple machines-forces, motion and work/ energy, magnetism & electricity	Adapting to environmental changes	Changes in Earth-erosion, water cycle, plate tectonics intro
5	Sound, light, color	Senses	Earth in solar system-Earth's revolution, rotation, moon phases, tides, day and night
6	Properties of matter/ elements, compounds, mixtures	Matter and energy in ecosystems/ human impact	Atmosphere, wind, seasons, ground and surface water
7	Energy, work and machines	Cell structure & function, body systems, bacteria & food preservation	Earth structure, plate tectonics, glaciation, weathering, volcanoes, earthquakes
8	Forces and motion, bridges, chemistry	Cell division (meiosis)/ human reproduction/ genes and chromosomes	Earth and solar system-planets, orbital movement, gravity, moon phases, seasons
HS Integrated Science	Structure of matter and periodic table, chemical bonding and polymers, heat and energy, electricity and magnetism	Environmental science	Earth's internal properties and cycles
HS Biology	N/A	Biochemistry, cell structure and function, energy use and creation, genetics and heredity, DNA structure and function, evolution	N/A
HS Chemistry	Atomic structure and periodic table, chemical bonds and molecular structure, chemical reactions and stoichiometry, thermochemistry and chemical kinetics, states of matter, solutions & bases	N/A	N/A

Science Curriculum
Key Concept Science Vocabulary

Grade	Scientific Inquiry	Physical Science	Life Science	Earth Science
K	• observe • describe • question • predict • test • measure • compare • contrast • Venn Diagram • pattern • data • record data • data table • graph • relationship • conclusion	• senses • observe • observation • property • sort • classify • material • float • sink • flexible • heavy • magnetic • nonmagnetic • thermometer • shelter • rigid • transparent • waterproof water-resistant	• classify • reproduce • offspring • characteristics • living • non-living • plants • animal • similarities • differences	• weather • season (winter/ spring/summer/ autumn) • thermometer • temperature • precipitation • freeze • melt • evaporate • condensation

1	• observe
	• describe
	• question
	• background knowledge
	• predict
	• test
	• investigate
	• measure
	• compare
	• contrast
	• Venn Diagram
	• pattern
	• data
	• record data
	• data table
	• graph
	• relationship
	• conclusion
		• position
		• motion
		• shadow
		• light source
		  • object
		  • surface
		• transparent
		• opaque
		• translucent
		• push
		• pull
		• force
		• kinetic energy
		• potential energy
		• centimeter
		• meter
		• gram
		• kilogram
		• milliliter
		• liter
		• graduated cylinder
		• thermometer
		• Celsius
		• Fahrenheit
			• organism
			• plant
			• animal
			• energy
			• photosynthesis
			• breathe
			• lungs
			• gills
			• absorb
			• life cycle
			• metamorphosis
			• egg
			• structures (body parts and plant parts)
			• insect
			• caterpillar
			• chrysalis
			• habitat
				• position
				• motion
				• push
				• pull
				• force
				• weather & clouds
				• cirrus
				• cumulus
				• stratus
				• condensation evaporation

Science Curriculum
Key Concept Science Vocabulary

Grade	Scientific Inquiry	Physical Science	Life Science	Earth Science
2	• observe • describe • question • background knowledge • predict • hypothesis • test • experiment • investigate • measure • evidence • compare • pattern • data • record data • data table • graph • relationship • conclusion • Scientific Method	• property • classify • matter • state of matter • solid • liquid • gas • volume • viscosity • flow rate	• life cycle • structures (plant parts) • seed • germinate • reproduce • flower • pollen • pollinator • seed dispersal • nutrient • crop • grain • carbohydrate • protein • dairy • fruit • vegetable • fats • oils • energy •	• soil • property • classify • mixture • particle • humus • sand • silt • clay • loam • texture • nutrients
3	• observe • describe • question • background knowledge • problem • hypothesis • test • variable • constant • investigate • experiment • measure • evidence • compare • pattern • record data • data table • graph • relationship • conclusion • Scientific Method	• physical property • state of matter • solid • liquid • gas • dissolve • absorb • conduct • attract • melt • freeze • boil • evaporate • condense •	• adaptation • advantage • camouflage • hibernation • migration • dormancy • extinction • habitat • omnivore • herbivore • carnivore	• property • classify • texture • igneous • sedimentary • metamorphic • fossil • crystal • mineral • luster • natural resources • renewable • nonrenewable • recycle • conserve

Science Curriculum
Key Concept Science Vocabulary

Grade	Scientific Inquiry	Physical Science	Life Science	Earth Science
4	• observe • question • research • problem • hypothesis • test • experiment • procedure • measure • multiple trials • variables • constant • control group • data • graph • relationship • analyze • conclusion • Scientific Method • investigate	• motion • force • speed • gravity • friction • mass • magnet • attract (attraction) • repel (repulsion) • iron • pole • force • electric current • energy source • battery • contact • complete (closed) circuit • incomplete (open) circuit • conductor insulator	• ecosystem • organism • abiotic • factors • nutrient • producer • consumer • herbivore • carnivore • omnivore • decomposer • food chain • food web • interdependence • predator • prey • adaptation • migrate	• water cycle • evaporation • condensation • precipitation • erosion • sediment • valley • floodplain • delta

Science Curriculum
Key Concept Science Vocabulary

Grade	Scientific Inquiry	Physical Science	Life Science	Earth Science
5	• observe • compare • contrast • question • research • hypothesis • investigate • test • experiment • procedure • measure • multiple trials • variables • constant • control group • data • graph • relationship • analyze • conclusion • Scientific Method	• reflect • absorb • refract • transparent • translucent • opaque • angle • vibration • transfer • volume • pitch • transmit	• sense organ • receptor • stimulus • response • nervous system • vibration • reflect • refract • cornea • pupil • iris • lens • retina • white light • absorb • aqueous humor • vitreous humor • sclera • variable • fair test • reaction time • hand lens • magnifying glass • telescope • periscope • lens • mirror • concave • convex • focus	• sphere • illuminate • reflect • rotate • day/night cycle (24-hour rotation period) • horizon • orbit • revolve • month (one lunar cycle) • moon phase • new moon • waxing • waning • crescent • gibbous • first quarter • last quarter

Science Curriculum
Key Concept Science Vocabulary

Grade	Scientific Inquiry	Physical Science	Life Science	Earth Science
6	• scientific method • problem/ question • hypothesis • procedure • analysis • conclusion • observation/data • evidence/data • independent variable • dependent variable • control group • qualitative • quantitative	• characteristic property • matter • molecule • dense • solid • liquid • gas • phase change • condense • evaporate • mass • weight • inertia • volume • density • solubility • saturated • solution • boiling point • melting point • mixtures • solution • solvent • solute • colloid • particle • atom • proton • neutron • electron • atomic mass • element • molecule • compound • metal • nonmetal • metalloid • physical change • chemical change • exothermic • endothermic • temperature • pressure	• ecosystem • interdependence • biodiversity • organism • population • biotic factor • abiotic factor • food chain • photosynthesis • producer • consumer • herbivore • carnivore • omnivore • food web • predator • prey • community • biosphere • adaptation • surface water • ground water • fresh water • salt water • pollutant • watershed • point source • pollution • nonpoint source • pollution • well • septic system • wastewater • topography	• air pressure • humidity • air mass • cold/warm front • precipitation • global wind • sea breeze • land breeze • temperature • climate

Science Curriculum
Key Concept Science Vocabulary

Grade	Scientific Inquiry	Physical Science	Life Science	Earth Science
7	• independent variable • dependent variable • constant • controlled variable • control • hypothesis • theory • measurable • qualitative • quantitative • analysis conclusion	• work • force • distance • input • output • weight • newton • gravity • friction • joule • machine • simple machine • compound machine • mechanical advantage • mechanical efficiency • energy • mechanical • kinetic • potential • transfer • transformation • conservation	• structure • function • cell • organelle • cytoplasm • nucleus • cell membrane • mitochondrion • tissue • organ • organ system • organism • unicellular • multicellular • mitosis • microbe • bacteria • binary fission • dehydration • pickling • irradiation • refrigeration • optimum • spoilage	• core • mantle • crust • convection • tectonic plate • boundary • fold • fault • ridge • mountain • earthquake • volcano • weathering • erosion • glacier • valley • floodplain

Science Curriculum
Key Concept Science Vocabulary

Grade	Scientific Inquiry	Physical Science	Life Science	Earth Science
8	• independent variable • dependent variable • controlled variable • control group • experimental group • controlled experiment • reliable • valid • qualitative • quantitative • error • continuous • discrete • analysis • conclusion	• motion • point of reference • speed • constant speed • average speed • force • friction • gravity • inertia • mass • weight • acceleration • balanced/ unbalanced forces • net force • circular motion • load • tension • compression • beam bridge • truss bridge • suspension bridge • cable-stayed bridge • terminal velocity • air resistance • free fall • momentum • homogeneous mixture • heterogeneous mixture • solvent • solution • solute • colloid • valence • pH • acid • base	• multicellular organism • heredity • trait • chromosome • gene • DNA • species • mitosis • meiosis • gamete • adolescence • hormone • testes • sperm • ovary • egg • fallopian tube • uterus • somatic cell • germ cell • embryo • fetus	• orbit • revolve • day • year • period • mass • rotate • hemisphere • season • month (one lunar cycle) • moon phase • new moon • waxing • waning • crescent • gibbous • first quarter • last quarter • satellite • solar eclipse • lunar eclipse • tide • neap tide • spring tide

Science Curriculum
Key Concept Science Vocabulary

	Scientific Inquiry	Physical Science		
		Structure of Matter	Chemical Bonding	Polymers
INTEGRATED SCIENCE –HIGH SCHOOL	• independent variable • dependent variable • control • constant • reliable • relevant variable • quantitative • qualitative • error • analysis • conclusion • credible • valid	• atom • proton • neutron • electron • energy level • atomic number • mass number • element • compound • molecule • isotope • metals • nonmetals • netalloids • alloys • mixtures • pure substances • homogenous • heterogeneous	• ionic bond • covalent bond • metallic bonding • chemical reactions • chemical equations • decomposition • combustion • single replacement • double replacement • incomplete combustion • endothermic • exothermic • reaction rates • polar • nonpolar • pH • acid • base • neutralization • indicator	• polymer • cross-linked polymers • hydrocarbon • organic compound • tensile strength • abrasion • puncture • linear polymer • branched polymer

Science Curriculum
Key Concept Science Vocabulary

	Physical Science		Life Science	Earth Science
INTEGRATED SCIENCE –HIGH SCHOOL	Heat & Energy	Electricity and Magnetism	• fossil fuels • renewable resources • nonrenewable resources • nuclear fission • nuclear reactor • hydrogen fuel cell • greenhouse gas • climate change • Brownfield Site • remediation • recycle • landfill • hydrogen fuel cell • solar/photo-voltaic cell • wind energy	• tectonic plates • Carbon Cycle • Water Cycle • Nitrogen Cycle • subduction • divergent • convergent • convection current
	• conduction • convection • radiation • specific heat • temperature • heat	• electrical charge • field lines • voltage • current • resistance • series circuit • parallel circuit • magnetic field • poles • magnetic north pole • Magnetic south pole		

Science Curriculum
Key Concept Science Vocabulary

	Scientific Inquiry	Life Science		
		Biochemistry	Cell Structure & Function	Energy Use & Creation
BIOLOGY – HIGH SCHOOL	• independent variable • dependent variable • control • constant • reliable • relevant variable • quantitative • qualitative • error • analysis • conclusion • credible • valid • probability	• valence electron • polar • nonpolar • covalent bond • hydrogen bond • cohesion • adhesion • hydrolysis • dehydration (condensation) reaction • carbohydrates • monosaccharide • disaccharide • starch • cellulose • glycogen • lipids • nucleic acids • proteins • amino acid • enzyme • substrate • active site • catalyst • denaturation (proteins) • homeostasis	• prokaryote • eukaryote • endosymbiotic theory • nucleus • endoplasmic reticulum • ribosomes • vesicle • Golgi apparatus • lysosome • mitochondria • vacuole • chloroplast • cell wall • phospholipid bilayer • passive transport • diffusion • osmosis • facilitated transport • active transport • endocytosis • exocytosis • mitosis • interphase • prophase • metaphase • anaphase • telophase • centrosome • microtubules • sister chromatids • chromosome • genes • genome	• ATP (Adenosine Triphosphate) • Photosynthesis • chlorophyll • autotroph • heterotroph • light reaction • Calvin Cycle • cellular respiration • fermentation • anaerobic respiration aerobic respiration

Science Curriculum
Key Concept Science Vocabulary

	Life Science			
BIOLOGY – HIGH SCHOOL	Genetics & Heredity	DNA Structure & Function	Evolution	Microbes
	• asexual reproduction • sexual reproduction • homologous chromosomes • autosomes • sex chromosomes • crossing over • meiosis • gametes • punnett square • genotype • phenotype • dominant • recessive • probability • homozygous • heterozygous • incomplete dominance • codominance • X-linked traits • polygenic inheritance • genetic disorder • pedigree karyotype	• nucleotide • DNA (Deoxyribonucleic Acid) • DNA polymerase • transcription • translation • RNA polymerase • mRNA (messanger RNA) • tRNA (transfer RNA) • codon • anticodon • rRNA (ribosomal RNA) • mutation • recombinant DNA • cloning • electrophoresis • DNA fingerprinting	• Natural Selection • homologous structures • analagous structures • biogeography • artificial selection • carrying capacity • immigration • emigration • speciation	• Baceteria • Antibiotic • Virus • Vaccine • Antibody

Science Curriculum
Key Concept Science Vocabulary

	Scientific Inquiry	Physical Science		
		Atomic Structure and Periodic Table		Chemical Bonds and Molecular Structure
CHEMISTRY – HIGH SCHOOL	• scientific method • problem • independent variable • dependent variable • constant • control • hypothesis • procedure • data • error • percent error • precision • accuracy • mass • weight • significant figure • scientific notation • metric system • directly proportional • inversely proportional density	• matter • atom • element • mixture • homogeneous mixture • heterogeneous mixture • physical property • physical change • intensive property • extensive property • mass • pressure • temperature • volume • distillation • filtration • chromatography • chemical property • chemical change • compound • atomic number • proton • neutron • electron • valence electron • isotope • mass number • average atomic mass • atomic mass number (amu) • mole • Avogadro's number • molar mass • energy level • electron configuration	• electromagnetic spectrum • wavelength • frequency • amplitude • quantum • photon • ground state • excited state • period • group • periodic law • alkali metals • alkaline earth metals • noble gases • halogens • transition metals • inner transition metals • atomic radius • ion • cation • anion • ionic radius • ionization energy • electronegativity • metals • nonmetals • metalloids	• chemical bond • octet rule • Lewis structure • ionic bond • formula unit • polyatomic ion • metallic bond • alloy • malleable • ductile • conductivity • covalent bond • single bond • double bond • triple bond • polar • nonpolar • molecule • diatomic molecule • dipole • dipole interactions • dispersion forces • hydrogen bond • van der Waals forces • VSEPR Theory • empirical formula • percent composition • binary compound

Science Curriculum
Key Concept Science Vocabulary

	Physical Science			
CHEMISTRY – HIGH SCHOOL	Chemical Reactions and Stoichiometry	Thermochemistry and Chemical Kinetics	States of Matter	Solutions, Acids & Bases
	• precipitate • coefficient • subscript • reversible reaction • synthesis • decomposition • single-displacement • double-displacement • combustion • activity series • spectator ion • stoichiometry • mole ratio • limiting reactant • excess reactant • actual yield • theoretical yield • percent yield	• calorimeter • heat • joule • specific heat • exothermic • endothermic • entropy • enthalpy • activation energy • equilibrium • catalyst • reversible reaction • irreversible reaction • Le Chatelier's principle	• kinetic molecular theory • ideal gas • real gas • elastic collision • melting • freezing • vaporization • evaporation • condensation • sublimation • deposition • phase diagram • melting point • boiling point • normal pressure • triple point • critical point • solid • liquid • gas • Boyle's Law • Charles' Law • Gay-Lussac's Law • Combined Gas Law • Ideal Gas Law • Dalton's Law of Partial Pressure • absolute zero • diffusion • effusion • compressibility	• soluble • aqueous • solvent • solute • suspension • colloid • solution • electrolyte • nonelectrolyte • saturated • unsaturated • supersaturated • molarity • molality • concentration • dilution • acid • base • neutralization • salt • titration • equivalence point • end point • indicator • hydronium ion • hydroxide ion

Scientific Inquiry Grade Level Expectations — Scientific Inquiry	K	1	2	3	4	5	6	7	8	HS
1. Make observations and ask questions about nature and the world around them.	X	X	X	X	X	X				
2. Make observations and identify questions that can be answered through scientific investigations.							X	X	X	X
3. Acquire background information.	X	X	X	X						
4. Gather background information from a variety of sources.					X	X				
5. Read, interpret, and examine the credibility of scientific claims in different sources of information.							X	X	X	X
6. Make predictions based on observed patterns.	X	X	X	X						
7. Formulate and justify predictions.					X	X				
8. Formulate and justify predictions based on prior knowledge.							X	X	X	X
9. Design, conduct, and observe simple investigations.	X	X	X	X						
10. Design, conduct, and observe investigations.					X	X				
11. Design and conduct controlled scientific investigations.							X	X	X	X
12. Use senses and simple measuring tools to collect data.	X	X	X	X						
13. Use senses and measuring tools to collect data.					X	X				
14. Use appropriate tools to gather, analyze, and interpret data.							X	X	X	X
15. Organize data in tables and graphs in order to interpret information.	X	X	X	X						
16. Construct tables and graphs and interpret the meaning of experimental results.					X	X				
17. Identify and present relationships between variables in appropriate tables and graphs.							X	X	X	X
18. Read, write, listen, and speak about observations of the natural world.	X	X	X	X						
19. Describe natural phenomena using words, graphs, and drawings.					X	X				
20. Develop explanations and models based on evidence and logical thinking.							X	X	X	X
21. Analyze data, draw conclusions, and identify sources of error.							X	X	X	X
22. Draw conclusions through pictures, oral, written, or electronic formats.	X	X	X	X						

Scientific Inquiry Grade Level Expectations — Scientific Inquiry	K	1	2	3	4	5	6	7	8	HS
23. Draw conclusions and communicate scientific information and ideas in oral, written, and/or electronic formats.					X	X				
24. Communicate findings in various formats using relevant science vocabulary, supporting data, and clear logic.							X	X	X	X
25. Conducts additional investigations as necessary.							X	X	X	X

Physical Science-Grade level Expectations--Properties of Matter	K	1	2	3	4	5	6	7	8
1. Match each of the five senses with its associated body part and the kind of information it perceives.	X								
2. Make scientific observations using the senses, and distinguish between an object's observable properties and its name or its uses.	X								
3. Classify organisms or objects by one and two observable properties and explain the rule used for sorting (e.g., size, color, shape, texture or flexibility).	X								
4. Use simple tools and nonstandard units to estimate or predict properties such as size, heaviness, magnetic attraction and float/sink.	X								
5. Describe properties of materials such as wood, plastic, metal, cloth or paper, and sort objects by the material from which they are made.	X								
6. Count, order and sort objects by their observable properties.	X								
7. Compare and contrast the properties that distinguish solids, liquids and gases.			X						
8. Classify objects and materials according to their state of matter.			X						
9. Measure and compare the sizes of different solids.			X						
10. Measure and compare the volume of a liquid poured into different containers.			X						
11. Design a fair test to compare the flow rates of different liquids and granular solids.			X						
12. Compare and contrast the properties of solids, liquids and gases.				X					
13. Demonstrate that solids, liquids and gases are all forms of matter that take up space and have weight.				X					
14. Carry out simple tests to determine if materials dissolve, sink or float in water, conduct heat or attract to magnets.				X					
15. Classify materials based on their observable properties, including state of matter.				X					
16. Design and conduct fair tests to investigate the absorbency of different materials, write conclusions based on evidence, and analyze why similar investigations might produce different results.				X					
17. Explain the role of heating and cooling in changing matter from one state to another during freezing, melting, evaporation and condensation.				X					

Physical Science-Grade level Expectations--Properties of Matter (continued)	K	1	2	3	4	5	6	7	8
18. Distinguish between mass and density.							X		
19. Explain that density is a ratio of mass to volume. Use density to identify elements or separate mixtures.							X		
20. Demonstrate that different substances float or sink in water depending on their density.							X		
21. Compare and contrast the properties of metals, nonmetals and metalloids.							X		
22. Differentiate between a mixture and an element or compound and identify examples.							X		
23. Conduct and report on an investigation that uses physical means such as particle size, density, solubility or magnetism to separate substances in a mixture.							X		
24. Use the patterns in the Periodic Table to locate metals, metalloids and nonmetals and to predict the general characteristics of an element.							X		
25. Compare and contrast physical and chemical changes, and use evidence to support or refute a claim that a chemical reaction has occurred.							X		
26. Demonstrate the arrangement and motion of atoms or molecules in solids, liquids, and gases.							X		
27. Predict the phase change that will result from the absorption or release of heat energy by solids, liquids, or gases.							X		

Physical Science-Grade level Expectations-Energy, Transfer and Transformations	K	1	2	3	4	5	6	7	8
28. Construct complete (closed) and incomplete (open) series circuits in which electrical energy is transformed into heat, light, sound and/or motion energy.					X				
29. Draw labeled diagrams of complete and incomplete circuits, explain necessary components and how components can be arranged to make a complete circuit.					X				
30. Predict whether diagrammed circuit configurations will light a bulb.					X				
31. Develop a method for testing conductivity and analyze data to generalize that metals are generally good electrical conductors and nonmetals are not.					X				
32. Observe magnetic effects associated with electricity and investigate factors that affect the strength of an electromagnet.					X				
33. Describe materials that are attracted by magnets.					X				
34. Design procedures to move objects and separate mixtures of solids using magnets.					X				
35. Investigate how magnets react with other magnets and analyze findings to identify patterns in the interactions between north and south poles of magnets.					X				
36. Give examples of uses of magnets (e.g., motors, generators, household devices).					X				
37. Generalize that vibrating objects produce sound if the vibrations are transferred from the object through another material (e.g., air, a solid, or a liquid).						X			
38. Demonstrate how the loudness, pitch and quality/timbre of sound can be varied.						X			
39. Design and conduct investigations to determine factors that affect pitch.						X			
40. Describe the properties of materials that reflect or absorb sound.						X			
41. Analyze properties of materials that cause sound to be reflected or absorbed, then apply findings to design a device that reflects or absorbs sound.						X			
42. Construct simple musical instruments (e.g., rubber band guitars, drums, etc.) that produce sounds with various pitches, volume and timbres.						X			
43. Provide evidence that light travels in straight lines away from a source in all directions.						X			
44. Investigate how light is refracted as it passes through a lens or through one transparent material to another.						X			
45. Demonstrate that white light is composed of many colors.						X			

Physical Science-Grade level Expectations-Energy, Transfer and Transformations (continued)	K	1	2	3	4	5	6	7	8
46. Explain that all visible objects are reflecting some light to the human eye.						X			
47. Contrast the way light is reflected by a smooth, shiny object (e.g., mirror or pool of water) and how light is reflected by other objects.						X			
48. Measure angles to predict the path of light reflected by a mirror.						X			
49. Determine whether a material is opaque, transparent or translucent based on how light passes through it.						X			
50. Design and conduct light absorption experiments that vary the size, length, direction and clarity of a shadow by changing the position of the light-blocking object or the light source.						X			
51. Use a diagram or model of a moving object (roller coaster, pendulum, etc.) to describe the conversion of potential energy into kinetic energy and vice versa.								X	
52. Discuss different forms of energy and describe how they can be converted from one form to another for use by humans (e.g., thermal, electrical, light, chemical, mechanical).								X	
53. Trace energy conversions that occur in the human body.								X	
54. Calculate potential and kinetic energy and relate those quantities to total energy in a system.								X	

Physical Science-Grade level Expectations--Forces and Motion	K	1	2	3	4	5	6	7	8
55. Compare and contrast the relative positions of objects using words (in front of, behind, next to, inside of, above or below) and numbers (by measuring its distance from another object).		X							
56. Apply direct and indirect pushes and pulls to cause objects to move (change position) in different ways (e.g., straight line, forward and backward, zigzag, in a circle).		X							
57. Classify objects by the way they move (e.g., spinning, rolling, bouncing).		X							
58. Conduct simple experiments and evaluate different ways to change the speed and direction of an object's motion.		X							
59. Demonstrate that a force can cause an object to start moving, stop, or change speed or direction.					X				
60. Use measurement tools and standard units to compare and contrast the motion of common objects such as toy cars, balls, model rockets or planes in terms of change in position, speed and direction.					X				
61. Design and conduct experiments to determine how the motion of an object is related to the mass of the object and the strength of the force applied.					X				
62. Describe how friction forces caused by air resistance or interactions between surface materials affect the motion of objects.					X				
63. Predict the effect of an object's mass on its motion.					X				
64. Calculate work done on an object as force or distance varies.								X	
65. Explain in writing how the six simple machines make work easier, but do not alter the amount of work done on an object.								X	
66. Determine ways to modify a simple machine (inclined plane, pulley, and lever) to improve its mechanical advantage.								X	
67. Defend the statement, "Work output of a machine is always less than work input because of energy lost due to "friction."								X	
68. Design and create a working compound machine from several simple machines.								X	
69. Demonstrate how forces, including friction, act upon an object to change its position over time in relation to a fixed point of reference.									X
70. Calculate the average speed of an object and distinguish between instantaneous speed and average speed of an object.									X

Physical Science-Grade level Expectations--Forces and Motion	K	1	2	3	4	5	6	7	8
71. Create and interpret distance-time graphs for objects moving at constant and nonconstant speeds.									X
72. Predict the motion of an object given the magnitude and direction of forces acting upon it (net force).									X
73. Investigate and demonstrate how unbalanced forces cause acceleration (change in speed and/or direction of an object's motion).									X
74. Assess in writing the relationship between an object's mass and its inertia when at rest and in motion.									X
75. Express mathematically how the mass of an object and the force acting on it affect its acceleration.									X
76. Design and conduct an experiment to determine how gravity and friction (air resistance) affect a falling object.									X
77. Illustrate how the circular motion of an object is caused by a center seeking force (centripetal force) resulting in the object's constant acceleration.									X
78. Compare and contrast the properties of groups on the periodic table.									X
79. Differentiate between a mixture, solution, element, and compound and identify examples of each.									X
80. Use the patterns in the Periodic Table to predict the general characteristics and bonding power for elements 1 through 18 in the table.									X
81. Explain the concept pH as it relates to the pH scale and identifying a solution as acid, base, or neutral.									X

Physical Science-Grade level Expectations--Science & Technology in Society	K	1	2	3	4	5	6	7	8
82. Conduct simple tests to compare the properties of different materials and their usefulness for making roofs, windows, walls or floors (e.g., waterproof, transparent, strong).	X								
83. Seek information in books, magazines and pictures that describes materials used to build shelters by people in different regions of the world.	X								
84. Compare and contrast the materials used by humans and animals to build shelters.	X								
85. Use nonstandard and standard measurements to describe and compare the weight, length, and size of objects and organisms.		X							
86. Show approximate size of a centimeter, meter, inch, foot and yard using referents such as a finger, a hand or a book.		X							
87. Select appropriate tools for measuring length, height, weight or liquid volume.		X							
88. Use metric and customary rulers to measure length, height or distance in centimeters, meters, inches, feet and yards.		X							
89. Use balances and scales to compare and measure the heaviness of objects and organisms in kilograms, grams, pounds and ounces.		X							
90. Use graduated cylinders, beakers and measuring cups to measure the volume of liquids in milliliters, liters, cups and ounces.		X							
91. Use thermometers to measure air and water temperature in degrees Celsius and degrees Fahrenheit.		X							
92. Make graphs to identify patterns in recorded measurements such as growth or temperature over time.		X							
93. Discuss and analyze how the placement of lenses and mirrors in periscopes and telescopes affects the quality of the image formed.						X			
94. Evaluate the best optical instrument to perform a given task.						X			
95. Design and conduct simple investigations to determine how the shape of a lens or mirror (concave, convex, flat) affects the direction in which light rays travel.						X			
96. Identify the forces acting on a truss, beam and suspension bridge, including compression, tension and gravity using models, pictures or diagrams.									X

Physical Science-Grade level Expectations--Science & Technology in Society (continued)	K	1	2	3	4	5	6	7	8
97. Explain in writing the advantages and disadvantages of truss, beam and suspension bridge design and visually identify each bridge.									X
98. Conduct an experiment to discover and report on a bridge's ability to support a load based upon the interplay of tension and compression forces that result in a net force of zero.									X

Life Science-Grade level Expectations--Structure and Function	K	1	2	3	4	5	6	7	8
1. Infer from direct observation and print or electronic information that most animals and plants need water, food and air to stay alive.		X							
2. Identify structures and behaviors used by mammals, birds, amphibians, reptiles, fish and insects to move around, breathe and obtain food and water (e.g., legs/wings/fins, gills/lungs, claws/fingers, etc.)		X							
3. Sort and classify plants (or plant parts) by observable characteristics (e.g., leaf shape/size, stem or trunk covering, flower or fruit).		X							
4. Use senses and simple measuring tools to measure the effects of water and sunlight on plant growth.		X							
5. Compare and contrast information about animals and plants found in fiction and nonfiction sources.		X							
6. Explain that living things experience a life cycle that includes birth, growth, reproduction and death.		X							
7. Distinguish between animals that are born alive (e.g., humans, dogs, cows) and those that hatch from eggs (e.g., chickens, sea turtles, crocodiles).		X							
8. Compare and contrast the changes in structure and behavior that occur during the life cycles of animals that undergo metamorphosis with those that do not.		X							
9. Analyze recorded observations to compare the metamorphosis stages of different animals and make predictions based on observed patterns.		X							
10. Use senses and simple tools to observe and describe the roots, stems, leaves, flowers and seeds of various plants (including trees, vegetables and grass.)			X						
11. Use magnifiers to observe and diagram the parts of a flower.			X						
12. Describe the functions of roots, stems, leaves, flowers and seeds in completing a plant's life cycle.			X						
13. Record observations and make conclusions about the sequence of stages in a flowering plant's life cycle.			X						

Life Science-Grade level Expectations--Structure and Function (continued)	K	1	2	3	4	5	6	7	8
14. Compare and contrast how seeds of different plants are adapted for dispersal by water, wind or animals.			X						
15. Conduct a fair test to explore factors that affect seed germination and plant growth.			X						
16. Explain the role of sensory organs in perceiving stimuli (e.g., light/dark, heat/cold, flavors, pain, etc.)						X			
17. Pose testable questions and design experiments to determine factors that affect human reaction time.						X			
18. Conduct simple tests to explore the capabilities of the human senses.						X			
19. Summarize nonfiction text to explain the role of the brain and spinal cord in responding to information received from the sense organs.						X			
20. Identify the major structures of the human eye, ear, nose, skin and tongue, and explain their functions.						X			
21. Draw diagrams showing the straight path of light rays from a source to a reflecting object to the eye, allowing objects to be seen.						X			
22. Describe the properties of different materials and the structures in the human eye that enable humans to perceive color.						X			
23. Generalize that optical tools, such as binoculars, telescopes, eyeglasses or periscopes, change the path of light by reflecting or refracting it.						X			
24. Explain how eyeglasses or contact lenses improve vision by changing the path of light to the retina.						X			
25. Analyze the similarities and differences between structures of the human eye and those of a simple camera.						X			
26. Compare and contrast living organisms that are single celled with multicellular organisms.								X	
27. Illustrate and describe in writing the structure and the function of the cell membrane, cytoplasm, mitochondria and nucleus in an animal cell.								X	

Life Science-Grade level Expectations--Structure and Function (continued)	K	1	2	3	4	5	6	7	8
28. Explain how the structure and function of multicellular organisms (animals) is dependent on the interaction of cells, tissues, organs and organ systems.								X	
29. Investigate and explain in writing the basic structure and function of the human skeletal system.								X	
30. Differentiate between the structures and range of motion associated with ball, socket and hinge joints and relate human joints to simple machines.								X	
31. Demonstrate how the muscles, tendons, ligaments and bones interact to support the human body and allow movement.								X	
32. Label the major parts of the human respiratory system and explain in writing the function of each part (nasal cavity, trachea, bronchi, lungs and diaphragm).								X	
33. Label the major parts of the human circulatory system and explain in writing the function of each part (heart, veins, arteries and capillaries).								X	
34. Design and conduct controlled variable experiments to analyze the interaction between the circulatory and respiratory systems as the demand for oxygen changes.								X	
35. Label the major parts of the human digestive system and explain in writing the function of each part in the chemical and physical breakdown of food (mouth, esophagus, stomach, small intestine, large intestine and rectum).								X	

Life Science-Grade level Expectations--Heredity and Evolution	K	1	2	3	4	5	6	7	8
36. Observe and describe differences between living and nonliving things in terms of growth, offspring and need for energy from "food."	X								
37. Sort, count, and classify living and nonliving things in the classroom, the schoolyard and in pictures.	X								
38. Use nonstandard measures to estimate and compare the height, length or weight of different kinds of plants and animals.	X								
39. Observe and write, speak or draw about similarities and differences between plants and animals.	X								
40. Match pictures or models of adults with their offspring (animals and plants).	X								
41. Classify varied individuals of the same species by one and two attributes (e.g., rabbits or cats with different fur colors; rabbits or dogs with upright or floppy ears, etc.).	X								
42. Compare and contrast the external features and behaviors that enable different animals and plants (including those that are extinct) to get food, water and sunlight; find mates; and be protected in specific land and water habitats.				X					
43. Explain how behaviors such as hibernation, dormancy and migration give species advantages for surviving unfavorable environmental conditions.				X					
44. Give examples of ways animals benefit from camouflage.				X					
45. Evaluate whether an adaptation gives a plant or animal a survival advantage in a given environment.				X					
46. Design a model of an organism whose adaptations give it an advantage in a specific environment.				X					
47. Relate the continued existence of any species to its successful reproduction and explain in writing the factors that contribute to successful reproduction.									X
48. Describe the structure, location and function of chromosomes, genes and DNA and how they relate to each other in the living cell.									X
49. Illustrate and chart the purpose, cell type (somatic and germ) and resulting chromosome count during cell division in mitosis and meiosis.									X
50. Identify the major structures in human male and female reproductive systems and explain where meiosis and gamete formation take place.									X

Life Science-Grade level Expectations--Heredity and Evolution (continued)	K	1	2	3	4	5	6	7	8
51. Investigate and report on the role of hormone production as it initiates and regulates the creation of male and female germ cells from birth through adolescence and into adulthood.									X
52. Compare and contrast the events and processes that occur when a human egg is fertilized or not fertilized.									X
53. Demonstrate the relationship of corresponding genes on pairs of chromosomes to traits inherited by offspring.									X
54. Describe in writing the role of the germ cells in the formation of the human zygote and its resulting 23 pairs of chromosomes, the 23rd of which determines gender and the other 22 of which determine the characteristics of that offspring.									X

Life Science-Grade level Expectations--Matter & Energy in Ecosystems	K	1	2	3	4	5	6	7	8
55. Give examples of ways that living and nonliving things are interdependent within an ecosystem.					X				
56. Draw diagrams showing how the sun's energy enters and is transferred from producers to consumers in a local land or aquatic food chain.					X				
57. Design and conduct simple investigations to record interactions among producers, consumers, herbivores, carnivores, omnivores and decomposers in an ecosystem.					X				
58. Analyze food webs to describe how energy is transferred from plants to various animals in an ecosystem.					X				
59. Distinguish between naturally occurring changes in ecosystems and those caused by human activity.					X				
60. Predict the effect an environmental change, such as drought or forest destruction, might have on the community of living things.					X				
61. Explain the interdependence between biotic and abiotic factors within a given ecosystem.							X		
62. Design and conduct a scientific investigation to explore the porosity and permeability of soils and their ability to support different plant life.							X		
63. Present an oral or written argument to support the claim that "The sun is the source of energy to support life on Earth."							X		
64. Investigate and report on the effects of abiotic factors on a plant's ability to carry out photosynthesis.							X		
65. Compare and contrast the energy transfers and matter cycling among producers, consumers and decomposers in varied Connecticut ecosystems.							X		
66. Create and interpret graphs that illustrate relationships between predator-prey populations over time.							X		
67. Evaluate the impacts of environmental changes caused by nature and by humans.							X		

Life Science-Grade level Expectations--Science & Technology in Society	K	1	2	3	4	5	6	7	8
68. Explain that food is a source of carbohydrates, proteins and fats —nutrients that animals (including humans) convert to energy that they use to stay alive and grow.			X						
69. Classify foods into groups based on their source, and relate common foods to the plant or animal from which they come.			X						
70. Give examples of ways people can improve soil quality and crop growth (e.g., irrigation, fertilizer, pest control).			X						
71. Compare and contrast how different cultures meet needs for basic nutrients by consuming various foods.			X						
72. Evaluate the nutritional value of different foods by analyzing package labels.			X						
73. Investigate and describe in writing different types of microbes and the environmental conditions necessary for their survival.								X	
74. Describe the optimum conditions for rapid bacterial growth.								X	
75. Illustrate and describe the structural differences between bacterial and animal cells.								X	
76. Discover and discuss how humans use bacteria to produce food and identify examples.								X	
77. Compare and contrast the role of bacteria in food production and food spoilage.								X	
78. Evaluate and report how each method of food preservation including dehydration, pickling, irradiation and refrigeration works to stop or inhibit bacterial growth and give examples of each.								X	

Earth Science-Grade level Expectations--Changing Earth	K	1	2	3	4	5	6	7	8
1. Use senses and simple tools (e.g., sieves and settlement tests) to separate soil into components such as rock fragments, water, air and plant remains.			X						
2. Classify soils by properties such as color, particle size (sand, silt or clay), or amount of organic material (loam).			X						
3. Explain the importance of soil to plants, animals and people.			X						
4. Evaluate the quality of different soils in terms of observable presence of air, water, living things and plant remains.			X						
5. Conduct fair tests to investigate how different soil types affect plant growth and write conclusions supported by evidence.			X						
6. Differentiate between rocks and minerals.				X					
7. Use the senses and simple measuring tools to gather data about various rocks and classify them based on observable properties (e.g., shape, size, color, weight, visible markings).				X					
8. Conduct simple tests to determine properties of different minerals (e.g. color, odor, streak, luster, hardness, magnetism), organize data in a table, and use the data and other resources to identify unknown mineral specimens.				X					
9. Summarize nonfiction text to compare and contrast the conditions under which igneous, metamorphic and sedimentary rocks are formed.				X					
10. Observe and analyze rock properties (e.g., crystal size or layers) to infer the conditions under which the rock was formed.				X					
11. Evaluate the usefulness of different rock types for specific applications (e.g., buildings, sidewalks, stone walls, statues or monuments).				X					

Earth Science-Grade level Expectations—Earth in the Solar System	K	1	2	3	4	5	6	7	8
12. Observe, record and predict the sun's position at different times of day (morning, noon, afternoon or night).		X							
13. Conduct simple investigations of shadows and analyze how shadows change as the relative position of the sun (or an artificial light source) relative to the earth changes.		X							
14. Explain the motion of the Earth relative to the sun that causes Earth to experience cycles of day and night						X			
15. Construct models demonstrating Earth's rotation on its axis, the moon's revolution around the earth, and the earth and moon revolving around the sun.						X			
16. Distinguish between the sun as a source of light and the moon as a reflection of that light.						X			
17. Observe and record the moon's appearance over time and analyze findings to describe the cyclical changes in its appearance from Earth (moon phases).						X			
18. Relate the moon phases to changes in the moon's position relative to the earth and sun during its 29-day revolution around the earth.						X			
19. Describe in writing how gravitational attraction and the inertia of objects in the solar system keep them on a predictable elliptical pathway.									X
20. Distinguish between rotation of Earth on its axis and its elliptical revolution around the sun.									X
21. Use models to explain how Earth's revolution around the sun affects changes in daylight hours and seasonal temperatures.									X
22. Compare the revolution times of planets and relate them to distance from the sun.									X
23. Design and conduct a scientific simulation to explore the relationship between the angle of the light source and the temperature on the surface its strikes.									X
24. Use a model to demonstrate the phases of the moon relative to the position of the sun, Earth and moon.									X
25. Develop a model or illustration to show the relative positions of the Earth, sun, and moon during a lunar and solar eclipse and explain how those positions influence the view from Earth.									X
26. Describe factors affecting tidal changes and analyze tidal change data for Long Island Sound.									X

Earth Science-Grade level Expectations--Energy in the Earth's Systems	K	1	2	3	4	5	6	7	8
27. Use the senses to observe daily weather conditions and record data systematically using organizers such as tables, charts, picture graphs or calendars.	X								
28. Analyze weather data collected over time (during the day, from day to day, and from season to season) to identify patterns and make comparisons and predictions.	X								
29. Observe, compare and contrast cloud shapes, sizes and colors, and relate the appearance of clouds to fair weather or precipitation.	X								
30. Write, speak or draw ways that weather influences humans, other animals and plants.	X								
31. Make judgments about appropriate clothing and activities based on weather conditions.	X								
32. Describe the role of heat energy (i.e., heating and cooling) in the continuous cycling of water between the earth and the atmosphere through evaporation, condensation and precipitation.					X				
33. Use models to demonstrate that topography causes precipitation landing on Earth to move in streams and rivers from higher to lower elevations.					X				
34. Design and conduct simple investigations to determine how moving water (flowing downhill or in ocean waves) causes changes to the land, the coastline or the course of a stream or river.					X				
35. Pose testable questions and employ simple equipment and measuring tools to collect data about factors that affect erosion (e.g., type of earth material in an area, volume of moving water, slope of land, vegetation coverage).					X				
36. Present evidence to support a scientific claim about the relationship between the amount and speed of moving water and the size of earth materials moved (e.g., sand, silt, pebbles, boulders).					X				
37. Compare the composition and functions of the earth's atmospheric layers.							X		
38. Explain how changes in temperature, pressure, moisture and density of air create weather.							X		
39. Describe differences between climate and weather.							X		
40. Create models or diagrams that demonstrate how solar energy drives different phases of the water cycle.							X		
41. Design, conduct and report in writing an investigation to compare the heat absorption and release rates of water and earth materials.							X		

Earth Science-Grade level Expectations--Energy in the Earth's Systems (continued)	K	1	2	3	4	5	6	7	8
42. Compare and contrast conditions that cause local sea breezes/land breezes and global wind patterns.							X		
43. Predict the type of weather that may result given certain cloud types, warm and cold fronts and air pressure.							X		
44. Explain the causes of temperature differences between coastal and inland areas.							X		
45. Illustrate and describe in writing the composition of the three major layers of the earth's interior.								X	
46. Explain how Earth's internal energy is transferred to move tectonic plates.								X	
47. Demonstrate the processes of folding and faulting of the earth's crust.								X	
48. Correlate common geological features/events (deep sea trenches, mountains, earthquakes, volcanoes) with the location of plate boundaries.								X	
49. Examine and compare geological features that result from constructive forces shaping the surface of the earth over time (e.g., mountains, ridges, volcanoes) with geological features that result from destructive forces shaping the surface of the earth over time.								X	
50. Analyze and interpret data about the location, frequency and intensity of earthquakes.								X	
51. Compare and contrast the major agents of erosion and deposition of sediments: running water, moving ice, wave action, wind and mass movement due to gravity.								X	
52. Investigate and determine how glaciers form and affect the earth's surface as they change over time.								X	
53. Distinguish between weathering and erosion.								X	
54. Observe and report on the geological events that are responsible for having shaped Connecticut's landscape.								X	

Earth Science-Grade level Expectations--Science & Technology in Society	K	1	2	3	4	5	6	7	8
55. Describe ways people use earth materials, such as fossil fuels, trees, water, soils and rocks as natural resources to improve their lives.				X					
56. Summarize nonfiction text to explain how humans use technology to access and use natural resources to produce electricity or other products (e.g., paper or concrete).				X					
57. Explain advantages and disadvantages of renewable and nonrenewable energy sources that can be used for making electricity, fueling cars or heating homes.				X					
58. Design and conduct experiments to evaluate the effectiveness of different insulating materials for keeping a substance (or space) warm or cold (i.e., conducting heat).				X					
59. Use mathematics to estimate, measure and graph the quantity of a natural resource (e.g., water, paper) used by an individual (or group) in a certain time period.				X					
60. Evaluate the environmental advantages and disadvantages of reducing, reusing, recycling and replacing as conservation methods.				X					
61. Discuss and chart the reasons why water is essential for life.							X		
62. Observe, analyze and record the unique physical and chemical properties of water.							X		
63. Research the differences in quantities between fresh water (solid and liquid) and salt water covering the earth's surface and report on the impact to humans.							X		
64. Investigate and explain in writing how substances, both harmful and beneficial, dissolve in and are carried by surface and ground water.							X		
65. Use appropriate maps to locate and identify the major watersheds that drain into Long Island Sound and analyze how the topography influences the way water moves in the Long Island Sound watershed.							X		
66. Research and evaluate in writing the effects of common point and nonpoint water pollutants in Connecticut.							X		
67. Compare and contrast the general structures, processes and limitations of a septic system to a secondary wastewater treatment plant.							X		
68. Debate the effectiveness of a law designed to protect water resources.							X		

Science Curriculum
Grade Level Expectations

Kindergarten

I. Scientific Inquiry

Process Skills of Inquiry
How is scientific knowledge created and communicated?

1. Make observations and ask questions about nature and the world around them.
3. Acquire background information.
6. Make predictions based on observed patterns.
9. Design, conduct, and observe simple investigations.
12. Use senses and simple measuring tools to collect data.
15. Organize data in tables and graphs in order to interpret information.
18. Read, write, listen, and speak about observations of the natural world.
22. Draw conclusions through pictures, oral, written, or electronic formats.

II. Physical Science

Properties of Matter
Objects have properties that can be observed and used to describe similarities and differences

1. Match each of the five senses with its associated body part and the kind of information it perceives.
2. Make scientific observations using the senses, and distinguish between an object's observable properties and its name or its uses.
3. Classify organisms or objects by one and two observable properties and explain the rule used for sorting (e.g., size, color, shape, texture or flexibility).
4. Use simple tools and nonstandard units to estimate or predict properties such as size, heaviness, magnetic attraction and float/sink.
5. Describe properties of materials such as wood, plastic, metal, cloth or paper, and sort objects by the material from which they are made.
6. Count, order and sort objects by their observable properties.

Science and Technology in Society
Some objects are natural, while others have been designed and made by people to improve the quality of life.

82. Conduct simple tests to compare the properties of different materials and their usefulness for making roofs, windows, walls or floors (e.g., waterproof, transparent, strong).
83. Seek information in books, magazines and pictures that describes materials used to build shelters by people in different regions of the world.
84. Compare and contrast the materials used by humans and animals to build shelters.

Science Curriculum
Grade Level Expectations

Kindergarten

III. Life Science

Heredity and Evolution
Many different kinds of living things inhabit the earth.

36. Observe and describe differences between living and nonliving things in terms of growth, offspring and need for energy from "food."
37. Sort, count, and classify living and nonliving things in the classroom, the schoolyard and in pictures.
38. Use nonstandard measures to estimate and compare the height, length or weight of different kinds of plants and animals.
39. Observe and write, speak or draw about similarities and differences between plants and animals.
40. Match pictures or models of adults with their offspring (animals and plants).
41. Classify varied individuals of the same species by one and two attributes (e.g., rabbits or cats with different fur colors; rabbits or dogs with upright or floppy ears, etc.).

IV. Earth Science

Energy in the Earth's Systems
W*eather conditions vary daily and seasonally.*

27. Use the senses to observe daily weather conditions and record data systematically using organizers such as tables, charts, picture graphs or calendars.
28. Analyze weather data collected over time (during the day, from day to day, and from season to season) to identify patterns and make comparisons and predictions.
29. Observe, compare and contrast cloud shapes, sizes and colors, and relate the appearance of clouds to fair weather or precipitation.
30. Write, speak or draw ways that weather influences humans, other animals and plants.
31. Make judgments about appropriate clothing and activities based on weather conditions.

Science Curriculum
Grade Level Expectations

Grade 1

I. Scientific Inquiry

Process Skills of Inquiry
How is scientific knowledge created and communicated?

1. Make observations and ask questions about nature and the world around them.
3. Acquire background information.
6. Make predictions based on observed patterns.
9. Design, conduct, and observe simple investigations.
12. Use senses and simple measuring tools to collect data.
15. Organize data in tables and graphs in order to interpret information.
18. Read, write, listen, and speak about observations of the natural world.
22. Draw conclusions through pictures, oral, written, or electronic formats.

II. Physical Science

Forces and Motion
The sun appears to move across the sky in the same way every day, but its path changes gradually over the seasons.

55. Compare and contrast the relative positions of objects using words (in front of, behind, next to, inside of, above or below) and numbers (by measuring its distance from another object).
56. Apply direct and indirect pushes and pulls to cause objects to move (change position) in different ways (e.g., straight line, forward and backward, zigzag, in a circle).
57. Classify objects by the way they move (e.g., spinning, rolling, bouncing).
58. Conduct simple experiments and evaluate different ways to change the speed and direction of an object's motion.

Science and Technology in Society
The properties of materials and organisms can be described more accurately through the use of standard measuring units.

85. Use nonstandard and standard measurements to describe and compare the weight, length, and size of objects and organisms.
86. Show approximate size of a centimeter, meter, inch, foot and yard using referents such as a finger, a hand or a book.
87. Select appropriate tools for measuring length, height, weight or liquid volume.
88. Use metric and customary rulers to measure length, height or distance in centimeters, meters, inches, feet and yards.
89. Use balances and scales to compare and measure the heaviness of objects and organisms in kilograms, grams, pounds and ounces.

Grade 1

II. Physical Science (continued)

Science and Technology in Society (continued)

90. Use graduated cylinders, beakers and measuring cups to measure the volume of liquids in milliliters, liters, cups and ounces.
91. Use thermometers to measure air and water temperature in degrees Celsius and degrees Fahrenheit.
92. Make graphs to identify patterns in recorded measurements such as growth or temperature over time.

III. Life Science

Structure and Function
Living things have different structures and behaviors that allow them to meet their basic needs.

1. Infer from direct observation and print or electronic information that most animals and plants need water, food and air to stay alive.
2. Identify structures and behaviors used by mammals, birds, amphibians, reptiles, fish and insects to move around, breathe and obtain food and water (e.g., legs/wings/fins, gills/lungs, claws/fingers, etc.)
3. Sort and classify plants (or plant parts) by observable characteristics (e.g., leaf shape/size, stem or trunk covering, flower or fruit).
4. Use senses and simple measuring tools to measure the effects of water and sunlight on plant growth.
5. Compare and contrast information about animals and plants found in fiction and nonfiction sources.

Organisms change in form and behavior as part of their life cycles.

6. Explain that living things experience a life cycle that includes birth, growth, reproduction and death.
7. Distinguish between animals that are born alive (e.g., humans, dogs, cows) and those that hatch from eggs (e.g., chickens, sea turtles, crocodiles).
8. Compare and contrast the changes in structure and behavior that occur during the life cycles of animals that undergo metamorphosis with those that do not.
9. Analyze recorded observations to compare the metamorphosis stages of different animals and make predictions based on observed patterns.

Grade 1

IV. Earth Science

Earth in the Solar System
Most objects in the solar system are in a regular and predictable motion.

12. Observe, record and predict the sun's position at different times of day (morning, noon, afternoon or night).
13. Conduct simple investigations of shadows and analyze how shadows change as the relative position of the sun (or an artificial light source) relative to the earth changes.

Science Curriculum
Grade Level Expectations

Grade 2

I. Scientific Inquiry

Process Skills of Inquiry
How is scientific knowledge created and communicated?

1. Make observations and ask questions about nature and the world around them.
3. Acquire background information.
6. Make predictions based on observed patterns.
9. Design, conduct, and observe simple investigations.
12. Use senses and simple measuring tools to collect data.
15. Organize data in tables and graphs in order to interpret information.
18. Read, write, listen, and speak about observations of the natural world.
22. Draw conclusions through pictures, oral, written, or electronic formats.

II. Physical Science

Properties of Matter
Materials can be classified as solid, liquid or gas based on their observable properties.

7. Compare and contrast the properties that distinguish solids, liquids and gases.
8. Classify objects and materials according to their state of matter.
9. Measure and compare the sizes of different solids.
10. Measure and compare the volume of a liquid poured into different containers.
11. Design a fair test to compare the flow rates of different liquids and granular solids.

III. Life Science

Structure and Function
Plants change their forms as part of their life cycles.

10. Use senses and simple tools to observe and describe the roots, stems, leaves, flowers and seeds of various plants (including trees, vegetables and grass.)
11. Use magnifiers to observe and diagram the parts of a flower.
12. Describe the functions of roots, stems, leaves, flowers and seeds in completing a plant's life cycle.
13. Record observations and make conclusions about the sequence of stages in a flowering plant's life cycle.
14. Compare and contrast how seeds of different plants are adapted for dispersal by water, wind or animals.
15. Conduct a fair test to explore factors that affect seed germination and plant growth.

Grade 2

III. Life Science (continued)

Science and Technology in Society
Human beings, like all other living things, have special nutritional needs for survival.

68. Explain that food is a source of carbohydrates, proteins and fats —nutrients that animals (including humans) convert to energy that they use to stay alive and grow.
69. Classify foods into groups based on their source, and relate common foods to the plant or animal from which they come.
70. Give examples of ways people can improve soil quality and crop growth (e.g., irrigation, fertilizer, pest control).
71. Compare and contrast how different cultures meet needs for basic nutrients by consuming various foods.
72. Evaluate the nutritional value of different foods by analyzing package labels.

IV. Earth Science

The Changing Earth
Earth materials have varied physical properties that make them useful in different ways.

1. Use senses and simple tools (e.g., sieves and settlement tests) to separate soil into components such as rock fragments, water, air and plant remains.
2. Classify soils by properties such as color, particle size (sand, silt or clay), or amount of organic material (loam).
3. Explain the importance of soil to plants, animals and people.
4. Evaluate the quality of different soils in terms of observable presence of air, water, living things and plant remains.
5. Conduct fair tests to investigate how different soil types affect plant growth and write conclusions supported by evidence.

Science Curriculum
Grade Level Expectations

Grade 3

I. Scientific Inquiry

Process Skills of Inquiry
How is scientific knowledge created and communicated?

1. Make observations and ask questions about nature and the world around them.
3. Acquire background information.
6. Make predictions based on observed patterns.
9. Design, conduct, and observe simple investigations.
12. Use senses and simple measuring tools to collect data.
15. Organize data in tables and graphs in order to interpret information.
18. Read, write, listen, and speak about observations of the natural world.
22. Draw conclusions through pictures, oral, written, or electronic formats.

II. Physical Science

Properties of Matter
Materials have properties that can be identified and described through the use of simple tests.

12. Compare and contrast the properties of solids, liquids and gases.
13. Demonstrate that solids, liquids and gases are all forms of matter that take up space and have weight.
14. Carry out simple tests to determine if materials dissolve, sink or float in water, conduct heat or attract to magnets.
15. Classify materials based on their observable properties, including state of matter.
16. Design and conduct fair tests to investigate the absorbency of different materials, write conclusions based on evidence, and analyze why similar investigations might produce different results.
17. Explain the role of heating and cooling in changing matter from one state to another during freezing, melting, evaporation and condensation.

III. Life Science

Heredity and Evolution
Organisms can survive and reproduce only in environments that meet their basic needs.

42. Compare and contrast the external features and behaviors that enable different animals and plants (including those that are extinct) to get food, water and sunlight; find mates; and be protected in specific land and water habitats.
43. Explain how behaviors such as hibernation, dormancy and migration give species advantages for surviving unfavorable environmental conditions.
44. Give examples of ways animals benefit from camouflage.

Grade 3

III. Life Science (continued)

45. Evaluate whether an adaptation gives a plant or animal a survival advantage in a given environment.
46. Design a model of an organism whose adaptations give it an advantage in a specific environment.

IV. Earth Science

The Changing Earth
Earth materials have different physical and chemical properties.

6. Differentiate between rocks and minerals.
7. Use the senses and simple measuring tools to gather data about various rocks and classify them based on observable properties (e.g., shape, size, color, weight, visible markings).
8. Conduct simple tests to determine properties of different minerals (e.g. color, odor, streak, luster, hardness, magnetism), organize data in a table, and use the data and other resources to identify unknown mineral specimens.
9. Summarize nonfiction text to compare and contrast the conditions under which igneous, metamorphic and sedimentary rocks are formed.
10. Observe and analyze rock properties (e.g., crystal size or layers) to infer the conditions under which the rock was formed.
11. Evaluate the usefulness of different rock types for specific applications (e.g., buildings, sidewalks, stone walls, statues or monuments).

Science and Technology in Society

Earth materials provide resources for all living things, but these resources are limited and should be conserved.

55. Describe ways people use earth materials, such as fossil fuels, trees, water, soils and rocks as natural resources to improve their lives.
56. Summarize nonfiction text to explain how humans use technology to access and use natural resources to produce electricity or other products (e.g., paper or concrete).
57. Explain advantages and disadvantages of renewable and nonrenewable energy sources that can be used for making electricity, fueling cars or heating homes.
58. Design and conduct experiments to evaluate the effectiveness of different insulating materials for keeping a substance (or space) warm or cold (i.e., conducting heat).
59. Use mathematics to estimate, measure and graph the quantity of a natural resource (e.g., water, paper) used by an individual (or group) in a certain time period.
60. Evaluate the environmental advantages and disadvantages of reducing, reusing, recycling and replacing as conservation methods.

Science Curriculum
Grade Level Expectations

Grade 4

I. Scientific Inquiry

Process Skills of Inquiry
How is scientific knowledge created and communicated?

1. Make observations and ask questions about nature and the world around them.
4. Gather background information from a variety of sources.
7. Formulate and justify predictions.
10. Design, conduct, and observe
13. Uses senses and measuring tools to collect data.
16. Construct tables and graphs and interpret the meaning of experimental results.
19. Describe natural phenomena using words, graphs, and drawings.
23. Draw conclusions and communicate scientific information and ideas in oral, written, and/or electronic formats.

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II. Physical Science

Energy, Transfer and Transformations
Electrical and magnetic energy can be transferred and transformed.

28. Construct complete (closed) and incomplete (open) series circuits in which electrical energy is transformed into heat, light, sound and/or motion energy.
29. Draw labeled diagrams of complete and incomplete circuits, explain necessary components and how components can be arranged to make a complete circuit.
30. Predict whether diagrammed circuit configurations will light a bulb.
31. Develop a method for testing conductivity and analyze data to generalize that metals are generally good electrical conductors and nonmetals are not.
32. Observe magnetic effects associated with electricity and investigate factors that affect the strength of an electromagnet.
33. Describe materials that are attracted by magnets.
34. Design procedures to move objects and separate mixtures of solids using magnets.
35. Investigate how magnets react with other magnets and analyze findings to identify patterns in the interactions between north and south poles of magnets.
36. Give examples of uses of magnets (e.g., motors, generators, household devices).

Forces and Motion
The position and motion of objects can be changed by pushing or pulling.

59. Demonstrate that a force can cause an object to start moving, stop, or change speed or direction.
60. Use measurement tools and standard units to compare and contrast the motion of common objects such as toy cars, balls, model rockets or planes in terms of change in position, speed and direction.
61. Design and conduct experiments to determine how the motion of an object is related to the mass of the object and the strength of the force applied.

Grade 4

II. Physical Science (continued)

Forces and Motion (continued)

62. Describe how friction forces caused by air resistance or interactions between surface materials affect the motion of objects.
63. Predict the effect of an object's mass on its motion.

III. Life Science

Matter and Energy in Ecosystems
All organisms depend on the living and nonliving features of the environment for survival.

55. Give examples of ways that living and nonliving things are interdependent within an ecosystem.
56. Draw diagrams showing how the sun's energy enters and is transferred from producers to consumers in a local land or aquatic food chain.
57. Design and conduct simple investigations to record interactions among producers, consumers, herbivores, carnivores, omnivores and decomposers in an ecosystem.
58. Analyze food webs to describe how energy is transferred from plants to various animals in an ecosystem.
59. Distinguish between naturally occurring changes in ecosystems and those caused by human activity.
60. Predict the effect an environmental change, such as drought or forest destruction, might have on the community of living things.

IV. Earth Science

Energy in the earth's systems
Water has a major role in shaping the earth's surface.

32. Describe the role of heat energy (i.e., heating and cooling) in the continuous cycling of water between the earth and the atmosphere through evaporation, condensation and precipitation.
33. Use models to demonstrate that topography causes precipitation landing on Earth to move in streams and rivers from higher to lower elevations.
34. Design and conduct simple investigations to determine how moving water (flowing downhill or in ocean waves) causes changes to the land, the coastline or the course of a stream or river.
35. Pose testable questions and employ simple equipment and measuring tools to collect data about factors that affect erosion (e.g., type of earth material in an area, volume of moving water, slope of land, vegetation coverage).
36. Present evidence to support a scientific claim about the relationship between the amount and speed of moving water and the size of earth materials moved (e.g., sand, silt, pebbles, boulders).

Science Curriculum
Grade Level Expectations

Grade 5

I. Scientific Inquiry

Process Skills of Inquiry
How is scientific knowledge created and communicated?

1. Make observations and ask questions about nature and the world around them.
4. Gather background information from a variety of sources.
7. Formulate and justify predictions.
10. Design, conduct, and observe
13. Uses senses and measuring tools to collect data.
16. Construct tables and graphs and interpret the meaning of experimental results.
19. Describe natural phenomena using words, graphs, and drawings.
23. Draw conclusions and communicate scientific information and ideas in oral, written, and/or electronic formats.

II. Physical Science

Energy, Transfer and Transformations
Sound and light are forms of energy.

37. Generalize that vibrating objects produce sound if the vibrations are transferred from the object through another material (e.g., air, a solid, or a liquid).
38. Demonstrate how the loudness, pitch and quality/timbre of sound can be varied.
39. Design and conduct investigations to determine factors that affect pitch.
40. Describe the properties of materials that reflect or absorb sound.
41. Analyze properties of materials that cause sound to be reflected or absorbed, then apply findings to design a device that reflects or absorbs sound.
42. Construct simple musical instruments (e.g., rubber band guitars, drums, etc.) that produce sounds with various pitches, volume and timbres.
43. Provide evidence that light travels in straight lines away from a source in all directions.
44. Investigate how light is refracted as it passes through a lens or through one transparent material to another.
45. Demonstrate that white light is composed of many colors.
46. Explain that all visible objects are reflecting some light to the human eye.
47. Contrast the way light is reflected by a smooth, shiny object (e.g., mirror or pool of water) and how light is reflected by other objects.
48. Measure angles to predict the path of light reflected by a mirror.
49. Determine whether a material is opaque, transparent or translucent based on how light passes through it.
50. Design and conduct light absorption experiments that vary the size, length, direction and clarity of a shadow by changing the position of the light-blocking object or the light source.

Grade 5

II. Physical Science (continued)

Science and Technology in Society
Humans have the capacity to build and use tools to advance the quality of their lives.

93. Discuss and analyze how the placement of lenses and mirrors in periscopes and telescopes affects the quality of the image formed.
94. Evaluate the best optical instrument to perform a given task.
95. Design and conduct simple investigations to determine how the shape of a lens or mirror (concave, convex, flat) affects the direction in which light rays travel.

III. Life Science

Structure and Function
Perceiving and responding to information about the environment is critical to the survival of organisms.

16. Explain the role of sensory organs in perceiving stimuli (e.g., light/dark, heat/cold, flavors, pain, etc.)
17. Pose testable questions and design experiments to determine factors that affect human reaction time.
18. Conduct simple tests to explore the capabilities of the human senses.
19. Summarize nonfiction text to explain the role of the brain and spinal cord in responding to information received from the sense organs.
20. Identify the major structures of the human eye, ear, nose, skin and tongue, and explain their functions.
21. Draw diagrams showing the straight path of light rays from a source to a reflecting object to the eye, allowing objects to be seen.
22. Describe the properties of different materials and the structures in the human eye that enable humans to perceive color.
23. Generalize that optical tools, such as binoculars, telescopes, eyeglasses or periscopes, change the path of light by reflecting or refracting it.
24. Explain how eyeglasses or contact lenses improve vision by changing the path of light to the retina.
25. Analyze the similarities and differences between structures of the human eye and those of a simple camera.

Grade 5

IV. Earth Science

Earth in the Solar System
Most objects in the solar system are in a regular and predictable motion.

14. Explain the motion of the earth relative to the sun that causes Earth to experience cycles of day and night.
15. Construct models demonstrating Earth's rotation on its axis, the moon's revolution around the earth, and the earth and moon revolving around the sun.
16. Distinguish between the sun as a source of light and the moon as a reflection of that light.
17. Observe and record the moon's appearance over time and analyze findings to describe the cyclical changes in its appearance from Earth (moon phases).
18. Relate the moon phases to changes in the moon's position relative to the earth and sun during its 29-day revolution around the earth.

Science Curriculum
Grade Level Expectations

Grade 6

I. Scientific Inquiry

Process Skills of Inquiry
How is scientific knowledge created and communicated?

2. Make observations and identify questions that can be answered through scientific investigations.
5. Read, interpret, and examine the credibility of scientific claims in different sources of information.
8. Formulate and justify predictions based on prior knowledge.
11. Design and conduct controlled scientific investigations.
14. Use appropriate tools to gather, analyze, and interpret data.
17. Identify and present relationships between variables in appropriate tables and graphs.
20. Develop explanations and models based on evidence and logical thinking.
21. Analyze data, draw conclusions, and identify sources of error.
24. Communicate findings in various formats using relevant science vocabulary, supporting data, and clear logic.
25. Conducts additional investigations as necessary.

II. Physical Science

Properties of Matter
Materials can be classified as pure substances or mixtures, depending on their chemical and physical properties.

18. Distinguish between mass and density.
19. Explain that density is a ratio of mass to volume. Use density to identify elements or separate mixtures.
20. Demonstrate that different substances float or sink in water depending on their density.
21. Compare and contrast the properties of metals, nonmetals and metalloids.
22. Differentiate between a mixture and an element or compound and identify examples.
23. Conduct and report on an investigation that uses physical means such as particle size, density, solubility or magnetism to separate substances in a mixture.
24. Use the patterns in the Periodic Table to locate metals, metalloids and nonmetals and to predict the general characteristics of an element.
25. Compare and contrast physical and chemical changes, and use evidence to support or refute a claim that a chemical reaction has occurred.
26. Demonstrate the arrangement and motion of atoms or molecules in solids, liquids and gases.
27. Predict the phase change that will result from the absorption or release of heat energy by solids, liquids or gases.

Science Curriculum
Grade Level Expectations

Grade 6

III. Life Science

Matter and Energy in Ecosystems
An ecosystem is composed of all the populations that are living in a certain space and the physical factors with which they interact.

61. Explain the interdependence between biotic and abiotic factors within a given ecosystem.
62. Design and conduct a scientific investigation to explore the porosity and permeability of soils and their ability to support different plant life.
63. Present an oral or written argument to support the claim that "The sun is the source of energy to support life on Earth."
64. Investigate and report on the effects of abiotic factors on a plant's ability to carry out photosynthesis.
65. Compare and contrast the energy transfers and matter cycling among producers, consumers and decomposers in varied Connecticut ecosystems.
66. Create and interpret graphs that illustrate relationships between predator-prey populations over time.
67. Evaluate the impacts of environmental changes caused by nature and by humans.

IV. Earth Science

Energy in the earth's systems
Variations in the amount of the sun's energy hitting the earth's surface affects daily and seasonal weather patterns.

37. Compare the composition and functions of the earth's atmospheric layers.
38. Explain how changes in temperature, pressure, moisture and density of air create weather.
39. Describe differences between climate and weather.
40. Create models or diagrams that demonstrate how solar energy drives different phases of the water cycle.
41. Design, conduct and report in writing an investigation to compare the heat absorption and release rates of water and earth materials.
42. Compare and contrast conditions that cause local sea breezes/land breezes and global wind patterns.
43. Predict the type of weather that may result given certain cloud types, warm and cold fronts and air pressure.
44. Explain the causes of temperature differences between coastal and inland areas.

Grade 6

IV. Earth Science (continued)

Science and Technology in Society
Water moving across and through earth materials carries with it the products of human activities.

61. Discuss and chart the reasons why water is essential for life.
62. Observe, analyze and record the unique physical and chemical properties of water.
63. Research the differences in quantities between fresh water (solid and liquid) and salt water covering the earth's surface and report on the impact to humans.
64. Investigate and explain in writing how substances, both harmful and beneficial, dissolve in and are carried by surface and ground water.
65. Use appropriate maps to locate and identify the major watersheds that drain into Long Island Sound and analyze how the topography influences the way water moves in the Long Island Sound watershed.
66. Research and evaluate in writing the effects of common point and nonpoint water pollutants in Connecticut.
67. Compare and contrast the general structures, processes and limitations of a septic system to a secondary wastewater treatment plant.
68. Debate the effectiveness of a law designed to protect water resources.

Science Curriculum
Grade Level Expectations

Grade 7

I. Scientific Inquiry

Process Skills of Inquiry
How is scientific knowledge created and communicated?

2. Make observations and identify questions that can be answered through scientific investigations.
5. Read, interpret, and examine the credibility of scientific claims in different sources of information.
8. Formulate and justify predictions based on prior knowledge.
11. Design and conduct controlled scientific investigations.
14. Use appropriate tools to gather, analyze, and interpret data.
17. Identify and present relationships between variables in appropriate tables and graphs.
20. Develop explanations and models based on evidence and logical thinking.
21. Analyze data, draw conclusions, and identify sources of error.
24. Communicate findings in various formats using relevant science vocabulary, supporting data, and clear logic.
25. Conducts additional investigations as necessary

II. Physical Science

Energy, Transfer and Transformations
Energy provides the ability to do work and can exist in many forms.

51. Use a diagram or model of a moving object (roller coaster, pendulum, etc.) to describe the conversion of potential energy into kinetic energy and vice versa.
52. Discuss different forms of energy and describe how they can be converted from one form to another for use by humans (e.g., thermal, electrical, light, chemical, mechanical).
53. Trace energy conversions that occur in the human body.
54. Calculate potential and kinetic energy and relate those quantities to total energy in a system.

Force and Motion
An object's inertia causes it to continue to move the way it is moving unless it is acted upon by a force.

64. Calculate work done on an object as force or distance varies.
65. Explain in writing how the six simple machines make work easier but do not alter the amount of work done on an object.
66. Determine ways to modify a simple machine (inclined plane, pulley and lever) to improve its mechanical advantage.
67. Defend the statement, "Work output of a machine is always less than work input because of energy lost due to friction."
68. Design and create a working compound machine from several simple machines.

Grade 7

III. Life Science

Structure and Function
Many organisms, including humans, have specialized organ systems that interact with each other to maintain dynamic internal balance.

26. Compare and contrast living organisms that are single celled with multicellular organisms.
27. Illustrate and describe in writing the structure and the function of the cell membrane, cytoplasm, mitochondria and nucleus in an animal cell.
28. Explain how the structure and function of multicellular organisms (animals) is dependent on the interaction of cells, tissues, organs and organ systems.
29. Investigate and explain in writing the basic structure and function of the human skeletal system.
30. Differentiate between the structures and range of motion associated with ball, socket and hinge joints and relate human joints to simple machines.
31. Demonstrate how the muscles, tendons, ligaments and bones interact to support the human body and allow movement.
32. Label the major parts of the human respiratory system and explain in writing the function of each part (nasal cavity, trachea, bronchi, lungs and diaphragm).
33. Label the major parts of the human circulatory system and explain in writing the function of each part (heart, veins, arteries and capillaries).
34. Design and conduct controlled variable experiments to analyze the interaction between the circulatory and respiratory systems as the demand for oxygen changes.
35. Label the major parts of the human digestive system and explain in writing the function of each part in the chemical and physical breakdown of food (mouth, esophagus, stomach, small intestine, large intestine and rectum).

Science and Technology in Society

Technology allows us to improve food production and preservation, thus improving our ability to meet the nutritional needs of growing populations.

73. Investigate and describe in writing different types of microbes and the environmental conditions necessary for their survival.
74. Describe the optimum conditions for rapid bacterial growth.
75. Illustrate and describe the structural differences between bacterial and animal cells.
76. Discover and discuss how humans use bacteria to produce food and identify examples.
77. Compare and contrast the role of bacteria in food production and food spoilage.
78. Evaluate and report how each method of food preservation including dehydration, pickling, irradiation and refrigeration works to stop or inhibit bacterial growth and give examples of each

Grade 7

IV. Earth Science

Energy in the earth's systems
Landforms are the result of the interaction of constructive and destructive forces over time.

45. Illustrate and describe in writing the composition of the three major layers of the earth's interior.
46. Explain how Earth's internal energy is transferred to move tectonic plates.
47. Demonstrate the processes of folding and faulting of the earth's crust.
48. Correlate common geological features/events (deep sea trenches, mountains, earthquakes, volcanoes) with the location of plate boundaries.
49. Examine and compare geological features that result from constructive forces shaping the surface of the earth over time (e.g., mountains, ridges, volcanoes) with geological features that result from destructive forces shaping the surface of the earth over time.
50. Analyze and interpret data about the location, frequency and intensity of earthquakes.
51. Compare and contrast the major agents of erosion and deposition of sediments: running water, moving ice, wave action, wind and mass movement due to gravity.
52. Investigate and determine how glaciers form and affect the earth's surface as they change over time.
53. Distinguish between weathering and erosion.
54. Observe and report on the geological events that are responsible for having shaped Connecticut's landscape.

Science Curriculum
Grade Level Expectations

Grade 8

I. Scientific Inquiry

Process Skills of Inquiry
How is scientific knowledge created and communicated?

2. Make observations and identify questions that can be answered through scientific investigations.
5. Read, interpret, and examine the credibility of scientific claims in different sources of information.
8. Formulate and justify predictions based on prior knowledge.
11. Design and conduct controlled scientific investigations.
14. Use appropriate tools to gather, analyze, and interpret data.
17. Identify and present relationships between variables in appropriate tables and graphs.
20. Develop explanations and models based on evidence and logical thinking.
21. Analyze data, draw conclusions, and identify sources of error.
24. Communicate findings in various formats using relevant science vocabulary, supporting data, and clear logic.
25. Conducts additional investigations as necessary.

II. Physical Science

Force and Motion
An object's inertia causes it to continue to move the way it is moving unless it is acted upon by a force.

69. Demonstrate how forces, including friction, act upon an object to change its position over time in relation to a fixed point of reference.
70. Calculate the average speed of an object and distinguish between instantaneous speed and average speed of an object.
71. Create and interpret distance-time graphs for objects moving at constant and nonconstant speeds.
72. Predict the motion of an object given the magnitude and direction of forces acting upon it (net force).
73. Investigate and demonstrate how unbalanced forces cause acceleration (change in speed and/or direction of an object's motion).
74. Assess in writing the relationship between an object's mass and its inertia when at rest and in motion.
75. Express mathematically how the mass of an object and the force acting on it affect its acceleration.
76. Design and conduct an experiment to determine how gravity and friction (air resistance) affect a falling object.
77. Illustrate how the circular motion of an object is caused by a center seeking force (centripetal force) resulting in the object's constant acceleration.
78. Compare and contrast the properties of groups on the periodic table.
79. Differentiate between a mixture, solution, element, compound and identify examples of each.

Grade 8

II. Physical Science (continued)

80. Use the patterns in the Periodic Table to predict the general characteristics and bonding power for elements 1 through 18 in the table.
81. Explain the concept of pH as it relates to the pH scale and identifying a solution as acid, base or neutral.

Science and Technology in Society

In the design of structures there is a need to consider factors such as function, materials, safety, cost and appearance.

96. Identify the forces acting on a truss, beam and suspension bridge, including compression, tension and gravity using models, pictures or diagrams.
97. Explain in writing the advantages and disadvantages of truss, beam and suspension bridge design and visually identify each bridge.
98. Conduct an experiment to discover and report on a bridge's ability to support a load based upon the interplay of tension and compression forces that result in a net force of zero.

III. Life Science

Heredity and Evolution
Reproduction is a characteristic of living systems and it is essential for the continuation of every species.

47. Relate the continued existence of any species to its successful reproduction and explain in writing the factors that contribute to successful reproduction.
48. Describe the structure, location and function of chromosomes, genes and DNA and how they relate to each other in the living cell.
49. Illustrate and chart the purpose, cell type (somatic and germ) and resulting chromosome count during cell division in mitosis and meiosis.
50. Identify the major structures in human male and female reproductive systems and explain where meiosis and gamete formation take place.
51. Investigate and report on the role of hormone production as it initiates and regulates the creation of male and female germ cells from birth through adolescence and into adulthood.
52. Compare and contrast the events and processes that occur when a human egg is fertilized or not fertilized.
53. Demonstrate the relationship of corresponding genes on pairs of chromosomes to traits inherited by offspring.
54. Describe in writing the role of the germ cells in the formation of the human zygote and its resulting 23 pairs of chromosomes, the 23rd of which determines gender and the other 22 of which determine the characteristics of that offspring.

Grade 8

IV. Earth Science

Earth in the Solar System
The solar system is composed of planets and other objects that orbit the sun.

19. Describe in writing how gravitational attraction and the inertia of objects in the solar system keep them on a predictable elliptical pathway.
20. Distinguish between rotation of Earth on its axis and its elliptical revolution around the sun.
21. Use models to explain how Earth's revolution around the sun affects changes in daylight hours and seasonal temperatures.
22. Compare the revolution times of planets and relate them to distance from the sun.
23. Design and conduct a scientific simulation to explore the relationship between the angle of the light source and the temperature on the surface it strikes.
24. Use a model to demonstrate the phases of the moon relative to the position of the sun, Earth and moon.
25. Develop a model or illustration to show the relative positions of the earth, sun and moon during a lunar and solar eclipse and explain how those positions influence the view from Earth.
26. Describe factors affecting tidal changes and analyze tidal change data for Long Island Sound.

Science Curriculum
Grade Level Expectations

High School - Integrated Science

I. Scientific Inquiry

Process Skills of Inquiry
How is scientific knowledge created and communicated?

2. Make observations and identify questions that can be answered through scientific investigations.
5. Read, interpret, and examine the credibility of scientific claims in different sources of information.
8. Formulate and justify predictions based on prior knowledge.
11. Design and conduct controlled scientific investigations.
14. Use appropriate tools to gather, analyze, and interpret data.
17. Identify and present relationships between variables in appropriate tables and graphs.
20. Develop explanations and models based on evidence and logical thinking.
21. Analyze data, draw conclusions, and identify sources of error.
24. Communicate findings in various formats using relevant science vocabulary, supporting data, and clear logic.
25. Conducts additional investigations as necessary.

II. Physical Science

Structure of Matter and Periodic Table
How does the structure of matter affect the properties and uses of materials?

1. Describe the effects of adding energy to matter in terms of the motion of atoms and molecules, and the resulting phase changes. (D1)
2. Describe the general structure of the atom, and explain how the properties of the first 20 elements in the Periodic Table are related to their atomic structures. (D10)
3. Use the relationship between atomic number, mass number, and the structure of the atom to determine the number of subatomic particles in an atom.
4. Differentiate between isotopes of the same element.
5. Compare and contrast the three main groups of elements - metals, nonmetals, and metalloids.
6. Explain how mixtures are different from pure substances and investigate separation techniques for homogeneous and heterogeneous mixtures.

Chemical Bonding and Polymers
How does the type of bonding relate to function and application of chemical reactions?

7. Describe how atoms combine to form new substances by transferring electrons (ionic bonding) or sharing electrons (covalent bonding). (D11)
8. Describe combustion reactions of hydrocarbons and their resulting by-products. (D14)
9. Examine how energy is transferred during chemical bonding.
10. Explain how the structure of the carbon atom affects the type of bonds it forms in organic and inorganic molecules. (D13)

High School - Integrated Science

II. Physical Science (continued)

Chemical Bonding and Polymers (continued)

11. Explain the general formation and structure of carbon-based polymers, including synthetic polymers, such as polyethylene, and biopolymers, such as carbohydrate. (D15)
12. Explain how simple chemical monomers can be combined to create linear, branched and/or cross-linked polymers. (D16)
13. Explain how the chemical structure of polymers affects their physical properties. (D17)
14. Understand solubility and concentrations of solutions.
15. Relate the concentration of hydronium ions to pH.
16. Explain the chemical composition of acids and bases, and explain the change of pH in neutralization reactions. (D12)
17. Understand how energy cannot be created or destroyed; however energy can be converted from one form to another.

Heat and Energy
What are the three methods of heat transfer and how are they used?

18. Explain how energy is transferred by conduction, convection and radiation. (D2)
19. Describe energy transformations among heat, light, electricity and motion. (D3)
20. Develop a method to apply solar energy with the goal of heating up a substance.
21. Energy enter the Earth system primarily as solar radiation, is captured by materials and photosynthetic processes, and eventually is transformed into heat.
22. Explain the difference between heat and temperature.

Electricity and Magnetism
How are moving electrons responsible for electricity and magnetism?

23. Illustrate positive and negative charges and their field lines.
24. Explain the relationship among voltage, current and resistance in a simple series circuit and a parallel circuit. (D4)
25. Compare the applications of simple series circuits and parallel circuits in real-world scenarious.
26. Explain how electricity is used to produce heat and light in incandescent bulbs and heating elements. (D5)
27. Explain how heat is used to generate electricity. (D7)
28. Describe the relationship between current and magnetism. (D6)
29. Explore how a magnet is surrounded by a magnetic field that exerts a force on magnetic materials.

Science Curriculum
Grade Level Expectations

High School - Integrated Science

III. Life Science

Environmental Science (Energy Resources, Pollution, Acid Rain)
How is the technology of energy use affecting the Earth and the quality of our lives?

30. Describe the availability, current uses and environmental issues related to the use of fossil and nuclear fuels to produce electricity. (D8)
31. Describe the availability, current uses and environmental issues related to the use of hydrogen fuel cells, wind, nuclear, hydroelectric, biomass and solar energy to produce electricity (D9)
32. Explain the short- and long-term impacts of landfills and incineration of waste materials on the quality of the environment. (D18)
33. Explain how the accumulation of mercury, phosphates and nitrates effects the quality of water and the organisms that live in the rivers, lakes, and oceans, while investigating the remediation of these contaminants.
34. Explain how the release of sulfur dioxide (SO_2) into the atmosphere can form acid rain, and how acid rain affects water sources, organisms and human-made structures. (D22)
35. Explain how the accumulation of carbon dioxide (CO_2) in the atmosphere increases Earth's "greenhouse" effect and may cause climate changes. (D23)
36. Explain how land development, transportation options and consumption of resources may affect the environment. (D25)
37. Describe human efforts to reduce the consumption of raw materials and improve air and water quality. (D26)

IV. Earth Science

Earth's Internal Properties and Cycles
How do materials cycle through Earth's systems?

38. Understand that elements on Earth exist in essentially fixed amounts and are located in various chemical reservoirs.
39. Investigate the cyclical movement of matter between reservoirs, and how this movement is driven by the Earth's internal and external energy sources.
40. Explain how internal energy of the Earth causes matter to cycle through the magma and the solid earth.(D21)
41. Investigate how the tectonic plates have shifted and continue to shift due to convection currents.
42. Explain how chemical and physical processes cause carbon to cycle through the major earth reservoirs. (D19)
43. Investigate the effect humans have on the carbon cycle.
44. Explain how solar energy causes water to cycle through the major earth reservoirs. (D20)

Science Curriculum
Grade Level Expectations

High School - Biology

I. Scientific Inquiry

Process Skills of Inquiry
How is scientific knowledge created and communicated?

2. Make observations and identify questions that can be answered through scientific investigations.
5. Read, interpret, and examine the credibility of scientific claims in different sources of information.
8. Formulate and justify predictions based on prior knowledge.
11. Design and conduct controlled scientific investigations.
14. Use appropriate tools to gather, analyze, and interpret data.
17. Identify and present relationships between variables in appropriate tables and graphs.
20. Develop explanations and models based on evidence and logical thinking.
21. Analyze data, draw conclusions, and identify sources of error.
24. Communicate findings in various formats using relevant science vocabulary, supporting data, and clear logic.

II. Life Science

Biochemistry
How do valence electrons reflect the type of bonding and ultimately the characteristics of the molecule?

1. Discuss the role of valence electrons in the formation of chemical bonds.
2. Compare and contrast polar and non-polar covalent bonds.
3. Relate the chemistry of an individual water molecule to its properties such as cohesion, adhesion, ability to dissolve like substances & heat capacity.
4. Define the term hydrogen bond and the characteristics of this type molecular attraction.
5. Describe the versatility of carbon in the formation of molecules essential to life.
6. Identify the formation and breakdown of biological polymers.
7. Explain the structure of the four basic macromolecules (carbohydrates, lipids, nucleic acids & proteins).
8. Discuss how the structure of enzymes relates to their function in living organisms.D29
9. Describe how enzymes lower the energy required to carry-out chemical reactions.D29
10. Discuss the catalytic cycle of enzymes using the terms active site, substrate and enzyme-substrate complex. D29

High School – Biology

II. Life Science (continued)

Biochemistry (continued)

11. Summarize how controlling enzyme function (feedback mechanisms) helps organisms maintain homeostasis. D29
12. Observe how the environmental condition (pH, temperature, salinity, etc.) of the enzyme relates to its function in a living system.

Cell Structure & Function

How does the structure of the cell relate to its function?

1. Compare and contrast prokaryotic and eukaryotic cells.
2. Explain the endosymbiotic theory as it relates to the evolution of eukaryotic cells.
3. State the limits surface to volume ratio places on cells.
4. Give examples of how the structure of cells relates to their role in living things.
5. Describe the role of the various organelles in the functioning of the cell.
6. Examine the role of the endomembrane system as it relates to the production of proteins in the cell.
7. Formulate the differences between plant and animal cells. D27
8. Discuss the eukaryotic cell as a dynamic foundation of life.
9. Model diffusion as it relates to the movement of substances across a cell membrane. D30
10. Elaborate on the structure of a phospholipid and how it relates to its function as a semi-permeable membrane. D30
11. Assess the role of proteins in biological membranes. D30
12. Compare passive and active transport across a membrane. D30
13. Explain how the size & polarity of substances affects it ability to diffuse across the plasma membrane.
14. Explain on cells use bulk transport to move molecules between the cell and its environment.
15. Relate the structure and function of the membrane to the fluid mosaic model.
16. Propose the purpose of cellular division (reproduction, growth & repair).
17. Compare and contrast the terms genome, DNA, genes and chromosomes.
18. Relate the terms gamete & somatic cells.
19. Describe the phases of the cell cycle (PPMAT).
20. Trace the relationship between mitosis and cancer.

High School – Biology

II. Life Science (continued)

Energy Use & Creation
How do producers provide the necessary chemical energy for the ecosystem?

21. Relate the structure of ATP to its ability to produce energy for cellular work.
22. Compare the process of photosynthesis to cellular respiration.
23. Explain how the mitochondrion uses the chemical energy of food to generate ATP for cellular work.
24. Summarize how the process of fermentation produces foods with unique properties.
25. Compare heterotrophs (consumers) to autotrophs (producers) including their role in the ecosystem.
26. Illustrate the role of chlorophyll in the process of photosynthesis.
27. Compare the color of plants to the wavelengths of light they utilize for photosynthesis.
28. Describe the overall equation of photosynthesis including the generation of oxygen through the splitting of water.

Genetics & Heredity
What are the four ways meiosis and sexual reproduction lead to the variation necessary for Natural Selection?

29. Compare sexual reproduction to asexual reproduction.
30. Relate homologous chromosomes to sister chromatids.
31. Explain the difference between sex chromosomes and autosomes.
32. Cite the differences between the stages of meiosis I and meiosis II.
33. Outline the process of crossing over in prophase I of meiosis.
34. Describe the differences between metaphase I of meiosis and metaphase of mitosis.
35. Highlight how meiosis and sexual reproduction leads to evolution. D36
36. State the relationship between the gametes produced in meiosis with the construction of a punnett square. D37
37. Outline the role of Mendel as the founder of classical genetics.
38. Explain the difference between genotype and phenotype.
39. Create punnett squares that demonstrate dominant and recessive traits. D37
40. Connect the use of punnett squares to probability. D37
41. Use punnett squares to demonstrate inheritance patterns beyond those highlighted by Mendel (incomplete dominance, codominance, X – linked traits, multiple alleles and polygenic inheritance). D38
42. Explain why genetic disorders are different than infectious diseases. D39
43. Demonstrate, using a pedigree, how a family might pass on a genetic disorder. D38
44. Explain the inheritance pattern and symptoms of some common genetic disorders (Down syndrome, cystic fibrosis, sickle cell anemia and achondroplasia).

High School – Biology

DNA Structure & Function

What is the information flow from DNA to RNA to proteins?

45. Discuss how the work of Griffith, Hershey & Chase led to the discovery of DNA as the molecule of heredity.
46. Explain how Watson, Crick & Franklin uncovered the structure of DNA.
47. Describe the structure of a nucleotide.
48. Interpret how the structure of DNA leads to its replication.
49. Outline the role of DNA polymerase in the formation of a complementary strand of DNA.
50. List the steps that lead to recombinant plasmids or the cloning of specific gene sequences. D34
51. Explain the risks and benefits of altering the genetic composition and cell produces of existing organisms. D35
52. Cite ways the DNA electrophoresis is used in the field of genetics.
53. Discuss how DNA samples at a crime scene are used as evidence in criminal investigation.
54. Describe the flow of information from DNA → RNA → protein in cells. D28
55. Explain the process of transcription including its location within the cell.
56. Identify the steps of translation including the role of the ribosome.
57. Predict the outcome of mutations in DNA including the causes of mutations. D40
58. Classify mutations as either germ cell mutations or somatic cell mutations. D40

Evolution

How do small changes in DNA lead to organisms that are better suited for their environment?

59. Articulate how evolution is defined as descent with modification. D42
60. Evaluate evolutionary hypothesis of Lamarck.
61. Track the events of Darwin's life and how they influenced his theory of Natural Selection.
62. Summarize the components of Natural Selection. D40, D42
63. Explore artificial selection, anatomical and molecular homologies, fossil evidence & biogeography as evidence for evolution. D41
64. Analyze the factors that affect the carrying capacity of the ecosystem. D43
65. Relate emigration, immigration, birth rate and death rate to the exponential growth rate of human populations. D44
66. State the technological advances that have led to the size and growth rate of human populations throughout history. D45
67. Microbes –What are the benefits and dangers of microbes?
68. Investigate the similarities and differences between bacteria and viruses. D31
69. Explore how bacterial and viral infectious diseases are transmitted, and explain the roles of sanitation, vaccination and antibiotic medication in the prevention and treatment of infectious diseases. D32
70. Express how bacteria and yeasts are used to produce foods for human consumption. D33

Science Curriculum
Grade Level Expectations

High School - Chemistry

I. Scientific Inquiry

Process Skills of Inquiry
How is scientific knowledge created and communicated?

2. Make observations and identify questions that can be answered through scientific investigations.
5. Read, interpret, and examine the credibility of scientific claims in different sources of information.
8. Formulate and justify predictions based on prior knowledge.
11. Design and conduct controlled scientific investigations.
14. Use appropriate tools to gather, analyze, and interpret data.
17. Identify and present relationships between variables in appropriate tables and graphs.
20. Develop explanations and models based on evidence and logical thinking.
21. Analyze data, draw conclusions, and identify sources of error.
24. Communicate findings in various formats using relevant science vocabulary, supporting data, and clear logic.
25. Conducts additional investigations as necessary.

II. Physical Science

Atomic Structure and Periodic Table
How is the atomic structure related to chemical and physical properties?

7. Describe and classify matter based on physical and chemical properties and interactions between molecules or atoms.
8. Research and explain crucial contributions and critical experiments of Dalton, Thomson, Rutherford, Bohr, de Broglie, and Schrodinger and describe how each discovery contributed to the current model of atomic and nuclear structure.
9. Calculate the number of protons, neutrons and electrons in individual isotopes using atomic numbers and mass numbers
10. Write electron configurations of elements and ions following the Aufbau principle, Hund's Rule, and Pauli Exclusion Principle.
11. Apply physics and quantum mechanical model to the behavior of electrons electromagnetic spectrum)
12. Develop a model of atomic and nuclear structure based on theory and knowledge of fundamental particles.
13. Analyze patterns and trends in the organization of elements in the periodic table and compare their relationship to position in the Periodic Table.

Chemical Bonds and Molecular Structure
How does the type of chemical bond determine molecular structure and properties of a compound?

14. Compare different types of intermolecular forces and explain the relationship between intermolecular forces, boiling points, and vapor pressure when comparing differences in properties of pure substances.
15. Compare the properties and reactivity of compounds according to their bonding type.
16. Identify proper chemical formulas and utilize correct nomenclature.
17. Understanding the importance and application of Avogadro's number.
18. Use the VSPER Theory to determine Lewis structures and molecular geometry of covalent compounds.

High School - Chemistry

II. Physical Science (continued)

Chemical Reactions and Stoichiometry
How is the Law of Conservation of Matter supported in chemical reactions and stoichiometry?

19. Classify chemical reactions by type (combination, decomposition, single-replacement, double-replacement, and combustion).
20. Balance chemical equations according to the Law of Conservation of Matter.
21. Use stoichiometry to calculate the amount of reactants consumed and products formed.
22. Utilize an activity series to predict the outcome of a reaction.

Thermochemistry and Chemical Kinetics
How is the behavior of molecules influenced by thermodynamics?

23. Explain thermodynamics associated with physical and chemical concepts related to entropy, enthalpy, and heat energy.
24. Describe and identify factors (temperature, concentration, pressure, surface area, presence of a catalyst) affecting the rates of reaction and equilibrium.
25. Analyze and draw conclusions from an energy diagram.
26. Describe activation energy and how it relates to endothermic and exothermic reactions.
27. Infer the shift in equilibrium when a stress is applied to a chemical system (LeChatelier's Principle).

States of Matter
What is the relationship between kinetic theory and the states of matter?

28. Identify and differentiate between the states of matter.
29. Analyze the nature and behavior of gaseous, liquid, and solid substances using the kinetic molecular theory.
30. Use the combined gas law, ideal gas law, and Dalton's law of partial pressure to explain the relationships between volume, temperature, pressure, and quantity in moles.
31. Identify the triple point, critical point, state of matter, and phase change using a phase diagram.

Solutions, Acids & Bases
How does concentration affect physical and chemical properties of aqueous solutions?

32. Explain how chemical kinetics and polarity affect the solution process.
33. Utilize molarity in stoichiometric calculations.
34. Identify individual colligative properties, such as osmotic pressure, vapor pressure, boiling point elevation and freezing point depression.
35. Understand the Arrhenius and Bronsted-Lowry theories of acids and bases.
36. Relate hydronium and hydroxide concentrations to pH and pOH.
37. Explain the change of pH and use of indicators in neutralization reactions.
38. Identify the general characteristics of acids and bases
39. Make observations and complete calculations for titration reactions.

Instructional

Support

Assessment

Appendix