CT State Dept of Education
Prekindergarten – Grade 8
SCIENCE
Curriculum Standards
And Assessment Expectations
(Grade Level Expectations, Grade Level Learning Concepts)
(adapted for New Haven Public Schools Pacing)

Aug11

NEW HAVEN PUBLIC SCHOOLS SCIENCE CONTENT OUTLINE *www.newhavenscience.org* (Note, K-6 content order subject to change and is dependent on kit supply/ specific rotation)

	Quarter One		Quarter Two	Quarter	Three	Quarter Four	
K	Weather (STCWeather)		Object Properties (FossWood)		Seasons	Living Things: Characteristics (FOSS Trees)	
1	Compare/ Contrast Measurement (STC CompareMeasure)		Motion (NK)		Light Properties (DSM SunShadows)	Living Things: Structure (STC Organism)	
2	Solids/Liquids (STC)		Soil (STC or DSM)		Nutrition (NK)	Animal Life Cycles (STC Butterfly)	
3	Rocks (STC)		Material Properties *ET (STC ChemTest)		Recycling/ Conservation (NK)	Plant Life Cycles (STC PlantGrowth)	
4	Force and Motion (STC MotionDesign)		Ecosystems (NK)		Water (STC Land/Water)	Electricity *ET (STC ElecCircuit)	
5	Sound (UNHSound)	Light and Color (GEMS ColorAnalyzer)	Light and Uses (Lenses) (GEMS MoreMagnifier)	Senses *ET (NK)	Sun, Earth, Moon (GEMS) **(CMT TEST FOLLOWS)**	Health Topics	
6	Ecosystem Populations (STC Ecosytem)		Weather Systems (FOSS Weather/Water)		Water Resources *ET (URI Watershed)	Simple Machines (FOSS Lever)	
7	Properties of Matter	Chemical Properties	Cells	Genetics/ Reproduction	Life Systems Musculo-Skeletal	Life Systems Biochemical *ET	Microbes/ Food Preservation
8	Forces/Bridges	Forces/ Motion *ET	Solar System Motion	Landforms/Earth Forces	Tectonic Plates **(CMT TEST FOLLOWS)**	Rock Cycle	Natural Disasters
9 PhyChem	Heat/Phase Changes	Atoms/ Bonding *ET	Polymers *ET	Earth chemical cycles *ET	Earth Materials/ Environ Impact *ET	Energy/ Electricity *ET	Energy Sources/ Impacts *ET
10 Bio	BioChemistry *ET	Cells/ Bacteria/ Viruses *ET	Heredity/ Genetics *ET	Evolution	Diseases Populations *ET **(CAPT TEST FOLLOWS)**	Organism Interdependence	Organism Behavior/ Structure
11 Chem	Chemical Properties	Atomic Structure	Nuclear	Compounds/ Bonding	Reactions/ Equations	Gas Behavior	Organic Chemistry
12 Physics	Motion	ACCEL	2 D Motion	Forces/Work	Energy/Electric	Wave/Sound/Light	Mod Physics

*ET = CT Embedded Task, NHPS District Unit Tasks and Quarterly Assessments Also Required Grades 7-12,

New Haven City Wide Science Fair May 15,16,17 www.nhsciencefair.org

Grades PreK-2 Core Scientific Inquiry, Literacy and Numeracy, www.newhavenscience.org

How is scientific knowledge created and communicated?

Content Standards	Expected Performances
SCIENTIFIC INQUIRY • Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena. **SCIENTIFIC LITERACY** • Scientific literacy includes speaking, listening, presenting, interpreting, reading and writing about science. **SCIENTIFIC NUMERACY** • Mathematics provides useful tools for the description, analysis and presentation of scientific data and ideas.	**A INQ.1** Make observations and ask questions about objects, organisms and the environment. **A INQ.2** Use senses and simple measuring tools to collect data. **A INQ.3** Make predictions based on observed patterns. **A INQ.4** Read, write, listen and speak about observations of the natural world. **A INQ.5** Seek information in books, magazines and pictures. **A INQ.6** Present information in words and drawings. **A INQ.7** Use standard tools to measure and describe physical properties such as weight, length and temperature. **A INQ.8** Use nonstandard measures to estimate and compare the sizes of objects. **A INQ.9** Count, order and sort objects by their properties. **A INQ.10** Represent information in bar graphs.

Properties of Matter - How does the structure of matter affect the properties and uses of materials? **PREKINDERGARTEN (See PreK curriculum, little scientists kits)**			
PK.1 - Objects have properties that can be observed and used to describe similarities and differences			
Core Science Curriculum Framework	**Preschool Curriculum Framework**	**Grade-Level Expectations** *Students should be able to:*	**Preschool Assessment Framework**
PK.1.a. Some properties can be observed with the senses, and others can be discovered by using simple tools or tests**.**	Cognitive Development: Logical-Mathematical/Scientific Thinking - 1. Ask questions about and comment on observations and experimentation; 2. Collect, describe and record information; 3. Use equipment for investigation; 4. Use common instruments to measure things; 5. Demonstrate understanding of one-to-one correspondence while counting; 6. Order several objects on the basis of one attribute; 7. Sort objects by one or more attributes and regroup the objects based on a new attribute; 8. Engage in a scientific experiment with a peer or with a small group.	1. Use senses to make observations of objects and materials within the child's immediate environment. 2. Use simple tools (e.g., balances and magnifiers) and nonstandard measurement units to observe and compare properties of objects and materials. 3. Make comments or express curiosity about observed phenomena (e.g., "I notice that…" or "I wonder if…"). 4. Count, order and sort objects (e.g. blocks, crayons, toys) based on one visible property (e.g., color, shape, size). 5. Conduct simple tests to determine if objects roll, slide or bounce.	COG 1 Engages in scientific inquiry COG 3 Sorts objects COG 5 Compares and orders objects and events COG 6 Relates number to quantity

Heredity and Evolution – What processes are responsible for life's unity and diversity? **PREKINDERGARTEN (SEE PREK CURRICULUM, LITTLE SCIENTISTS KITS)**			
PK.2 — Many different kinds of living things inhabit the Earth.			
Core Science Curriculum Framework	**Preschool Curriculum Framework**	**Grade-Level Expectations** ***Students should be able to:***	**Preschool Assessment Framework**
PK.2.a. Living things have certain characteristics that distinguish them from nonliving things, including growth, movement, reproduction and response to stimuli.	**Cognitive Development: Logical-Mathematical/Scientific Thinking -** 1. Ask questions about and comment on observations and experimentation; 2. Collect, describe and record information; 3. Sort objects by one or more attributes and regroup the objects based on a new attribute; 4. Compare and contrast objects and events. **Personal and Social Development –** 1. Identify themselves by family and gender. 2. State at least two ways in which children are similar and two ways in which they are different.	1. Use the senses and simple tools to make observations of characteristics and behaviors of living and nonliving things. 2. Give examples of living things and nonliving things. 3. Make observations and distinguish between the characteristics of plants and animals. 4. Compare attributes of self, family members or classmates, and describe how they are similar and different.	COG 1 Engages in scientific inquiry COG 3 Sorts objects COG 5 Compares and orders objects and events P & S 9 Recognizes similarities and appreciates differences

Energy in the Earth's Systems – How do external and internal sources of energy affect the Earth's systems? **PREKINDERGARTEN (SEE PREK CURRICULUM, LITTLE SCIENTISTS KITS)**			
PK.3 — Weather conditions vary daily and seasonally.			
Core Science Curriculum Framework	**Preschool Curriculum Framework**	**Grade-Level Expectations** ***Students should be able to:***	**Preschool Assessment Framework**
PK.3.a. Daily and seasonal weather conditions affect what we do, what we wear and how we feel.	**Cognitive Development: Logical-Mathematical/Scientific Thinking -** 1. Ask questions about and comment on observations and experimentation; 2. Collect, describe and record information; 3. Demonstrate an understanding of sequence of events and time periods; 4. Make and verify predictions about what will occur. **Personal and Social Development –** 1. Use self-help skills	1. Use the senses to observe and describe evidence of current or recent weather conditions (e.g., flags blowing, frost on window, puddles after rain, etc.) 2. Notice weather conditions and use words and numbers to describe and analyze conditions over time (e.g., "it rained 5 times this month".) 3. Identify the season that corresponds with observable conditions (e.g., falling leaves, snow vs. rain, buds on trees or greener grass). 4. Make judgments about appropriate clothing and activities based on weather conditions.	COG 1 Engages in scientific inquiry PHY 3 Cares for self independently

Science and Technology in Society – How do science and technology affect the quality of our lives? **PREKINDERGARTEN (SEE PREK CURRICULUM, LITTLE SCIENTISTS KITS)**			
PK.4 — Some objects are natural, while others have been designed and made by people to improve the quality of life.			
Core Science Curriculum Framework	**Preschool Curriculum Framework**	**Grade-Level Expectations** ***Students should be able to:***	**Preschool Assessment Framework**
PK.4.a. Humans select materials with which to build structures based on the properties of the materials.	**Cognitive Development: Logical-Mathematical/Scientific Thinking -** 1. Ask questions about and comment on observations and experimentation; 2. Sort objects by one or more attributes and regroup the objects based on a new attribute; 3. Make and verify predictions about what will occur; 4. Engage in a scientific experiment with a peer or with a small group; **Personal and Social Development –** 1. Demonstrate the ability to use a minimum of two different strategies to attempt to solve a problem; **Creative Expression/Aesthetic Development -** 1. Use a variety of art materials and activities for sensory experience and exploration.	1. Observe, describe and sort building materials by properties such as strength, weight, stiffness or flexibility. 2. Pose questions and conduct simple tests to compare the effectiveness of different building materials (e.g., blocks of wood, plastic, foam or cardboard) for constructing towers, bridges and buildings. 3. Make judgments about the best building materials to use for different purposes (e.g., making the tallest tower or the longest bridge). 4. Invent and explain techniques for stabilizing a structure. 5. Compare block structures to pictures and to real structures in the neighborhood.	P & S 1 Shows self-direction with a range of materials COG 1 Engages in scientific inquiry COG 2 Uses a variety of strategies to solve problems COG 3 Sorts objects COG 7 Demonstrates spatial awareness CRE 1 Builds and constructs to represent own ideas

Energy in the Earth's Systems - How do external and internal sources of energy affect the Earth's systems? **NEW HAVEN KINDERGARTEN UNIT 1, 3 STC Weather Kit (kits are rotated among schools) , www.newhavenscience.org** (as well as inquiry standards)			
K.3 — Weather conditions vary daily and seasonally.			
Core Science Curriculum Framework	**Underlying Concepts** *Students should understand that…*	**Grade-Level Expectations** *Students should be able to…*	**Assessment**
K.3.a. Daily and seasonal weather conditions affect what we do, what we wear and how we feel.	1. The sun is the source of heat and light that warms the land, air and water. Variations in the amount of sunlight that reaches the earth cause the weather. 2. Weather conditions can be observed and described as sunny, cloudy, rainy, foggy, snowy, stormy, windy, hot or cold. Weather observations can be made based on how we feel, what we see or hear, or by using weather measurement instruments such as thermometers. 3. Changes in weather conditions can be recorded during different times of day, from day to day, and over longer periods of time (seasonal cycle). Repeated observations can show patterns that can be used to predict general weather conditions. For example, temperatures are generally cooler at night than during the day and colder in winter than in spring, summer or fall. 4. Weather influences how we dress, how we feel, and what we do outside. 5. Weather affects the land, animals and plants, and bodies of water. 6. When the temperature is below "freezing," water outside freezes to ice and precipitation falls as snow or ice; when the temperature is above freezing, ice and snow melt and precipitation falls as rain. 7. Clouds and fog are made of tiny drops of water. Clouds have different shapes, sizes and colors that can be observed and compared. Some cloud types are associated with precipitation and some with fair weather. 8. Wind is moving air. Sometimes air moves fast and sometimes it hardly moves at all. Wind speed can be estimated by observing the things that it moves, such as flags, tree branches or sailboats. **SCIENTIFIC LITERACY TERMINOLOGY:** weather, season (winter, spring, summer, fall), thermometer, precipitation, freezing, melt	1. Use the senses to observe daily weather conditions and record data systematically using organizers such as tables, charts, picture graphs or calendars. 2. 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. 3. Observe, compare and contrast cloud shapes, sizes and colors, and relate the appearance of clouds to fair weather or precipitation. 4. Write, speak or draw ways that weather influences humans, other animals and plants. 5. Make judgments about appropriate clothing and activities based on weather conditions.	**A7**. Describe and record daily weather conditions. **A8**. Relate seasonal weather patterns to appropriate choices of clothing and activities.

Properties of Matter - How does the structure of matter affect the properties and uses of materials?

NEW HAVEN KINDERGARTEN UNIT 2 DSM Properties/FOSS Wood Kit (kits are rotated among schools) , www.newhavenscience.org(as well as inquiry standards)

K.1 - Objects have properties that can be observed and used to describe similarities and differences

Core Science Curriculum Framework	Underlying Concepts *Students should understand that:*	Grade-Level Expectations *Students should be able to:*	Expected Performances
K.1.a. Some properties can be observed with the senses, and others can be discovered by using simple tools or tests.	1. Humans have five senses that they use to observe their environment. A specific sense organ is associated with each sense. 2. Objects have properties that can be observed using the senses. Examples include size, weight, shape, color, texture, transparency, etc. An object's observable properties do not include the object's name or its uses. 3. Sorting objects into groups based on one (or more) of their properties makes it possible to observe and describe their similarities and differences. 4. Placing objects in order based on their size or weight makes it possible to observe patterns and describe relationships among the objects in a group. 5. Objects can be described and sorted based on the materials from which they are made (for example, wood, paper, fabric, plastic, glass or metal). Objects can be made of a mixture of materials. 6. Objects can be described and sorted based on the results of simple tests. Simple tests include actions such as bending, squeezing, holding it near a magnet or putting it in water. Objects can be described as magnetic/nonmagnetic, flexible/not flexible, hard/soft, a floater/sinker, etc. 7. The heaviness of objects can be compared using the sense of touch. Balances and scales are measurement tools that allow people to observe and compare the heaviness of objects more accurately. Objects can be sorted into groups that have the same heaviness, or into groups that are "more heavy than" or "less heavy than" a given object. 8. The temperature of the air, water or bodies can be compared using the sense of touch. A thermometer is a measurement tool that allows people to compare temperatures more accurately. 9. Objects can be sorted into groups based on measurements of their size. Nonstandard units for measuring size include hands, footsteps, pennies or paper clips. **SCIENTIFIC LITERACY TERMINOLOGY**: senses, observe, observation, property, sort, classify, material, float, sink, flexible, heavy, magnetic, nonmagnetic, thermometer	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 five 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.	**A1.** Use the senses and simple measuring tools, such as rulers and equal-arm balances, to observe common objects and sort them into groups based on size, weight, shape or color. **A2.** Sort objects made of materials such as wood, paper and metal into groups based on properties such as flexibility, attraction to magnets, and whether they float or sink in water. **A3.** Count objects in a group and use mathematical terms to describe quantitative relationships such as: same as, more than, less than, equal, etc.

Science and Technology in Society - How do science and technology affect the quality of our lives? **NEW HAVEN: KINDERGARTEN UNIT 2 FOSS Wood Kit , DSM Properties Kit (kits are rotated among schools) , www.newhavenscience.org** (as well as inquiry standards)			
K.4 — Some objects are natural, while others have been designed and made by people to improve the quality of life. *This content standard is an application of the concepts in content standard K.1 and should be integrated into the same unit.*			
Core Science Curriculum Framework	**Underlying Concepts** *Students should understand that…*	**Grade-Level Expectations** *Students should be able to…*	**Assessment**
K.4.a. Humans select both natural and man-made materials to build shelters based on local climate conditions, properties of the materials, and their availability in the environment.	1. People need shelters to keep warm or cool, dry and safe. Shelters are made of materials that have properties that make them useful for different purposes. 2. People in different regions of the world build different kinds of shelters, depending on the materials available to them, the local climate and their customs. 3. Traditionally, people have built shelters using materials that they find nearby. Today, people build houses from materials that may come from far away. a. People who live in forested regions have traditionally built shelters using wood and/or leaves from nearby trees. b. People who live in regions with clay soils have traditionally built shelters using bricks or adobe made from clay. c. People who live in snowy regions have traditionally built shelters using snow and ice. d. People who live in regions with large animals have traditionally built shelters using animal skins. 4. Although they may look quite different, most shelters have walls, roofs and an entrance/exit; some shelters have doors, windows and floors. Walls, roofs and windows are made of materials that have specific properties. For example, walls require materials that are rigid, windows require materials that are transparent, and roofs require materials that are water-resistant. 5. Animals build shelters using materials that are easily available to them. The materials they use have properties that help the animals stay warm or cool, dry and safe. **SCIENTIFIC LITERACY TERMINOLOGY:** shelter, rigid, transparent	1. 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). 2. Seek information in books, magazines and pictures that describes materials used to build shelters by people in different regions of the world. 3. Compare and contrast the materials used by humans and animals to build shelters.	**A9**. Describe the types of materials used by people to build houses and the properties that make the materials useful.

Heredity and Evolution - What processes are responsible for life's unity and diversity? **New Haven: KINDERGARTEN UNIT 4 FOSS TREES Kit (kits are rotated among schools) , www.newhavenscience.org** (as well as inquiry standards)			
K.2 — Many different kinds of living things inhabit the Earth.			
Core Science Curriculum Framework	**Underlying Concepts** *Students should understand that…*	**Grade-Level Expectations** *Students should be able to…*	**Assessment**
K.2.a. Living things have certain characteristics that distinguish them from nonliving things, including growth, movement, reproduction and response to stimuli.	1. Things in our environment can be classified based on whether they are alive, were once alive or whether they were never alive. 2. Growth is an observable characteristic common to living things. 3. Reproduction is an observable characteristic common to living things. Living things can be classified into groups based on the different ways they reproduce. For example, some living things lay eggs, while others produce seeds or give birth. Offspring generally resemble their parents but are not identical to them. 4. Many living things move in response to their environment, but movement alone is not evidence of life. For example, cars and the wind both move, but they are not alive. 5. Plants and animals are living things. Plants have characteristics (such as roots, stems, leaves and flowers) that animals do not have. Animals have characteristics (such as body parts and body coverings) that plants do not have. 6. Animals can be classified into groups based on generally similar characteristics such as number of legs, type of body covering, or way of moving. Some animal groups are reptiles, insects, birds, fish and mammals. 7. Offspring are very much, but not exactly, like their parents and like one another. 8. Members of the same group of animals can look and behave very differently from each other. For example, goldfish and sharks are both fish, but there are distinct differences in their size, color and lifestyle. In addition, all goldfish are not identical to each other and neither are all sharks. 9. Plants can be classified into groups based on similarities in the appearance of their leaves, stems, blossoms or fruits. Some plant groups are grasses, vegetables, flowering plants and trees. 10. Members of the same group of plants can look and behave very differently from each other. For example, although oaks and palms are both trees, their size, shape, leaves and bark are very different. In addition, all oak trees are not identical to each other and neither are all palms. **SCIENTIFIC LITERACY TERMINOLOGY**: classify, reproduction, offspring, characteristics, reptile, insect, mammal	1. Observe and describe differences between living and nonliving things in terms of growth, offspring and need for energy from "food". 2. Sort and count living and nonliving things in the classroom, the schoolyard and in pictures. 3. Use nonstandard measures to estimate and compare the height, length or weight of different kinds of plants and animals. 4. Observe and write, speak or draw about similarities and differences between plants and animals. 5. Match pictures or models of adults with their offspring (animals and plants). 6. Recognize varied individuals as examples of the same kind of living thing (e.g., different color rabbits are all rabbits; different breeds of dogs are all dogs).	**A4**. Describe the similarities and differences in the appearance and behaviors of plants, birds, fish, insects and mammals (including humans). **A.5** Describe the similarities and differences in the appearance and behaviors of adults and their offspring. **A6**. Describe characteristics that distinguish living from nonliving things.

Science and Technology in Society – How do science and technology affect the quality of our lives? **New Haven: GRADE 1 Unit 1 STC Compare/Measure Kit (kits are rotated among schools) , www.newhavenscience.org** (as well as inquiry standards)			
1.4 The properties of materials and organisms can be described more accurately through the use of standard measuring units. *This content standard should be integrated within all PK–5 standards.*			
Core Science Curriculum Framework	**Underlying Concepts** *Students should understand that…*	**Grade-Level Expectations** *Students should be able to…*	**Assessment**
1.4.a. Various tools can be used to measure, describe and compare different objects and organisms.	1. Observations can be expressed in words, pictures or numbers. Measurements add accuracy to observations. 2. Objects and organisms can be described using nonstandard measurement units, such as hand-lengths, pencil-lengths, handfuls, etc. 3. Standard measurement units are more accurate than nonstandard units because they have consistent values agreed on by everyone. For example, "My caterpillar is one finger long" is much less accurate than "My caterpillar is 4 centimeters long." 4. Scientists and nonscientists all over the world use the metric system of measurement. In the United States, the customary measurement system is used in daily life. Equivalent values between the two systems can be estimated (for example, 1 inch is a little more than 2 centimeters). 5. Specific tools are used to measure different quantities: a. Metric rulers are used to measure length, height or distance in centimeters and meters; customary rulers measure length, height or distance in inches, feet or yards. b. Balances and scales are used to compare and measure the heaviness of objects. Grams and kilograms are units that express mass; ounces and pounds are units that express weight. c. Graduated cylinders, beakers and measuring cups are tools used to measure the volume of liquids. Volume can be expressed in milliliters (mL), liters (L), cups or ounces. d. Thermometers are tools used to measure temperature; thermometers can indicate temperature in degrees Celsius or degrees Fahrenheit, or both. **SCIENTIFIC LITERACY TERMINOLOGY:** centimeter, meter, gram, kilogram, milliliter, liter, graduated cylinder, thermometer, Celsius, Fahrenheit	1. Use nonstandard and standard measurements to describe and compare the weight, length, and size of objects and organisms. 2. Show approximate size of a centimeter, meter, inch, foot and yard using referents such as a finger, a hand or a book. 3. Select appropriate tools for measuring length, height, weight or liquid volume. 4. Use metric and customary rulers to measure length, height or distance in centimeters, meters, inches, feet and yards. 5. Use balances and scales to compare and measure the heaviness of objects and organisms in kilograms, grams, pounds and ounces. 6. Use graduated cylinders, beakers and measuring cups to measure the volume of liquids in milliliters, liters, cups and ounces. 7. Use thermometers to measure air and water temperature in degrees Celsius and degrees Fahrenheit. 8. Make graphs to identify patterns in recorded measurements such as growth or temperature over time.	**A17**. Estimate, measure and compare the sizes and weights of different objects and organisms using standard and nonstandard measuring tools.

Forces and Motion - What makes objects move the way they do?

NEW HAVEN: GRADE 1 UNIT 2, 3 DSM Sun/Shadows Kit, (DSM Force Motion) (kits are rotated among schools) , www.newhavenscience.org (as well as inquiry standards)

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

Core Science Curriculum Framework	**Underlying Concepts** *Students should understand that…*	**Grade-Level Expectations** *Students should be able to…*	**Assessment**
1.1.a An object's position can be described by locating it relative to another object or the background. **1.1.b** An object's motion can be described by tracing and measuring its position over time.	**GRADE-LEVEL CONCEPT 1.1.a.** 1. An object's **position** can be described by comparing it to the position of another stationary object. One object can be *in front of, behind, next to, inside of, above or below* another object. 2. The sun's position in the daytime sky can be described relative to stationary objects on Earth. For example, the sun can be "just above the treetops," "high or low in the sky," or "on the other side of the school." 3. The description of an object's **position** from one observer's point of view may be different from that reported from a different observer's viewpoint. For example, a box of crayons between two students is near Susan's left hand but near John's right hand. 4. When an observer changes **position**, different words may be needed to describe an object's position. For example, when I am sitting on the bench the sun is "behind" me; when I move to the slide, the sun is "in front of" me. 5. The same object when viewed from close up appears larger than it does when viewed from far away (although the actual size of the object does not change.) For example, a beach ball held in one's arms appears larger than it does when viewed from across the playground. 6. An object's **position** can be described using words ("near the door"), numbers (10 centimeters away from the door) or labeled diagrams. **GRADE-LEVEL CONCEPT 1.1.b.** 1. Things **move** in many ways, such as spinning, rolling, sliding, bouncing, flying or sailing. 2. An object is in **motion** when its position is changing. Because the sun's position changes relative to objects on Earth throughout the day, it appears to be moving across the sky. 3. Changes in the sun's position throughout the day can be measured by observing changes in shadows outdoors. Shadows occur when light is blocked by an object. An object's shadow appears opposite the light source. Shadow lengths depend on the position of the light source. 4. Motion is caused by a push or a pull. A push or pull is called a force. 5. An object can be set in motion by forces that come from direct contact, moving air, magnets or by gravity pulling it down toward the earth. 6. Pushes and pulls can start motion, stop motion, speed it up, slow it down or change its direction. **SCIENTIFIC LITERACY TERMINOLOGY:** position, motion, shadow, push, pull, force	1. 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). 2. 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). 3. Classify objects by the way they move (e.g., spinning, rolling, bouncing). 4. Conduct simple experiments and evaluate different ways to change the speed and direction of an object's motion. 5. Observe, record and predict the sun's position at different times of day (morning, noon, afternoon or night). 6. Conduct simple investigations of shadows and analyze how shadows change as the relative position of the sun (or an artificial light source) changes.	**A10**. Describe how the motion of objects can be changed by pushing and pulling. **A11**. Describe the apparent movement of the sun across the sky and the changes in the length and direction of shadows during the day.

Structure and Function - How are organisms structured to ensure efficiency and survival? **NEW HAVEN GRADE 1 UNIT 4 STC ORGANISMS Kit (kits are rotated among schools) , www.newhavenscience.org** (as well as inquiry standards)			
1.2 — Living things have different structures and behaviors that allow them to meet their basic needs.			
Core Science Curriculum Framework	**Underlying Concepts** *Students should understand that…*	**Grade-Level Expectations** *Students should be able to…*	**Assessment**
1.2.a. Animals need air, water and food to survive. **1.2.b.** Plants need air, water and sunlight to survive.	**GRADE-LEVEL CONCEPT 1.2.a.** 1. All living things (organisms) need air, water and food to stay alive and grow; they meet these needs in different ways. 2. Most animals move from place to place to find food and water. Some animals have two legs, four legs, six legs or more for moving. Other animals move using fins, wings or by slithering. 3. Animals get air in different ways. For example, humans breathe with lungs, while fish breathe with gills. 4. Animals get food in different ways. Some animals eat parts of plants and others catch and eat other animals. 5. Animals get water in different ways. Some animals have special body parts, such as noses, tongues or beaks that help them get water. 6. Fictional animals and plants can have structures and behaviors that are different than real animals and plants. **GRADE-LEVEL CONCEPT 1.2.b.** 1. Plants absorb sunlight and air through their leaves and water through their roots. 2. Plants use sunlight to make food from the air and water they absorb. 3. Plants have various leaf shapes and sizes that help them absorb sunlight and air. 4. Plant roots grow toward a source of water. 5. Plant stems grow toward sunlight. **SCIENTIFIC LITERACY TERMINOLOGY:** organism, plant, animal, energy, breathe, lungs, gills, absorb	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.	**A12**. Describe the different ways that animals, including humans, obtain water and food. **A13**. Describe the different structures plants have for obtaining water and sunlight. **A14**. Describe the structures that animals, including humans, use to move around.

Properties of Matter - How does the structure of matter affect the properties and uses of materials? **New Haven: GRADE 2 Unit 1 STC Solids/Liquids Kit (kits are rotated among schools) , www.newhavenscience.org** (as well as inquiry standards)			
2.1 — Materials can be classified as solid, liquid or gas based on their observable properties.			
Core Science Curriculum Framework	**Underlying Concepts** *Students should understand that…*	**Grade-Level Expectations** *Students should be able to…*	**Assessment**
2.1.a Solids tend to maintain their own shapes, while liquids tend to assume the shapes of their containers, and gases fill their containers fully.	1. All materials (matter) take up space. Matter can be classified by whether it is in solid, liquid or gas form. Each state of matter has unique properties. 2. Solids are the only state of matter that keep their own shape. A solid's shape can only be changed if a force is applied to it, such as hammering, slicing or twisting. Solids can be hard, soft, bouncy or stretchy. 3. Solids take up a certain amount of space (volume); the volume does not change if the solid is placed in different containers. 4. Liquids do not have their own shape; they go to the bottom of a container and take on the shape of the part of the container they occupy. Liquids pour and flow from a higher point to a lower point; some liquids flow faster than others. 5. Liquids have a definite volume. When a liquid is poured into different containers, the shape of the liquid may change, but the volume does not. 6. Gases do not have a definite shape; they take on the shape of whatever container they occupy. For example, the air in an inflated balloon can be squeezed and reshaped. 7. Gases do not have a definite volume; they spread out in all directions to fill any size container, or they keep spreading in all directions if there is no container. For example, blowing even a small amount of air into a balloon immediately fills the entire balloon; the smell of baking bread eventually fills the entire house and even outside. **SCIENTIFIC LITERACY TERMINOLOGY:** property, classify, matter, state of matter, solid, liquid, gas, volume	1. Compare and contrast the properties that distinguish solids, liquids and gases. 2. Classify objects and materials according to their state of matter. 3. Measure and compare the sizes of different solids. 4. Measure and compare the volume of a liquid poured into different containers. 5. Design a fair test to compare the flow rates of different liquids and granular solids.	**A18**. Describe differences in the physical properties of solids and liquids.

The Changing Earth - How do materials cycle through the Earth's systems?

New Haven : GRADE 2 Unit 2: STC/DSM Soils Kit (kits are rotated among schools) , www.newhavenscience.org (as well as inquiry standards)

2.3 — Earth materials have varied physical properties that make them useful in different ways.

Core Science Curriculum Framework	Underlying Concepts *Students should understand that…*	Grade-Level Expectations *Students should be able to…*	Assessment
2.3.a. Soils can be described by their color, texture and capacity to retain water. **2.3.b.** Soils support the growth of many kinds of plants, including those in our food supply.	**GRADE-LEVEL CONCEPT 2.3.a.** 1. Soil is a mixture of pieces of rock (particles), living and once living things (humus), water and air. The components of soil can be separated using sieves and settlement tests. 2. There are different types of soil that vary from place to place. Soil properties can be observed and compared. Soils can be classified by properties such as color, particle size, or amount of organic material (humus). Digging a deep hole shows that soils are often found in layers that have different colors and textures. 3. The size of the particles in soils gives the soil its texture. Soils can be classified by how they feel: Sandy soils feel gritty, silty soils feel powdery, clay soils feel sticky, and soils with small rocks feel rough and scratchy. 4. The broken rocks that make up soils can be tiny (silt and clay), medium (sand), or large (pebbles). Soils can be classified by the size of their particles. 5. A soil's texture affects how it packs together; soils that pack together tightly hold less air and water than soils that stay loosely packed. 6. There are different types of soil that vary from place to place. Some soil types are suited for supporting the weight of buildings and highways; other soil types are suited for planting food crops or forest growth. **GRADE-LEVEL CONCEPT 2.3.b.** 1. Many plants need soil to grow. Soil holds water and nutrients that are taken in (absorbed) by plant roots. 2. Soil is a habitat for many living things. Some organisms live in the soil and others live on the soil. Worms and other underground animals create spaces for air, water and plant roots to move through soil. 3. Plants we eat ("crops") grow in different soil types. Plant height, root length, number of leaves, and number of flowers can all be affected by how much water, air and organic material the soil holds. 4. To support the growth of different plants, people can change the properties of soils by adding nutrients (fertilizing), water (irrigating) or air (tilling). **SCIENTIFIC LITERACY TERMINOLOGY:** soil, property, classify, mixture, particle, humus, sand, silt, clay, texture, nutrients	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.	**A21**. Sort different soils by properties, such as particle size, color and composition. **A22**. Relate the properties of different soils to their capacity to retain water and support the growth of certain plants.

Science and Technology in Society - How do science and technology affect the quality of our lives? **New Haven GRADE 2: Unit 3 UNH Nutrition Unit /PANA Nutrition , www.newhavenscience.org** (as well as inquiry standards)			
2.4 Human beings, like all other living things, have special nutritional needs for survival. *This content standard is an application of the concepts in content standard 2.3 and should be integrated into the same unit.*			
Core Science Curriculum Framework	**Underlying Concepts** *Students should understand that…*	**Grade-Level Expectations** *Students should be able to…*	**Assessment**
2.4.a. The essential components of balanced nutrition can be obtained from plant and animal sources. **2.4.b.** People eat different foods in order to satisfy nutritional needs for carbohydrates, proteins and fats.	**GRADE-LEVEL CONCEPT 2.4.a.** 1. People need to eat a variety of foods to get the energy and nutrients they need to grow, move and stay healthy. Foods are classified as grains, fruits, vegetables, dairy, meats and beans, and oils. 2. Some foods people eat come from plants that grow wild or are planted by farmers as crops. A fruit is the ripened ovary of a flower; vegetables are the roots, stems, leaves or flowers of plants. 3. Some foods people eat come from animals that are wild or are raised on ranches. Meat, fish, dairy products and eggs all come from animals. 4. The types of crops that can grow in an area depend on the climate and soil. Some foods are grown and sold by local farms, and some foods are grown far away and transported to local grocery stores. **GRADE-LEVEL CONCEPT 2.4.b.** 1. All people need the same basic nutrients to grow, move and stay healthy; different cultures satisfy these needs by consuming different foods. 2. The level of energy and nutrients individuals need depends on their age, gender and how active they are. 3. Most foods contain a combination of nutrients. Labels on food packages describe the nutrients contained in the food and how much energy the food provides (calories). 4. Breads, cereals, rice and pasta are sources of carbohydrates, which provide energy. 5. Meat, poultry, fish, beans, eggs and nuts are sources of protein, which keeps the body working properly. 6. Fruits and vegetables are sources of vitamins and minerals, which keep the body healthy. 7. Nuts, meats and fish are sources of fats and oils, which provide energy. **SCIENTIFIC LITERACY TERMINOLOGY:** nutrient, crop, grain, carbohydrate, protein, dairy, fats, oils, energy	1. Explain that food is a source of carbohydrates, protein and fats — nutrients that animals (including humans) convert to energy they use to stay alive and grow. 2. Classify foods into groups based on their source, and relate common foods to the plant or animal from which they come. 3. Give examples of ways people can improve soil quality and crop growth (e.g., irrigation, fertilizer, pest control). 4. Compare and contrast how different cultures meet needs for basic nutrients by consuming various foods. 5. Evaluate the nutritional value of different foods by analyzing package labels.	**A23**. Identify the sources of common foods and classify them by their basic food groups. **A24**. Describe how people in different cultures use different food sources to meet their nutritional needs.

Structure and Function - How are organisms structured to ensure efficiency and survival? **NEW HAVEN: GRADE 2 UNIT 4 STC Butterflies Kit (kits are rotated among schools) , www.newhavenscience.org** (as well as inquiry standards)			
1.3 — Organisms change in form and behavior as part of their life cycles.			
Core Science Curriculum Framework	**Underlying Concepts** *Students should understand that…*	**Grade-Level Expectations** *Students should be able to…*	**Assessment**
1.3.a. Some organisms undergo metamorphosis during their life cycles; other organisms grow and change, but their basic form stays essentially the same.	1. Plants and animals have life cycles that include a predictable sequence of stages: they begin life, develop into adults, reproduce and eventually die. Plants and animals produce offspring of their own kind. Offspring closely resemble their parents, but individuals vary in appearance and behavior. 2. Animals are either born alive (for example, humans, dogs and cows) or hatched from eggs (for example, chickens, sea turtles or crocodiles). 3. Animals change throughout their lives. Many animals begin life as smaller, less capable forms of the adult. As they develop, they grow larger and become more independent (for example, humans or robins). 4. Some animals change dramatically in structure and function during their life cycle in a process called metamorphosis. 5. Frogs are amphibians that undergo metamorphosis during their life cycle. As they grow, frogs develop different structures that help them meet their basic needs in water and then on land: a. Tadpoles hatch from eggs, live in water, breathe using gills, and swim using a tail. As they metamorphose into frogs, tadpoles lose their gills and their tails. b. Adult frogs live on land and in water. They breathe air using lungs and develop webbed feet and hinged legs for swimming in water and hopping on land. After a female frog mates, she lays her eggs, and the cycle begins again. 6. Butterflies are insects that undergo metamorphosis during their life cycle. As they go through egg, larva, pupa and adult stages, butterflies develop different structures that help them meet their basic needs in very different ways: a. Caterpillars hatch from eggs, live on plants, get food by chewing leaves and move about using legs. As they metamorphose into butterflies inside a chrysalis, they develop wings, antennae and different mouth parts. b. Butterflies live on land and in the air. They get food by sucking nectar from flowers and move around primarily using wings to fly. After a female butterfly mates, she searches for the proper host plant to lay her eggs, and the cycle begins again. 7. Comparing the life cycle stages of different organisms shows how they are alike in some ways and unique in other ways. **SCIENTIFIC LITERACY TERMINOLOGY:** life cycle, egg, metamorphosis, structures (body parts), amphibian, tadpole, gills, lungs, insect, caterpillar	1. Explain that living things experience a life cycle that includes birth, growth, reproduction and death. 2. Distinguish between animals that are born alive (e.g., humans, dogs, cows) and those that hatch from eggs (e.g., chickens, sea turtles, crocodiles). 3. 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. 4. Analyze recorded observations to compare the metamorphosis stages of different animals and make predictions based on observed patterns.	**A15**. Describe the changes in organisms, such as frogs and butterflies, as they undergo metamorphosis. **A16**. Describe the life cycles of organisms that grow but do not metamorphose.

Grades 3-5 Core Scientific Inquiry, Literacy and Numeracy , www.newhavenscience.org

How is scientific knowledge created and communicated?

Content Standards	Expected Performances
SCIENTIFIC INQUIRY 1. Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena. **SCIENTIFIC LITERACY** 2. Scientific literacy includes speaking, listening, presenting, interpreting, reading and writing about science. **SCIENTIFIC NUMERACY** 3. Mathematics provides useful tools for the description, analysis and presentation of scientific data and ideas.	**B INQ.1** Make observations and ask questions about objects, organisms and the environment. **B INQ.2** Seek relevant information in books, magazines and electronic media. **B INQ.3** Design and conduct simple investigations. **B INQ.4** Employ simple equipment and measuring tools to gather data and extend the senses. **B INQ.5** Use data to construct reasonable explanations. **B INQ.6** Analyze, critique and communicate investigations using words, graphs and drawings. **B INQ.7** Read and write a variety of science-related fiction and nonfiction texts. **B INQ.8** Search the Web and locate relevant science information. **B INQ.9** Use measurement tools and standard units (e.g., centimeters, meters, grams, kilograms) to describe objects and materials. **B INQ.10** Use mathematics to analyze, interpret and present data.

The Changing Earth - How do materials cycle through the Earth's systems? **New Haven : GRADE 3 Unit 1 STC Rocks Kit (School Kits) (kits are rotated among schools) , www.newhavenscience.org** (as well as inquiry standards)			
3.3 — Earth materials have different physical and chemical properties.			
Core Science Curriculum Framework	**Underlying Concepts** *Students should understand that…*	**Grade-Level Expectations** *Students should be able to…*	**CMT Expected Performances**
3.3.a. Rocks and minerals have properties that may be identified through observation and testing; these properties determine how earth materials are used.	1. Earth is mainly made of rock. Rocks on the earth's surface are constantly being broken down into smaller and smaller pieces, from mountains to boulders, stones, pebbles and small particles that make up soil. 2. Rocks can be sorted based on properties, such as shape, size, color, weight or texture. 3. Properties of rocks can be used to identify the conditions under which they were formed. 4. Igneous rocks are formed when melted rock cools, hardens and forms crystals. Melted rock that cools slowly inside a volcano forms large crystals as it cools. Melted rock that cools rapidly on the earth's surface forms small crystals (or none at all). 5. Sedimentary rocks are formed underwater when small particles of sand, mud, silt or ancient shells/skeletons settle to the bottom in layers that are buried and cemented together over a long period of time. They often have visible layers or fossils. 6. Metamorphic rocks are formed when igneous or sedimentary rocks are reheated and cooled or pressed into new forms. They often have bands, streaks or clumps of materials. 7. Rock properties make them useful for different purposes. Rocks that can be cut into regular shapes are useful for buildings and statues; rocks that crumble easily are useful for making mixtures such as concrete and sheetrock. 8. All rocks are made of materials called minerals that have properties that may be identified by testing. Mineral properties include color, odor, streak, luster, hardness and magnetism. 9. Minerals are used in many ways, depending on their properties. For example, gold is a mineral that is easily shaped to make jewelry; talc is a mineral that breaks into tiny grains useful for making powders. **SCIENTIFIC LITERACY TERMINOLOGY:** property, classify, texture, igneous, sedimentary, metamorphic, fossil, crystal, mineral	1. Differentiate between rocks and minerals. 2. 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). 3. 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. 4. Summarize nonfiction text to compare and contrast the conditions under which igneous, metamorphic and sedimentary rocks are formed. 5. Observe and analyze rock properties (e.g., crystal size or layers) to infer the conditions under which the rock was formed. 6. Evaluate the usefulness of different rock types for specific applications (e.g., buildings, sidewalks, stone walls, statues or monuments).	**B5**. Describe the physical properties of rocks and relate them to their potential uses. **B6**. Relate the properties of rocks to the possible environmental conditions during their formation.

Properties of Matter - How does the structure of matter affect the properties and uses of materials? **New Haven: GRADE 3 Unit 2 STC Chemical Tests Kit (kits are rotated among schools) , www.newhavenscience.org** (as well as inquiry standards)			
3.1 Materials have properties that can be identified and described through the use of simple tests.			
Core Science Curriculum Framework	**Underlying Concepts** *Students should understand that…*	**Grade-Level Expectations** *Students should be able to…*	**CMT Expected Performances**
3.1.a. Heating and cooling cause changes in some of the properties of materials.	1. Materials have properties that are directly observable; examples include its state of matter, or its size, shape, color or texture. Other properties can only be observed by doing something to the material (simple tests). Materials can be sorted and classified based on their testable properties. 2. Some materials dissolve (disappear) when mixed in water; others accumulate on the top or the bottom of the container. The temperature of water can affect whether, and at what rate, materials dissolve in it. 3. Some materials, such as sponges, papers and fabrics, absorb water better than others. 4. Some materials float when placed in water (or other liquids such as cooking oil or maple syrup); others sink to the bottom of the container. 5. Some materials conduct heat better than others. Materials that are poor heat conductors are useful for keeping things cold or hot. 6. Some materials are attracted to magnets. Magnetic materials contain iron. 7. The physical properties of a material can be changed, but the material remains the same. For example, a block of wood can be cut, sanded or painted, but it is still wood. 8. Heating and cooling cause materials to change from one state of matter to another and back again. Adding heat can cause solids to melt into liquids (for example, chocolate, ice cream, butter or wax); removing heat (cooling) can cause liquids to harden into solids (for example, hot candle wax hardens as it cools). 9. Adding heat can cause water to boil and evaporate into a gas in the air (for example, steam rises from heated water); removing heat (cooling) can cause water vapor to condense into liquid water (for example, warm steam hitting a cold mirror). Water outdoors or in an open container evaporates without boiling (for example, puddles, ponds, fish tanks, etc.) 10. Water may exist as a solid, liquid or gas, depending on its temperature. If water is turned into ice and then the ice is allowed to melt, the amount of water is the same as it was before freezing. 11. Liquid water becomes solid water (ice) when its temperature cools to 0 degrees Celsius (32 degrees Fahrenheit). Warming ice to a temperature above 0 degrees Celsius causes it to melt into liquid water. **SCIENTIFIC LITERACY TERMINOLOGY:** physical property, state of matter, solid, liquid, gas, dissolve, absorb, conduct, attract, melt, freeze, boil, evaporate, condense	1. Compare and contrast the properties of solids, liquids and gases. 2. Demonstrate that solids, liquids and gases are all forms of matter that take up space and have weight. 3. Carry out simple tests to determine if materials dissolve, sink or float in water, conduct heat or attract to magnets. 4. Classify materials based on their observable properties, including state of matter. 5. 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. 6. Explain the role of heating and cooling in changing matter from one state to another during freezing, melting, evaporation and condensation.	**B1**. Sort and classify materials based on properties such as dissolving in water, sinking and floating, conducting heat, and attracting to magnets. **B2**. Describe the effect of heating on the melting, evaporation, condensation and freezing of water.

Science and Technology in Society - How do science and technology affect the quality of our lives?

New Haven: GRADE 3 Unit 3 Recycling (includes Soggy Paper Embedded Task) , www.newhavenscience.org (as well as inquiry standards)

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

This content standard is an application of the concepts in content standards 3.1 and 3.3 should be integrated within one of those units.

Core Science Curriculum Framework	Underlying Concepts *Students should understand that…*	Grade-Level Expectations *Students should be able to…*	CMT Expected Performances
3.4.a. Decisions made by individuals can affect the global supply of many resources.	1. Earth materials that occur in nature include rocks, minerals, soils, water and the gases of the atmosphere. Earth materials are natural resources that provide us with things we need to live, including food, clothing, water, air, shelter, land and energy. 2. Some natural resources are useful to people in their raw form (for example, fresh water, soil or air); other natural resources must be modified to meet human needs (for example, petroleum must be extracted from rocks and refined into gasoline, heating oil or plastics; wood from trees must be processed to make paper). 3. The supply of many natural resources such as fossil fuels, metals, fresh water and fertile soil is limited; once they are used up or contaminated they are difficult or impossible to replace. 4. Human actions can affect the survival of plants and animals. The products of the fuels people burn affect the quality of the air. Waste and chemicals from factories, farms, lawns and streets affect the quality of the water and soil. 5. Humans can extend the use of some natural resources by reducing the amounts they use (for example, driving less to reduce the amount of gasoline used; turning off faucets when not in use). 6. Humans can extend the use of some natural resources by recycling, or collecting used materials and processing them into new materials (for example, collecting waste paper or plastic bottles and making them into new products). 7. Humans can extend the use of some natural resources by reusing products instead of buying new ones (for example, washing containers that food is packaged in and using them again to store different foods or objects). 8. Humans can extend the use of some natural resources by replacing what they use (for example, planting new trees to replace those that are cut for lumber or paper; purifying dirty water from storm drains and discharging clean water back into a river). **SCIENTIFIC LITERACY TERMINOLOGY:** natural resources, recycle	1. Describe ways people use earth materials, such as fossil fuels, trees, water, soils and rocks as natural resources to improve their lives. 2. 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). 3. Explain advantages and disadvantages of renewable and nonrenewable energy sources that can be used for making electricity, fueling cars or heating homes. 4. 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). 5. 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. 6. Distinguish among reducing, reusing, recycling and replacing as conservation techniques.	**B7**. Describe how earth materials can be conserved by reducing the quantities used, and by reusing and recycling materials rather than discarding them.

Structure and Function - How are organisms structured to ensure efficiency and survival? **New Haven GRADE 3 Unit 4 STC Plants Kit (kits are rotated among schools) , www.newhavenscience.org** (as well as inquiry standards)			
2.2 — Plants change their forms as part of their life cycles.			
Core Science Curriculum Framework	**Underlying Concepts** *Students should understand that…*	**Grade-Level Expectations** *Students should be able to…*	**CMT Expected Performances**
2.2.a. The life cycles of flowering plants include seed germination, growth, flowering, pollination and seed dispersal.	1. Flowering plants progress through a sequenced life cycle. First, seeds sprout (germinate), then seedlings grow into adult plants with leaves and flowers. If the flowers are pollinated, seeds develop that will grow into new plants to continue the life cycle. 2. Roots, stems, leaves, flowers and seeds are structures that develop during different stages of the plant's life cycle. 3. Seeds contain the beginnings of a new plant (embryo) and the food (energy source) the new plant needs to grow until it is mature enough to produce its own food. Different plant varieties produce seeds of different size, color and shape. 4. Environmental conditions, such as temperature, amount of light, amount of water and type of soil, affect seed germination and plant development. 5. A plant's seed will grow into a new plant that resembles but is not identical to the parent plant or to other new plants. For example, marigold plants produce marigold seeds that grow into new marigold plants. Individual marigolds, however, vary in height, number of leaves, etc. 6. Seedlings are young plants that produce the structures that will be needed by the plant to survive in its environment: Roots and leaves begin to grow and take in nutrients, water and air; and the stem starts to grow towards sunlight. 7. Adult plants form more leaves that help the plant collect sunlight and air to make its food. They produce flowers that are the structures responsible for reproduction. 8. Flowers have structures that produce pollen, attract pollinators and produce seeds that can grow into new plants. Some flowers have structures that develop into fruits, berries or nuts that contain the seeds that can grow into new plants. 9. Some seeds fall to the ground and germinate close to the parent plant; other seeds are carried (dispersed) by wind, animals, or water to places far away. The structure of the se is related to the way it is dispersed. **SCIENTIFIC LITERACY TERMINOLOGY:** life cycle, structures (body parts), seed, germinate, reproduce, flower, pollen, pollinator, seed dispersal	1. Use senses and simple tools to observe and describe the roots, stems, leaves, flowers and seeds of various plants (including trees, vegetables and grass.) 2. Use magnifiers to observe and diagram the parts of a flower. 3. Describe the functions of roots, stems, leaves, flowers and seeds in completing a plant's life cycle. 4. Record observations and make conclusions about the sequence of stages in a flowering plant's life cycle. 5. Compare and contrast how seeds of different plants are adapted for dispersal by water, wind or animals. 6. Conduct a fair test to explore factors that affect seed germination and plant growth.	**A19**. Describe the life cycles of flowering plants as they grow from seeds, proceed through maturation and produce new seeds. **A20**. Explore and describe the effects of light and water on seed germination and plant growth.

Heredity and Evolution - What processes are responsible for life's unity and diversity? **New Haven: GRADE 3 Unit 4 STC Plant Growth Kit (kits are rotated among schools) , www.newhavenscience.org** (as well as inquiry standards)			
3.2 — Organisms can survive and reproduce only in environments that meet their basic needs.			
Core Science Curriculum Framework	**Underlying Concepts** *Students should understand that…*	**Grade-Level Expectations** *Students should be able to…*	**CMT Expected Performances**
3.2.a. Plants and animals have structures and behaviors that help them survive in different environments.	1. Plants and animals have physical and behavioral adaptations that allow them to survive in certain environments. Adaptations are passed from parents to offspring. Individuals that happen to be bigger, stronger or faster can have an advantage over others of the same kind for finding food and mates. 2. Animals have behavioral and structural adaptations for getting food. Structural adaptations include things such as specialized teeth for tearing meat or grinding grasses; specialized beaks for cracking seeds, snatching insects, tearing meat or spearing fish; sharp claws for grasping; keen sense of smell, or long, sticky tongues for reaching food. Behavioral adaptations include actions such as following herds of prey animals, spinning webs or stalking. 3. Animals have behavioral and structural adaptations for protection from predators. Some animals have camouflage that allows them to stay concealed by blending in with their surroundings; some animals look like other animals to avoid being eaten. Structural adaptations include things such as sharp quills, hard shells or antlers. Behavioral adaptations include actions such as staying absolutely still, producing a bad odor, appearing or sounding scary, or fleeing. 4. Animals have behavioral and structural adaptations for surviving harsh environmental conditions. Animals that live in cold climates have insulating body coverings such as blubber, down or thick undercoats that keep them warm. Animals that live in hot climates keep cool by releasing heat from big ears or by panting, or by living underground. Some animals survive seasonal changes by slowing down body functions (hibernating in dens, tunnels or mud) or moving to more favorable conditions (migrating). 5. Plants have adaptations for getting the sunlight they need to survive. Examples include growing or facing toward sunlight and sending out chutes or tendrils to get taller than neighboring plants. 6. Plants have adaptations for protection from predators. Examples include spines, thorns and toxins (for example, poison ivy). 7. Plants have adaptations for surviving in different environmental conditions. Examples include dropping leaves in winter when sunlight and water are limited, having needle-shaped leaves that shed snow, or surviving drought by storing water in thick stems. **SCIENTIFIC LITERACY TERMINOLOGY:** adaptation, advantage, camouflage, hibernation, migration	1. 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. 2. Explain how behaviors such as hibernation, dormancy and migration give species advantages for surviving unfavorable environmental conditions. 3. Give examples of ways animals benefit from camouflage. 4. Evaluate whether an adaptation gives a plant or animal a survival advantage in a given environment. 5. Design a model of an organism whose adaptations give it an advantage in a specific environment.	**B3**. Describe how different plants and animals are adapted to obtain air, water, food and protection in specific land habitats. **B4**. Describe how different plants and animals are adapted to obtain air, water, food and protection in water habitats.

Forces and Motion - What makes objects move the way they do? **New Haven : GRADE 4 Unit 1 STC Motion?Design Kit (kits are rotated among schools) , www.newhavenscience.org** (as well as inquiry standards)			
4.1 — The position and motion of objects can be changed by pushing or pulling.			
Core Science Curriculum Framework	**Underlying Concepts** *Students should understand that…*	**Grade-Level Expectations** *Students should be able to…*	**CMT Expected Performances**
4.1.a. The size of the change in an object's motion is related to the strength of the push or pull. **4.1. b.** The more massive an object is, the less effect a given force will have on its motion.	**GRADE-LEVEL CONCEPT 4.1.a.** 1. An object is in motion when its position is changing. Speed describes how far an object moves in a given amount of time (for example, miles per hour). 2. A force is a push or pull that can cause an object to move, stop, or change speed or direction. 3. The greater the force, the greater the change in motion. For example, two people can push a heavy box that could not be pushed by one person alone. 4. Given an object, changing the amount of force applied to it causes measurable effects. 5. When an object does not move in response to a push or a pull, it is because another equal-sized force, such as gravity or friction, is counteracting the push or pull. Gravity (the earth's pulling force) and friction (the force between two surfaces) are common forces that work against motion. **GRADE-LEVEL CONCEPT 4.1.b.** 1. The amount of force needed to move an object is related to the object's mass. 2. The greater the object's mass, the greater the force needed to move it, stop it or change its speed or direction. 3. An object with a small mass is easier to stop or cause a change in motion than an object with a large mass. 4. Given the same amount of force, changing the mass of an object has measurable effects. **SCIENTIFIC LITERACY TERMINOLOGY:** motion, force, speed, gravity, friction, mass	1. Demonstrate that a force can cause an object to start moving, stop, or change speed or direction. 2. 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. 3. 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. 4. Describe how friction forces caused by air resistance or interactions between surface materials affect the motion of objects. 5. Predict the effect of an object's mass on its motion.	**B8.** Describe the effects of the strengths of pushes and pulls on the motion of objects. **B9.** Describe the effect of the mass of an object on its motion.

Matter and Energy in Ecosystems - How do matter and energy flow through ecosystems? **New Haven: GRADE 4 Unit 2 UNH Ecosystems, Literacy habitats books, www.newhavenscience.org**			
4.2 — All organisms depend on the living and nonliving features of the environment for survival.			
Core Science Curriculum Framework	**Underlying Concepts** *Students should understand that…*	**Grade-Level Expectations** *Students should be able to…*	**CMT Expected Performances**
4.2.a. When the environment changes, some organisms survive and reproduce, and others die or move to new locations.	1. Living and nonliving things interact in land and water environments called ecosystems. Every ecosystem has certain conditions ("abiotic factors") and a variety of living things ("organisms") that are adapted for survival in those conditions. Abiotic factors include the quality and amount of air, sunlight, water and soil, as well as the terrain and climate. 2. Organisms depend on other organisms and on the nonliving things in an ecosystem to meet their basic needs for food, water and protection. 3. Plants use energy from the sun to produce their own food from air and water. The type of soil, amount of water and temperature range in an area determine the plants that grow there. 4. Animals that live in an area get their energy and nutrients either directly or indirectly from plants that grow there: herbivores consume only plants, carnivores consume animals, and omnivores consume both animals and plants. Decomposers consume plant and animal waste and remains, returning nutrients to the soil where they are used again by plants. 5. Some of the sun's energy is transferred from one organism to another when a plant or animal is consumed by another animal. A food chain is a simple model that illustrates the passage of energy from one organism to another. Food webs are more realistic models that show the varied energy-passing relationships among plants and animals in an ecosystem. 6. Environments are always changing. Some changes occur naturally (examples include disease outbreaks, violent storms, forest fires sparked by lightning). Other changes are caused by human activity (examples include establishing conservation areas, passing laws to control pollution, clearing forests for agriculture or construction, applying chemicals to lawns and crops, burning fossil fuels, etc.). 7. Changes in an environment are sometimes beneficial to organisms and sometimes harmful. For example, a newly created beaver pond provides habitat that attracts frogs and raccoons to an area; but trees, earthworms and moles are no longer able to survive in the area. 8. When environments change, some organisms can accommodate the change by eating different foods or finding different shelters (for example, hawks nest on city buildings and consume pigeons and rats). Those organisms that can no longer meet their basic needs die or move to new locations. **SCIENTIFIC LITERACY TERMINOLOGY:** ecosystem, organism, abiotic factors, nutrient, producer, consumer, herbivore, carnivore, omnivore, decomposer, food chain, food web	1. Give examples of ways that living and nonliving things are interdependent within an ecosystem. 2. Draw diagrams showing how the sun's energy enters and is transferred from producers to consumers in a local land or aquatic food chain. 3. Design and conduct simple investigations to record interactions among producers, consumers, herbivores, carnivores, omnivores and decomposers in an ecosystem. 4. Analyze food webs to describe how energy is transferred from plants to various animals in an ecosystem. 5. Distinguish between naturally occurring changes in ecosystems and those caused by human activity. 6. Predict the effect an environmental change, such as drought or forest destruction, might have on the community of living things.	**B10**. Describe how animals, directly or indirectly, depend on plants to provide the food and energy they need to grow and survive. **B11**. Describe how natural phenomena and some human activities may cause changes to habitats and their inhabitants.

Energy in the Earth's Systems - How do external and internal sources of energy affect the Earth's systems? **New Haven: GRADE 4 Unit 3 STC Land/Water Kit (kits are rotated among schools) , www.newhavenscience.org**			
4.3 — Water has a major role in shaping the Earth's surface.			
Core Science Curriculum Framework	**Underlying Concepts** *Students should understand that…*	**Grade-Level Expectations** *Students should be able to…*	**CMT Expected Performances**
4.3.a. Water circulates through the Earth's crust, oceans and atmosphere.	1. Water is continuously moving between Earth's surface and the atmosphere in a process called the water cycle. The energy that causes the water cycle comes from the sun. 2. Most precipitation that falls to Earth goes directly into oceans. Some precipitation falls on land and accumulates in lakes and ponds or moves across the land. 3. Rain or snowmelt in high elevations flows downhill in many streams which collect in lower elevations to form a river that flows downhill to an ocean. 4. Water moving across the earth pushes along soil and breaks down pieces of rock in a process called erosion. Moving water carries away rock and soil from some areas and deposits them in other areas, creating new landforms or changing the course of a stream or river. 5. The amount of erosion in an area, and the type of earth material that is moved, are affected by the amount of moving water, the speed of the moving water, and by how much vegetation covers the area. 6. Rivers carve out valleys as they move between mountains or hills. The speed of the river's flow depends on the slope of the land. The speed of the river's flow affects the shape of the river's course (straight or meandering), the shape of the valleys it carves (u-shaped or v-shaped) and the amount of earth material that is pushed along or left behind in floodplains and deltas. 7. Water moving in ocean waves carries sand, shells and debris away from some coastal areas and deposits them in new areas, changing the shape of the coastline. 8. Erosion is constantly reshaping the earth's land surface. Sometimes the effects of erosion are immediate (for example, a flash flood or a hurricane) and sometimes the effects of erosion take a long time (for example, the changing course of a river or the carving of the Grand Canyon). **SCIENTIFIC LITERACY TERMINOLOGY:** water cycle, evaporate, condense, precipitation, erosion, valley, floodplain, delta	1. Describe the role of the sun's energy (i.e., heating and cooling) in the continuous cycling of water between the earth and the atmosphere through evaporation, condensation and precipitation. 2. Use models to demonstrate that topography causes precipitation landing on Earth to move in streams and rivers from higher to lower elevations. 3. 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. 4. 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). 5. 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., silt, pebbles, boulders).	**B12**. Describe how the sun's energy impacts the water cycle. **B13**. Describe the role of water in erosion and river formation.

Energy Transfer and Transformations - What is the role of energy in our world? **New Haven: GRADE 4 Unit 4 STC Electric Circuits Kit includes Go With the Flow Embedded Task (kits are rotated among schools) , www.newhavenscience.org**			
4.4 — Electrical and magnetic energy can be transferred and transformed.			
Core Science Curriculum Framework	**Underlying Concepts** *Students should understand that…*	**Grade-Level Expectations** *Students should be able to…*	**CMT Expected Performances**
4.4.a. Electricity in circuits can be transformed into light, heat, sound and magnetic effects. **4.4.b.** Magnets can make objects move without direct contact between the object and the magnet.	**GRADE-LEVEL CONCEPT 4.4.a.** 1. Electric current flows (is transferred) from an energy source (battery) through a continuous loop (circuit) and back to the source. A complete circuit (also called a closed circuit) forms a closed loop that allows electric current to flow; an incomplete circuit (also called an open circuit) has a break in the loop that prevents the flow of electric current. 2. Complete circuits can be made by connecting wires, batteries and bulbs in certain sequences. Circuits are completed only when certain parts of a battery, a bulb or a wire are touching (making contact). Circuit diagrams show the relative positions of batteries, bulbs and wires in complete circuits. 3. Conductors are materials that allow electric current to flow through them in an electric circuit. An open circuit can be completed by inserting a conductive material. If a bulb stays lit when an object is added to an electric circuit, the material is a conductor. 4. Insulators are materials that do not allow electric current to flow through them in an electric circuit. If a bulb does not stay lit when an object is added to an electric circuit, the material is an insulator. 5. Conductors can be tested to compare how easily they allow electricity to flow through them. 6. Electrical energy is changed (transformed) into light and heat energy as it passes through a bulb in a circuit. Electrical energy can be transformed into sound energy as it passes through a bell or a radio in a circuit. 7. Adding batteries or bulbs to a circuit can produce observable changes. 8. Electricity flowing through an electrical circuit produces magnetic effects in the wires. The electromagnet can be turned on and off, and its strength can be varied and measured. **GRADE-LEVEL CONCEPT 4.4.b.** 1. Magnets pull on ("attract") objects made of iron or that have iron in them. Materials can be identified using magnets, and mixtures of materials can be separated using magnets. 2. Some areas of a magnet have stronger magnetic attraction than other areas. 3. Magnets can pull (attract) or push (repel) other magnets. 4. The ends of a magnet are called "poles." A magnet's poles are often referred to as "north" and "south." When the north pole of one magnet is placed near the north pole of another magnet, they repel each other; when the south pole of one magnet is placed near the south pole of another magnet, they repel each other; when the north pole of one magnet is placed near the south pole of another magnet, they attract each other. 5. A magnet's push or pull can cause a magnetic object or another magnet to move without direct contact. The strength of a magnet's attractive force can be measured by recording the number or mass of the objects it attracts or the distance across which it attracts objects. 6. When a magnet, or a magnetized object such as a compass needle, is allowed to swing freely, its ends will point toward the earth's magnetic north and south poles. **7.** Magnets and electromagnets have many uses in everyday life. Examples may include paper clip containers, refrigerator door seals, shower curtain weights, or a compass. **SCIENTIFIC LITERACY TERMINOLOGY:** magnet, attract (attraction), repel (repulsion), iron, pole, force**,** electric current, energy source, battery, contact, complete (closed) circuit, incomplete (open) circuit, conductor, insulator	1. Construct complete (closed) and incomplete (open) series circuits in which electrical energy is transformed into heat, light, sound and/or motion energy. 2. Draw labeled diagrams of complete and incomplete circuits, explain necessary components and how components can be arranged to make a complete circuit. 3. Predict whether diagrammed circuit configurations will light a bulb. 4. Develop a method for testing conductivity and analyze data to generalize that metals are generally good electrical conductors and nonmetals are not. 5. Observe magnetic effects associated with electricity and investigate factors that affect the strength of an electromagnet. 6. Describe materials that are attracted by magnets. 7. Design procedures to move objects and separate mixtures of solids using magnets. 8. Investigate how magnets react with other magnets and analyze findings to identify patterns in the interactions between north and south poles of magnets. 9. Give examples of uses of magnets (e.g., motors, generators, household devices).	**B14**. Describe how batteries and wires can transfer energy to light a bulb. **B15**. Explain how simple electrical circuits can be used to determine which materials conduct electricity. **B16**. Describe the properties of magnets, and how they can be used to identify and separate mixtures of solid materials.

Energy Transfer and Transformations -What is the role of energy in our world? **New Haven: GRADE 5 Unit 1 UNH Sound Kit , www.newhavenscience.org**			
5.1 — Sound and light are forms of energy.			
Core Science Curriculum Framework	**Underlying Concepts** *Students should understand that…*	**Grade-Level Expectations** *Students should be able to…*	**CMT Expected Performances**
5.1.a. Sound is a form of energy that is produced by the vibration of objects and is transmitted by the vibration of air and objects	**GRADE-LEVEL CONCEPT 5.1.a.** 1. There are a variety of sounds in our environment. Sounds have characteristics, such as loudness, pitch and quality (or "timbre"), that allow them to be identified. 2. For sound to occur, there must be a vibrating object, a material through which the vibrations are transferred (for example, air or water), and a receiver (for example, an ear) to perceive the sound. 3. Objects can be caused to vibrate by actions such as striking, strumming, bowing, plucking or blowing. 4. Sounds can vary in loudness ("volume"). Volume is affected by the strength of the force causing the vibration. For example, striking a drum forcefully or gently produces sounds with different volumes. 5. Sounds can have a high or low tone ("pitch"). The pitch of a sound depends on the speed of the vibration. Objects that vibrate quickly have a high pitch, while those that vibrate slowly have a low pitch. 6. Pitch is affected by characteristics such as the shape, length, tension or thickness of the vibrating material (for example, the vibrating material may be a string, a glass, a wire or a drum). 7. Sound travels (is "transmitted") through materials by causing them to vibrate. Sound is not transmitted if there are no materials to vibrate. Solids, liquids and gases (air) transmit sound differently. 8. Sounds can be reflected or absorbed, depending on the properties of the material it hits. Sound tends to bounce off smooth, hard surfaces, producing an echo; sound tends to be absorbed by soft, porous surfaces, producing a muffled sound.	1. 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). 2. Demonstrate how the loudness, pitch and quality/timbre of sound can be varied. 3. Design and conduct investigations to determine factors that affect pitch. 4. Describe the properties of materials that reflect or absorb sound. 5. Analyze properties of materials that cause sound to be reflected or absorbed, then apply findings to design a device that reflects or absorbs sound. 6. Construct simple musical instruments (e.g., rubber band guitars, drums, etc.) that produce sounds with various pitches, volume and timbres.	B17**. Describe the factors that affect the pitch and loudness of sound produced by vibrating objects.**

Energy Transfer and Transformations -What is the role of energy in our world? **New Haven: GRADE 5 Unit 2 GEMS Color Analyzers/More Than Magnifiers Light Kit , www.newhavenscience.org**			
5.1 — Sound and light are forms of energy.			
Core Science Curriculum Framework	**Underlying Concepts** *Students should understand that…*	**Grade-Level Expectations** *Students should be able to…*	**CMT Expected Performances**
5.1.b. Light is a form of energy that travels in a straight line and can be reflected by a mirror, refracted by a lens, or absorbed by objects.	**GRADE-LEVEL CONCEPT 5.1.b.** 1. Light travels in straight paths away from a source of illumination in all directions until it hits an object. Some sources of illumination produce their own light (for example, the sun, fire, light bulb); other sources of illumination reflect light produced by something else (for example, the moon or a mirror). 2. Light interacts with objects in various ways; it can be reflected off the object, absorbed by the object, or refracted through the object. 3. Materials can be classified based on how much light passes through them. Transparent materials allow most light to pass through them. Translucent materials allow some light to pass through them. Opaque materials do not allow any light to pass through them. 4. Objects that have flat, smooth surfaces reflect light and produce a mirror-like image. Objects that have curved or uneven surfaces scatter the reflected light and produce distorted or blurry images. 5. Light always reflects away from a mirror at the same angle that it hits the mirror. The angle of incoming light equals the angle of reflected light. 6. Objects that block light traveling from a source produce shadows. The shape, length, direction and clarity of a shadow depend on the shape and position of the object. 7. Light changes direction ("refracts") as it passes from one transparent material to another (for example, as it passes from air to water or through lenses. **SCIENTIFIC LITERACY TERMINOLOGY**: reflect, absorb, refract, transparent, translucent, opaque, angle, vibration, transfer, volume, pitch, transmit, reflect, absorb	1. Provide evidence that light travels in straight lines away from a source in all directions. 2. Investigate how light is refracted as it passes through a lens or through one transparent material to another. 3. Demonstrate that white light is composed of many colors. 4. Explain that all visible objects are reflecting some light to the human eye. 5. 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. 6. Measure angles to predict the path of light reflected by a mirror. 7. Determine whether a material is opaque, transparent or translucent based on how light passes through it. 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.	**B18**. Describe how sound is transmitted, reflected and/or absorbed by different materials. B19**. Describe how light is absorbed and/or reflected by different surfaces**

Science and Technology in Society - How do science and technology affect the quality of our lives?

New Haven GRADE 5: Unit 2 GEMS Light Kits , www.newhavenscience.org

5.4 — Humans have the capacity to build and use tools to advance the quality of their lives.

This content standard is an application of the concepts in content standard 5.1 and should be integrated into the same unit.

Core Science Curriculum Framework	Underlying Concepts *Students should understand that…*	Grade-Level Expectations *Students should be able to…*	CMT Expected Performances
5.4.a. Advances in technology allow individuals to acquire new information about the world.	1. People design optical tools (for example, binoculars, telescopes, eyeglasses or periscopes) that enable them to see things better or to see what cannot be seen by human eyes alone. Optical tools change the path of light by reflecting or refracting it. 2. Throughout history new optical technologies have led to new discoveries and understandings that change people's lives. 3. Periscopes allow people to see things that are not within their line of sight (for example, around corners, over walls, under a table, or above the ocean's surface from a submerged submarine). 4. Telescopes make distant objects appear larger (and therefore closer). 5. Magnifiers, such as hand lenses, microscopes or make-up mirrors, make objects appear larger. 6. The shape of a lens or mirror (concave, convex or flat) affects the direction in which light travels: a. Telescopes focus light using a lens that refracts the light (refracting telescope) or a curved mirror that reflects the light (reflecting telescope). b. Periscopes use flat mirrors to reflect light to change its path. c. Magnifying glasses use convex lenses to refract light so that objects appear larger. 7. Some human eyes do not focus light properly onto the retina. Eyeglasses are lenses that improve vision by changing the path of light (refracting it) so it forms an image on the retina. 8. Cameras have parts that function similarly to the human eye: HUMAN EYE | CAMERA | FUNCTION Eyelid | Lens cap | Protect interior parts Pupil | Lens opening | Allow light to enter Cornea, | Lens | Focus light rays on a point Retina | Film (or digital medium) | Respond to light resulting in an image **SCIENTIFIC LITERACY TERMINOLOGY:** optical tool, hand lens, magnifying glass, telescope, periscope, lens, mirror, concave, convex, reflect, refract, focus, camera and eye parts (see chart above)	1. Generalize that optical tools, such as binoculars, telescopes, eyeglasses or periscopes, change the path of light by reflecting or refracting it. 2. Construct simple periscopes and telescopes, and analyze how the placement of their lenses and mirrors affects the quality of the image formed. 3. Evaluate the best optical instrument to perform a given task. 4. 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. 5. Explain how eyeglasses or contact lenses improve vision by changing the path of light to the retina. 6. Analyze the similarities and differences between structures of the human eye and those of a simple camera.	**B24**. Compare and contrast the structures of the human eye with those of the camera. **B25**. Describe the uses of different instruments, such as eye glasses, magnifiers, periscopes and telescopes, to enhance our vision.

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

Core Science Curriculum Framework	Underlying Concepts *Students should understand that…*	Grade-Level Expectations *Students should be able to…*	CMT Expected Performances
5.2.a The sense organs perceive stimuli from the environment and send signals to the brain through the nervous system.	1. Animals have sense organs that are structured to gather information about their environment. Information perceived by the senses allows animals to find food, water, mates and protection. 2. Each sense organ perceives specific kinds of stimuli. Some human senses are more or less developed than the senses of other animals. 3. Sense organs transfer information through a network of nerves to the brain where it is interpreted and responded to. The brain responds by sending messages to all parts of the body. The type of response and the amount of time it takes for the response to occur vary depending on the stimulus. 4. The human ear is structured to collect sound vibrations from the environment and pass them through the middle ear (eardrum and small bones) and inner ear (hair-lined tubes) to the auditory nerve where they are transformed into electrical signals that are sent to different parts of the brain. 5. The human eye is structured to collect light through the cornea and the pupil. The amount of light that enters the eye is controlled by the iris. The cornea and the lens refract the light and focus it onto the retina and the optic nerve where it is transformed into electrical signals that are sent to different parts of the brain. 6. For anything to be visible, light must be present. For a person to see an object, the light it reflects or produces must have a straight, unobstructed path to the eye. 7. Human eyes have receptors for perceiving shades of red, orange, yellow, green, blue, indigo and violet. 8. Sunlight (or "white light") is a combination of colors. White light passed through prisms, water droplets or diffraction gratings can be refracted to show its component colors: red, orange, yellow, green, blue, indigo and violet. 9. The perceived color of an object depends on the color of the light illuminating it and the way the light interacts with the object. The color humans see is the color that is reflected by the object. For example, an object that appears green is absorbing all colors except green, which is reflected to the eye. 10. Human skin is structured to detect information related to texture, temperature, pressure and vibration. Each sensation has different receptors distributed around the body; some areas of the body have greater concentrations of receptors for certain sensations, making those areas more sensitive than others to texture, temperature, or pressure. 11. Human noses are structured to collect and detect chemicals floating in the air (odors). Tiny hairs behind the nose have special receptors that respond to airborne chemicals and produce electrical signals that are transmitted to different parts of the brain by the olfactory nerve. 12. Human tongues are sense organs that are structured for detecting chemicals dissolved in saliva (flavors). Taste buds respond to 4 basic tastes: salty, sweet, sour and bitter. Special receptors in taste buds respond to tastes and produce electrical signals that transmit information through nerves to different parts of the brain. **SCIENTIFIC LITERACY TERMINOLOGY:** sense organ, receptor, stimulus, response, nervous system, vibration, reflect, refract, cornea, pupil, iris, lens, retina, white light, absorb	1. Explain the role of sensory organs in perceiving stimuli (e.g., light/dark, heat/cold, flavors, pain, etc.) 2. Pose testable questions and design experiments to determine factors that affect human reaction time. 3. Conduct simple tests to explore the capabilities of the human senses. 4. Summarize nonfiction text to explain the role of the brain and spinal cord in responding to information received from the sense organs. 5. Identify the major structures of the human eye, ear, nose, skin and tongue, and explain their functions. 6. Draw diagrams showing the straight path of light rays from a source to a reflecting object to the eye, allowing objects to be seen. 7. Describe the properties of different materials and the structures in the human eye enable humans to perceive color.	**B20**. Describe how light absorption and reflection allow one to see the shapes and colors of objects. **B21**. Describe the structure and function of the human senses and the signals they perceive.

Earth in the Solar System - How does the position of Earth in the solar system affect conditions on our planet? **New Haven: GRADE 5 Unit 4 GEMS Earth, Moon, Stars Kit , www.newhavenscience.org**			
5.3 — Most objects in the solar system are in a regular and predictable motion.			
Core Science Curriculum Framework	**Underlying Concepts** *Students should understand that…*	**Grade-Level Expectations** *Students should be able to…*	**CMT Expected Performances**
5.3.a. The positions of the earth and moon relative to the sun explain the cycles of day and night, and the monthly moon phases.	1. The sun, Earth and its moon are spherical objects that move in two ways: they spin (rotate) and they change positions relative to each other (revolve). 2. The sun is a star that produces light that travels in straight lines away from the sun in all directions. Light from the sun illuminates objects that reflect light, including Earth and its moon. The side of the earth that is facing the sun experiences daylight; the side of the earth facing away from the sun experiences night. All parts of the earth experience a cycle that includes both day and night, providing evidence that the earth is rotating on its axis. 3. The amount of time it takes for the earth to rotate once on its axis is regular and predictable (24 hours), and is called "a day." Earth's rotation makes it appear as if the sun is moving across the sky from east to west. 4. The moon is a rocky object that revolves around the earth in a circular path called an orbit. The amount of time it takes for the moon to revolve once around the earth is about 29 days and is called a "lunar month." 5. Half of the moon is always illuminated by the sun. Phases of the moon occur because a different portion of the lit half of the moon is visible from Earth each day as the moon revolves around the earth. 6. The changes in the moon's phases occur in a regular and predictable sequence. At predictable periods during the lunar cycle, the moon is visible in either the daytime or the nighttime sky. 7. At the beginning of a lunar month, no lit part of the moon is visible from Earth (new moon). As the moon progresses through the first two quarters of its complete trip around the earth, larger portions of the right side of the moon are illuminated each day. When the moon has completed half its trip around the earth, the full moon is illuminated. During the third and fourth quarters of the moon's trip around the earth, the illuminated portion gradually decreases so only the left side is illuminated and finally no lit portion of the moon is visible from Earth again. 8. Like the sun, the moon appears to rise at the eastern horizon and set at the western horizon due to the earth's rotation. From one day to the next, when observed at the same time from the same location, the moon's position in the sky varies in predictable ways. **SCIENTIFIC LITERACY TERMINOLOGY:** sphere, illuminate, reflect, rotate, day/night cycle (24-hour rotation period), horizon, orbit, revolve, month (one lunar cycle), moon phase, new moon	1. Explain the motion of the earth relative to the sun that causes Earth to experience cycles of day and night. 2. 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. 3. Distinguish between the sun as a source of light and the moon as a reflection of that light. 4. Observe and record the moon's appearance over time and analyze findings to describe the cyclical changes in its appearance from Earth (moon phases). 5. 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.	**B22**. Explain the cause of day and night based on the rotation of Earth on its axis. **B23**. Describe the monthly changes in the appearance of the moon, based on the moon's orbit around the Earth.

Grades 6-8 Core Scientific Inquiry, Literacy and Numeracy , www.newhavenscience.org

How is scientific knowledge created and communicated?

Content Standards	Expected Performances
SCIENTIFIC INQUIRY ♦Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena. ♦Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation. ♦Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists. **SCIENTIFIC LITERACY** ♦Scientific literacy includes speaking, listening, presenting, interpreting, reading and writing about science. ♦Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media. **SCIENTIFIC NUMERACY** ♦Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas.	**C INQ.1** Identify questions that can be answered through scientific investigation. **C INQ.2** Read, interpret and examine the credibility of scientific claims in different sources of information. **C INQ.3** Design and conduct appropriate types of scientific investigations to answer different questions. **C INQ.4** Identify independent and dependent variables, and those variables that are kept constant, when designing an experiment. **C INQ.5** Use appropriate tools and techniques to make observations and gather data. **C INQ.6** Use mathematical operations to analyze and interpret data. **C INQ.7** Identify and present relationships between variables in appropriate graphs. **C INQ.8** Draw conclusions and identify sources of error. **C INQ.9** Provide explanations to investigated problems or questions. **C INQ.10** Communicate about science in different formats, using relevant science vocabulary, supporting evidence and clear logic.

Matter and Energy in Ecosystems – How do matter and energy flow through ecosystems?

New Haven GRADE 6: Unit 1 Prentice Hall Text/ STC Ecosystems Kit (kits are rotated among schools) , www.newhavenscience.org

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

Core Science Curriculum Framework	Underlying Concepts Students should understand that…	Grade-Level Expectations Students should be able to…	CMT Expected Performances
6.2.a. Populations in ecosystems are affected by biotic factors, such as other populations, and abiotic factors, such as soil and water supply. **6.2.b.** Populations in ecosystems can be categorized as producers, consumers and decomposers of organic matter.	**GRADE-LEVEL CONCEPT 6.2.a.** 1. An ecosystem is the complex interplay between the living organisms and physical environment in a specific area. 2. Ecosystems can be categorized into abiotic and biotic components. Abiotic components include nonliving things such as soil, minerals, climate, water, sunlight, and wind. Biotic components include all living things. 3. Interactions among biotic and abiotic factors support the flow of energy and cycling of materials in ecosystems. For example, air temperature, availability of water and amount of wind influence the growth of certain species of plants in an area, plant species provide food for animal populations, and plants and animals cycle oxygen and carbon dioxide. 4. Soil is a mixture of materials that includes weathered rocks and decomposed organic material, as well as air and water. Soils vary from place to place. The composition of soils affects how air and water move through the soil, and this influences the kinds of plants that can grow in it. 5. Water is a mixture of materials that includes dissolved oxygen and minerals as well as suspended sediments and debris. 6. Soil and water provide important habitats for plants and animals within ecosystems. **GRADE-LEVEL CONCEPT 6.2.b.** 1. The sun is the main source of energy on Earth. During photosynthesis, green plants use the energy of sunlight to change the elements in carbon dioxide (CO_2) and water (H_20) into materials (simple carbohydrates) that are a source of energy for the plant to carry on its life processes. 2. Photosynthesis is affected by abiotic factors such as amount of sunlight, availability of water and air temperature. 3. Green plants are the producers in an ecosystem; they rely directly on sunlight to produce the materials they use for energy. 4. Plants are a source of energy (food) and nutrients for animals that consume them. Energy passed to consumers that eat plants came indirectly from the sun as a result of photosynthesis. Some animals consume plants, and other animals consume animals that eat plants in predator-prey relationships. 5. Consumers are adapted for eating different foods: *herbivores* are consumers that eat only plants; *carnivores* are consumers that eat only animals; *omnivores* are consumers that eat both plants and animals. 6. Decomposers (mainly bacteria and fungi) consume dead plants and animals and break down the organic materials, thus returning nutrients to the environment for reuse by other organisms. 7. Plants and animals within an ecosystem interact in various ways as they compete for limited resources. Relationships among organisms can be beneficial or harmful to one or both organisms. 8. Food chains are models that show how materials and energy are transferred from producers to different levels of consumers in an ecosystem. The basis of every food chain is the energy stored in green plants. 9. Food webs are models that show the complex variety of energy sources available to most consumers in an ecosystem.	1. Analyze and interpret how biotic and abiotic factors interact within a given ecosystem. 2. Design and conduct a scientific investigation to explore the porosity and permeability of soils and their ability to support different plant life. 3. Defend the statement, "The sun is the main source of energy on Earth." 4. Express in general terms how plants and other photosynthetic organisms use the sun's energy. 5. Investigate and report on the effects of abiotic factors on a plant's ability to photosynthesize. 6. Compare and contrast how energy and matter flow in a Connecticut ecosystem emphasizing the interactions among producers, consumers and decomposers. 7. Identify local examples of predator-prey relationships and justify the impact of each type of population on the other. 8. Create and interpret graphs that illustrate the fluctuation of populations over time. 9. Distinguish a food chain from a food web and identify local examples of each.	**C4.** Describe how abiotic factors, such as temperature, water and sunlight, affect the ability of plants to create their own food through photosynthesis. **C5.** Explain how populations are affected by predator-prey relationships. **C6.** Describe common food webs in different Connecticut ecosystems.

	10. Connecticut has forest and park ecosystems, as well as fresh water and marine ecosystems that include a variety of plants and animals. 11. An energy pyramid is a model that shows the use of energy in an ecosystem. A large number of producers and primary consumers support a smaller number of higher-level consumers due to the consumption and loss of energy at each consumer level. 12. Populations of species within an ecosystem are affected by the availability of resources such as food, water, living space, or mates. Populations can be reduced or increased by environmental changes caused by nature (for example, droughts, forest fires or disease) and by humans (climate change, land development or overhunting). 13. Predator-prey relationships help to maintain a balanced ecosystem. Increases or decreases in prey populations result in corresponding increases or decreases in predator populations. Predators limit the size of prey populations, increasing the variety of species that can live in an area. Fluctuations over time in populations of interacting species can be represented in graphs. 14. All organisms cause changes in the environment where they live. Some of the changes caused by organisms can be helpful to the ecosystem and others can damage the ecosystem. **SCIENTIFIC LITERACY TERMINOLOGY:** ecosystem, organisms, population, biotic factor, abiotic factor, food chain, photosynthesis, producer, consumer, herbivore, carnivore, omnivore, food web, predator, prey	10. Explain the impact of environmental conditions such as climate, elevation, topography or water quality on food chains. 11. Predict what will happen to a population based upon current trends (fires, disease, overhunting, development) and defend the prediction.	

Energy in the Earth's Systems – How do external and internal sources of energy affect the Earth's systems

New Haven GRADE 6 Unit 2 Prentice Hall Text/NeoSci/Foss Weather Kits , www.newhavenscience.org

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

Core Science Curriculum Framework	Underlying Concepts *Students should understand that…*	Grade-Level Expectations *Students should be able to…*	CMT Expected Performances
6.3.a Local and regional weather are affected by the amount of solar energy the area receives and proximity to a large body of water.	1. Earth is surrounded by layers of gases (atmosphere) that influence the environment and support life. Weather on Earth is caused by the daily changes in the temperature, pressure and amount of moisture in the lower atmosphere. Regions of the earth experience distinct long-term climate conditions caused, in part, by different amounts of solar energy they receive. 2. Heat energy causes molecules to move. The molecules that make up all matter are in constant motion. Solids, liquids and gases differ in the movement and arrangements of their molecules. Molecules in gases move randomly and independently of one another. Molecules in liquids move around each other randomly, but are loosely held together by an attraction force. Molecules in solids are closely locked in a patterned position and can only vibrate back and forth. 3. When heat energy is added to a substance, its molecules move faster (increased temperature) and spread apart from each other (become less densely arranged). When heat energy is removed, molecules move slower (decreased temperature) and come together (become more densely arranged). 4. If enough heat energy is absorbed by a solid or a liquid, the molecules may overcome the forces holding them together and change to a new state of matter. Solids change to liquids (melt) and liquids change to gases (vaporization) when heat energy is absorbed from the surroundings. Conversely, heat energy is given off when gases change to liquids (condensation) or liquids change to solid (freezing). 5. Different surfaces on Earth absorb and release solar energy at different rates. Land has a lower heat capacity than water; therefore land temperatures change more rapidly than water temperatures do. The surface temperature of large bodies of water, such as the oceans that cover a great deal of the earth, affects the temperature of the air above them. 6. Earth's atmosphere (air) is a mixture of different amounts of gases (mainly nitrogen, followed by oxygen, carbon dioxide and water vapor). Air molecules constantly press on and around objects on Earth (air pressure). Due to the pulling force of Earth's gravity, air close to Earth is more dense than air higher in the atmosphere; denser air causes greater air pressure. 7. Wind is caused by air moving from areas of high pressure to low pressure. Cool, dense air is high pressure and tends to sink; warm, less dense air is low pressure and tends to rise. Local and global winds move in predictable patterns based on uneven heating of Earth's surface. 8. Local winds can be influenced by atmospheric conditions, terrain (mountain, deserts) and closeness to large bodies of water. Near coastal areas, the day to night temperature and pressure differences between land and water cause local winds to blow from ocean to land ("sea breeze") during day and from land to ocean ("land breeze") at night. 9. Global winds are caused by the circulation of cold, dense polar air and warm, less dense equatorial air. The rotation of the earth, combined with the location of the continents, causes bands of wind patterns on the earth. For example, weather tends to move generally from west to east. 10. Large bodies of water absorb heat energy, causing water to evaporate. The amount of water vapor in the atmosphere (humidity) is dependant on the temperature of the air. Warm air holds more water vapor than cool air. As warm, humid air rises and cools, its molecules become more	1. Compare the composition and structure of the Earth's atmospheric layers. 2. Demonstrate how changes in temperature, pressure, moisture and density of air affect weather patterns (e.g., air masses and air pressure.) 3. Describe in writing how solar energy drives Earth's weather systems. 4. Investigate and report on how the introduction of heat affects the motion of particles and the distance between them. 5. Illustrate the transfer of energy as matter changes phase. 6. Design, conduct and report in writing an investigation that reveals different substances absorb and release heat at different rates. 7. Research and give examples of heat transfer and local weather differences in Connecticut. 8. Investigate and explain the movement of local winds, including "sea breezes" and "land breezes," based upon the uneven heating of the Earth's surface and a change in air pressure. 9. Examine and explain that global winds are caused by uneven heating of the Earth's surface and the rotation of the Earth. 10. Design a weather forecast based upon collected weather data.	**C7.** Describe the effect of heating on the movement of molecules in solids, liquids and gases. **C8.** Explain how local weather conditions are related to the temperature, pressure and water content of the atmosphere and the proximity to a large body of water. **C9.** Explain how the uneven heating of the Earth's surface causes winds and affects the seasons.

	closely spaced and the water vapor condenses into tiny water droplets that are less dense than air (clouds). 11. Weather on Earth is caused by daily variations in the temperature, pressure and humidity of different bodies of air (air masses). Warm, moist, less dense air masses rise, thus decreasing air pressure usually indicates that cloudy, wet, warmer weather is approaching. Cool, dry, denser air masses sink, thus increasing air pressure usually indicates clear, dry, cooler weather is approaching. 12. When masses of warm, moist air interact with masses of cool, dry air, the boundary is called a warm front. The way in which the air masses move past one another influences the type of weather that results. Weather predictions can be made based on the pattern of warm, wet, low pressure air being typically followed by cool, dry, high pressure air. 13. Connecticut, and the northeast in general, often has rapidly changing weather because three patterns of moving air interact here: cold, dry air from the north, warm, moist air from the Atlantic ocean coastline, and air moving across the US from west to east. **SCIENTIFIC LITERACY TERMINOLOGY:** molecule, dense, solid, liquid, gas, melting, freezing, condense, evaporate, air pressure, humidity, air mass, cold/warm front, precipitation, global wind, sea breeze, land breeze.		

Science and Technology in Society – How do science and technology affect the quality of our lives?

New Haven GRADE 6 Unit 3 Prentice Hall Text/ URI Watersheds Includes DigIn Embedded Task , www.newhavenscience.org

6.4 — Water moving across and through earth materials carries with it the products of human activities.

This content standard is an application of the concepts in content standard 6.2 and should be integrated into the same unit.

Core Science Curriculum Framework	Underlying Concepts *Students should understand that…*	Grade-Level Expectations *Students should be able to…*	CMT Expected Performances
6.4.a Most precipitation that falls on Connecticut eventually reaches Long Island Sound.	1. Water is essential for life and is a distinguishing feature of Earth among the planets in our solar system. Humans and other organisms use water in various ways. 2. The surface of Earth is largely covered with water, most of which is saltwater found in oceans. Only freshwater is drinkable, and it is found on the land (surface water), beneath the ground (groundwater), and frozen in glaciers. 3. Water is a universal solvent that dissolves and carries many substances through the environment (for example, acid rain, calcium, carbon dioxide, oxygen, salt, metals, etc). Many substances that are dissolved in water may be either harmful (pollutants) or beneficial to organisms (minerals, oxygen, nutrients). Water temperature affects its ability to dissolve substances such as oxygen and salt. 4. Some water that falls to Earth as precipitation soaks into the ground, some evaporates almost immediately, and some moves across earth's surfaces filling streams, rivers and reservoirs. Factors affecting whether water seeps into the ground include the amount of rainfall, the length of time it falls, the permeability of the ground surface and subsurface, the saturation of the soil, and the steepness (slope) of the land. 5. Water moving beneath the earth's surface is influenced by size of and spaces between the particles in rock and soils. 6. Water moving across the earth's surface is affected by the shape and slope of the land and the properties of the surface materials it encounters. The area draining into a river system or other body of water is a watershed. Folds and faults in Connecticut's landform cause water to move generally from north to south, eventually draining into Long Island Sound. 7. Water moving through a watershed picks up, suspends or dissolves various substances produced by nature and by human activities. The quality and usability of water depends on what materials have been picked up, carried and concentrated in the water. 8. Water quality is important to support a variety of aquatic life and for human consumption. Water quality is evaluated by measuring indicators such as levels of dissolved oxygen, pH, turbidity and the presence of other dissolved substances. Substances such as heavy metals (e.g., lead and aluminum), sulfur, fertilizers, road salt are pollutants that may be dissolved in surface water or ground water, making the water unhealthy. 9. Water entering Long Island Sound carries with it the products of human use. These pollutants negatively impact the aquatic life, commercial and recreational uses of the Sound. 10. Point source pollution, such as untreated sewage, industrial or recreational waste, can be discharged directly into the Sound if it is not regulated and controlled. 11. Nonpoint source pollution is difficult to trace or control because it originates across the large watershed area that drains into Long Island Sound. A major contaminant reaching Long Island Sound by way of watersheds is nitrogen. 12. Drinking water may come from groundwater sources accessed by drilling wells, or from surface	1. Discuss and chart the reasons why water is essential for life. 2. Observe, analyze and record the unique physical and chemical properties of water. 3. 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. 4. Investigate and explain in writing how substances, both harmful and beneficial, dissolve in and are carried by surface and ground water. 5. 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. 6. Research and evaluate in writing the effects of common point and non-point water pollutants in Connecticut. 7. Compare and contrast the general structures, processes and limitations of a septic system to a secondary wastewater treatment plant. 8. Debate the effectiveness of a law designed to protect water resources.	**C10.** Explain the role of septic and sewage systems on the quality of surface and ground water. **C11.** Explain how human activity may impact water resources in Connecticut, such as ponds, rivers and the Long Island Sound ecosystem.

	water reservoirs. 13. People's use of water adds waste products and harmful materials to the water which must be removed before returning the water to the environment. Wastewater can be purified using various physical, biological and chemical processes. 14. Septic systems use settling and bacterial digestion to break down wastes in a holding tank; then the water is further purified as it is spread across a leaching field and percolates through layers of soil. 15. Sewage treatment facilities are required in densely populated areas. Sewage treatment facilities use multiple filtration, biological and chemical methods to purify water before returning the water to the environment. 16. Laws, regulations and remedial actions have helped to protect and restore water resources. **SCIENTIFIC LITERACY TERMINOLOGY:** surface water, ground water, fresh water, salt water, pollutant, watershed, point source pollution, nonpoint source pollution, well, septic system, wastewater		

Energy Transfer And Transformations – What is the role of energy in our world? **New Haven GRADE 6 Unit 4 DSM/NeoSci/FOSS Simple Machines Levers Kit , www.newhavenscience.org**			
7.1 — Energy provides the ability to do work and can exist in many forms.			
Core Science Curriculum Framework	**Underlying Concepts** *Students should understand that…*	**Grade-Level Expectations** *Students should be able to…*	**CMT Expected Performances**
7.1.a Work is the process of making objects move through the application of force. **7.1.b** Energy can be stored in many forms and can be transformed into the energy of motion.	**GRADE-LEVEL CONCEPT 7.1.a.** 1. In order for an object to change its motion, a push/pull (force) must be applied over a distance. 2. Forces can act between objects that are in direct contact, such as pulling directly on a string or friction acting on a sliding block. Forces can act over a distance, such as gravity or magnetism. Forces are measured in Newtons or pounds using scales. 3. Work is a scientific concept that expresses the mathematical relationship between the amount of force needed to move an object and how far it moves. For work to be done, a force must be applied for a distance in the same direction as the motion. An object that does not move has no work done on it, even if forces are being applied. 4. Work (measured in Joules) is calculated by multiplying the force (measured in Newtons) times the distance (measured in meters). When an object is lifted, the work done is the product of the force of gravity (weight) times the height the object is lifted. The amount of work done is increased if more force is applied or if the object is moved a greater distance. 5. Simple machines can be used to move objects. People do "input" work on a simple machine which, in turn, does "output" work in moving an object. Simple machines are not used to change the amount of work to move or lift an object; rather, simple machines change the amount of effort force and distance for the simple machine to move the object. 6. Simple machines work on the principle that a small force applied over a long distance is equivalent work to a large force applied over a short distance. 7. Some simple machines are used to move or lift an object over a greater output distance (snow shovel), or change direction of an object's motion, but most are used to reduce the amount of effort (input force) required to lift or move an object (output force). 8. An inclined plane is a simple machine that reduces the effort force needed to raise an object to a given height. The effort force and distance and output force and distance depend on the length and height (steepness) of the inclined plane. 9. A pulley is a simple machine that reduces the effort force needed to lift a heavy object by applying the force through a greater distance (pulling more rope through the pulley). The effort force and distance, output force and distance, and direction of motion all depend on the number of pulleys and their position. 10. A lever is a simple machine that reduces the effort force needed to lift a heavy object by applying the force at a greater distance from the fulcrum of the lever. The effort force and distance, output force and distance, and direction of motion all depend on the position of the fulcrum in relationship to the input and output forces. 11. The mechanical advantage of a simple machine indicates how useful the machine is for performing a given task by comparing the output force to the input force. The mechanical advantage is the number of times a machine multiplies the effort force. The longer the distance over which the effort force is applied, the greater the mechanical advantage of the machine. 12. The mechanical advantage of a machine can be calculated by dividing the resistance force by the effort force. Most of the time the resistance force is the weight of the object in Newtons. 13. Simple machines always produce less work output than work put in, because some motion energy is converted to heat and sound energy by friction.	1. Conduct simple experiments that show and explain how forces work to change the motion of an object. 2. Calculate work done on an object as force or distance varies. 3. Explain in writing how the six simple machines make work easier but do not alter the amount of work done on an object and demonstrate how everyday objects function as simple machines 4. Determine ways to modify a simple machine (inclined plane, pulley and lever) to improve its mechanical advantage. 5. Defend the statement, "Work output of a machine is always less than work input because of energy lost due to friction." 6. Design and create a working compound machine from several simple machines. 7. 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. 8. Discuss different forms of energy and describe how they can be converted from one form to another for use	**C12.** Explain the relationship among, force, distance and work, and use the relationship ($W = F$ x D) to calculate work done in lifting heavy objects. **C13.** Explain how simple machines, such as inclined planes, pulleys and levers, are used to create mechanical advantage. **C14.** Describe how different types of stored (potential) energy can be used to make objects move.

	GRADE-LEVEL CONCEPT 7.1.b. 1. Energy is the ability to cause objects to change position (motion). 2. Potential energy is the capacity for doing work that a body possesses because of its position or condition. Gravitational potential energy (an object about to roll down a hill), elastic potential energy (a stretched rubber band) and chemical potential energy (carbohydrates in foods). 3. Kinetic energy is energy a body possesses because it is in motion. 4. Energy can be changed (transformed) from one form to another. For example, potential chemical energy of foods, which is often measured in Calories, is transformed by cells into heat, electrical and kinetic energy used in the body. 5. When energy is transformed, the total amount of energy stays constant (is conserved). 6. Work is done to lift an object, giving it gravitational potential energy (weight x height). The gravitational potential energy of an object moving down a hill is transformed into kinetic energy as it moves, reaching maximum kinetic energy at the bottom of the hill. 7. Some kinetic energy is always transformed into heat by friction; therefore, the object will never reach the same height it started from again without added energy. **SCIENTIFIC LITERACY TERMINOLOGY:** Force, friction, gravity, weight, newton, scale, work, joule, effort (input) force, output force, simple machine, lever, fulcrum, pulley, inclined plane, mechanical advantage, energy, potential energy, kinetic energy, energy transformation, conservation of energy.	by humans (e.g., thermal, electrical, light, chemical, mechanical). 9. Trace energy conversions that occur in the human body once food enters and explain the conversions in writing. 10. Calculate potential and kinetic energy and relate those quantities to total energy in a system.	

Properties of Matter- How does the structure of matter affect the properties and uses of materials?

New Haven GRADE 7: Prentice Hall Matter Text Unit 1, 2 Matter and Chemistry , www.newhavenscience.org

6.1 — Materials can be classified as pure substances or mixtures, depending on their chemical and physical properties.

Core Science Curriculum Framework	Underlying Concepts Students should understand that…	Grade-Level Expectations Students should be able to…	CMT Expected Performances
6.1.a. Mixtures are made of combinations of elements and/or compounds, and they can be separated by using a variety of physical means. **6.1.b** Pure substances can be either elements or compounds, and they cannot be broken down by physical means.	**GRADE-LEVEL CONCEPT 6.1.a.** 1. Everything is made of matter. Matter has two fundamental properties: it has weight (mass) and it takes up space (volume). 2. All matter has a variety of properties, some of which are characteristic of the substance. Characteristic properties do not depend on the amount of the substance (as mass and volume do). Properties such as magnetic attraction, conductivity, density, pH, boiling point and solubility are characteristic properties that can be used to identify substances. 3. Solids, liquids or gases can be combined to form mixtures. In a mixture, each substance keeps its individual properties. In some mixtures, each of the components can be seen (for example, rocks, twigs, insects and leaves are visible components of soil); in other mixtures, the individual substances blend so well that they appear to be a single substance (for example, oxygen, nitrogen and carbon dioxide are mixed together to form air). 4. Mixtures can be separated using different methods, depending on the physical properties of the component substances. Filtering, evaporating, floating/settling, dissolving, and using magnets are all methods for separating mixtures based on the properties of their components. 5. Solutions are mixtures that appear to be single substances because particles have dissolved and spread evenly throughout the mixture. Not all separation methods are effective for separating the components of solutions. **GRADE-LEVEL CONCEPT 6.1.b.** 1. All matter is made of particles called atoms that are too small to be seen without special magnification. For example, a gold ring can be broken into smaller and smaller pieces until the pieces are no longer visible. 2. All matter is made of different combinations of about 100 pure substances called elements. The smallest particle of an element is an atom. Iron is an example of an element that is made up of only iron atoms. 3. Each element has distinct characteristic properties. The Periodic Table of Elements is used to organize elements based on properties such as their reactivity, state of matter, conductivity or density. Element names are represented by letter symbols on the Periodic Table. 4. Some elements, such as iron (“Fe”) and aluminum (“Al”), are classified as *metals* because they have similar properties. Individual metallic elements have distinct characteristic properties (for example, sodium (“Na”) is a light, soft metal that is nonmagnetic, while iron is a magnetic metal that is denser than sodium and aluminum). 5. Some elements, such as carbon (“C”), hydrogen (“H”), oxygen (“O”) and chlorine (“Cl”), are classified as *nonmetals*. Carbon is a nonmetal that occurs in several different forms (graphite, diamond, and coal), each of which has distinct properties. Hydrogen and oxygen are nonmetals that are similar in that they are both gases; however, each gas has distinct properties such as reactivity or flammability. 6. Atoms can combine chemically to make a molecule of a new substance with new properties called a compound. A molecule is the smallest part of a compound and is made of atoms of different	1. Describe the structure of the atom and its component parts. 2. Explain that density (mass/volume) is a characteristic property that can be used to identify an element or substance. 3. Compare and contrast the properties of a metal (aluminum, iron, etc.) with a non-metal (oxygen, carbon, etc.) 4. Illustrate the differences in the physical and chemical properties of a molecule and the individual atoms that bonded to form that molecule. 5. Differentiate between a mixture and an element or compound and identify examples. 6. Conduct and report on an investigation that uses physical means such particle size, density, solubility and magnetism to separate substances in a mixture. 7. Use the patterns in the Periodic Table to locate metals, semi-metals and non-metals and to predict the general characteristics of an element.	**C1.** Describe the properties of common elements, such as oxygen, hydrogen, carbon, iron and aluminum. **C2.** Describe how the properties of simple compounds, such as water and table salt, are different from the properties of the elements of which they are made. **C3.** Explain how mixtures can be separated by using the properties of the substances from which they are made, such as particle size, density, solubility and boiling point.

	elements in specific amounts. Unlike mixtures, compounds cannot be separated using the physical properties of the component elements. 7. Compounds have different properties than the individual elements of which they are made. For example, table salt (NaCl) is a compound with different characteristic properties than the elements sodium and chlorine from which it is made; water (H_20) is a compound with different characteristic properties than the elements hydrogen and oxygen from which it is made. Different amounts of the same elements can produce compounds with different properties (for example, water (H_20) and hydrogen peroxide (H_20_2). 8. In a chemical reaction, atoms can rearrange to form different molecules of new compounds. During photosynthesis, carbon dioxide (CO_2) is taken in by green plants and combined with water (H_2O). The carbon, hydrogen and oxygen atoms rearrange to make two new compounds: glucose (made of atoms of carbon, oxygen, and hydrogen) and oxygen gas (made of atoms of oxygen). 9. In a chemical reaction, the same amount of matter (mass) is present at the start and the end, since the atoms are not created or destroyed but simply rearrange. **SCIENTIFIC LITERACY TERMINOLOGY:** Characteristic property, mass, weight, volume, density, solubility, boiling point, mixture, solution, particle, atom, element, molecule, compound, metal, non-metal, chemical reaction		

Structure and Function – How are organisms structured to ensure efficiency and survival? **New Haven GRADE 7 Prentice Hall Cells Text Units 3 Cells , www.newhavenscience.org**			
7.2 — Many organisms, including humans, have specialized organ systems that interact with each other to maintain dynamic internal balance.			
Core Science Curriculum Framework	**Underlying Concepts** *Students should understand that…*	**Grade-Level Expectations** *Students should be able to…*	**CMT Expected Performances**
7.2.a All organisms are composed of one or more cells; each cell carries on life-sustaining functions. .	**GRADE-LEVEL CONCEPT 7.2.a.** 1. Living things have characteristics that distinguish them from nonliving things. Living things use energy, respond to their environment, grow and develop, produce waste and reproduce. 2. Organisms are made of tiny cells that perform the basic life functions and keep the organism alive. Many organisms (for example yeast, algae) are single-celled and many organisms (for example plants, fungi and animals) are made of millions of cells that work in coordination. 3. All cells come from other cells and they hold the genetic information needed for cell division and growth. When a body cell reaches a certain size, it divides into two cells, each of which contains identical genetic information. This cell division process is called mitosis. 4. The cell is filled with a fluid called *cytoplasm*; cells contain discrete membrane-enclosed structures called *organelles*. Each of the organelles performs a specific cellular function and it can be identified by its shape. ▪ The nucleus contains the genetic materials (chromosomes), and it directs the cell activities, growth and division. ▪ The mitochondrion contains enzymes that break down sugars and release chemical energy. One cell can contain hundreds of mitochondria. 1. The entire cell is surrounded by the plasma membrane which controls the flow of materials into and out of the cell. **SCIENTIFIC LITERACY TERMINOLOGY:** structure, function, cell, mitosis, organelle, cytoplasm, nucleus, cell membrane, mitochondrion, tissue, organ, system	1. Compare and contrast living organisms that are single celled with multicellular organisms. 2. Illustrate and describe in writing the structure and the function of the cell membrane, cytoplasm, mitochondria and nucleus in an animal cell. 3. Explain how the structure and function of multicellular organisms (animals) is dependent on the interaction of cells, tissues, organs and organ systems.	**C15.** Describe the basic structures of an animal cell, including the nucleus, cytoplasm, mitochondria and cell membrane, and how they function to support life.

Heredity and Evolution – What processes are responsible for life's unity and diversity? **New Haven Grade 7 Prentice Hall Heredity Text Unit 4 Genetics/Reproduction , www.newhavenscience.org**			
8.2 — Reproduction is a characteristic of living systems and it is essential for the continuation of every species.			
Core Science Curriculum Framework	**Underlying Concepts** *Students should understand that…*	**Grade-Level Expectations** *Students should be able to…*	**CMT Expected Performances**
8.2.a Heredity is the passage of genetic information from one generation to another. **8.2.b** Some of the characteristics of an organism are inherited and some result from interactions with the environment.	**GRADE-LEVEL CONCEPT 8.2.a** 1. Living organisms must reproduce to continue the existence of their species. Through reproduction new individuals which resemble their parents are formed. All the organisms alive today arose from preexisting organisms. 2. All the cells in a multicellular organism result from a single fertilized egg cell, through a process of continuous cell divisions (mitosis). Instructions for how an organism develops are stored in DNA molecules which are part of the chromosomes inside the cell nucleus. 3. The chromosomes occur in matching pairs, and each cell in a multicellular organism contains the number of chromosomes that are typical of that species. For example, cells in human beings contain 23 pairs of chromosomes; 46 in all. 4. Organisms grow by increasing the number of body cells. During *mitosis*, a body cell first duplicates the chromosomes and then divides into two identical daughter cells, each one with a complete set of chromosomes. 5. Most multicellular organisms reproduce by *sexual r*eproduction, in which new cells are produced by the combination of two germ cells (gametes). During *meiosis*, matching chromosomes in each pair separate from each other so that each germ cell contains only half of the chromosomes of the original cell. 6. Mitosis and meiosis are similar processes in that they both result in the separation of existing cells into new ones. They differ in that the germ cells produced during meiosis have only one copy of each chromosome. When two germ cells unite during fertilization, the resulting zygote has two copies of each chromosome, one from each parent, ensuring maternal and paternal genetic contribution. 7. Meiosis and gamete formation takes place in the reproductive organs; *testes* in males produce the sperm and *ovaries* in females produce the eggs. 8. In humans, the reproductive organs are in place at birth, but are readied to perform their reproductive functions by hormones released during adolescence. Males produce millions of sperm over the course of their adult life. Females are born with a finite number of immature eggs in the ovaries that are released one at a time in a monthly cycle. 9. In humans, if an egg is fertilized by a sperm in the female's fallopian tube, the resulting *zygote* may develop into a fetus in the female uterus. If the egg is not fertilized, it will leave the female's body in a monthly discharge of the uterine lining (menstrual cycle). 10. A segment of DNA that holds the information for a specific trait is called a gene. Each chromosome in a pair carries the same genes in the same place, but there are different versions of each gene. 11. In sexual reproduction, offspring of the same parents will have different combinations of genes and traits, creating genetic variability within the species. Sexual reproduction is the basis for the evolution of living organisms.	1. Relate the continued existence of any species to its successful reproduction and explain in writing the factors that contribute to successful reproduction. 2. Describe the structure, location and function of chromosomes, genes and DNA and how they relate to each other in the living cell. 3. Illustrate and chart the purpose, cell type (somatic and germ) and resulting chromosome count during cell division in mitosis and meiosis. 4. Identify the major structures in human male and female reproductive systems and explain where meiosis and gamete formation take place. 5. 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. 6. Compare and contrast the events and processes that occur when a human egg is fertilized or not fertilized. 7. Demonstrate the relationship of corresponding genes on pairs of chromosomes to traits inherited by offspring. 8. 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.	**C25.** Explain the differences in cell division in somatic and germ cells. **C26.** Describe the structure and function of the male and female human reproductive systems, including the process of egg and sperm development. **C27.** Describe how genetic information is organized in genes on chromosomes, and explain sex determination in humans.

	GRADE-LEVEL CONCEPT 8.2.b 1. Gender in humans is a trait determined by genes carried by a special pair of chromosomes identified as "X" and "Y". Female gametes have only an "X" chromosome; male gametes can have either an "X" or a "Y". The sperm that fertilizes the egg determines the sex of the offspring: a zygote containing two X chromosomes will develop into a female and a zygote containing X and Y chromosomes will develop into a male. 2. Most human traits are inherited from parents, but some are the result of environmental conditions. For example, eating and exercising habits may affect the body mass and shape of individuals in the same family. **SCIENTIFIC LITERACY TERMINOLOGY:** multicellular organism, heredity, trait, chromosome, gene, DNA, species, mitosis, meiosis, gamete, adolescence, hormone, testes, sperm, ovary, egg, fallopian tube, uterus		

Structure and Function – How are organisms structured to ensure efficiency and survival?

New Haven GRADE 7 Prentice Hall Human Body Text Units 5, 6 Cells, Human Body Systems, STC Human Body Kit , www.newhavenscience.org

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

Core Science Curriculum Framework	Underlying Concepts *Students should understand that…*	Grade-Level Expectations *Students should be able to…*	CMT Expected Performances
7.2.b Multicellular organisms need specialized structures and systems to perform basic life functions.	**GRADE-LEVEL CONCEPT 7.2.b.** 1. Systems consist of parts that interact with and influence each other. Parts of a system work together to make the whole entity work. Similarly, each part of an animal body has a specific job to do, and all the different parts work together to support life. 2. Although all cells have similar basic structures, in multicellular organisms cells have specialized shapes that enable them to perform specific roles (for example, muscle, nerve, and skin cells can be identified by their distinct shapes). 3. Groups of similar cells are organized in tissues that have specific functions (for example, providing support, connecting parts, carrying messages, protecting internal and external surfaces). 4. Different tissues work together to form an organ, and organs work together as organ systems to perform essential life functions. 5. The human skeletal system includes bones joined together by ligaments. The skeletal system functions to shape and support the body, protect internal organs, enable movement, form blood cells, and store minerals such as calcium and phosphorous. 6. Joints are places where two bones come together and body movement can occur. The structure of a joint (for example, ball and socket, hinge or pivot) determines the kind of movement possible at that point. 7. The human muscular system includes skeletal, smooth and cardiac muscles. The skeletal muscles are attached to bones by tendons and they are responsible for the movement of the body. The cardiac muscle is responsible for the pumping action of the heart and the smooth muscles are related to the movement of the internal organs. 8. The muscular and skeletal systems interact to support the body and allow movement. 9. The major parts of the human respiratory system are the nose, trachea, bronchi and lungs. This system is responsible for breathing and exchange of gases between the body and its surroundings. 10. The major parts of the human circulatory system are the heart, arteries, veins and capillaries. The right side of the heart pumps blood to the lungs for gas exchange; the left side of the heart pumps the oxygenated blood around the body. 11. The blood is made up of plasma, red and white blood cells, and platelets. Its main role is to carry small food molecules and respiratory gases (oxygen and carbon dioxide) to and from cells. Blood cells are also responsible for destroying invading particles, preventing diseases, and stopping bleeding after injuries. 12. The respiratory and circulatory systems work together to provide all cells with oxygen and nutrients. When the body's need for oxygen changes, the circulatory and respiratory systems respond by increasing or decreasing breathing and heart rates. These changes can be measured by counting breaths, heartbeats or pulses per minute. 13. The major parts of the human digestive system are the mouth, esophagus, stomach, small intestine and large intestine. This system is responsible for breaking down food, absorbing	1. Investigate and explain in writing the basic structure and function of the human skeletal system. 2. Differentiate between the structures and range of motion associated with ball, socket and hinge joints and relate human joints to simple machines. 3. Demonstrate how the muscles, tendons, ligaments and bones interact to support the human body and allow movement. 4. 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). 5. Label the major parts of the human circulatory system and explain in writing the function of each part (heart, veins, arteries and capillaries). 6. Design and conduct controlled variable experiments to analyze the interaction between the circulatory and respiratory systems as the demand for oxygen changes. 7. 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).	**C16.** Describe the structures of the human digestive, respiratory and circulatory systems and explain how they function to bring oxygen and nutrients to the cells and expel waste materials. **C17.** Explain how the human musculoskeletal system supports the body and allows movement.

	nutrients and water, and eliminating waste. The liver and pancreas support the functions of the major digestive organs by producing and releasing digestive liquids into the digestive tract. 14. The nervous, immune and excretory systems interact with the digestive, respiratory and circulatory systems to maintain the body's dynamic internal balance (homeostasis). **SCIENTIFIC LITERACY TERMINOLOGY:** structure, function, cell, mitosis, organelle, cytoplasm, nucleus, cell membrane, mitochondrion, tissue, organ, system		

Science and Technology in Society – How do science and technology affect the quality of our lives? **New Haven GRADE 7 Unit 7 Food Safety, USDA Food Safety Kit, STC Food Chemistry Kit , www.newhavenscience.org**			
7.3 — Technology allows us to improve food production and preservation, thus improving our ability to meet the nutritional needs of growing populations. ***This content standard is an application of the concepts in content standard 7.2 and should be integrated into the same unit.***			
Core Science Curriculum Framework	**Underlying Concepts** *Students should understand that…*	**Grade-Level Expectations** *Students should be able to…*	**CMT Expected Performances**
7.4.a Various microbes compete with humans for the same sources of food.	1. Microorganisms (microbes) are microscopic organisms, such as bacteria, yeast and mold, that are found almost everywhere: in air, soil and water, inside our bodies and in our foods. 2. Bacteria are single-celled organisms that differ from other single-celled organisms in that they do not have organelles such as a nucleus, mitochondrion or chloroplast. 3. Bacteria are an essential component of any food web because they break down complex organic matter into simple materials used by plants. Some bacteria can produce their own food through photosynthesis and others are consumers that compete for foods that humans eat. 4. Some bacteria can be beneficial to humans. Certain bacteria live symbiotically in the digestive tracts of animals (including humans) and help break down food. Other bacteria are used by humans to purify waste water and to produce foods such as cheese and yogurt. 5. Some bacteria are harmful to humans. They can spoil food, contaminate water supplies and cause infections and illness. 6. Food preservation methods create conditions that kill bacteria or inhibit their growth by interfering with the bacterium's life processes. Food preservation methods include removing moisture by dehydration or salting, removing oxygen by vacuum-packing, lowering pH by pickling, lowering temperature by refrigerating or freezing, and destroying the bacterial cells by irradiation or heat (pasteurizing and cooking). 7. Throughout history, humans have developed different methods to ensure the availability of safe food and water to people around the world. **SCIENTIFIC LITERACY TERMINOLOGY:** microbe, bacteria, single-celled organism, dehydration, pickling, irradiation	1. Investigate and describe in writing different types of microbes and the environmental conditions necessary for their survival. 2. Describe the optimum conditions for rapid bacterial growth. 3. Illustrate and describe the structural differences between bacterial and animal cells. 4. Discover and discuss how humans use bacteria to produce food and identify examples. 5. Compare and contrast the role of bacteria in food production and food spoilage. 6. 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.	**C21.** Describe how freezing, dehydration, pickling and irradiation prevent food spoilage caused by microbes.

Science and Technology in Society – How do science and technology affect the quality of our lives?

New Haven GRADE 8 Unit 1 Bridges/Forces, Prentice Hall Force Text, STC Motion Energy Kit , www.newhavenscience.org

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

This content standard is an application of the concepts in content standard 8.1 and should be integrated into the same unit.

Core Science Curriculum Framework	Underlying Concepts *Students should understand that…*	Grade-Level Expectations *Students should be able to…*	CMT Expected Performances
8.4.a Bridges can be designed in different ways to withstand certain loads and potentially destructive forces.	1. Force is a push or a pull and is described by its strength and direction and can be caused by a moving or a stationary object. Forces are measured in Newtons or pounds using scales. 2. Forces can act simultaneously on an object from all directions with different strengths (magnitudes). When the magnitude and direction of all the forces acting on an object are combined, or added together, the total force (net force) determines the object's motion. Forces in opposite directions are subtracted; forces in the same direction are added. 3. If the strength of all the forces acting on an object from one direction is equivalent to the strength of the forces from the opposite direction, then the forces cancel each other out, and are said to be balanced. 4. Bridges are elevated structures designed to support the movement of objects over a span. Two important forces at work in bridges are *tension* and *compression*. 5. Bridges must support their own weight (dead load) and the weight of those objects that will cross over them or act on them from time to time, such as wind, snow and ice (live load). Bridges are kept stable by balancing the load forces with the supporting forces of the structure. These forces can cause parts of the bridge structure to push together (compression) or pull apart (tension). 6. Different bridge designs distribute tension and compression forces in different ways, depending on the shapes of the parts of the structure. The biggest difference among bridge designs is the distances they can cross in a single span. Shapes commonly used in bridge design include arches, triangles and rectangles. 7. Bridges are constructed of different materials whose properties and costs vary. Some materials are strong against compression forces but weak against tension forces; some materials resist fire, corrosion or weathering. Materials commonly used in bridge design include wood, rope, aluminum, concrete and steel. 8. A beam bridge balances the load by concentrating it entirely onto the two piers that support the bridge at either end. When a force pushes down on the beam, the beam bends. Its top edge is pushed together (compression), and its bottom edge is pulled apart (tension). The amount of bend depends on the length of the beam. 9. A truss bridge uses rigid, interlocking beams to form a system of triangles that distribute the load among all parts of the structure, increasing the structural strength of the bridge. 10. A suspension bridge uses cables suspended from tall towers to hold up the deck and distribute the load. The tension and compression forces acting on the beam are distributed among the cables (which experience tension) and the towers (which experience compression). 11. Engineers and scientists build models of bridges, conduct controlled experiments to learn how they will withstand various stresses, and consider the benefits and trade-offs of various design alternatives. 12. Bridge design is influenced by the length of the span, the properties of the materials and the environmental conditions, as well as by practical considerations, such as the bridge's appearance, cost of materials or construction site challenges. **13.** Bridges can fail because they have faulty parts, are used in ways that exceed what was intended by the design, or were poorly designed to begin with. **SCIENTIFIC LITERACY TERMINOLOGY**: balanced/unbalanced forces, net force, load, tension force, compression force, beam bridge, truss bridge, suspension bridge	1. Identify the forces acting on a truss, beam and suspension bridge, including compression, tension and gravity using models, pictures or diagrams. 2. Explain in writing the advantages and disadvantages of truss, beam and suspension bridge design and visually identify each bridge. 3. 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. 4. Use technology to simulate how engineers plan, test and revise designs of bridges given parameters including cost, time, safety and aesthetics.	**C30.** Explain how beam, truss and suspension bridges are designed to withstand the forces that act on them.

Force and Motion – What makes objects move the way they do?

New Haven GRADE 8 Unit 2 Motion/Forces, Prentice Hall Force Text, STC Motion Energy Kit , www.newhavenscience.org

8.1 — An object's inertia causes it to continue to moving the way it is moving unless it is acted upon by a force.

Core Science Curriculum Framework	Underlying Concepts *Students should understand that…*	Grade-Level Expectations *Students should be able to…*	CMT Expected Performances
8.1.a The motion of an object can be described by its position, direction of motion and speed. **8.1.b** An unbalanced force acting on an object changes its speed and/or direction of motion. **8.1.c** Objects moving in circles must experience force acting toward the center.	**GRADE-LEVEL CONCEPT 8.1.a** 1. An object is said to be in motion when its position changes in relation to a point of reference. An object's motion can be described and represented graphically according to its position, direction of motion, and speed. 2. Speed describes the change in an object's position over a period of time, and is measured in units such as meters per second or miles per hour. 3. Average speed takes into account the different speeds at which an object moves over a period of time. Average speed is calculated by dividing the total distance traveled by the change in time, regardless of any changes in motion or direction during its travel. 4. Motion of objects can be represented on a distance vs. time line graph, with distance traveled as the vertical ("y") axis and time as the horizontal ("x") axis. The steepness and slant of the motion line vary depending on the speed and direction of the moving objects. A straight horizontal line indicates an object at rest. **GRADE-LEVEL CONCEPT 8.1.b** 1. In order for an object to change its motion, a push/pull (force) must be applied over a distance. 2. Forces can act between objects that are in direct contact, or they can act over a distance. There are forces of attraction, such as gravity or magnetism, and forces of resistance, such as friction and drag (air resistance). Forces are measured in Newtons or pounds using scales. 3. Forces can act simultaneously on an object from all directions with different strengths (magnitudes). When the magnitude and direction of all the forces acting on an object are combined, or added together, the total force (net force) determines the object's motion. Forces in opposite directions are subtracted; forces in the same direction are added. 4. If the strength of all the forces acting on an object from one direction is equivalent to the strength of the forces from the opposite direction, then the forces cancel each other out, and are said to be balanced. Balanced forces keep an object moving with the same speed and direction, including keeping it at rest. 5. If the net force acting on an object is not zero, then the forces are said to be unbalanced, and the object's speed or direction will change, changing its motion (acceleration). Acceleration is any change in motion, and occurs when something speeds up, slows down or changes direction. On a position time graph, this would be indicated by a change in the steepness of the motion line, or by a curved line. 6. The greater the unbalanced force on an object, the greater its change in motion (acceleration). The greater the mass of an object, the greater the force needed to	1. Demonstrate how forces, including friction, act upon an object to change its position over time in relation to a fixed point of reference. 2. Calculate the average speed of an object and distinguish between instantaneous speed and average speed of an object. 3. Create and interpret distance-time graphs for objects moving at constant and nonconstant speeds. 4. Predict the motion of an object given the magnitude and direction of forces acting upon it (net force). 5. Investigate and demonstrate how unbalanced forces cause acceleration (change in speed and/or direction of an object's motion). 6. Assess in writing the relationship between an object's mass and its inertia when at rest and in motion. 7. Express mathematically how the mass of an object and the force acting on it affect its acceleration. 8. Design and conduct an experiment to determine how gravity and friction (air resistance) affect a falling object. 9. Illustrate how the circular motion of an object is caused by a center seeking force (centripetal force) resulting in the object's constant acceleration.	**C22.** Calculate the average speed of a moving object and illustrate the motion of objects in graphs of distance over time. **C23.** Describe the qualitative relationships among force, mass and changes in motion. **C24.** Describe the forces acting on an object moving in a circular path.

	change its acceleration. Given the same amount of force, an object with a greater mass will change acceleration less. The total net force acting on an object can be determined by measuring its mass and change in motion (acceleration). **GRADE-LEVEL CONCEPT 8.1.c** 1. Some objects continuously change direction without changing speed, causing them to move in a circular path. Circular motion is caused by a constant unbalanced force that is constantly changing direction and pulling towards the center. If there were no force pulling the object toward the center, it would continue to move in a straight line in the direction it was moving before the force was removed. **SCIENTIFIC LITERACY TERMINOLOGY:** Motion, point of reference, speed, constant speed, average speed, position-time graph, slope, force, friction, gravity, inertia, mass, acceleration, balanced/unbalanced forces, net force, circular motion		

Earth in the Solar System – How does the position of Earth in the solar system affect conditions on our planet?

New Haven GRADE 8 Unit 3 Earth/Moon Motions, Prentice Hall Astronomy Text, GEMS Reasons Seasons Kit, www.newhavenscience.org

8.3 — The solar system is composed of planets and other objects that orbit the sun.

Core Science Curriculum Framework	Underlying Concepts *Students should understand that…*	Grade-Level Expectations *Students should be able to…*	CMT Expected Performances
8.3.a Gravity is the force that governs the motions of objects in the solar system. **8.3.b** The motion of the Earth and moon relative to the sun causes daily, monthly and yearly cycles on the Earth.	**GRADE-LEVEL CONCEPT 8.3.a** 1. Earth is part of a system of celestial bodies that are grouped together around a central star, the Sun. This system includes objects of different masses and composition such as planets, moons, asteroids, minor planets, and comets. These objects move in predictable paths determined by gravity. 2. Gravity is a force of attraction between two objects. The strength of gravitational force depends on the total mass of the two objects and the distance between them. The greater the total mass, the greater the force of gravity. The greater the distance between two objects, the less the force of gravity. 3. The difference between an object's mass and its weight is explained by gravity. Mass is the measure of the amount of matter in an object; weight is the force of gravity between an object and the celestial body it is on. Bodies in the solar system have different masses; therefore the same object has a different weight on each celestial body. 4. Objects in the solar system are held in their predictable paths by the inward-pulling gravitational attraction of the very massive sun. The interaction of the center-pulling force of gravity with a moving object's inertia (tendency to keep moving) keeps one object in circle-like motion (revolution) around another. This causes planets to orbit around the center of the solar system and moons to orbit around planets. 5. The Earth and other planets move through space in two ways: rotation on an axis and revolution around the sun. Earth revolves around the sun in a near-circular path, explaining cyclical phenomena such as seasons and changes in visible star patterns (constellations). 6. The time it takes for an object to complete one revolution around the sun depends on the speed at which it is moving and the size of its orbit. Objects more distant from the sun's gravitational pull move slower than those that are closer. Earth's period of revolution is about 365 days (year); planets that are more distant from the sun take longer to orbit (revolve) around the sun, resulting in longer years. **GRADE-LEVEL CONCEPT 8.3.b** 1. Earth rotates around an axis or rotation, a line going through the center of the earth from the north pole to the south pole. The tilt of Earth's axis relative to its orbital path, combined with the spherical shape of the earth, cause differences in the amount and intensity of the sun's light striking different latitudes of the earth. 2. Earth experiences seasons as northern or southern hemispheres are tilted toward the sun over the course of its 365-day revolution period. Earth's tilt causes seasonal differences in the height of the perceived path of the sun and the number of hours of sunlight. Seasons are not related to a change in distance between the Earth and the Sun, since that distance changes very little. 3. The moon changes its position relative to the earth and sun as it revolves around the earth in a period of about 29 days. The same half of the moon is always reflecting light from the Sun; some of the reflected light reaches Earth. Phases of the moon are explained by	1. Relate the strength of gravitational force between two objects to their mass and the distance between the centers of the two objects and provide examples. 2. Describe in writing how gravitational attraction and the inertia of objects in the solar system keep them on a predictable elliptical pathway. 3. Distinguish between rotation of Earth on its axis and its elliptical revolution around the sun. 4. Investigate and report in writing how the Earth's revolution around the sun affects changes in daylight and seasons. 5. Compare the revolution times of all the planets and relate it to their distance from the sun. 6. Conduct and report on an investigation that shows how the Earth's tilt on its axis and position around the sun relates to the intensity of light striking the Earth's surface. 7. Use a model to demonstrate the phases of the moon relative to the position of the sun, Earth and moon. 8. 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.	**C28.** Explain the effect of gravity on the orbital movements of planets in the solar system. **C29.** Explain how the relative motion and relative position of the sun, Earth and moon affect the seasons, phases of the moon and eclipses.

	changes in the angle at which the sun's light strikes the moon and is reflected to Earth. The relative position of the Sun, Earth and moon can be predicted given a diagram of a moon phase. 4. Eclipses occur when the moon, Earth and sun occasionally align in specific ways. A solar eclipse occurs when the when the moon is directly between the Earth and the sun (during new moon phase) and the moon blocks the sun's light, creating a moving shadow on parts of the earth. A lunar eclipse occurs when the Earth is directly between the moon and the sun (full moon phase), the Earth blocks the sun's light, casting a shadow over the moon. 5. Ocean tides on Earth are caused by the moon's gravitational force pulling on large bodies of water as the Earth and moon move around each other daily. The regular daily and monthly movement of the water (tides) can be predicted. **SCIENTIFIC LITERACY TERMINOLOGY:** Force, gravity, orbit, revolution, year, period, mass, weight, rotation, hemisphere, season, phase, new moon, solar eclipse, lunar eclipse, tides.		

Energy in the Earth's Systems – How do external and internal sources of energy affect the Earth's Systems?

New Haven GRADE 8 Unit 5,6 Earth Surface /Movements, Prentice Hall Earth Text, GEMS Plate Tectonics Kit, www.newhavenscience.org

7.4 — Landforms are the result of the interaction of constructive and destructive forces over time.

Core Science Curriculum Framework	Underlying Concepts *Students should understand that…*	Grade-Level Expectations *Students should be able to…*	CMT Expected Performances
7.3.a Volcanic activity and the folding and faulting of rock layers during the shifting of the Earth's crust affect the formation of mountains, ridges and valleys. 7.3.b Glaciation, weathering and erosion change the Earth's surface by moving earth materials from place to place.	**GRADE-LEVEL CONCEPT 7.3.a.** 1. Earth's surface is constantly being shaped and reshaped by natural processes. Some of these processes, like earthquakes and volcanic eruptions, produce dramatic and rapid change. Others, like weathering and erosion, usually work less conspicuously over longer periods of time. 2. Glaciers form in areas where annual snowfall is greater than the seasonal melt, resulting in a gradual build-up of snow and ice from one season to the next. 3. Glaciers increase and decrease in size over long periods of time, depending on variations in Earth's climate. 4. Glaciers move slowly, spreading outward across a region or moving down a slope. 5. Moving glaciers reshape the land beneath them by scraping, carving, transporting and depositing soil and rock. 6. Glacial landforms have identifiable shapes. Connecticut's landscape provides many examples of glacial movement and deposition. 7. Weathering and erosion work together as destructive natural forces. Both are forces that break down rock into small particles called sediments. 8. Weathering is caused by physical, chemical or biological means. Rock properties, such as hardness, porosity or mineral content, influence susceptibility to weathering. 9. Erosion loosens and transports sediment formed by weathering. Moving water and wind cause changes to existing landforms and create new landforms such as valleys, floodplains, plateaus, canyons, caves or dunes. **GRADE-LEVEL CONCEPT 7.3.b.** 1. Earth's surface features, such as mountains, volcanoes and continents, are the constantly-changing result of dynamic processes and forces at work inside the Earth. 2. The solid Earth has a core, mantle and crust, each with distinct properties. 3. Earth's crust is broken into different "tectonic plates" that float on molten rock and move very slowly. Continental drift is driven by convection currents in the hot liquid mantle beneath the crust. 4. The presence of plant and animal fossils of the same age found around different continent shores, along with the matching coastline shapes of continental land masses, provides evidence that the continents were once joined. 5. Tectonic plates meet and interact at divergent, convergent or transform boundaries. The way in which the plates interact at a boundary affects outcomes such as folding, faulting, uplift or earthquakes. 6. The folding and faulting of rock layers during the shifting of the Earth's crust causes the constructive formation of mountains, ridges and valleys. 7. Mountain formation can be the result of convergent tectonic plates colliding, such as the	1. Illustrate and describe in writing the composition of the three major layers of the Earth's interior. 2. Explain how Earth's internal energy is transferred to move tectonic plates. 3. Demonstrate the processes of folding and faulting of the Earth's crust. 4. Correlate common geological features/events (deep sea trenches, mountains, earthquakes, volcanoes) with the location of plate boundaries. 5. 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. 6. Analyze and interpret data about the location, frequency and intensity of earthquakes. 7. 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. 8. Investigate and determine how glaciers form and affect the Earth's surface as they change over time. 9. Distinguish between weathering and erosion. 10. Observe and report on the geological events that are responsible for having shaped Connecticut's landscape.	**C18.** Describe how folded and faulted rock layers provide evidence of gradual up and down motion of the Earth's crust. **C19.** Explain how glaciation, weathering and erosion create and shape valleys and floodplains. **C20.** Explain how the boundaries of tectonic plates can be inferred from the location of earthquakes and volcanoes.

	Appalachians and the Himalayas; mountains may also be formed as a result of divergent tectonic plates moving apart and causing rifting as in East Africa or Connecticut. 8. Most volcanoes and earthquakes are located at tectonic plate boundaries where plates come together or move apart from each other. A geographic plot of the location of volcanoes and the centers of earthquakes allows us to locate tectonic plate boundaries. 9. The geological makeup of Connecticut shows evidence of various earth processes, such as continental collisions, rifting, and folding that have shaped its structure. **SCIENTIFIC LITERACY TERMINOLOGY:** Erosion, weathering, glacier, valley, floodplain, core, mantle, folds, fault/fault line, continent, tectonic plate, plate boundary, convection, mountains, volcano, earthquake.		

NEW HAVEN PUBLIC SCHOOLS SCIENCE CONTENT OUTLINE *www.newhavenscience.org* (Note, K-6 content order subject to change and is dependent on kit supply/ specific rotation)

	Quarter One		Quarter Two	Quarter	Three	Quarter Four	
K	Weather (STCWeather)		Object Properties (FossWood)		Seasons	Living Things: Characteristics (FOSS Trees)	
1	Compare/ Contrast Measurement (STC CompareMeasure)		Motion (NK)		Light Properties (DSM SunShadows)	Living Things: Structure (STC Organism)	
2	Solids/Liquids (STC)		Soil (STC or DSM)		Nutrition (NK)	Animal Life Cycles (STC Butterfly)	
3	Rocks (STC)		Material Properties *ET (STC ChemTest)		Recycling/ Conservation (NK)	Plant Life Cycles (STC PlantGrowth)	
4	Force and Motion (STC MotionDesign)		Ecosystems (NK)		Water (STC Land/Water)	Electricity *ET (STC ElecCircuit)	
5	Sound (UNHSound)	Light and Color (GEMS ColorAnalyzer)	Light and Uses (Lenses) (GEMS MoreMagnifier)	Senses *ET (NK)	Sun, Earth, Moon (GEMS) **(CMT TEST FOLLOWS)**	Health Topics	
6	Ecosystem Populations (STC Ecosytem)		Weather Systems (FOSS Weather/Water)		Water Resources *ET (URI Watershed)	Simple Machines (FOSS Lever)	
7	Properties of Matter	Chemical Properties	Cells	Genetics/ Reproduction	Life Systems Musculo-Skeletal	Life Systems Biochemical *ET	Microbes/ Food Preservation
8	Forces/Bridges	Forces/ Motion *ET	Solar System Motion	Landforms/Earth Forces	Tectonic Plates **(CMT TEST FOLLOWS)**	Rock Cycle	Natural Disasters
9 PhyChem	Heat/Phase Changes	Atoms/ Bonding *ET	Polymers *ET	Earth chemical cycles *ET	Earth Materials/ Environ Impact *ET	Energy/ Electricity *ET	Energy Sources/ Impacts *ET
10 Bio	BioChemistry *ET	Cells/ Bacteria/ Viruses *ET	Heredity/ Genetics *ET	Evolution	Diseases Populations *ET **(CAPT TEST FOLLOWS)**	Organism Interdependence	Organism Behavior/ Structure
11 Chem	Chemical Properties	Atomic Structure	Nuclear	Compounds/ Bonding	Reactions/ Equations	Gas Behavior	Organic Chemistry
12 Physics	Motion	ACCEL	2 D Motion	Forces/Work	Energy/Electric	Wave/Sound/Light	Mod Physics

*ET = CT Embedded Task, NHPS District Unit Tasks and Quarterly Assessments Also Required Grades 7-12,

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