Kenmore-Tonawanda School District

Science Curriculum

6-8th grade

2015 - 2016

6th Grade
Science Curriculum

Chemistry and Physics

STANDARD 4: The Physical Setting – Chemistry **I can statements must be written and included in the map**

Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.

Below is an estimated of the appropriate time allotment for each unit.

I. **Physical properties of matter = 5 to 6 weeks**
II. **Chemical properties of matter = 3 to 4 weeks**
III. **Atoms and the Periodic Table = 4 to 5 weeks**
IV. **Energy Interactions = 3 to 4 weeks**

PHYSICAL PROPERTIES OF MATTER

Key Idea 3: Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

Tier 2 Vocabulary

Characteristic	Affected	Explain	Determined	Definite
Identify	Components	Described	Comparative	Composition
Properties	Combination	Separated		

Tier 3 Vocabulary

Phases of matter	Boiling point	Electrical conductivity	Freezing point	Density
Solid	Liquid	Gas	Plasma	Heat
Hardness	Solubility	Attractive forces	Particle	Volume
Matter	Mass {D=m/v}	Buoyancy	Mixture	Compound
Physical change	Chemical composition	Chemical properties	Physical change	Freezing
Melting	Condensation	Boiling	Evaporation	Tearing
Crushing	Physical combinations	Physical means	Homogeneous	Heterogeneous
Sublimation	Conductivity	Ductility	Hardness	Malleability
Phase change	Filtering	Insoluble	Soluble	Magnetism
Settling	Contract	Expand	Mass	Volume
Solvent	Solute	pH	pH scale	Acid
Base	Indicators	Litmus paper	Phenolphthalein	pH paper

Performance Indicator:

3.1: Students observe and describe properties of materials, such as density, conductivity, and solubility.

3.2: Students distinguish between chemical and physical changes.

Physical Skills:

1.Follow safety procedures in the classroom and laboratory.
2. Safely and accurately use the following measurement tools: metric ruler; balance; stopwatch; graduated cylinder; and thermometer.
3. Use appropriate units for measured or calculated values.
4. Recognize and analyze patterns and trends.
5. Classify objects according to an established scheme and a student-generated scheme.
6. sequence events.
7. Identify cause-and-effect relationships.
8. use indicators and interpret results.
9. Determine the density of liquids, and regular- and irregular-shaped objects.
10. Determine the volume of a regular- and irregular-shaped solid, using water displacement.
11. Determine the identity of an unknown element, using physical and chemical properties.
12. Using appropriate resources, separate the parts of a mixture.

Major Understandings:

3.1a : Substances have characteristic properties. Some of these properties include color, odor, phase at room temperature, density, solubility, heat and electrical conductivity, hardness, and boiling and freezing points.

3.1b : Solubility can be affected by the nature of the solute and solvent, temperature, and pressure. The rate of solution can be affected by the size of the particles, stirring, temperature, and the amount of solute already dissolved.

3.1c : The motion of particles helps to explain the phases (states) of matter as well as changes from one phase to another. The phase in which matter exists depends on the attractive forces among its particles.

3.1d : Gases have neither a determined shape nor a definite volume. Gases assume the shape and volume of a closed container.

3.1e : A liquid has definite volume, but takes the shape of a container.

3.1f : A solid has definite shape and volume. Particles resist a change in position.

3.1g : Characteristic properties can be used to identify different materials, and separate a mixture of substances into its components. For example, iron can be removed from a mixture by means of a magnet. An insoluble substance can be separated from a soluble substance by such processes as filtration, settling, and evaporation.

3.1h : Density can be described as the amount of matter that is in a given amount of space. If two objects have equal volume, but one has more mass, the one with more mass is denser.

3.1i : Buoyancy is determined by comparative densities.

3.2a : During a physical change a substance keeps its chemical composition and properties. Examples of physical changes include freezing, melting, condensation, boiling, evaporation, tearing, and crushing.

3.2b : Mixtures are physical combinations of materials and can be separated by physical means.

Labs:

1. Develop density skills by performing a variety of density labs.
    a. Various solids
    b. Density change when object is cut in half
    c. Density or irregular shaped objects.
2. Measure solids and liquids using a variety of procedures.
3. Separate a variety of mixtures by physical means.
4. Investigate how various factors affect rate of solutes dissolving in a solvent
    a. Sugar in water
    b. Salt in water
5. Demonstrate physical changes of water.
6. pH labs
7. pH of household materials

Expanded Process Skills:

Key Idea 1:
Information technology is used to retrieve, process, and communicate information as a tool to enhance learning.
1.1 Use a range of equipment and software to integrate several forms of information in order to create good-quality audio, video, graphic, and text-based presentations.

1.2 Use spreadsheets and database software to collect, process, display, and analyze information. Students access needed information from electronic databases and on-line telecommunication services.

1.2 Systematically obtain accurate and relevant information pertaining to a particular topic from a range of sources, including local and national media, libraries, museums, governmental agencies, industries, and individuals.

1.4 Collect data from probes to measure events and phenomena. 1.4a collect the data, using the appropriate, available tool 1.4b organize the data 1.4c use the collected data to communicate a scientific concept

Key Idea 2:

Beyond the use of reasoning and consensus, scientific inquiry involves the testing of proposed explanations involving the use of conventional techniques and procedures and usually requiring considerable ingenuity

S2.2 Develop, present, and defend formal research proposals for testing their own explanations of common phenomena, including ways of obtaining needed observations and ways of conducting simple controlled experiments.
S2.2a include appropriate safety procedures
S2.2b design scientific investigations (e.g., observing, describing, and comparing; collecting samples; seeking more information, conducting a controlled experiment; discovering new objects or phenomena; making models)
S2.2c design a simple controlled experiment
S2.2d identify independent variables (manipulated), dependent variables (responding), and constants in a simple controlled experiment
S2.2e choose appropriate sample size and number of trials

S2.3 Carry out their research proposals, recording observations and measurements (e.g., lab notes, audiotape, computer disk, videotape) to help assess the explanation.
S2.3a use appropriate safety procedures
S2.3b conduct a scientific investigation
S2.3c collect quantitative and qualitative data

CCLS - Literacy:

CCSS.ELA-Literacy.RST.6-8.3
Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

CCSS.ELA-Literacy.RST.6-8.4
Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 6-8 texts and topics*.

CHEMICAL PROPERTIES OF MATTER

Key Idea 3: Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

Tier 2 Vocabulary

Characteristic	Affected	Explain	Determined	Definite
Identify	Components	Described	Comparative	Composition
Properties	Combination	Separated	Substances	Categories
Similar	Ordinary	Reaction		

Tier 3 Vocabulary

Physical change	Chemical change	New substances	Physical properties	Chemical properties
Metals	Nonmetals	Noble gases	Law of Conservation of Mass	Chemical reaction
Sublimation	Thermal expansion	Absolute zero	Mixture	Heterogeneous
Homogeneous	Reactants	Products	Balanced chemical equations	Product
Reactant	Reaction	Produce	Yield	Crushing
Physical means	Physical combination	Endothermic	Exothermic	

Performance Indicator 3.2:

Students distinguish between chemical and physical changes.

Physical Setting – Chemistry Skills:

1.Follow safety procedures in the classroom and laboratory.
2. Safely and accurately use the following measurement tools: metric ruler; balance; stopwatch; graduated cylinder; and thermometer.
3. Use appropriate units for measured or calculated values.
4. Recognize and analyze patterns and trends.
5. Classify objects according to an established scheme and a student-generated scheme.
6. sequence events.
7. Identify cause-and-effect relationships.
8. use indicators and interpret results.
9. Using the periodic table, identify an element as a metal, nonmetal, or noble gas.
10. Determine the identity of an unknown element, using physical and chemical properties.
11. Using appropriate resources, separate the parts of a mixture.

Major Understandings:

3.2c : During a chemical change, substances react in characteristic ways to form new substances with different physical and chemical properties. Examples of chemical changes include burning of wood, cooking of an egg, rusting of iron, and souring of milk.

3.2d : Substances are often placed in categories if they react in similar ways. Examples include metals, nonmetals, and noble gases.

3.2e : The Law of Conservation of Mass states that during an ordinary chemical reaction matter cannot be created or destroyed. In chemical reactions, the total mass of the reactants equals the total mass of the products.

Labs:

1. Baking soda and vinegar lab
2. Chemical reactions
3. Endothermic/exothermic lab
4. Mass of glow stick before and after cracking

Expanded Process Skills:

Key Idea 2:
Knowledge of the impacts and limitations of information systems is essential to its effectiveness and ethical use.

2.1 Understand the need to question the accuracy of information displayed on a computer because the results produced by a computer may be affected by incorrect data entry.
2.1a critically analyze data to exclude erroneous information
2.1b identify and explain sources of error in a data collection

2.2 Identify advantages and limitations of data-handling programs and graphics programs.

2.3 Understand why electronically stored personal information has greater potential for misuse than records kept in conventional form.

CCLS - Literacy:

CCSS.ELA-Literacy.RST.6-8.1
Cite specific textual evidence to support analysis of science and technical texts.

CCSS.ELA-Literacy.RST.6-8.2
Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

CCSS.ELA-Literacy.RST.6-8.3
Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

ATOMS AND THE PERIODIC TABLE

Key Idea 3: Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

Tier 2 Vocabulary

Characteristic	Affected	Explain	Determined	Definite
Identify	Components	Described	Comparative	Composition
Properties	Combination	Separated	Substances	Categories
Different	Interactions	Arranged	Defined	Perpetually
Combine	Multitude	Produce	Pure	Model
Classifying	Predict			

Tier 3 Vocabulary

Metals	Non-metals	Noble gases	Metalloids	Family
Period	Group	Atoms	Protons	Neutrons
Electrons	Nucleus	Molecules	Kinetic molecular theory	Periodic table
Atomic mass	Atomic number	Energy levels	Electron rings	Valence electrons
Chemical symbol	Compounds	Pure	Elements	Common element symbols and names
Neutron number determination	Negative charge	Positive charge	Neutral	Orbits
Bohr model	Chemical change	Precipitate	Bond	Ion
Molecule	Column	Rows	Transition elements	Reactions

Performance Indicator 3.3:

Students develop mental models to explain common chemical reactions and changes in states of matter.

Physical Setting – Chemistry Skills:

1.Follow safety procedures in the classroom and laboratory.
2. Safely and accurately use the following measurement tools: metric ruler; balance; stopwatch; graduated cylinder; and thermometer.
3. Use appropriate units for measured or calculated values.
4. Recognize and analyze patterns and trends.
5. Classify objects according to an established scheme and a student-generated scheme.
6. sequence events.
7. Identify cause-and-effect relationships.
8. use indicators and interpret results.
9. Using the periodic table, identify an element as a metal, nonmetal, or noble gas.

Major Understandings:

3.3a : All matter is made up of atoms. Atoms are far too small to see with a light microscope.

3.3b :
Atoms and molecules are perpetually in motion. The greater the temperature, the greater the motion.

3.3c : Atoms may join together in well-defined molecules or may be arranged in regular geometric patterns.

3.3d : Interactions among atoms and/or molecules result in chemical reactions.

3.3e : The atoms of any one element are different from the atoms of other elements.

3.3f : There are more than 100 elements. Elements combine in a multitude of ways to produce compounds that account for all living and nonliving substances. Few elements are found in their pure form.

3.3g : The periodic table is one useful model for classifying elements. The periodic table can be used to predict properties of elements (metals, nonmetals, noble gases).

Labs:

1. Build atoms with candy
2. Build water molecule with candy
3. Assign an atom students build model
4. Burning steel wool
5. Baking soda and vinegar volcanoes
6. Elemental scavenger hunt (students check household products for commonly used elements).
7. Endothermic and exothermic labs

Expanded Process Skills:

Key Idea 2:
Beyond the use of reasoning and consensus, scientific inquiry involves the testing of proposed explanations involving the use of conventional techniques and procedures and usually requiring considerable ingenuity.

S2.1 Use conventional techniques and those of their own design to make further observations and refine their explanations, guided by a need for more information.
S2.1a demonstrate appropriate safety techniques
S2.1b conduct an experiment designed by others
S2.1c design and conduct an experiment to test a hypothesis S2.1d use appropriate tools and conventional techniques to solve problems about the natural world, including:

- measuring
- observing
- describing
- classifying
- sequencing

CCLS - Literacy:

CCSS.ELA-Literacy.RST.6-8.9
Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

CCSS.ELA-Literacy.RST.6-8.4
Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 6-8 texts and topics*.

ENERGY INTERACTIONS

Key Idea 4: Energy exists in many forms, and when these forms change energy is conserved.

Tier 2 Vocabulary

Characteristic	Affected	Explain	Determined	Definite
Identify	Components	Described	Comparative	Composition
Properties	Combination	Separated	Sources	Contain
Considered	Examples	Activities	Involve	Transformed
Products	Different	Relative	Predictable	Transferred
Facilitate	Expand	Exception	Addition	

Tier 3 Vocabulary

Chemical energy	Mechanical energy	Energy transformations	Heat energy	Types of energies
Light energy	Sound energy	Electrical energy	Nuclear energy	Kinetic energy
Potential energy	Geothermal energy	Radioactivity	Fossil fuel	Nonrenewable resources
Renewable resources	Solar energy	Biomass	Moving water	Convection
Conduction	Radiation	Expand contract	Chemical reactions	Phase change
Melting evaporation	Condensation freezing	Wind energy	Atoms	Molecules

Performance Indicators:

4.1: Students describe the sources and identify the transformations of energy observed in everyday life.
4.2: Students observe and describe heating and cooling events.
4.3: Students observe and describe energy changes as related to chemical reactions.

Physical Skills:

1.Follow safety procedures in the classroom and laboratory.
2. Safely and accurately use the following measurement tools: metric ruler; balance; stopwatch; graduated cylinder; and thermometer.
3. Use appropriate units for measured or calculated values.
4. Recognize and analyze patterns and trends.
5. Classify objects according to an established scheme and a student-generated scheme.
6. sequence events.
7. Identify cause-and-effect relationships.
8. use indicators and interpret results.

Major Understandings:

4.1a : The Sun is a major source of energy for Earth. Other sources of energy include nuclear and geothermal energy.

4.1a : The Sun is a major source of energy for Earth. Other sources of energy include nuclear and geothermal energy.

4.1b : Fossil fuels contain stored solar energy and are considered nonrenewable resources. They are a major source of energy in the United States. Solar energy, wind, moving water, and biomass are some examples of renewable energy resources.

4.1c : Most activities in everyday life involve one form of energy being transformed into another. For example, the chemical energy in gasoline is transformed into mechanical energy in an automobile engine. Energy, in the form of heat, is almost always one of the products of energy transformations.

4.1d : Different forms of energy include heat, light, electrical, mechanical, sound, nuclear, and chemical. Energy is transformed in many ways.

4.1e : Energy can be considered to be either kinetic energy, which is the energy of motion, or potential energy, which depends on relative position.

4.2a : Heat moves in predictable ways, flowing from warmer objects to cooler ones, until both reach the same temperature.

4.2b : Heat can be transferred through matter by the collisions of atoms and/or molecules (conduction) or through space (radiation). In a liquid or gas, currents will facilitate the transfer of heat (convection).

4.2c : During a phase change, heat energy is absorbed or released. Energy is absorbed when a solid changes to a liquid and when a liquid changes to a gas. Energy is released when a gas changes to a liquid and when a liquid changes to a solid.

4.2d : Most substances expand when heated and contract when cooled. Water is an exception, expanding when changing to ice.

4.2e : Temperature affects the solubility of some substances in water.

4.3a : In chemical reactions, energy is transferred into or out of a system. Light, electricity, or mechanical motion may be involved in such transfers in addition to heat.

Labs:

1.

Expanded Process Skills:

Key Idea 1:
The central purpose of scientific inquiry is to develop explanations of natural phenomena in a continuing, creative process.

S1.1 Formulate questions independently with the aid of references appropriate for guiding the search for explanations of everyday observations.
S1.1a formulate questions about natural phenomena
S1.1b identify appropriate references to investigate a question
S1.1c refine and clarify questions so that they are subject to scientific investigation

S1.2 Construct explanations independently for natural phenomena, especially by proposing preliminary visual models of phenomena.
S1.2a independently formulate a hypothesis
S1.2b propose a model of a natural phenomenon
S1.2c differentiate among observations, inferences, predictions, and explanations

CCLS - Literacy:

CCSS.ELA-Literacy.RST.6-8.7
Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

CCSS.ELA-Literacy.RST.6-8.8
Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

CCSS.ELA-Literacy.RST.6-8.9
Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

Grade 6 Curriculum Description

The grade 6 curriculum comprises topics in Physics as outlined in the following pages. Included are suggested labs, demos, literacy and group activities.

It should be understood that the scientific method, lab safety and knowledge of lab equipment must be integrated in the unit where appropriate. We have included experimentation in most units and a research/debate activity in the energy unit, however these standard requirements could be satisfied within any unit the teacher chooses.

The suggested important vocabulary listed in the outline includes words that are not associated with the content in this unit but are necessary for student learning. These words meet the common core literacy standards for building tier 2 and 3 vocabulary. It was assumed the teacher is familiar with the content vocabulary that would need to be taught so we did not include them in the curriculum guide for 6^{th} grade.

Below is an estimate of the approximate time allotment for each unit.

Conservation of energy - 2 weeks

Types of energy and transfers of energy - 2 weeks

Kinetic and Potential energy and transfer of energy – 2 weeks

Sound – 2 weeks

Light – 1 week

Electricity and Magnetism – 3 weeks

Forces and Motion, Speed and Acceleration – 2 weeks

Newton's Laws – 2 weeks

Work and Simple Machines – 2 weeks

Note: info was extracted from **: http://www.corestandards.org/ELA-Literacy/RST/6-8/#CCSS.ELA-Literacy.RST.6-8.7 & http://www.p12.nysed.gov/ciai/mst/sci/documents/intersci.pdf**

CONSERVATION OF ENERGY, TYPES OF AND TRANSFERS OF ENERGY, KINETIC AND POTENTIAL

STANDARD 4: The physical setting

Key Idea 4:
Energy exists in many forms; when these forms change, energy is conserved.

Tier 2 Vocabulary:

Energy	Renewable	Non-renewable	Biomass	Heat
Transformed	Mechanical	Solar	"Relative to"	Stored
products	Conservation	alternative		

Tier 3 Vocabulary:

Kinetic	Potential	Mechanical	Friction	Conservation of energy

PERFORMANCE INDICATOR 4.1 and 4.5
Describe the sources and identify the transformations of energy observed in everyday life

Describe the situations that support the principal of conservation of energy

Process Skills:
safely and accurately use a metric ruler, use appropriate units for measured or calculated values, recognize and analyze patterns and trends.

Major Understandings:

4.1a The Sun is a major source of energy for Earth. Other sources of energy include nuclear and geothermal energy.

4.1b Fossil fuels contain stored solar energy and are considered nonrenewable resources. They are a major source of energy in the United States. Solar energy, wind, moving water, and biomass are some examples of renewable energy resources.

4.1c Most activities in everyday life involve one form of energy being transformed into another. For example, the chemical energy in gasoline is transformed into mechanical energy in an automobile engine. Energy, in the form of heat, is almost always one of the products of energy transformations.

4.1d Different forms of energy include heat, light, electrical, mechanical, sound, nuclear, and chemical. Energy is transformed in many ways.

4.1e Energy can be considered to be either kinetic energy, which is the energy of motion, or potential energy, which depends on relative position. Describe situations that support the principle of conservation of energy.

4.5a Energy cannot be created or destroyed, but only changed from one form into another.

4.5b Energy can change from one form to another, although in the process some energy is always converted to heat. Some systems transform energy with less loss of heat than others.

Labs:

use station activities so students experience and manipulate various energy transfers

ramp activity measuring speed and acceleration and/or comparing height of release point vs. kinetic energy

create a parachute that produces the slowest falling time design and build an egg crate that insulates energy from impact

basketball/tennis ball drop

Compare types of energy usage in the USA and associate cost benefit and environmental impact

Write a summary and draw a flow diagram of energy transfer in a system ex) suns energy transferring to photosynthesis or food energy transferring to mechanical via respiration or wind energy transferring to electrical via wind mills (there are hundreds of others)

Draw and label kinetic and potential energy points on a roller coaster and/or pendulum

Expanded Process Skills:

STANDARD 1—Analysis, Inquiry, and Design

Key idea 1 Scientific inquiry: Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions

M1.1a identify independent and dependent variables

M1.1b identify relationships among variables including: direct, indirect, cyclic, constant; identify non-related material

M2.1b quantify patterns and trends

Labs:

1)Compare types of energy usage in the USA and associate cost benefit and environmental impact

2) Write a summary and draw a flow diagram of energy transfer in a system ex) suns energy transferring to photosynthesis or food energy transferring to mechanical via respiration or wind energy transferring to electrical via wind mills (there are hundreds of others)

3) Draw and label kinetic and potential energy points on a roller coaster and/or pendulum

Key Idea 1: Engineering and design:

Engineering design is an iterative process involving modeling and optimization (finding the best solution within given constraints); this process is used to develop technological solutions to problems within given constraints

T1.3 Consider constraints and generate several ideas for alternative solutions, using group and individual ideation techniques (group discussion, brainstorming, forced connections, role play);

defer judgment until a number of ideas have been generated; evaluate (critique) ideas; and explain why the chosen solution is optimal.

T1.3a generate ideas for alternative solutions

T1.3b evaluate alternatives based on the constraints of design

T1.4 develop plans, including drawings with measurements and details of construction, and construct a model of the solution, exhibiting a degree of craftsmanship.

T1.4a design and construct a model of the product or process

T1.4b construct a model of the product or process

T1.5 In a group setting, test their solution against design specifications, present and evaluate results, describe how the solution might have been modified for different or better results, and discuss trade-offs that might have to be made.

T1.5a test a design

T1.5b evaluate a design

CCLS- Literacy

CCSS.ELA-LITERACY.RST.6-8.8
Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

Debate about conventional vs alternative sources of energy, cost and benefits

CCSS.ELA-LITERACY.RST.6-8.7
Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

SOUND

LIGHT

ELECTRICITY AND MAGNETISM

STANDARD 4: The physical setting

Key Idea 4:
Energy exists in many forms; when these forms change, energy is conserved.

Tier 2 Vocabulary:

absorb	transmit	emit	refract	reflect	vacuum	"attractive force"	Vibrational
Transfer	Repel	Disturbances	Direct vs. indirect	convert			

Tier 3 Vocabulary:

Electromagnetic spectrum	Transverse waves	Longitudinal wave	Visible spectrum	Circuit
Magnetic field	Domains	Infrared	Ultra violet	Resistance
voltage	Simple circuit	Parallel circuit	Magnetic poles	Refraction
Reflection	Microwaves	Dopplar		

PERFORMANCE INDICATOR: 4.4

Observe and describe the properties of sound, light, magnetism and electricity.

Process Skills:
safely and accurately use a metric ruler, stopwatch, spring scale, voltmeter, use appropriate units for measured or calculated values, recognize and analyze patterns and trends. Determine the electrical conductivity of a material, using a simple circuit, and determine the speed and acceleration of a moving object.

Major Understandings:

4.4a Different forms of electromagnetic energy have different wavelengths. Some example of electromagnetic energy are microwaves, infrared light, visible light, ultraviolet light, X-rays, and gamma rays.

4.4b Light passes through some materials, sometimes refracting in the process. Materials absorb and reflect light, and may transmit light. To see an object, light from that object, emitted by or reflected from it, must enter the eye.

4.4c Vibrations in materials set up wave-like disturbances that spread away from the source. Sound waves are an example. Vibrational waves move at different speeds in different materials. Sound cannot travel in a vacuum.

4.4d Electrical energy can be produced from a variety of energy sources and can be transformed into almost any other form of energy.

4.4e Electrical circuits provide a means of transferring electrical energy.

4.4f Without touching them, material that has been electrically charged attracts uncharged material, and may either attract or repel other charged material.

4.4g Without direct contact, a magnet attracts certain materials and either attracts or repels other magnets. The attractive force of a magnet is greatest at its poles.

PERFORMANCE INDICATOR 5.2:

Observe, describe, and compare effects of forces (gravity, electric current, and magnetism) on the motion of objects.

5.2b Electric currents and magnets can exert a force on each other.

Labs:

-Slinky activity demonstrating transverse and longitudinal motion
-Resonating activities like: sound of different lengths of string, string instruments resonating with tuning fork , swinging of vacuum pipe, sound traveling thru PVC pipe, sound in a bell jar vacuum to demo the need of matter for sound to travel, playing various notes using different water heights, xylophone demo
-Station labs for circuits and static electricity
-Static electricity with balloons or pith balls
-Vandergraf static generator demo
-Prism demo to show the colors of the visible spectrum
-Magnet lab with iron filings to observe magnetic fields (Val has stations lab)
-Lab to separate sand, salt and iron

Expanded Process Skills:

STANDARD 1—Analysis, Inquiry, and Design

Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions

S1.2a independently formulate a hypothesis

S1.4 Seek to clarify, to assess critically, and to reconcile with their own thinking the ideas presented by others, including peers, teachers, authors, and scientists.

S2.1d use appropriate tools and conventional techniques to solve problems about the natural world, including: • measuring• observing• describing• classifying• sequencing

CCLS- Literacy

CCSS.ELA-LITERACY.RST.6-8.3

Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Craft and Structure:

CCSS.ELA-LITERACY.RST.6-8.4

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 6-8 texts and topics*.

FORCES AND MOTION; NEWTONS LAWS, SPEED, ACCELERATION WORK & SIMPLE MACHINES

STANDARD 4: The Physical Setting

Key idea 5:
Energy and matter interact through forces that result in changes in motion.

Introduction: Examples of objects in motion can be seen all around us. These motions result from an interaction of energy and matter. This interaction creates forces (pushes and pulls) that produce predictable patterns of change. Common forces would include gravity, magnetism, and electricity. Friction is a force that should always be considered in a discussion of motion.

When the forces acting on an object are unbalanced, changes in that object's motion occur. The changes could include a change in speed or a change in direction. When the forces are balanced, the motion of that object will remain unchanged. Understanding the laws that govern motion allows us to predict these changes in motion.

Tier 2 Vocabulary:

interaction	interact	predictable	common	govern	lubricating
balanced vs. unbalanced	absolute	misleading	effect	complex	
subjected	exerts	orbiting	projectiles	opposes	Transfer
Combination	reducing	opposes	reaction		

Tier 3 Vocabulary:

Speed	Acceleration	Inertia	Velocity	Wheel and axle
Pulley	Lever	Screw	inclined plane	Wedge
Mechanical advantage	Newtons laws	Force	Work	Conservation of energy
Transfer of energy	gravity	friction	Newton unit	Joules

PERFORMANCE INDICATOR 5.1:
Describe different patterns of motion of objects.

Process Skills:
safely and accurately use a metric ruler, stopwatch, spring scale, voltmeter, use appropriate units for measured or calculated values, recognize and analyze patterns and trends. Determine the electrical conductivity of a material, using a simple circuit, and determine the speed and acceleration of a moving object.

Identify cause and effects, sequence events, use indicators and interpret result

Major Understandings:

5.1a The motion of an object is always judged with respect to some other object or point. The idea of absolute motion or rest is misleading.

5.1b The motion of an object can be described by its position, direction of motion, and speed.

5.1c An object's motion is the result of the combined effect of all forces acting on the object. A moving object that is not subjected to a force will continue to move at a constant speed in a straight line. An object at rest will remain at rest.

5.1d Force is directly related to an object's mass and acceleration. The greater the force, the greater the change in motion.

5.1e For every action there is an equal and opposite reaction.

PERFORMANCE INDICATOR 5.2:
Observe, describe, and compare effects of forces (gravity, electric current, and magnetism) on the motion of objects.

Process Skills:
safely and accurately use a metric ruler, stopwatch, spring scale, voltmeter, use appropriate units for measured or calculated values, recognize and analyze patterns and trends. Determine the electrical conductivity of a material, using a simple circuit, and determine the speed and acceleration of a moving object.

Identify cause and effects, sequence events, use indicators and interpret results

Major Understandings:

5.2a Every object exerts gravitational force on every other object. Gravitational force depends on how much mass the objects have and on how far apart they are. Gravity is one of the forces acting on orbiting objects and projectiles.

5.2b Electric currents and magnets can exert a force on each other.

5.2c Machines transfer mechanical energy from one object to another.

5.2d Friction is a force that opposes motion.

5.2e A machine can be made more efficient by reducing friction. Some common ways of reducing friction include lubricating or waxing surfaces.

5.2f Machines can change the direction or amount of force, or the distance or speed of force required to do work.

5.2g Simple machines include a lever, a pulley, a wheel and axle, and an inclined plane. A complex machine uses a combination of interacting simple machines, e.g., a bicycle

Labs:

-Station activities for Newton's laws (flying table cloth with dishes, cup with index card and penny, swinging cup of water on rope to illustrate centrifugal force, basketball/tennis activity, different size and weight ball dropped from same height, bicycle wheel rotation force, Euler's Disk demo, tug of war, ect)
-Simple machine stations (different bird beaks acting as simple machines, Rube Goldberg comic machines, crowbar vs pliers to extract nail; short screwdriver vs long screwdriver, see-saw lengths for different weights, make a mobile with different weights, using body parts as simple machines like teeth and legs, pulley lab, ramp lab using spring scale and weights, doorknob and faucet demo)
-Speed vs. acceleration graph plot and analysis activity

Expanded Process Skills:

Standard 1 Analysis, Inquiry and Design Mathematical Analysis:

Key Idea 1: Abstraction and symbolic representation are used to communicate mathematically.

M1.1a identify independent and dependent variables

M1.1b identify relationships among variables including: direct, indirect, cyclic, constant; identify non-related material

M1.1c apply mathematical equations to describe relationships among variables in the natural world

Key Idea 3: Critical thinking skills are used in the solution of mathematical problems.

M3.1 Apply mathematical knowledge to solve real-world problems and problems that arise from the investigation of mathematical ideas, using representations such as pictures, charts, and tables.

M3.1a use appropriate scientific tools to solve problems about the natural world

Standard 6: Interconnectedness: Common Themes, MODELS:

Key Idea 2: Models are simplified representations of objects, structures, or systems used in analysis, explanation, interpretation, or design

2.2 Use models to study processes that cannot be studied directly (e.g., when the real process is too slow, too fast, or too dangerous for direct observation).

Standard 6: Interconnectedness: Common Themes, Patterns of change:

Key Idea 5: Identifying patterns of change is necessary for making predictions about future behavior and conditions.

5.1 Use simple linear equations to represent how a parameter changes with time.

5.2 Observe patterns of change in trends or cycles and make predictions on what might happen in the future.

CCLS- Literacy

CCSS.ELA-LITERACY.RST.6-8.6
Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

CCSS.ELA-LITERACY.RST.6-8.9
Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

Articles and videos of simple machines