

Fourth Grade

Essential Questions by Unit

Strand	Unit	Essential Questions
Strand 1 Matter & Energy	Mixtures and Solutions Electricity	What makes up our world? What causes change in our physical world? What patterns occur when matter changes? How does energy move?
Strand 2 Force & Motion	Laws of Motion Electricity	How and why do objects move? What are the patterns of movement that affect our world?
Strand 3 Living Systems	Classification of Plants and Animals	What does it mean to be alive? How can living things be so different yet be so alike?
Strand 4 Ecology		
Strand 5 Earth Systems		
Strand 6 Universe		
Strand 7 Scientific Inquiry	Inquiry	What type of questions can science answer? How can I investigate my ideas about nature?
Strand 8 Science, Technology & Human Activity	Science, Technology & Human Activity	How does science impact our life?

Fourth Grade Level Expectations

Strand 1: Properties and Principles of Matter and Energy

1. Changes in properties and states of matter provide evidence of the atomic theory of matter

A. Objects, and the materials they are made of, have properties that can be used to describe and classify them

Scope and Sequence – Mixtures and Solutions

- Describe and compare the masses of objects to the nearest gram using balances
- Describe and compare the volumes (the amount of space an object occupies) of objects using a graduated cylinder
- Recognize no two objects can occupy the same space at the same time (e.g., water level rises when an object or substance, such as a rock, is placed in a quantity of water)
- Classify types of materials (e.g., water, salt, sugar, iron filings, salt water) into substances (materials that have specific physical properties) or mixtures of substances by using their characteristic properties

B. Properties of mixtures depend upon the concentrations, properties, and interactions of particles

Scope and Sequence – Mixtures and Solutions

- Identify water as a solvent that dissolves materials (Do NOT assess the term solvent)
- Observe and describe how mixtures are made by combining solids or liquids, or a combination of these
- Distinguish between the components in a mixture (e.g., trail mix, conglomerate rock, salad)
- Describe ways to separate the components of a mixture by their properties (i.e., sorting, filtration, magnets, screening)

I. Mass is conserved during any physical or chemical change

Scope and Sequence – Mixtures and Solutions

- Recognize that the total mass of a material remains constant whether it is together, in parts, or in a different state

2. Energy has a source, can be transferred, and can be transformed into various forms but is conserved between and within systems

A. Forms of energy have a source, a means of transfer (work and heat), and a receiver

Scope and Sequence – Forms of Energy: Electrical Circuits

- Construct and diagram a complete electric circuit by using a source (e.g., battery), means of transfer (e.g., wires), and receiver (e.g., resistance bulbs, motors, fans)
- Observe and describe the evidence of energy transfer in a closed series circuit (e.g., lit bulb, moving motor, fan)
- Classify materials as conductors or insulators of electricity when placed within a circuit (e.g., wood, pencil lead, plastic, glass, aluminum foil, lemon juice, air, water)

Strand 2: Properties and Principles of Force and Motion

1. The motion of an object is described by its change in position relative to another object or point

A. The motion of an object is described as a change in position, direction, and speed relative to another object (frame of reference)

Scope and Sequence – Laws of Motion

- Classify different types of motion (straight line, curved, back and forth)
- Describe an object's motion in terms of distance and time

2. Forces affect motion

A. Forces are classified as either contact (pushes, pulls, friction, buoyancy) or non-contact forces (gravity, magnetism), that can be described in terms of direction and magnitude

Scope and Sequence – Laws of Motion

- Identify the forces acting on the motion of objects traveling in a straight line
- Recognize friction as a force that slows down or stops a moving object that is touching another object or surface
- Compare the forces (measured by a spring scale in Newtons) **required to overcome friction when an object moves over different surfaces (i.e., rough/smooth)**

B. Every object exerts a gravitational force on every other object

Scope and Sequence – Laws of Motion

- Determine the gravitational pull of the Earth on an object (weight) using a spring scale

D. Newton's Laws of Motion explain the interaction of mass and forces, and are used to predict changes in motion

Scope and Sequence – Laws of Motion

- Recognize that balanced forces do not affect an object's motion
- Describe how unbalanced forces acting on an object changes its speed (faster/slower), direction of motion, or both
- Explain how increasing or decreasing the amount of force on an object affects the motion of that object
- Explain how the mass of an object (e.g., cars, marbles, rocks, boulders) affects the force required to move it
- Predict how the change in speed of an object (i.e., faster/slower/remains the same) is affected by the amount of force applied to an object and the mass of the object

Scope and Sequence – Forms of Energy: Electrical Circuits

- Predict the effects of an electrostatic force (static electricity) on the motion of objects (attract or repel)

Strand 3: Characteristics and Interactions of Living Organisms

1. There is a fundamental unity underlying the diversity of all living organisms

D. Plants and animals have different structures that serve similar functions necessary for the survival of the organism

*Scope and Sequence – **Classification of Plants and Animals***

- Compare structures (e.g., wings vs. fins vs. legs; gills vs. lungs; feathers vs. hair vs. scales) that serve similar functions for animals belonging to different vertebrate classes

E. Biological classifications are based on how organisms are related

*Scope and Sequence – **Classification of Plants and Animals***

- Explain how similarities are the basis for classification
- Distinguish between plants (which use sunlight to make their own food) and animals (which must consume energy-rich food)
- Classify animals as vertebrates or invertebrates
- Classify vertebrate animals into classes (amphibians, birds, reptiles, mammals, fish) based on their characteristics
- Identify plants or animals using simple dichotomous keys

2. Living organisms carry out life processes in order to survive

C. Complex multicellular organisms have systems that interact to carry out life processes through physical and chemical means

*Scope and Sequence – **Classification of Plants and Animals***

- Recognize the major life processes carried out by the major systems of plants and animals (e.g., support, reproductive, digestive, transport/circulatory, excretory, response) (Do NOT assess naming of organs within each system or explanation of the processes carried out by those systems)

Strand 7: Scientific Inquiry

1. Science understanding is developed through the use of science process skills, scientific knowledge, scientific investigation, reasoning, and critical thinking

A. Scientific inquiry includes the ability of students to formulate a testable question and explanation, and to select appropriate investigative methods in order to obtain evidence relevant to the explanation

*Scope and Sequence - **All Units***

- Formulate testable questions and explanations (hypotheses)
- Recognize the characteristics of a fair and unbiased test
- Conduct a fair test to answer a question

B. Scientific inquiry relies upon gathering evidence from qualitative and quantitative observations

*Scope and Sequence - **All Units***

- Make qualitative observations using the five senses
- Make observations using simple tools and equipment (e.g., hand lenses, magnets, thermometers, metric rulers, balances, graduated cylinders, spring scale)
- Measure length to the nearest centimeter, mass using grams, temperature using degrees Celsius, volume to the nearest milliliter, weight to the nearest Newton
- Compare amounts/measurements
- Judge whether measurements and computation of quantities are reasonable

C. Evidence is used to formulate explanations

*Scope and Sequence - **All Units***

- Use quantitative and qualitative data as support for reasonable explanations
- Use data as support for observed patterns and relationships, and to make predictions to be tested

D. Scientific inquiry includes evaluation of explanations (hypotheses, laws, theories) in light of scientific principles (understandings)

*Scope and Sequence - **All Units***

- Evaluate the reasonableness of an explanation
- Analyze whether evidence supports proposed explanations

E. The nature of science relies upon communication of results and justification of explanations

*Scope and Sequence - **All Units***

- Communicate the procedures and results of investigations and explanations through:
 - ⇒ oral presentations
 - ⇒ drawings and maps
 - ⇒ data tables
 - ⇒ graphs (bar, single line, pictograph)
 - ⇒ writings

Strand 8: Impact of Science, Technology and Human Activity

1. The nature of technology can advance, and is advanced by, science as it seeks to apply scientific knowledge in ways that meet human needs

A. Designed objects are used to do things better or more easily and to do some things that could not otherwise be done at all

*Scope and Sequence – **Forms of Energy: Electrical Circuits***

- Design and construct an electrical device, using materials and/or existing objects, that can be used to perform a task (Assess Locally)

B. Advances in technology often result in improved data collection and an increase in scientific information

*Scope and Sequence – **Mixtures and Solutions/Forms of Energy: Electrical Circuits***

- Describe how new technologies have helped scientists make better observations and measurements for investigations (e.g., telescopes, magnifiers, balances, microscopes, computers, stethoscopes, thermometers)

C. Technological solutions to problems often have drawbacks as well as benefits

*Scope and Sequence – **Forms of Energy: Electrical Circuits/Laws of Motion***

- Identify how the effects of inventions or technological advances (e.g., different types of light bulbs, semiconductors/integrated circuits and electronics, satellite imagery, robotics, communication, transportation, generation of energy, renewable materials) may be helpful, harmful, or both (Assess Locally)

2. Historical and cultural perspectives of scientific explanations help to improve understanding of the nature of science and how science knowledge and technology evolve over time

A. People of different gender and ethnicity have contributed to scientific discoveries and the invention of technological innovations

Scope and Sequence – All Units

- a. Research biographical information about various scientists and inventors from different gender and ethnic backgrounds, and describe how their work contributed to science and technology (Assess Locally)

3. Science and technology affect, and are affected by, society

A. People, alone or in groups, are always making discoveries about nature and inventing new ways to solve problems and get work done

Scope and Sequence - All Units

- a. Identify a question that was asked, or could be asked, or a problem that needed to be solved when given a brief scenario (fiction or nonfiction of people working alone or in groups solving everyday problems or learning through discovery)
- b. Work with a group to solve a problem, giving due credit to the ideas and contributions of each group member (Assess Locally)