Disciplinary Core Idea

4.PS3.A: Definitions of Energy

The faster a given object is moving, the more energy it possesses. (4-PS3-1)

Disciplinary Core Idea

4.PS3.A: Definitions of Energy

Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3-2), (4-PS3-3)

Disciplinary Core Idea

4.PS3.B: Conservation of Energy and Energy Transfer

Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (4-PS3-2), (4-PS3-3)

Disciplinary Core Idea

4.PS3.B: Conservation of Energy and Energy Transfer

Light also transfers energy from place to place. (4-PS3-2)

Disciplinary Core Idea

4.PS3.B: Conservation of Energy and Energy Transfer

Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. (4-PS3-2), (4-PS3-4)

Disciplinary Core Idea

4.PS3.C: Relationship Between Energy and Forces

When objects collide, the contact forces transfer energy so as to change the objects' motions. (4-PS3-3)

Disciplinary Core Idea

4.PS3.D: Energy in Chemical Processes and Everyday Life

The expression “produce energy” typically refers to the conversion of stored energy into a desired form for practical use. (4-PS3-4)

Disciplinary Core Idea

4.ESS3.A: Natural Resources

Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. (4-ESS3-1)

Disciplinary Core Idea

4.ETS1.A: Defining and Delimiting Engineering Problems

Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (4-PS3-4)

Performance Expectation

4-ESS3-1: Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

Clarification Statement: Examples of renewable energy resources could include wind energy, water behind dams, and sunlight; non-renewable energy resources are fossil fuels and fissile materials. Examples of environmental effects could include loss of habitat due to dams, loss of habitat due to surface mining, and air pollution from burning of fossil fuels.
Assessment Boundary: none

Performance Expectation

4-PS3-1: Use evidence to construct an explanation relating the speed of an object to the energy of that object.

Clarification Statement: none
Assessment Boundary: Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy.

Performance Expectation

4-PS3-2: Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

Clarification Statement: none
Assessment Boundary: Assessment does not include quantitative measurements of energy.

Performance Expectation

4-PS3-3: Ask questions and predict outcomes about the changes in energy that occur when objects collide.

Clarification Statement: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.
Assessment Boundary: Assessment does not include quantitative measurements of energy.

Performance Expectation

4-PS3-4: Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

Clarification Statement: Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound; and, a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device.
Assessment Boundary: Devices should be limited to those that convert motion energy to electric energy or use stored energy to cause motion or produce light or sound.

Science and Engineering Practice

Asking Questions and Defining Problems

Asking questions and defining problems in grades 3–5 builds from grades K–2 experiences and progresses to specifying qualitative relationships.

Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. (4-PS3-3)

Science and Engineering Practice

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.

Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (4-PS3-2)

Science and Engineering Practice

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

Use evidence (e.g., measurements, observations, patterns) to construct an explanation. (4-PS3-1)

Science and Engineering Practice

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

Apply scientific ideas to solve design problems. (4-PS3-4)

Science and Engineering Practice

Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods.

Obtain and combine information from books and other reliable media to explain phenomena. (4-ESS3-1)

Crosscutting Concept

Cause and Effect

Cause and effect relationships are routinely identified and used to explain change. (4-ESS3-1)

Crosscutting Concept

Energy and Matter

Energy can be transferred in various ways and between objects. (4-PS3-1), (4-PS3-2), (4-PS3-3), (4-PS3-4)

Connection to Nature of Science

Science Is a Human Endeavor

Science affects everyday life. (4-PS3-4)

Connection to Nature of Science

Science Is a Human Endeavor

Most scientists and engineers work in teams. (4-PS3-4)

Connection to Engineering, Technology, and Applications of Science

Influence of Science, Engineering, and Technology on Society and the Natural World

Engineers improve existing technologies or develop new ones. (4-PS3-4)

Connection to Engineering, Technology, and Applications of Science

Influence of Science, Engineering, and Technology on Society and the Natural World

Over time, people's needs and wants change, as do their demands for new and improved technologies. (4-ESS3-1)

Connection to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology

Knowledge of relevant scientific concepts and research findings is important in engineering. (4-ESS3-1)

Common Core State Standards for ELA/Literacy

Reading Informational Text

RI.4.1 - Key Ideas and Details

Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (4-PS3-1)

Common Core State Standards for ELA/Literacy

Reading Informational Text

RI.4.3 - Key Ideas and Details

Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. (4-PS3-1)

Common Core State Standards for ELA/Literacy

Reading Informational Text

RI.4.9 - Integration of Knowledge and Ideas

Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-PS3-1)

Common Core State Standards for ELA/Literacy

Card Type name

W.4.2 - Text Types and Purposes

Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (4-PS3-1)

Common Core State Standards for ELA/Literacy

Card Type name

W.4.7 - Research to Build and Present Knowledge

Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-ESS3-1), (4-PS3-2), (4-PS3-3), (4-PS3-4)

Common Core State Standards for ELA/Literacy

Card Type name

W.4.8 - Research to Build and Present Knowledge

Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-ESS3-1), (4-PS3-1), (4-PS3-2), (4-PS3-3), (4-PS3-4)

Common Core State Standards for ELA/Literacy

Card Type name

W.4.9 - Research to Build and Present Knowledge

Draw evidence from literary or informational texts to support analysis, reflection, and research. (4-ESS3-1), (4-PS3-1)

Common Core State Standards for Mathematics

Operations & Algebraic Thinking

4.OA.A.1 - Use the four operations with whole numbers to solve problems.

Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 x 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations. (4-ESS3-1)

Common Core State Standards for Mathematics

Operations & Algebraic Thinking

4.OA.A.3 - Use the four operations with whole numbers to solve problems.

Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. (4-PS3-4)

Common Core State Standards for Mathematics

Mathematical Practices

MP.2 - Reason abstractly and quantitatively

Reason abstractly and quantitatively. (4-ESS3-1)

Common Core State Standards for Mathematics

Mathematical Practices

MP.4 - Model with mathematics

Model with mathematics. (4-ESS3-1)