4.PS3.A: Definitions of Energy

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

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)

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

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

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)

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)
DCI: Energy

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)

DCI: Energy

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-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 on 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)

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**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)

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**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)

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**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)

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**Connection to Nature of Science**

**Science Is a Human Endeavor**

Science affects everyday life. (4-PS3-4)
Science Is a Human Endeavor
Most scientists and engineers work in teams. (4-PS3-4)

Influence of Science, Engineering, and Technology on Society and the Natural World
Engineers improve existing technologies or develop new ones. (4-PS3-4)

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)
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)

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)

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

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-PS3-1), (4-PS3-2), (4-PS3-3), (4-PS3-4)

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