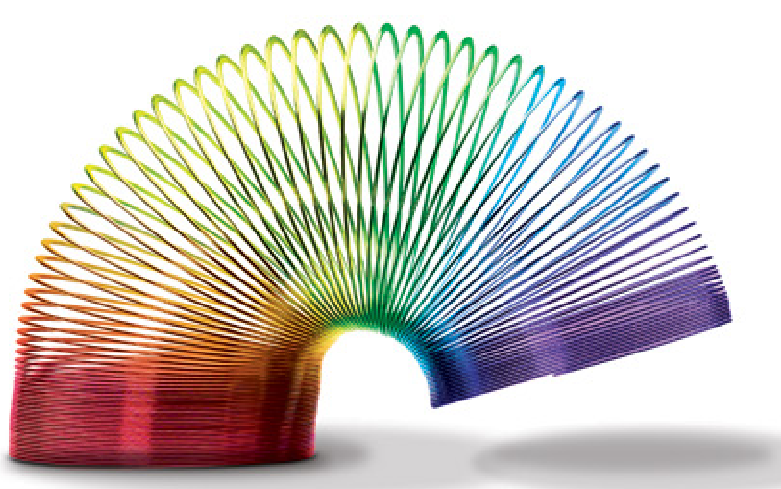
Teacher's Edition
Grade 4 • Unit 1

# Inspire Science

## Forces and Energy



McGraw Hill Education

## Performance Expectations at a Glance

In this unit, students will discover and practice the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts needed to perform the following Performance Expectations.

| **Performance Expectations** | MODULE: **Energy and Motion** |
|---|---|
| 4-PS3-1 | ● |
| 4-PS3-3 | ● |

## Correlations by Module to the NGSS

| MODULE: Energy and Motion | | |
|---|---|---|
| **4-PS3-1** | **Energy** | |
| **4-PS3-1** | **Use evidence to construct an explanation relating the speed of an object to the energy of that object.** *[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.]* | *26–28*, 29, *44–45*, 53 |
| **SEP** Science and Engineering Practices | | |
| **Constructing Explanations and Designing Solutions**<br>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.<br>• Use evidence (e.g., measurements, observations, patterns) to construct an explanation. | | *16–17,* 29, 37, 53, 22, *61–66*<br>*Teacher's Edition only: 45* |
| **DCI** Disciplinary Core Ideas | | |
| **PS3.A: Definitions of Energy**<br>• The faster a given object is moving, the more energy it possesses. | | 29, 31, 32 |
| **CCC** Crosscutting Concepts | | |
| **Energy and Matter**<br>• Energy can be transferred in various ways and between objects. | | *8–9*, 30–33, *35–37*, *44–45*, 52, 53, 54–55<br>*Teacher's Edition only: 17* |

*Inquiry activities are in italics.*

| 4-PS3-3 | Energy | |
|---|---|---|
| **4-PS3-3** | **Ask questions and predict outcomes about the changes in energy that occur when objects collide.**<br>*[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.]* | *35–37*, *44–45*, *54–55* |
| **SEP Science and Engineering Practices** | | |
| **Asking Questions and Defining Problems**<br>Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.<br>• Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. | | *8–9*, *46* |
| **DCI Disciplinary Core Ideas** | | |
| **PS3.A: Definitions of Energy**<br>• Energy can be moved from place to place by moving objects or through sound, light, or electric currents. | | 38, 48–49 |
| **PS3.B: Conservation of Energy and Energy Transfer**<br>• 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. | | 31, 49, 50–51, 52 |
| **PS3.C: Relationship Between Energy and Forces**<br>• When objects collide, the contact forces transfer energy so as to change the objects' motions. | | 48 |
| **CCC Crosscutting Concepts** | | |
| **Energy and Matter**<br>• Energy can be transferred in various ways and between objects. | | *8–9*, *30–33*, *35–37*, *44–45*, 52, 53, 54–55<br>*Teacher's Edition only: 17* |
| **ELD Connections** | | |
| ELD.PI.4.1 | | *17*, 34, 51, 55<br>Teacher's Edition *only*: 18, 20, 57 |
| ELD.PI.4.3 | | Teacher's Edition *only*: 29, 34, 60 |
| ELD.PI.4.12 | | *17*, 18, 20, 34, 38, 49, 51, 55, 58<br>Teacher's Edition *only*: 38, 47, 59 |

*Inquiry activities are in italics.*

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| **CCSS ELA/Literacy Connections** | |
|---|---|
| SL.4.3 | *45* |
| W.4.7 | *17*, 40, 60 |
| W.4.8 | *17*, 40, 60 |
| RI.4.3 | 40, 58 |
| L.4.6 | *17*, 18, 20, 34, 38, 51, 55, 58 |
| **ALSO INTEGRATES:** | |
| SEP Analyzing and Interpreting Data | *8–9*, *66* |
| SEP Obtaining, Evaluating, and Communicating Information | *63–66* |
| SEP Planning and Carrying Out Investigations | *8–9*, *16–17*, *26–28*, *35–37*, *44–46*, *54–55*, *61–66* |
| CCC Cause and Effect | 11, 13, *17,* 40, 57, 60 |
| 4.MD.A.2- Measurement and Data | 21, 27, 36, 45 |

*Inquiry activities are in italics.*


# Teacher's Edition

## Grade 4 • Unit 2

# Inspire Science

## Using Energy

McGraw Hill Education

## Performance Expectations at a Glance

In this unit, students will discover and practice the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts needed to perform the following Performance Expectations.

| Performance Expectations | MODULE: **Energy Transfer** | MODULE: **Natural Resources in the Environment** |
|---|---|---|
| 4-ESS3-1 | | ● |
| 4-PS3-2 | ● | |
| 4-PS3-4 | | ● |

## Correlations by Module to the NGSS

### MODULE: Energy Transfer

| 4-PS3-2 | Energy | |
|---|---|---|
| **4-PS3-2** | **Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.** *[Assessment Boundary: Assessment does not include quantitative measurements of energy.]* | *28–29*, 30–31, 32–33, *34–35*, *46–47*, *51–52*, *64–67*, *72* |
| **SEP Science and Engineering Practices** | | |
| **Planning and Carrying Out Investigations**<br>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.<br>• Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. | | *8–11*, *28–29*, *34–35*, *42*, *46–47*, *51–52*, *64–67*, *73*, *83* |

*Inquiry activities are in Italics.*

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| DCI **Disciplinary Core Ideas** | |
|---|---|
| **PS3.A: Definitions of Energy**<br>• Energy can be moved from place to place by moving objects or through sound, light, or electric currents. | 5, *16–17*<br>Teacher's Edition *only*: 24 |
| **PS3.B: Conservation of Energy and Energy Transfer**<br>• 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.<br>• Light also transfers energy from place to place.<br>• 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. | 5, 12–15, 30–31, 32–33, 43, 48-50, 53, 54–55, 68–69, 73<br>Teacher's Edition *only*: 75 |
| CCC **Crosscutting Concepts** | |
| **Energy and Matter**<br>• Energy can be transferred in various ways and between objects. | 11, 15, *20*, 30–31, 32–33, 54–55, 64–67, 68–69, 70, 72 |
| **ELD Connections** | |
| PI.4.10 | Teacher's Edition *only*: 22, 24, 40 |
| ELD.PI.4.11 | Teacher's Edition *only;* 13, 33, 49, 52, 75 |
| PI.4.2 | Teacher's edition *only*: 58, 69 |
| **CCSS ELA/Literacy Connections** | |
| RI.4.3 | 56 |
| W.4.7 | 38<br>Teacher's Edition *only*: 24, 60, 78, 81 |
| **ALSO INTEGRATES:** | |
| PE 4-PS3-4 | *79–84* |
| SEP Constructing Explanations and Designing Solutions | 11, 20, 28–29, 67, 79–84 |
| SEP Obtaining, Evaluating, and Communicating Information | 24, 38, 42, 60, 81 |
| DCI PS3.D: Energy in Chemical Processes and Everyday Life | 73 |

*Inquiry activities are in Italics.*

## MODULE: Natural Resources in the Environment

| 4-ESS3-1 | Energy | |
|---|---|---|
| 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.]* | 94–96, 97, *98–99*, 103, 110–111, 112–113, 114, 115, 123, *124–127*, 128–129, 130–131, 135 |

| SEP Science and Engineering Practices | |
|---|---|
| **Obtaining, Evaluating, and Communicating Information**<br>Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluate the merit and accuracy of ideas and methods.<br>• Obtain and combine information from books and other reliable media to explain phenomena. | *98–99*, 117, 135, 155 |
| **DCI Disciplinary Core Ideas** | |
| **ESS3.A: Natural Resources**<br>• 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. | 89, 94–96, 110–111, 112–113, 114, 123, *124–127*, 128–129, 130–131, 135 |
| **CCC Crosscutting Concepts** | |
| **Cause and Effect**<br>• Cause and effect relationships are routinely identified and used to explain change. | *8–11*, *34–35*, *51–52*, 59, *92–93*, 123, *124–127*, 128–129, 130–131, 135, 136, 138, *142–143*, 149 |
| **Connections to Engineering, Technology, and Applications of Science**<br>**Interdependence of Science, Engineering, and Technology**<br>• Knowledge of relevant scientific concepts and research findings is important in engineering. | Teacher's Edition *only*: *117*, 135 |
| **Influence of Engineering, Technology, and Science on Society and the Natural World**<br>• Over time, people's needs and wants change, as do their demands for new and improved technologies. | Teacher's Edition *only*: 97, 99, 112, 135, *143* |

*Inquiry activities are in Italics.*

| 4-PS3-4 | Earth's Place in the Universe | |
|---|---|---|
| 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.]* | *142–143*, *153–157* |
| **SEP Science and Engineering Practices** | | |
| **Constructing Explanations and Designing Solutions**<br>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.<br>• Apply scientific ideas to solve design problems. | | 127, *142–143*, 152, *155–158* |
| **DCI Disciplinary Core Ideas** | | |
| **PS3.B: Conservation of Energy and Energy Transfer**<br>• 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. | | 113, 114, 116<br>Teacher's Edition *only*: 97 |
| **PS3.D: Energy in Chemical Processes and Everyday Life**<br>• The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. | | 97 |
| **ETS1.A: Defining Engineering Problems**<br>• 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. (secondary) | | *155–158* |
| **CCC Crosscutting Concepts** | | |
| ***Connections to Engineering, Technology, and Applications of Science* Influence of Engineering, Technology, and Science on Society and the Natural World**<br>• Engineers improve existing technologies or develop new ones. | | 99, 112, 135, *143* |
| ***Connections to Nature of Science* Science is a Human Endeavor**<br>• Most scientists and engineers work in teams.<br>• Science affects everyday life. | | 148 |
| **Energy and Matter**<br>• Energy can be transferred in various ways and between objects. | | 97, *143* |

*Inquiry activities are in Italics.*

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| | |
|---|---|
| **ELD Connections** | |
| PI.4.2 | 104, 135, 138<br>Teacher's Edition *only*: 127 |
| PI.4.11 | 104, 120, 138<br>Teacher's Edition *only*: 97, 100, 115, 129, 132, 145, 148 |
| PI.4.5 | Teacher's Edition *only*: 113 |
| PI.4.6 | Teacher's Edition *only*: 116, 149 |
| **CCSS ELA/Literacy Connections** | |
| RI.4.3 | Teacher's Edition *only*: 131, 135 |
| RI.4.5 | 130–131 |
| W.4.1 | 135 |
| W.4.7 | Teacher's Edition *only*: 116, *117*, *155* |
| **ALSO INTEGRATES:** | |
| SEP Planning and Carrying Out Investigations | *92–93*, *108–109*, *124–125*, *142–143* |
| DCI PS3.B: Conservation of Energy and Energy Transfer | 97, 112–113, 114, 116 |
| 4.MD.A.1 | 98 |

*Inquiry activities are in Italics.*

Teacher's Edition

Grade 4 • Unit 3

# Inspire Science

## Our Dynamic Earth

McGraw Hill Education

## Performance Expectations at a Glance

In this unit, students will discover and practice the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts needed to perform the following Performance Expectations.

| Performance Expectations | MODULE: **Earth and Its Changing Features** | MODULE: **Earthquakes** |
| --- | --- | --- |
| 3-5 ETS1-1 | | ● |
| 3-5 ETS1-2 | ● | ● |
| 3-5 ETS1-3 | ● | ● |
| 4-ESS1-1 | ● | |
| 4-ESS2-1 | ● | |
| 4-ESS2-2 | ● | ● |
| 4-ESS3-2 | ● | ● |
| 4-PS4-1 | | ● |

## Correlations by Module to the NGSS

### MODULE: Earth and Its Changing Features

| 3-5-ETS1-2 | Engineering Design | |
| --- | --- | --- |
| 3-5-ETS1-2 | **Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.** | *61–64* |
| **SEP Science and Engineering Practices** | | |
| **Constructing Explanations and Designing Solutions**<br>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.<br>• Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem. | | *30–31, 37–38, 47, 61–66* |
| **DCI Disciplinary Core Ideas** | | |
| **ETS1.B: Developing Possible Solutions**<br>• Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions.<br>• At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. | | *61–64* |

*Inquiry activities are in Italics.*

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| CCC Crosscutting Concepts | |
|---|---|
| **Influence of Science, Engineering, and Technology on Society and the Natural World**<br>• Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. | *63* |

| 3-5-ETS1-3 | Engineering Design | |
|---|---|---|
| **3-5-ETS1-3** | **Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.** | *61–63* |
| **SEP Science and Engineering Practices** | | |
| **Planning and Carrying Out Investigations**<br>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.<br>• Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. | | *8–11, 21–23, 30–31, 54–55, 62–63* |
| **DCI Disciplinary Core Ideas** | | |
| **ETS1.B: Developing Possible Solutions**<br>• Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. | | *61–64* |
| **ETS1.C: Optimizing the Design Solution**<br>• Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. | | *62–63* |

*Inquiry activities are in Italics.*

| 4-ESS1-1 | Earth's Place in the Universe | |
|---|---|---|
| 4-ESS1-1 | **Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.** *[Clarification Statement: Examples of evidence from patterns could include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and, a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock.] [Assessment Boundary: Assessment does not include specific knowledge of the mechanism of rock formation or memorization of specific rock formations and layers. Assessment is limited to relative time.]* | *30–31, 32–33, 34, 35* |
| SEP Science and Engineering Practices | | |
| **Constructing Explanations and Designing Solutions**<br>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.<br>• Identify the evidence that supports particular points in an explanation. (4-ESS1-1)) | | *30–31, 37–38, 47, 61–66* |
| DCI Disciplinary Core Ideas | | |
| **ESS1.C: The History of Planet Earth**<br>• Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (4-ESS1-1) | | *30–31, 32–33* |
| CCC Crosscutting Concepts | | |
| **Patterns**<br>• Patterns can be used as evidence to support an explanation. (4-ESS1-1) | | 6–7, 11, *21–23,* 24, *30–31, 38* |
| ***Connections to Nature of Science***<br>**Scientific Knowledge Assumes an Order and Consistency in Natural Systems**<br>• Science assumes consistent patterns in natural systems. (4-ESS1-1) | | *37–38* |

*Inquiry activities are in Italics.*

| 4-ESS2-1 | Earth's Systems | |
|---|---|---|
| **4-ESS2-1** | **Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.** *[Clarification Statement: Examples of variables to test could include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow.] [Assessment Boundary: Assessment is limited to a single form of weathering or erosion.]* | *46–47, 54–55, 61–66* |
| **SEP Science and Engineering Practices** | | |
| **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 and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. | | *8–11, 21–23, 30–31, 46–47, 54–55, 64–65* |
| **DCI Disciplinary Core Ideas** | | |
| **ESS2.A: Earth Materials and Systems** • Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. | | 48–49, 50–53 |
| **ESS2.E: Biogeology** • Living things affect the physical characteristics of their regions. | | 48–49 |
| **CCC Crosscutting Concepts** | | |
| **Cause and Effect** • Cause and effect relationships are routinely identified, tested, and used to explain change. | | *37–38, 46–47, 54–55, 64–66* |

*Inquiry activities are in Italics.*

| 4-ESS2-2 | Earth's Systems | |
|---|---|---|
| 4-ESS2-2 | **Analyze and interpret data from maps to describe patterns of Earth's features.**<br>*[Clarification Statement: Maps can include topographic maps of Earth's land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.]* | 6–7, 11, 18–19, 24 |
| **SEP Science and Engineering Practices** | | |
| **Analyzing and Interpreting Data**<br>Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.<br>• Analyze and interpret data to make sense of phenomena using logical reasoning. | | 6–7, *8–11*, *21–23*, 24, *30–31*, *46–47*, *54–55*, *64–67* |
| **DCI Disciplinary Core Ideas** | | |
| **ESS2.B: Plate Tectonics and Large-Scale System Interactions**<br>• The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth. | | *16–17*, *18–19*, 24 |
| **CCC Crosscutting Concepts** | | |
| **Patterns**<br>• Patterns can be used as evidence to support an explanation. | | 6–7, 11, *21–23*, 24, *30–31*, *37–38* |

| 4-ESS3-2 | Earth and Human Activity | |
|---|---|---|
| 4-ESS3-2 | **Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.***<br>*[Clarification Statement: Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity.] [Assessment Boundary: Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.]* | *61–66* |
| **SEP Science and Engineering Practices** | | |
| **Constructing Explanations and Designing Solutions**<br>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.<br>• Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. | | *30–31*, *37–38*, *47*, *61–66* |

*Inquiry activities are in Italics.*

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| DCI Disciplinary Core Ideas | |
| --- | --- |
| **ESS3.B: Natural Hazards**<br>• A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. | 18–19, 50, 56–57 |
| **ETS1.B: Designing Solutions to Engineering Problems**<br>• Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary) | *63, 65, 66* |
| **CCC Crosscutting Concepts** | |
| **Cause and Effect**<br>• Cause and effect relationships are routinely identified, tested, and used to explain change. | *37-38, 46–47, 54–55, 64–66* |
| ***Connections to Engineering, Technology, and Applications of Science***<br>**Influence of Engineering, Technology, and Science on Society and the Natural World**<br>• Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands. | *63* |
| **ELD Connections** | |
| ELD.PI.4.6 | 34–35<br>Teacher's Edition *only*: 13, 36, 48, 51, 56 |
| ELD. PI.4.10.b | 26, 57<br>Teacher's Edition *only*: 11, 33, 40 |
| **CCSS ELA/Literacy Connections** | |
| W.4.3.a, b, c, d, e; W.4.10 | 33 |
| W.4.4 | 33, 57 |
| W.7, W.8 | 26, 42, 57 |
| L.4.1, a, b, c, d, e, g, h | 26, 33, 57, 60, *66* |
| L.4.1.f; L.4.2, a, b, c, d; L.4.5, a, b, c | 33, 57 |
| L.4.6 | 24, 40, 57, 60, 67 |
| **ALSO INTEGRATES:** | |
| SEP Developing and Using Models | *22–23* |
| SEP Obtaining, Evaluating, and Communicating Information | *30–31, 46–47, 54–55,* |
| RF.4 | 35, 50 |
| RI.7 | 14–15 |

*Inquiry activities are in Italics.*

## MODULE: Earthquakes

| 3-5 ETS1-1 | Engineering Design | |
|---|---|---|
| 3-5 ETS1-1 | **Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.** | 126<br>Teacher's Edition *only*: 123 |
| **SEP Science and Engineering Practices** | | |
| **Asking Questions and Defining Problems**<br>Asking questions and defining problems in 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.<br>• Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost. | | *118–119* |
| **DCI Disciplinary Core Ideas** | | |
| **ETS1.A: Defining and Delimiting Engineering Problems**<br>• 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. | | 126, 127 |
| **CCC Crosscutting Concepts** | | |
| **Influence of Science, Engineering, and Technology on Society and the Natural World**<br>• People's needs and wants change over time, as do their demands for new and improved technologies. | | 111, 113, 114–115<br>Teacher's Edition *only*: 117 |

| 3-5-ETS1-2 | Engineering Design | |
|---|---|---|
| 3-5-ETS1-2 | **Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.** | *118–199,* 127, 128 |
| **SEP Science and Engineering Practices** | | |
| **Constructing Explanations and Designing Solutions**<br>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.<br>• Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem. | | *108–109, 53,* 126–128 |

*Inquiry activities are in Italics.*

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| DCI Disciplinary Core Ideas | |
|---|---|
| **ETS1.B: Developing Possible Solutions**<br>• Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions.<br><br>• At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. | 125, 126–128 |
| **CCC Crosscutting Concepts** | |
| **Influence of Science, Engineering, and Technology on Society and the Natural World**<br>• Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. | 111, 113, 114–115<br>Teacher's Edition *only*: 117 |

| 3-5-ETS1-3 | Engineering Design | |
|---|---|---|
| **3-5-ETS1-3** | **Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.** | 126 |
| **SEP Science and Engineering Practices** | | |
| **Planning and Carrying Out Investigations**<br>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.<br>• Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. | | 126–127 |
| **DCI Disciplinary Core Ideas** | | |
| **ETS1.B: Developing Possible Solutions**<br>• Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. | | 125, 126–128 |
| **ETS1.C: Optimizing the Design Solution**<br>• Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. | | 125, 127–128 |

*Inquiry activities are in Italics.*

| 4-ESS2-2 | Earth's Systems | |
|---|---|---|
| 4-ESS2-2 | **Analyze and interpret data from maps to describe patterns of Earth's features.** *[Clarification Statement: Maps can include topographic maps of Earth's land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.]* | 73, *74–76*, 78, 79, 80–81, *83*, 84 |
| **SEP Science and Engineering Practices** | | |
| **Analyzing and Interpreting Data**<br>Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.<br>• Analyze and interpret data to make sense of phenomena using logical reasoning. | | *74*, *83*, *127* |
| **DCI Disciplinary Core Ideas** | | |
| **ESS2.B: Plate Tectonics and Large-Scale System Interactions**<br>• The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth. | | 71, 73, *74–76*, 78, 80–81, *83*, 84<br>Teacher's Edition *only*: 77, 84 |
| **CCC Crosscutting Concepts** | | |
| **Patterns**<br>• Patterns can be used as evidence to support an explanation. | | *74–77*, 80–81, *83*, 85, *99*, 103 |

| 4-ESS3-2 | Reduce Earthquake Damage | |
|---|---|---|
| 4-ESS3-2 | **Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.** *[Clarification Statement: Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity.] [Assessment Boundary: Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.]* | 118–119, 123–128 |
| **SEP Science and Engineering Practices** | | |
| **Constructing Explanations and Designing Solutions**<br>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.<br>• Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. | | 108–109, 119, *126–127*<br>Teacher's Edition *only*: 84 |

*Inquiry activities are in Italics.*

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| DCI **Disciplinary Core Ideas** | |
|---|---|
| **ESS3.B: Natural Hazards**<br>• A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. | 78, 110, 111, 112, 113, 114–115, 116–117, *118–119* |
| **ETS1.B: Designing Solutions to Engineering Problems**<br>• Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary) | *125–128* |
| CCC **Crosscutting Concepts** | |
| **Cause and Effect**<br>• Cause and effect relationships are routinely identified, tested, and used to explain change. | *98–99*, 103, 104 |
| ***Connections to Engineering, Technology, and Applications of Science* Influence of Engineering, Technology, and Science on Society and the Natural World**<br>• Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands. | 114–115 |

| 4-PS4-1 | Earth's Place in the Universe | |
|---|---|---|
| **4-PS4-1** | **Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.** *[Clarification Statement: Examples of models could include diagrams, analogies, and physical models using wire to illustrate wavelength and amplitude of waves.] [Assessment Boundary: Assessment does not include interference effects, electromagnetic waves, non-periodic waves, or quantitative models of amplitude and wavelength.]* | *90–92*, 93, 95–96, *98–99*, 102 |
| SEP **Science and Engineering Practices** | | |
| **Developing and Using Models**<br>Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.<br>• Develop a model using an analogy, example, or abstract representation to describe a scientific principle. | | 73, *74–76*, 80–81, *83*, 84, *91*, *98–99*, *108–109*, *126–128*<br>Teacher's Edition *only*: 93 |
| ***Connections to Nature of Science* Scientific Knowledge is Based on Empirical Evidence**<br>• Science findings are based on recognizing patterns. | | *83*, *99* |

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| DCI **Disciplinary Core Ideas** | |
|---|---|
| **PS4.A: Wave Properties**<br>• Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach.<br><br>• Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). | 88–89, *90–93*, 94, 95–96<br>Teacher's Edition *only*: 93, 102 |
| CCC **Crosscutting Concepts** | |
| **Patterns**<br>• Similarities and differences in patterns can be used to sort, classify, and analyze simple rates of change for natural phenomena. | *74–76*, 80–81, *83*, 85, *91*, *98–99*, 103<br>Teacher's Edition *only*: 77, 84 |
| **CCSS Math Connections** | |
| 4.NF.7 | 103 |
| 4.G.A.1 | 74–76 |
| **ELD Connections** | |
| PI.C.11 | Teacher's Edition *only*: 77 |
| ELD.PI.4.6 | 80–81, 114–115<br>Teacher's Edition *only*: 84, 102, 116, 120 |
| ELD.PI.4.11 | 86<br>Teacher's Edition *only*: 84, 93, 100 |
| ELD.PI.4.3 | Teacher's Edition *only*: 82 |
| **CCSS ELA/Literacy Connections** | |
| SL.4.2 | 118–119, 125 |
| W.4.8 | 81, 115, 118–119 |
| **ALSO INTEGRATES:** | |
| SEP Asking Questions and Defining Problems | *109*<br>Teacher's Edition *only*: 100, 116 |
| SEP Obtaining, Evaluating, and Communicating Information | *74–77*, *83*, *90–93*, *98–99*, *118–119*, *125–128* |
| SEP Planning and Carrying Out Investigations | *90–92*, *98–99*, *108–109*, *118–119*, *123–128* |
| CCC Structure and Function | *109* |

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| | |
|---|---|
| EP&C Principle III Concept a | 86 |
| EP&C Principle IV Concept b | *83* |
| EP&C Principle V Concept a | 86 |
| ELA RF.4.4 | 95, 111 |

*Inquiry activities are in Italics.*

Teacher's Edition

Grade 4 • Unit 4

# Inspire Science

## Information Processing and Living Things

McGraw Hill Education

## Performance Expectations at a Glance

In this unit, students will discover and practice the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts needed to perform the following Performance Expectations.

| Performance Expectations | MODULE: **Structures and Functions of Living Things** | MODULE: **Information Processing and Transfer** |
|---|---|---|
| 4-LS1-1 | ● | |
| 4-LS1-2 | | ● |
| 4-PS3-2 | | ● |
| 4-PS4-2 | | ● |
| 4-PS4-3 | | ● |

## Correlations by Module to the NGSS

### MODULE: Structures and Functions of Living Things

| 4-LS1 | From Molecules to Organisms: Structures and Processes | |
|---|---|---|
| 4-LS1-1 | **Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.** *[Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems.]* | 12, 13, 14, 15, 16, 17, *21*, 22, 31, *39*, 41, *45–50* |
| **SEP Science and Engineering Practices** | | |
| **Engaging in Argument from Evidence**<br>Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).<br>• Construct an argument with evidence, data, and/or a model. (4-LS1-1) | | 16, 31, *38–39*, 41, 49, 50, 61 |
| **DCI Disciplinary Core Ideas** | | |
| **LS1.A: Structure and Function**<br>• Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1) | | 12–13, 14–15, 16–17, 23, 32–33, 34, 35, 36–37, 41, 43 |

*Inquiry activities are in Italics.*

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| CCC Crosscutting Concepts | |
|---|---|
| **Systems and System Models**<br>• A system can be described in terms of its components and their interactions. (4-LS1-1) | *8–9*, 14–15, 16, *28–30* |
| **CCSS Math Connections** | |
| 4.G.A.3 | 13 |
| **ELD Connections** | |
| ELD.PI.4.10 | Teacher's Edition *Only*: 11, 18, 31, 32 |
| **CCSS ELA/Literacy Connections** | |
| W.4.1, a, b, c, d | 33, 50, 87 |
| RI.4.3 | *19–21* |
| RI.4.7 | 37, 41 |
| **ALSO INTEGRATED** | |
| SEP Asking Questions and Defining Problems | *8–9, 19–21, 28–30, 38–39*, 41, 49 |
| SEP Planning and Carrying Out Investigation | 8-9, *19–21, 28–30, 38–39* |
| Constructing Explanations and Designing Solutions | 22, 31, *38–39*, 41, 42, 50 |
| CCC Structure and Function | 6–7, 12–13, 14–15, 16–17, 22, *29*, 26–27, 31, 32–33, 34–36, *38–39*, 41, 42, 45–50 |

## MODULE: Information Processing and Transfer

| 4-LS1 | From Molecules to Organisms: Structures and Processes | |
|---|---|---|
| **4-LS1-2** | **Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.** *[Clarification Statement: Emphasis is on systems of information transfer.] [Assessment Boundary: Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.]* | 64-65, *67–69* |

*Inquiry activities are in Italics.*

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| SEP Science and Engineering Practices | |
|---|---|
| **Developing and Using Models**<br>Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.<br>• Use a model to test interactions concerning the functioning of a natural system. (4-LS1-2) | *59*, *69*, 72, *77*, 85 |
| **DCI Disciplinary Core Ideas** | |
| **LS1.D: Information Processing**<br>• Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. (4-LS1-2) | 62–63, 64–65, 71 |
| **CCC Crosscutting Concepts** | |
| **Systems and System Models**<br>• A system can be described in terms of its components and their interactions. (4-LS1-2) | *59*, 64–65, *67–69*, 71, *84–85* |

| 4-PS3-2 | Energy | |
|---|---|---|
| **4-PS3-2** | **Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.**<br>*[Assessment Boundary: Assessment does not include quantitative measurements of energy.]* | *76–77* |
| **SEP Science and Engineering Practices** | | |
| **Planning and Carrying Out Investigations**<br>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.<br>• Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. | | *58–60, 67–69, 76–77, 84–85, 96–97, 100–101* |

*Inquiry activities are in Italics.*

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| | |
|---|---|
| **DCI Disciplinary Core Ideas** | |
| **PS3.A: Definitions of Energy**<br>• Energy can be moved from place to place by moving objects or through sound, light, or electric currents. | *76–77*, 78–79, *97* |
| **PS3.B: Conservation of Energy and Energy Transfer**<br>• 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.<br><br>• Light also transfers energy from place to place.<br><br>• 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. | *76–77*, 78–79 |
| **CCC Crosscutting Concepts** | |
| **Energy and Matter**<br>• Energy can be transferred in various ways and between objects. | *76–77*, 78–79, *97* |

| 4-PS4 | Waves and Their Applications in Technologies for Information Transfer | |
|---|---|---|
| **4-PS4-2** | **Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.**<br>*[Assessment Boundary: Assessment does not include knowledge of specific colors reflected and seen, the cellular mechanisms of vision, or how the retina works.]* | *76–77* |
| **SEP Science and Engineering Practices** | | |
| **Developing and Using Models**<br>Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.<br>• Develop a model to describe phenomena. | | *59, 69*, 72, *77, 85* |
| **DCI Disciplinary Core Ideas** | | |
| **PS4.B: Electromagnetic Radiation**<br>• An object can be seen when light reflected from its surface enters the eyes. | | 78–79, 88–89, 91 |
| **CCC Crosscutting Concepts** | | |
| **Cause and Effect**<br>• Cause and effect relationships are routinely identified. | | *67–69, 76–77, 84–85*, 91 |

*Inquiry activities are in Italics.*

| 4-PS4 | Waves and Their Applications in Technologies for Information Transfer | |
|---|---|---|
| 4-PS4-3 | **Generate and compare multiple solutions that use patterns to transfer information.** *[Clarification Statement: Examples of solutions could include drums sending coded information through sound waves, using a grid of 1's and 0's representing black and white to send information about a picture, and using Morse code to send text.]* | *96–97*, 111–116 |
| **SEP Science and Engineering Practices** | | |
| **Constructing Explanations and Designing Solutions**<br>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.<br>• Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. | | 61, *67–69, 84–85, 96–97*, 111–116 |
| **DCI Disciplinary Core Ideas** | | |
| **PS4.C: Information Technologies and Instrumentation**<br>• Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa. | | 104–105 |
| **ETS1.C: Optimizing The Design Solution**<br>• Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. *(secondary)* | | 65, 81, 109, 111–116 |
| **CCC Crosscutting Concepts** | | |
| **Patterns**<br>• Similarities and differences in patterns can be used to sort and classify designed products. | | *96–97, 100–101, 107*, 111–116 |
| ***Connections to Engineering, Technology, and Applications of Science***<br>**Interdependence of Science, Engineering, and Technology**<br>• Knowledge of relevant scientific concepts and research findings is important in engineering. | | 99 |
| **CCSS Math Connections** | | |
| 4.OA.C | | *96*, 111–116 |
| 4.MD.5, a, b; 4.MD.6 | | *76–77* |
| MP.2, MP.4, MP.5, MP.6 | | *76–77, 96*, 114 |

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|---|---|
| **ELD Connections** | |
| ELD.PI.4.10 | Teacher's Edition *Only*: 61, 63, 65, 79, 86, 87, 99, 102, 105 |
| **CCSS ELA/Literacy Connections** | |
| RI.4.3 | 88–90, 87 |
| W.4.1, RI.4.7 | 87 |
| **ALSO INTEGRATES:** | |
| SEP Asking Questions and Defining Problems | *58–90, 67–69, 77, 84–85* |
| SEP Engaging in Argument from Evidence | 61, 87 |
| CCC Structure and Function | *58–60*, 62–63, *84–85* |

*Inquiry activities are in Italics.*