**Next Generation Science Standards for California Public Schools, Kindergarten through Grade Twelve**

**Grade Five**
***Standards Arranged by Disciplinary Core Ideas***

**California Department of Education**

**California clarification statements, marked with double asterisks, were incorporated by the California Science Expert Review Panel
The section entitled "Disciplinary Core Ideas" is reproduced verbatim from *A Framework for K–12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas*. Revised March 2015.

## 5-LS1 From Molecules to Organisms: Structures and Processes

<table>
<tr><th colspan="3">5-LS1 From Molecules to Organisms: Structures and Processes</th></tr>
<tr><td colspan="3">Students who demonstrate understanding can:<br>5-LS1-1. Support an argument that plants get the materials they need for growth chiefly from air and water. [Clarification Statement: Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.]</td></tr>
<tr><td colspan="3">The performance expectations above were developed using the following elements from the NRC document A Framework for K–12 Science Education:</td></tr>
<tr><th>Science and Engineering Practices</th><th>Disciplinary Core Ideas</th><th>Crosscutting Concepts</th></tr>
<tr><td>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>▪ Support an argument with evidence, data, or a model. (5-LS1-1)</td><td>LS1.C: Organization for Matter and Energy Flow in Organisms<br>▪ Plants acquire their material for growth chiefly from air and water. (5-LS1-1)</td><td>Energy and Matter<br>▪ Matter is transported into, out of, and within systems. (5-LS1-1)</td></tr>
<tr><td colspan="3">Connections to other DCIs in fifth grade: 5.PS1.A (5-LS1-1)</td></tr>
<tr><td colspan="3">Articulation of DCIs across grade-bands: K.LS1.C (5-LS1-1); 2.LS2.A (5-LS1-1); MS.LS1.C (5-LS1-1)</td></tr>
<tr><td colspan="3">California Common Core State Standards Connections:<br>ELA/Literacy –<br>RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (5-LS1-1)<br>RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.</td></tr>
</table>

| | |
|---|---|
| | (5-LS1-1) |
| **W.5.1.a–d** | Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-LS1-1) |
| *Mathematics* – | |
| **MP.2** | Reason abstractly and quantitatively. (5-LS1-1) |
| **MP.4** | Model with mathematics. (5-LS1-1) |
| **MP.5** | Use appropriate tools strategically. (5-LS1-1) |
| **5.MD.1** | Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems. (5-LS1-1) |

## Grade Five
***Standards Arranged by Disciplinary Core Ideas***

## 5-LS2 Ecosystems: Interactions, Energy, and Dynamics

### 5-LS2 Ecosystems: Interactions, Energy, and Dynamics

Students who demonstrate understanding can:

**5-LS2-1.** **Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.** [Clarification Statement: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.] [Assessment Boundary: Assessment does not include molecular explanations.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

#### Science and Engineering Practices

**Developing and Using Models**

Modeling in 3–5 builds on K–2 models and progresses to building and revising simple models and using models to represent events and design solutions.

- Develop a model to describe phenomena. (5-LS2-1)

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***Connections to Nature of Science***

**Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena**

- Science explanations describe the mechanisms for natural events. (5-LS2-1)

#### Disciplinary Core Ideas

**LS2.A: Interdependent Relationships in Ecosystems**

- The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which

#### Crosscutting Concepts

**Systems and System Models**

- A system can be described in terms of its components and their interactions. (5-LS2-1)

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| | | |
|---|---|---|
| | multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (5-LS2-1)<br>**LS2.B: Cycles of Matter and Energy Transfer in Ecosystems**<br>▪ Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. (5-LS2-1) | |
| *Connections to other DCIs in fifth grade:* **5.PS1.A** (5-LS2-1); **5.ESS2.A** (5-LS2-1) | | |
| *Articulation of DCIs across grade-bands:* **2.PS1.A** (5-LS2-1); **2.LS4.D** (5-LS2-1); **4.ESS2.E** (5-LS2-1); **MS.PS3.D** (5-LS2-1); **MS.LS1.C** (5-LS2-1); **MS.LS2.A** (5-LS2-1); **MS.LS2.B** (5-LS2-1) | | |
| *California Common Core State Standards Connections:*<br>*ELA/Literacy –*<br>**RI.5.7** Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-LS2-1)<br>**SL.5.5** Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5-LS2-1)<br>*Mathematics –*<br>**MP.2** Reason abstractly and quantitatively. (5-LS2-1)<br>**MP.4** Model with mathematics. (5-LS2-1) | | |

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## Grade Five
*Standards Arranged by Disciplinary Core Ideas*

### 5-ESS1 Earth's Place in the Universe

**5-ESS1 Earth's Place in the Universe**

Students who demonstrate understanding can:

**5-ESS1-1.** **Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth. [**Clarification Statement: Absolute brightness of stars is the result of a variety of factors. Relative distance from Earth is one factor that affects apparent brightness and is the one selected to be addressed by the performance expectation.]** [Assessment Boundary: Assessment is limited to relative distances, not sizes, of stars. Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, stage).]

**5-ESS1-2.** **Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.** [Clarification Statement: Examples of patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months.] [Assessment Boundary: Assessment does not include causes of seasons.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

#### Science and Engineering Practices

**Analyzing and Interpreting Data**

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.

- Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. (5-ESS1-2)

#### Disciplinary Core Ideas

**ESS1.A: The Universe and its Stars**

- The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. (5-ESS1-1)

**ESS1.B: Earth and the Solar System**

- The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These

#### Crosscutting Concepts

**Patterns**

- Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena. (5-ESS1-2)

**Scale, Proportion, and Quantity**

- Natural objects exist from the very small to the immensely large. (5-ESS1-1)

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| | | |
|---|---|---|
| **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>▪ Support an argument with evidence, data, or a model. (5-ESS1-1) | include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year. (5-ESS1-2) | |

*Connections to other DCIs in fifth grade:* N/A

*Articulation of DCIs across grade-bands:* **1.ESS1.A** (5-ESS1-2); **1.ESS1.B** (5-ESS1-2); **3.PS2.A** (5-ESS1-2); **MS.ESS1.A** (5-ESS1-1),(5-ESS1-2); **MS.ESS1.B** (5-ESS1-1),(5-ESS1-2);

*California Common Core State Standards Connections:*

**RI.5.1.a–d** Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (5-ESS1-1)

**RI.5.7** Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-ESS1-1)

**RI.5.8** Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s). (5-ESS1-1)

**RI.5.9** Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-ESS1-1)

**W.5.1.a–d** Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-ESS1-1)

**SL.5.5** Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5-ESS1-2)

*Mathematics* –

**MP.2** Reason abstractly and quantitatively. (5-ESS1-1),(5-ESS1-2)

**MP.4** Model with mathematics. (5-ESS1-1),(5-ESS1-2)

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### *Standards Arranged by Disciplinary Core Ideas*

| | |
|---|---|
| **5.NBT.2** | Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. (5-ESS1-1) |
| **5.G.2** | Represent real-world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. (5-ESS1-2) |

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## Grade Five
***Standards Arranged by Disciplinary Core Ideas***

### 5-ESS2 Earth's Systems

**5-ESS2 Earth's Systems**

Students who demonstrate understanding can:

**5-ESS2-1.** **Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.** [Clarification Statement: ****The geosphere, hydrosphere (including ice), atmosphere, and biosphere are each a system and each system is a part of the whole Earth System.** Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.] [Assessment Boundary: Assessment is limited to the interactions of two systems at a time.]

**5-ESS2-2.** **Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.** [Assessment Boundary: Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
|---|---|---|
| **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 example to describe a scientific principle. (5-ESS2-1)<br>**Using Mathematics and Computational Thinking**<br>Mathematical and computational thinking | **ESS2.A: Earth Materials and Systems**<br>▪ Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and | **Scale, Proportion, and Quantity**<br>▪ Standard units are used to measure and describe physical quantities such as weight and volume. (5-ESS2-2)<br>**Systems and System Models**<br>▪ A system can be described in terms of its components and their interactions. (5-ESS2-1) |

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|---|---|---|
| in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.<br>▪ Describe and graph quantities such as area and volume to address scientific questions. (5-ESS2-2) | influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. (5-ESS2-1)<br>**ESS2.C: The Roles of Water in Earth's Surface Processes**<br>▪ Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. (5-ESS2-2) | |

*Connections to other DCIs in fifth grade:* N/A

*Articulation of DCIs across grade-bands:* **2.ESS2.A** (5-ESS2-1); **2.ESS2.C** (5-ESS2-2); **3.ESS2.D** (5-ESS2-1); **4.ESS2.A** (5-ESS2-1); **MS.ESS2.A** (5-ESS2-1); **MS.ESS2.C** (5-ESS2-1),(5-ESS2-2); **MS.ESS2.D** (5-ESS2-1); **MS.ESS3.A** (5-ESS2-2)

*California Common Core State Standards Connections:*

*ELA/Literacy* –

**RI.5.7** Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-ESS2-1),(5-ESS2-2)

**W.5.8** Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (5-ESS2-2)

**SL.5.5** Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5-ESS2-1),(5-ESS2-2)

*Mathematics* –

**MP.2** Reason abstractly and quantitatively. (5-ESS2-1),(5-ESS2-2)

**MP.4** Model with mathematics. (5-ESS2-1),(5-ESS2-2)

**5.G.2** Represent real-world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. (5-ESS2-1)

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***Standards Arranged by Disciplinary Core Ideas***

## 5-ESS3 Earth and Human Activity

| **5-ESS3 Earth and Human Activity** | | |
|---|---|---|
| Students who demonstrate understanding can:<br>**5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.** | | |
| The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*: | | |
| **Science and Engineering Practices** | **Disciplinary Core Ideas** | **Crosscutting Concepts** |
| **Obtaining, Evaluating, and Communicating Information**<br>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.<br>▪ Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. (5-ESS3-1) | **ESS3.C: Human Impacts on Earth Systems**<br>▪ Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. (5-ESS3-1) | **Systems and System Models**<br>▪ A system can be described in terms of its components and their interactions. (5-ESS3-1)<br>---<br>***Connections to Nature of Science***<br>**Science Addresses Questions About the Natural and Material World.**<br>▪ Science findings are limited to questions that can be answered with empirical evidence. (5-ESS3-1) |
| *Connections to other DCIs in fifth grade:* N/A | | |
| *Articulation of DCIs across grade-bands:* **MS.ESS3.A** (5-ESS3-1); **MS.ESS3.C** (5-ESS3-1); **MS.ESS3.D** (5-ESS3-1) | | |
| *California Common Core State Standards Connections:*<br>*ELA/Literacy –*<br>**RI.5.1** Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. | | |

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| | |
|---|---|
| | (5-ESS3-1) |
| **RI.5.7** | Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.(5-ESS3-1) |
| **RI.5.9.a,b** | Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-ESS3-1) |
| **W.5.8** | Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (5-ESS3-1) |
| **W.5.9.a,b** | Draw evidence from literary or informational texts to support analysis, reflection, and research. (5-ESS3-1) |
| *Mathematics* – | |
| **MP.2** | Reason abstractly and quantitatively. (5-ESS3-1) |
| **MP.4** | Model with mathematics. (5-ESS3-1) |

## Grade Five
*Standards Arranged by Disciplinary Core Ideas*

### 5-PS1 Matter and Its Interactions

**5-PS1 Matter and Its Interactions**

Students who demonstrate understanding can:

**5-PS1-1.** **Develop a model to describe that matter is made of particles too small to be seen.** [Clarification Statement: Examples of evidence supporting a model could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.] [Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.]

**5-PS1-2.** **Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.** [Clarification Statement: Examples of reactions or changes could include phase changes, dissolving, and mixing that forms new substances.] [Assessment Boundary: Assessment does not include distinguishing mass and weight.]

**5-PS1-3.** **Make observations and measurements to identify materials based on their properties.** [Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.] [Assessment Boundary: Assessment does not include density or distinguishing mass and weight.]

**5-PS1-4.** **Conduct an investigation to determine whether the mixing of two or more substances results in new substances. [**Clarification Statement: Examples of combinations that do not produce new substances could include sand and water. Examples of combinations that do produce new substances could include baking soda and vinegar or milk and vinegar.]**

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
|---|---|---|
| **Developing and Using Models**<br>Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using | **PS1.A: Structure and Properties of Matter**<br>▪ Matter of any type can be subdivided into particles that are too small to see, | **Cause and Effect**<br>▪ Cause and effect relationships are routinely identified, tested, and used to explain change. (5-PS1-4) |

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| | | |
|---|---|---|
| models to represent events and design solutions.<br>▪ Develop a model to describe phenomena. (5-PS1-1)<br>**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>▪ 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. (5-PS1-4)<br>▪ Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (5-PS1-3)<br>**Using Mathematics and Computational Thinking**<br>Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical | but even then the matter still exists and can be detected by other means. A model shows that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects. (5-PS1-1)<br>▪ The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. (5-PS1-2)<br>▪ Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) (5-PS1-3)<br>**PS1.B: Chemical Reactions**<br>▪ When two or more different substances are mixed, a new substance with different properties may be formed. (5-PS1-4)<br>▪ No matter what reaction or change in properties occurs, the total weight of the | **Scale, Proportion, and Quantity**<br>▪ Natural objects exist from the very small to the immensely large. (5-PS1-1)<br>▪ Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. (5-PS1-2),(5-PS1-3)<br>**----------**<br>***Connections to Nature of Science***<br>**Scientific Knowledge Assumes an Order and Consistency in Natural Systems**<br>▪ Science assumes consistent patterns in natural systems. (5-PS1-2) |

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|---|---|---|
| properties and using computation and mathematics to analyze data and compare alternative design solutions.<br>▪ Measure and graph quantities such as weight to address scientific and engineering questions and problems. (5-PS1-2) | substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.) (5-PS1-2) | |

*Connections to other DCIs in fifth grade:* N/A

*Articulation of DCIs across grade-bands:* **2.PS1.A** (5-PS1-1),(5-PS1-2),(5-PS1-3); **2.PS1.B** (5-PS1-2),(5-PS1-4); **MS.PS1.A** (5-PS1-1),(5-PS1-2),(5-PS1-3),(5-PS1-4); **MS.PS1.B** (5-PS1-2),(5-PS1-4)

*California Common Core State Standards Connections:*

*ELA/Literacy –*

| | |
|---|---|
| **RI.5.7** | Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-PS1-1) |
| **W.5.7** | Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (5-PS1-2),(5-PS1-3),(5-PS1-4) |
| **W.5.8** | Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (5-PS1-2),(5-PS1-3),(5-PS1-4) |
| **W.5.9.a,b** | Draw evidence from literary or informational texts to support analysis, reflection, and research. (5-PS1-2),(5-PS1-3),(5-PS1-4) |

*Mathematics –*

| | |
|---|---|
| **MP.2** | Reason abstractly and quantitatively. (5-PS1-1),(5-PS1-2),(5-PS1-3) |
| **MP.4** | Model with mathematics. (5-PS1-1),(5-PS1-2),(5-PS1-3) |
| **MP.5** | Use appropriate tools strategically. (PS1-2),(PS1-3) |
| **5.NBT.2** | Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. (5-PS1-1) |

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## Grade Five
### *Standards Arranged by Disciplinary Core Ideas*

| | |
|---|---|
| **5.NF.7.a-c** | Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (5-PS1-1) |
| **5.MD.1** | Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real-world problems. (5-PS1-2) |
| **5.MD.3.a,b** | Recognize volume as an attribute of solid figures and understand concepts of volume measurement. (5-PS1-1) |
| **5.MD.4** | Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. (5-PS1-1) |

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## Grade Five
### *Standards Arranged by Disciplinary Core Ideas*

### 5-PS2 Motion and Stability: Forces and Interactions

**5-PS2 Motion and Stability: Forces and Interactions**

Students who demonstrate understanding can:

**5-PS2-1** **Support an argument that the gravitational force exerted by Earth on objects is directed down.** [Clarification Statement: "Down" is a local description of the direction that points toward the center of the spherical Earth.] [Assessment Boundary: Assessment does not include mathematical representation of gravitational force.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
|---|---|---|
| **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>▪ Support an argument with evidence, data, or a model. (5-PS2-1) | **PS2.B: Types of Interactions**<br>▪ The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. (5-PS2-1) | **Cause and Effect**<br>▪ Cause and effect relationships are routinely identified and used to explain change. (5-PS2-1) |

*Connections to other DCIs in fifth grade:* N/A

*Articulation of DCIs across grade-bands:* **3.PS2.A** (5-PS2-1); **3.PS2.B** (5-PS2-1); **MS.PS2.B** (5-PS2-1)**; MS.ESS1.B** (5-PS2-1); **MS.ESS2.C** (5-PS2-1)

*California Common Core State Standards Connections:*

*ELA/Literacy –*

**RI.5.1** Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (5-PS2-1)

**RI.5.9.a,b** Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.

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| | |
|---|---|
| | (5-PS2-1) |
| **W.5.1.a–d** | Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-PS2-1) |

## Grade Five
### *Standards Arranged by Disciplinary Core Ideas*

### 5-PS3 Energy

**5-PS3 Energy**

Students who demonstrate understanding can:

**5-PS3-1.** **Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.** [Clarification Statement: Examples of models could include diagrams, and flow charts.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
|---|---|---|
| **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 models to describe phenomena. (5-PS3-1) | **PS3.D: Energy in Chemical Processes and Everyday Life**<br>▪ The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). (5-PS3-1)<br>**LS1.C: Organization for Matter and Energy Flow in Organisms**<br>▪ Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. (secondary to 5-PS3-1) | **Energy and Matter**<br>▪ Energy can be transferred in various ways and between objects. (5-PS3-1) |

*Connections to other DCIs in fifth grade:* N/A

*Articulation of DCIs across grade-bands:* **K.LS1.C** (5-PS3-1); **2.LS2.A** (5-PS3-1); **4.PS3.A** (5-PS3-1); **4.PS3.B** (5-PS3-1); **4.PS3.D** (5-PS3-1); **MS.PS3.D** (5-PS3-1); **MS.PS4.B** (5-PS3-1); **MS.LS1.C** (5-PS3-1); **MS.LS2.B** (5-PS3-1)

*California Common Core State Standards Connections:*

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## Grade Five
### *Standards Arranged by Disciplinary Core Ideas*

| | |
|---|---|
| *ELA/Literacy –* | |
| **RI.5.7** | Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-PS3-1) |
| **SL.5.5** | Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5-PS3-1) |

## Grade Five
*Standards Arranged by Disciplinary Core Ideas*

### 3–5-ETS1 Engineering Design

**3–5-ETS1 Engineering Design**

Students who demonstrate understanding can:

**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.**

**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.**

**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.**

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
|---|---|---|
| **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. (3–5-ETS1-1) | **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. (3–5-ETS1-1) | **Influence of Engineering, Technology, and Science on Society and the Natural World**<br>▪ People's needs and wants change over time, as do their demands for new and improved technologies. (3–5-ETS1-1)<br>▪ Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3–5-ETS-2) |

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**Grade Five**
***Standards Arranged by Disciplinary Core Ideas***

| | | |
|---|---|---|
| **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. (3–5-ETS1-3)<br>**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. (3–5-ETS1-2) | **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. (3–5-ETS1-2)<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. (3–5-ETS1-2)<br>▪ Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. (3–5-ETS1-3)<br>**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. (3–5-ETS1-3) | |
| *Connections to other DCIs in this grade-band:* | | |

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*Connections to 3–5-ETS1.A: Defining and Delimiting Engineering Problems include:*
**Fourth Grade:** 4-PS3-4
*Connections to 3–5-ETS1.B: Designing Solutions to Engineering Problems include:*
**Fourth Grade:** 4-ESS3-2
*Connections to 3–5-ETS1.C: Optimizing the Design Solution include:*
**Fourth Grade:** 4-PS4-3

*Articulation of DCIs across grade-bands:* **K–2.ETS1.A** (3–5-ETS1-1),(3–5-ETS1-2),(3–5-ETS1-3); **K–2.ETS1.B** (3–5-ETS1-2); **K–2.ETS1.C** (3–5-ETS1-2),(3–5-ETS1-3); **MS.ETS1.A** (3–5-ETS1-1); **MS.ETS1.B** (3–5-ETS1-1),(3–5-ETS1-2),(3–5-ETS1-3); **MS.ETS1.C** (3–5-ETS1-2),(3–5-ETS1-3)

*California Common Core State Standards Connections:*

*ELA/Literacy –*

| | |
|---|---|
| **RI.5.1** | Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (3–5-ETS1-2) |
| **RI.5.7** | Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (3–5-ETS1-2) |
| **RI.5.9** | Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (3–5-ETS1-2) |
| **W.5.7** | Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (3–5-ETS1-1),(3–5-ETS1-3) |
| **W.5.8** | Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (3–5-ETS1-1),(3–5-ETS1-3) |
| **W.5.9.a,b** | Draw evidence from literary or informational texts to support analysis, reflection, and research. (3–5-ETS1-1), (3–5-ETS1-3) |

*Mathematics –*

| | |
|---|---|
| **MP.2** | Reason abstractly and quantitatively. (3–5-ETS1-1),(3–5-ETS1-2),(3–5-ETS1-3) |
| **MP.4** | Model with mathematics. (3–5-ETS1-1),(3–5-ETS1-2),(3–5-ETS1-3) |

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|---|---|
| **MP.5** | Use appropriate tools strategically. (3–5-ETS1-1),(3–5-ETS1-2),(3–5-ETS1-3) |
| **3.OA.1-4** | Represent and solve problems involving multiplication and division. (3–5-ETS1-1),(3–5-ETS1-2) |
| **3.OA.5-6** | Understand properties of multiplication and the relationship between multiplication and division. (3–5-ETS1-1),(3–5-ETS1-2) |
| **3.OA.7** | Multiply and divide within 100. (3–5-ETS1-1),(3–5-ETS1-2) |
| **3.OA.8-9** | Solve problems involving the four operations, and identify and explain patterns in arithmetic. (3–5-ETS1-1),(3–5-ETS1-2) |
| **4.OA.1-3** | Use the four operations with whole numbers to solve problems. (3–5-ETS1-1),(3–5-ETS1-2) |
| **4.OA.4** | Gain familiarity with factors and multiples. (3–5-ETS1-1),(3–5-ETS1-2) |
| **4.OA.5** | Generate and analyze patterns. (3–5-ETS1-1),(3–5-ETS1-2) |
| **5.OA.1-2.1** | Write and interpret numerical expressions. (3–5-ETS1-1),(3–5-ETS1-2) |
| **5.OA.3** | Analyze patterns and relationships. (3–5-ETS1-1),(3–5-ETS1-2) |