# Grade 4 Science Standards

| Domain: Energy | | | |
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| **Code:** | **Strand:** | **Rating** | **Completed** |
| 4.PS3.1 | Use evidence to construct an explanation relating the speed of an object to the energy of that object. | Supporting | |
| 4.PS3.2 | Make conclusions based on observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. | Priority | |
| 4.S5.C3.DPO2 | Describe how energy is transferred by using Scientific Method. | Supporting | |
| 4.PS3.3. | Ask questions and predict outcomes about the changes in energy that occur when objects collide. | Supporting | |
| 4.PS3.4. | Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.* | Supporting | |
| 4.S5.C3.DPO1 | Demonstrate that electricity flowing in circuits can produce light, heat, sound, and magnetic effects. | Priority | |
| 4.S4.C3.DPO2 | Differentiate renewable resources from nonrenewable resources. | Priority | |
| 4.ESS3.1 | Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment. | Supporting | |
| 4.S4.C3.DPO3 | Analyze the effect that limited resources (e.g., natural gas, minerals) may have on an environment. | Supporting | |

## Catholic Identity

- If students are using technology/devices, they should demonstrate Catholic responsibility through proper use of digital communication and apply digital citizenship.
- Plan and implement responsible stewardship of God's natural resources.

## Science and Engineering Practices

**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)

**Planning and Carrying Out Investigations**

## Disciplinary Ideas

**PS3.A: Definitions of Energy**
The faster a given object is moving, the more energy it possesses. (4.PS3.1) energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4.PS3.2),(4.PS3.3)

**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

## Crosscutting Concepts

**Cause and Effect**

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

**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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***Connections to Engineering,***

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)

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

**Obtaining, Evaluating, and Communicating Information**

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.

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

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)

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

**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)

**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)

**ESS3.A: Natural Resources**

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

**ETS1.A: Defining 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. (secondary to 4.PS3.4)

***Technology, and Applications of Science Interdependence of Science, Engineering***

- Knowledge of relevant scientific concepts and research findings is important in engineering. (4.ESS3.1) Influence of Engineering, Technology, and Science on Society and the Natural World
- Over time, people's needs and wants change, as do their demands for new and improved technologies. (4.ESS3.1)
- Engineers improve existing technologies or develop new ones. (4.PS3.4)

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***Connections to Nature of Science***

**Science is a Human Endeavor**

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

| Domain: Waves and Information | | | |
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| **Code:** | **Strand:** | **Rating** | **Completed** |
| 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. | Priority | |
| 4.PS4.2 | Discuss how changes in amplitude and wavelength can affect how an object moves. | Supporting | |
| 4.PS4.3 | Generate and compare multiple solutions that use patterns to transfer information. | Supporting | |

## Catholic Identity

- If students are using technology/devices, they should demonstrate Catholic responsibility through proper use of digital communication and apply digital citizenship.

## Science and Engineering Practices

**Developing and Using Models**
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.

- Develop a model using an analogy, example, or abstract representation to describe a scientific principle. (4-PS4-1)

**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.

- Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. (4- PS4-3)

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***Connections to Nature of Science***

**Scientific Knowledge is Based on Empirical Evidence**

- Science findings are based on recognizing patterns. (4-PS4-1)

## Disciplinary Ideas

**PS4.A: Wave Properties**

- 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. (4-PS4-1)
- Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks).(4-PS4-1)

**PS4.C: Information Technologies and Instrumentation**

- 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. (4-PS4-3)

**ETS1.C: Optimizing The Design Solution**

- Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. *(secondary to 4-PS4-3)*

## Crosscutting Concepts

**Patterns**

- Similarities and differences in patterns can be used to sort and classify natural phenomena.(4-PS4- 1)
- Similarities and differences in patterns can be used to sort and classify designed products. (4-PS4- 3)

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***Connections to Engineering, Technology, and Applications of Science***

Knowledge of relevant scientific concepts and research findings is important in engineering. (4-PS4-3)

| Domain: Structure, Function, and Information Processing | | | |
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| **Code:** | **Strand:** | **Rating** | **Completed** |
| 4.LS1.1 | Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. | Priority | |
| D3.S4.C1.DPO1 | Describe the function of the following plant structures: roots-absorb nutrients, stems-provide support, leaves-synthesize food, flowers-attract pollinators and produce seeds for reproduction | Supporting | |
| D4.S4.C1.DPO1 | Compare structures in plants (e.g., roots, stems, leaves, flowers) | Supporting | |
| D4.S4.C1.DPO2 | Compare structures in animals (e.g., muscles, bones, nerves) that serve different functions in growth and survival. | Supporting | |
| 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 | Priority | |
| 4.PS4.2 | Develop a model to explain and discuss that light reflecting from objects and entering the eye allows objects to be seen. | Supporting | |
| 4.LS4.1.1 | Identify the functions and parts of the skeletal system: protection- rib cage, cranium; support vertebrae; movement- pelvis, femur, hip | Supporting | |
| 4.LS4.1.2 | Identify the following types of muscles: cardiac- heart; smooth- stomach; skeletal –biceps | Supporting | |

## Catholic Identity

- If students are using technology/devices, they should demonstrate Catholic responsibility through proper use of digital communication and apply digital citizenship.
- Recognize that in God's infinite wisdom He created all living creatures with senses that enable them to survive.
- Respect life at all stages, as a gift given freely by God.

## Science and Engineering Practices

**Developing and Using Models**
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.

- Develop a model to describe phenomena. (4.PS4.2)
- Use a model to test interactions concerning the functioning of a natural system. (4.LS1.2)

**Engaging in Argument from**

## Disciplinary Ideas

**PS4.B: Electromagnetic Radiation**

- An object can be seen when light reflected from its surface enters the eyes. (4.PS4.2)

**LS1.A: Structure and Function**

- Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4.LS1.1)

**LS1.D: Information Processing**

- 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)

## Crosscutting Concepts

**Patterns**

- Cause and effect relationships are routinely identified. (4.PS4.2)

**Systems and System Models**
A system can be described in terms of its components and their interactions. (4.LS1.1), (4.LS1.2)

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| **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) | | |

| Domain: Earth's Systems: Processes that Shape Earth | | | |
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| **Code:** | **Strand:** | **Rating** | **Completed** |
| 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. | Priority | |
| 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 | Supporting | |
| 4.S6.C2.DPO1 | Identify the Earth processes that cause erosion. | Supporting | |
| 4.S6.C2.DPO2 | Describe how currents and wind cause erosion and land changes | Supporting | |
| 4.S6.C2.DPO3 | Describe the role that water plays in the following processes that alter the Earth's surface features: erosion, deposition, weathering | Supporting | |
| 4.ESS2.2 | Analyze and interpret data from maps to describe patterns of Earth's features | Supporting | |
| 4.ESS3.2 | Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. | Supporting | |

## Catholic Identity

- If students are using technology/devices, they should demonstrate Catholic responsibility through proper use of digital communication and apply digital citizenship.
- Evaluate the consequences of environmental occurrences that happen either rapidly or over a long period of time and how we are called in solidarity to help those involved in these events.
- Find out how students in your school can help families affected by a natural disaster. Plan a way to help.
- Become lifelong stewards who gratefully share the gifts of time, talent, and treasure.

## 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. (4.ESS2.1)

**Analyzing and Interpreting Data**
Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches

## Disciplinary Ideas

**ESS1.C: The History of Planet Earth**

- 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)

**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. (4.ESS2.1)

**ESS2.B: Plate Tectonics and Large-Scale System Interactions**

- The locations of mountain ranges, deep ocean trenches,

## Crosscutting Concepts

**Patterns**

- Patterns can used as evidence to support and explanation. (4.ESS1.1),(4.ESS2.2)

**Cause and Effect**

- Cause and effect relationships are routinely identified, tested and use to explain change. (4.ESS2.1),(4.ESS3.2)

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***Connections to Engineering, Technology, and Applications of Science***

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

- Engineers improve existing technologies or develop new ones to increase their benefits,

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| 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. (4.ESS2.2)<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>• Identify the evidence that supports particular points in an explanation. (4.ESS1.1)<br>• Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. (4.ESS3.2) | 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. (4.ESS2.2)<br>**ESS2.E: Biogeology**<br>• Living things affect the physical characteristics of their regions. (4.ESS2.1)<br>**ESS3.B: Natural Hazards**<br>• A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards<br>• but can take steps to reduce their impacts. (4.ESS3.2) (Note: This Disciplinary Core Idea can also be found in 3.WC.)<br>**ETS1.B: Designing Solutions to Engineering Problems**<br>• Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4.ESS3.2) | to decrease known risks, and to meet societal demands. (4.ESS3.2)<br>---<br>***Connections to Nature of Science***<br>**Scientific Knowledge Assumes an Order and Consistency in Natural systems.**<br>• Science assumes consistent patterns and natural systems. (4.ESS1.1) |

| Domain: Engineering Design | | | |
|---|---|---|---|
| **Code:** | **Strand:** | **Rating** | **Completed** |
| 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. | Priority | |
| 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. | Supporting | |
| 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. | Supporting | |

## Catholic Identity

- Share materials and work together in small groups, listen to the ideas of others. Be respectful and treat others as you wish to be treated.
- Use the God given gift of intellect to be resourceful and use simple tools to make tasks easier.
- Consider the pastoral as well as the practical nature of the problems and solutions we address.

## Science and Engineering Practices

**Asking Questions and Defining Problems**
Asking questions and defining problems in 3– 5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.

- 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)

**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.

- 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

## Disciplinary Ideas

**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. (3-5.ETS1.1)

**ETS1.B: Developing Possible Solutions**

- 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)
- 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)

## Crosscutting Concepts

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

- People's needs and wants change over time, as do their demands for new and improved technologies. (3-5.ETS1.1)
- Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5.ETS1.2)

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| 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) | • 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) | |