

Simple Solutions

NextGen Science 5

Alignment with DCIs

REVIEW STANDARDS

4-PS3.A: Definitions of Energy

- ✦ The faster a given object is moving, the more energy it possesses. (4-PS3-1)
 - Lesson 8
- ✦ Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3-2), (4-PS3-3)
 - Lesson 8

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

- ✦ Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (4-PS3-2), (4-PS3-3)
 - Lesson 8

3-PS2.A: Forces and Motion

- ✦ Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (3-PS2-1), (3-PS2-2)
 - Lesson 9
- ✦ Objects in contact exert forces on each other. (3-PS2-1)
 - Lesson 9

K-LS1.C: Organization for Matter and Energy Flow in Organisms

- ✦ All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. (K-LS1-1)
 - Lesson 11

4-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)
 - Lesson 12

4-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)
 - Lesson 13

4-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)
 - Lesson 14

GRADE FIVE DISCIPLINARY CORE IDEAS**ETS1-3 Science and Engineering Practices: Planning and Carrying Out Investigations**

- ✦ 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. (3-5ETS1-3)
 - Lessons 1, 2, 3

Science and Engineering Practices: Developing and Using Models

- ✦ Use models to describe phenomena. (5-PS3-1)
 - Lessons 4, 53, 54

Science and Engineering Practices: Graphing

- ✦ Describe and graph quantities such as area and volume to address scientific questions. (5-ESS2-2)
 - Lessons 58, 59

Crosscutting Concepts: Patterns

- ✦ Similarities and differences in patterns can be used to sort, classify, communicate, and analyze simple rates of change for natural phenomena and designed products.(5-ESS1-2)
 - Lessons 6, 99

Crosscutting Concepts: Cause and Effect

- ✦ Cause and effect relationships are routinely identified, tested, and used to explain change. (5-PS1-4)
 - Lesson 7

5-PS1 MATTER AND ITS INTERACTIONS**PS1.A: Structure and Properties of Matter**

- ✦ Matter of any type can be subdivided into particles that are too small to see, but even then, the matter still exists and can be detected by other means. A model showing 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)
 - Lessons 21, 22, 23, 24, 26

- ✦ The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. (5-PS1-2)
 - Lessons 27, 28, 39
- ✦ 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)
 - Lessons 29, 31, 32, 33, 34, 43, 44

PS1.B: Chemical Reactions

- ✦ When two or more different substances are mixed, a new substance with different properties may be formed. (5-PS1-4)
 - Lessons 36, 37, 38
- ✦ No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.) (5-PS1-2)
 - Lesson 39

5-PS2 MOTION AND STABILITY: FORCES AND INTERACTIONS

PS2.B: Types of Interactions

- ✦ The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. (5-PS2-1)
 - Lessons 41, 42

5-PS3 ENERGY

PS3.D: Energy in Chemical Processes and Everyday Life

- ✦ 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)
 - Lessons 46, 48, 53

LS1.C: Organization for Matter and Energy Flow in Organisms

- ✦ 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)
 - Lessons 47, 52

5-LS1 FROM MOLECULES TO ORGANISMS: STRUCTURE AND PROCESSES

LS1.C: Organization for Matter and Energy Flow in Organisms

- ✦ Plants acquire their material for growth chiefly from air and water. (5-LS1-1)
 - Lesson 46, 54

5-LS2 ECOSYSTEMS: INTERACTIONS, ENERGY, AND DYNAMICS

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 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)

– Lessons 46, 48, 49, 51, 53, 54, 76, 77, 78, 79, 81, 82

LS2.B: Cycles of Matter and Energy Transfer in Ecosystems

- ✦ 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)

– Lessons 46, 47, 48, 49, 54

5-ESS2 EARTH’S SYSTEMS

ESS2.A: Earth Materials and Systems

- ✦ 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 influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. (5-ESS2-1)

– Lessons 56, 57, 62, 63, 64, 66, 67, 68, 69, 71, 72

ESS2.C: The Roles of Water in Earth’s Surface Processes

- ✦ 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)

– Lessons 58, 59, 61

5-ESS1 EARTH’S PLACE IN THE UNIVERSE

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)

– Lessons 91, 92

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 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)

– Lessons 92, 93, 94, 96, 97, 98, 99

5-ESS3 EARTH AND HUMAN ACTIVITY

ESS3.C: Human Impacts on Earth Systems

- ✦ 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)
 - Lessons 83, 86, 88, 89

3-5-ETS1 ENGINEERING DESIGN

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)
 - Lessons 16, 17, 18, 19, 73, 89

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)
 - Lessons 16, 17, 18, 19, 73, 89
- ✦ 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)
 - Lessons 16, 17, 18, 19, 73, 89
- ✦ 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)
 - Lessons 16, 17, 18, 19, 73, 89

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. (3-5-ETS1-3)
 - Lessons 16, 17, 18, 19, 73, 89