

# Disciplinary Core Ideas: Grades 3, 4, 5

Adopted 2022

## Life Science

### 1. From Molecules to Organisms: Structures and Processes **LS.1**

- LS1-1.** Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. **3-5.LS1-1**
- LS1-2.** Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. **3-5.LS1-2**
- LS1-3.** 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. **3-5.LS1-3**
- LS1-4.** Plants acquire their material for growth chiefly from air and water. **3-5.LS1-4**
- LS1-5.** 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. **3-5.LS1-5**

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## 2. Ecosystems: Interactions, Energy, and Dynamics LS.2

- LS2-1. The food of almost any kind of animal can be traced back to plants. 3-5.LS2-1
- LS2-2. 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. 3-5.LS2-2
- LS2-3. Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gasses, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. 3-5.LS2-3
- LS2-4. When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. 3-5.LS2-4
- LS2-5. Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size. 3-5.LS2-5

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## 3. Heredity: Inheritance and Variation of Traits LS.3

- LS3-1. Many characteristics of organisms are inherited from their parents. 3-5.LS3-1
- LS3-2. Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. 3-5.LS3-2
- LS3-3. Different organisms vary in how they look and function because they have different inherited information. 3-5.LS3-3
- LS3-4. The environment also affects the traits that an organism develops. 3-5.LS3-4

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#### **4. Biological Evolution: Unity and Diversity** LS.4

- LS4-1. Some kinds of plants and animals that once lived on Earth are no longer found anywhere. 3-5.LS4-1
- LS4-2. Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. 3-5.LS4-2
- LS4-3. Some kinds of plants and animals that once lived on Earth are no longer found anywhere. 3-5.LS4-3
- LS4-4. Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. 3-5.LS4-4
- LS4-5. For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. 3-5.LS4-5
- LS4-6. Populations live in a variety of habitats, and change in those habitats affects the organisms living there. 3-5.LS4-6

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### **Earth and Space Science**

#### **1. Earth's Place in the Universe** ESS.1

- ESS1-1. 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. 3-5.ESS1-1
- ESS1-2. 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. 3-5.ESS1-2
- ESS1-3. 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. 3-5.ESS1-3

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## 2. Earth's Systems **ESS.2**

- ESS2-1.** 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. **3-5.ESS2-1**
- ESS2-2.** 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. **3-5.ESS2-2**
- ESS2-3.** 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. **3-5.ESS2-3**
- ESS2-4.** Nearly all of Earth's available water is in the ocean. Most freshwater is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. **3-5.ESS2-4**
- ESS2-5.** Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. **3-5.ESS2-5**
- ESS2-6.** Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. **3-5.ESS2-6**
- ESS2-7.** Living things affect the physical characteristics of their regions. **3-5.ESS2-7**

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## 3. Earth and Human Activity **ESS.3**

- ESS3-1.** 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. **3-5.ESS3-1**
- ESS3-2.** A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. **3-5.ESS3-2**
- ESS3-3.** 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. **3-5.ESS3-3**
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## Physical Science

### 1. Matter and Its Interactions PS.1

- PS1-1.** 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 shows that gasses 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; the effects of air on larger particles or objects. 3-5.PS1-1
- PS1-2.** The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. 3-5.PS1-2
- PS1-3.** 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.) 3-5.PS1-3
- PS1-4.** When two or more different substances are mixed, a new substance with different properties may be formed. 3-5.PS1-4
- PS1-5.** 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.) 3-5.PS1-5
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### 2. Motion and Stability: Forces and Interactions PS.2

- PS2-1.** 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. (Boundary: Qualitative and conceptual, but not quantitative addition of forces are used at this level.) 3-5.PS2-1
- PS2-2.** The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.) 3-5.PS2-2
- PS2-3.** Objects in contact exert forces on each other. 3-5.PS2-3
- PS2-4.** Electric, and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other. 3-5.PS2-4
- PS2-5.** The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. 3-5.PS2-5

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### 3. Energy PS.3

- PS3-1.** The faster a given object is moving, the more energy it possesses. 3-5.PS3-1
- PS3-2.** Energy can be moved from place to place by moving objects or through sound, light, or electric currents. 3-5.PS3-2
- PS3-3.** A bigger push or pull makes things go faster. 3-5.PS3-3
- PS3-4.** 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. 3-5.PS3-4
- PS3-5.** Light also transfers energy from place to place. 3-5.PS3-5
- PS3-6.** 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. 3-5.PS3-6
- PS3-7.** When objects collide, the contact forces transfer energy so as to change the objects' motions. 3-5.PS3-7
- PS3-8.** The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. 3-5.PS3-8
- PS3-9.** 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). 3-5.PS3-9

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### 4. Waves and Their Applications in Technologies for Information Transfer PS.4

- PS4-1.** 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; it does not move in the direction of the wave except when the water meets the beach. 3-5.PS4-1
- PS4-2.** Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). An object can be seen when light reflected from its surface enters the eyes. 3-5.PS4-2
- PS4-3.** Digitized information 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. 3-5.PS4-3
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## Engineering, Technology, and the Application of Science

### 1. Matter and Its Interactions EPS.1

- EPS1-1.** 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.EPS1-1
- EPS1-2.** 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.EPS1-2
- EPS1-3.** 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.EPS1-3
- EPS1-4.** Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. 3-5.EPS1-4
- EPS1-5.** Testing a solution involves investigating how well it performs under a range of likely conditions. 3-5.EPS1-5
- EPS1-6.** 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.EPS1-6