

Science
Grade-Level Expectations: Grade 4

Science as Inquiry

The Abilities to Do Scientific Inquiry

1. Ask questions about objects and events in the environment (e.g., plants, rocks, storms) (SI-E-A1)
2. Pose questions that can be answered by using students' own observations, scientific knowledge, and testable scientific investigations (SI-E-A1)
3. Use observations to design and conduct simple investigations or experiments to answer testable questions (SI-E-A2)
4. Predict and anticipate possible outcomes (SI-E-A2)
5. Identify variables to ensure that only one experimental variable is tested at a time (SI-E-A2)
6. Use a variety of methods and materials and multiple trials to investigate ideas (observe, measure, accurately record data) (SI-E-A2)
7. Use the five senses to describe observations (SI-E-A3)
8. Measure and record length, temperature, mass, volume, and area in both metric system and U.S. system units (SI-E-A4)
9. Select and use developmentally appropriate equipment and tools (e.g., magnifying lenses, microscopes, graduated cylinders) and units of measurement to observe and collect data (SI-E-A4)
10. Express data in a variety of ways by constructing illustrations, graphs, charts, tables, concept maps, and oral and written explanations as appropriate (SI-E-A5) (SI-E-B4)
11. Combine information, data, and knowledge from one or more of the science content areas to reach a conclusion or make a prediction (SI-E-A5)
12. Use a variety of appropriate formats to describe procedures and to express ideas about demonstrations or experiments (e.g., drawings, journals, reports, presentations, exhibitions, portfolios) (SI-E-A6)
13. Identify and use appropriate safety procedures and equipment when conducting investigations (e.g., gloves, goggles, hair ties) (SI-E-A7)

Understanding Scientific Inquiry

14. Identify questions that need to be explained through further inquiry (SI-E-B1)
15. Distinguish between what is known and what is unknown in scientific investigations (SI-E-B1)
16. Select the best experimental design to answer a given testable question (SI-E-B2)
17. Recognize that a variety of tools can be used to examine objects at different degrees of magnification (e.g., hand lens, microscope) (SI-E-B3)
18. Base explanations and logical inferences on scientific knowledge, observations, and scientific evidence (SI-E-B4)
19. Describe procedures and communicate data in a manner that allows others to understand and repeat an investigation or experiment (SI-E-B5)
20. Determine whether further investigations are needed to draw valid conclusions (SI-E-B6)
21. Use evidence from previous investigations to ask additional questions and to initiate further explorations (SI-E-B6)
22. Explain and give examples of how scientific discoveries have affected society (SI-E-B6)

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Physical Science

Properties of Objects and Materials

23. Determine linear, volume, and weight/mass measurements by using both metric system and U.S. system units to compare the results (PS-E-A2)
24. Illustrate how heating/cooling affects the motion of small particles in different phases of matter (PS-E-A4)
25. Describe various methods to separate mixtures (e.g., evaporation, condensation, filtration, magnetism) (PS-E-A5)

Position and Motion of Objects

26. Measure, record, and graph changes in position over time (e.g., speed of cars, ball rolling down inclined plane) (PS-E-B3)
27. Describe how the amount of force needed to cause an object to change its motion depends on the mass of the object (PS-E-B4)

Forms of Energy

28. Explain the relationship between volume (amplitude) of sound and energy required to produce the sound (PS-E-C1)
29. Compare the rates at which sound travels through solids, liquids, and gases (PS-E-C1)
30. Explain the relationship between frequency (rate of vibration) and pitch (PS-E-C1)
31. Diagram what happens to white light as it passes through a prism (PS-E-C2)
32. Describe how light bends or refracts when traveling through various materials (e.g., pencil in a glass of water) (PS-E-C2)
33. Describe how heat energy moves through a material by conduction (PS-E-C3)
34. Give examples of ways heat can be generated through friction (e.g., rubbing hands) (PS-E-C3)
35. Give examples of ways heat can be produced by conversion from other sources of energy (PS-E-C3)
36. Test and classify materials as *conductors* and *insulators* of electricity (PS-E-C4)
37. Demonstrate how a complete circuit is needed for conducting electricity (PS-E-C4)
38. Explain the effects of Earth's gravity on all objects at or near the surface of Earth (PS-E-C5)
39. Describe energy transformations (e.g., electricity to light, friction to heat) (PS-E-C6)

Life Science

Characteristics of Organisms

40. Explain the functions of plant structures in relation to their ability to make food through photosynthesis (e.g., roots, leaves, stems, flowers, seeds) (LS-E-A3)
41. Describe how parts of animals' bodies are related to their functions and survival (e.g., wings/flying, webbed feet/swimming) (LS-E-A3)
42. Describe how the organs of the circulatory and respiratory systems function (LS-E-A5)
43. Explain the primary role of carbohydrates, fats, and proteins in the body (LS-E-A6)
44. Analyze food labels to compare nutritional content of foods (e.g., amounts of carbohydrates, fats, proteins) (LS-E-A6)

Life Cycles of Organisms

45. Identify reproductive structures in plants and describe the functions of each (LS-E-B1)

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46. Describe how some plants can be grown from a plant part instead of a seed (LS-E-B1)
47. Sequence stages in the life cycles of various organisms, including seed plants (LS-E-B1)
48. Classify examples of plants and animals based on a variety of criteria (LS-E-B2)
49. Compare similarities and differences between parents and offspring in plants and animals (LS-E-B3)

Organisms and Their Environments

50. Explain how some organisms in a given habitat compete for the same resources (LS-E-C1)
51. Describe how organisms can modify their environment to meet their needs (e.g., beavers making dams) (LS-E-C1)
52. Describe how some plants and animals have adapted to their habitats (LS-E-C2)
53. Identify the habitat in which selected organisms would most likely live and explain how specific structures help organisms to survive (LS-E-C2)
54. Describe the effect of sudden increases or decreases of one group of organisms upon other organisms in the environment (LS-E-C3)

Earth and Space Science

Properties of Earth Materials

55. Recognize that sedimentary rocks are composed of particles that result from weathering and erosion (e.g., sandstones, conglomerates) (ESS-E-A1)
56. Investigate the properties of soil (e.g., color, texture, capacity to retain water, ability to support plant growth) (ESS-E-A1)
57. Explain how unequal heating of Earth's land and water affects climate and weather by using a model (ESS-E-A2)
58. Draw, label, and explain the components of a water cycle (ESS-E-A3)
59. Measure, chart, and predict the weather using various instruments (e.g., thermometer, barometer, anemometer) (ESS-E-A4)
60. Identify various types of weather-related natural hazards and effects (e.g., lightning, storms) (ESS-E-A4)
61. Identify safety measures applicable to natural hazards (ESS-E-A4)
62. Classify rocks and minerals according to texture, color, luster, hardness, and effervescence (ESS-E-A5)
63. Demonstrate and explain how Earth's surface is changed as a result of slow and rapid processes (e.g., sand dunes, canyons, volcanoes, earthquakes) (ESS-E-A5)

Objects in the Sky

64. Describe and sequence the phases of the Moon and eclipses (ESS-E-B2)
65. Compare a solar and a lunar eclipse (ESS-E-B2)
66. Diagram the movement of the Moon around Earth and the movement of Earth around the Sun (ESS-E-B2)
67. Explain the changing appearance of the Moon and its location in the sky over the course of a month (ESS-E-B3)
68. Identify the relationship between Earth's tilt and revolution and the seasons (ESS-E-B4)
69. Explain how technology has improved our knowledge of the universe (e.g., Hubble telescope, space stations, lunar exploration) (ESS-E-B6)

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Science and the Environment

70. Design an ecosystem that includes *living (biotic)* and *nonliving (abiotic)* components and illustrates interdependence (SE-E-A1)
71. Describe and explain food chains/webs and the directional flow of energy in various ecosystems (e.g., construct a model, drawing, diagram, graphic organizer) (SE-E-A2)
72. Predict and describe consequences of the removal of one component in a balanced ecosystem (e.g., consumer, herbivores, nonliving component) (SE-E-A2)