

Science
Grade-Level Expectations: Grade 7

Science as Inquiry

The Abilities Necessary to Do Scientific Inquiry

1. Generate testable questions about objects, organisms, and events that can be answered through scientific investigation (SI-M-A1)
2. Identify problems, factors, and questions that must be considered in a scientific investigation (SI-M-A1)
3. Use a variety of sources to answer questions (SI-M-A1)
4. Design, predict outcomes, and conduct experiments to answer guiding questions (SI-M-A2)
5. Identify independent variables, dependent variables, and variables that should be controlled in designing an experiment (SI-M-A2)
6. Select and use appropriate equipment, technology, tools, and metric system units of measurement to make observations (SI-M-A3)
7. Record observations using methods that complement investigations (e.g., journals, tables, charts) (SI-M-A3)
8. Use consistency and precision in data collection, analysis, and reporting (SI-M-A3)
9. Use computers and/or calculators to analyze and interpret quantitative data (SI-M-A3)
10. Identify the difference between description and explanation (SI-M-A4)
11. Construct, use, and interpret appropriate graphical representations to collect, record, and report data (e.g., tables, charts, circle graphs, bar and line graphs, diagrams, scatter plots, symbols) (SI-M-A4)
12. Use data and information gathered to develop an explanation of experimental results (SI-M-A4)
13. Identify patterns in data to explain natural events (SI-M-A4)
14. Develop models to illustrate or explain conclusions reached through investigation (SI-M-A5)
15. Identify and explain the limitations of models used to represent the natural world (SI-M-A5)
16. Use evidence to make inferences and predict trends (SI-M-A5)
17. Recognize that there may be more than one way to interpret a given set of data, which can result in alternative scientific explanations and predictions (SI-M-A6)
18. Identify faulty reasoning and statements that misinterpret or are not supported by the evidence (SI-M-A6)
19. Communicate ideas in a variety of ways (e.g., symbols, illustrations, graphs, charts, spreadsheets, concept maps, oral and written reports, equations) (SI-M-A7)
20. Write clear, step-by-step instructions that others can follow to carry out procedures or conduct investigations (SI-M-A7)
21. Distinguish between *observations* and *inferences* (SI-M-A7)
22. Use evidence and observations to explain and communicate the results of investigations (SI-M-A7)
23. Use relevant safety procedures and equipment to conduct scientific investigations (SI-M-A8)
24. Provide appropriate care and utilize safe practices and ethical treatment when animals are involved in scientific field and laboratory research (SI-M-A8)

Understanding Scientific Inquiry

25. Compare and critique scientific investigations (SI-M-B1)
26. Use and describe alternate methods for investigating different types of testable questions (SI-M-B1)
27. Recognize that science uses processes that involve a logical and empirical, but flexible, approach to problem solving (SI-M-B1)

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28. Recognize that investigations generally begin with a review of the work of others (SI-M-B2)
29. Explain how technology can expand the senses and contribute to the increase and/or modification of scientific knowledge (SI-M-B3)
30. Describe why all questions cannot be answered with present technologies (SI-M-B3)
31. Recognize that there is an acceptable range of variation in collected data (SI-M-B3)
32. Explain the use of statistical methods to confirm the significance of data (e.g., mean, median, mode, range) (SI-M-B3)
33. Evaluate models, identify problems in design, and make recommendations for improvement (SI-M-B4)
34. Recognize the importance of communication among scientists about investigations in progress and the work of others (SI-M-B5)
35. Explain how skepticism about accepted scientific explanations (i.e., hypotheses and theories) leads to new understanding (SI-M-B5)
36. Explain why an experiment must be verified through multiple investigations and yield consistent results before the findings are accepted (SI-M-B5)
37. Critique and analyze their own inquiries and the inquiries of others (SI-M-B5)
38. Explain that, through the use of scientific processes and knowledge, people can solve problems, make decisions, and form new ideas (SI-M-B6)
39. Identify areas in which technology has changed human lives (e.g., transportation, communication, geographic information systems, DNA fingerprinting) (SI-M-B7)
40. Evaluate the impact of research on scientific thought, society, and the environment (SI-M-B7)

Physical Science

Properties and Changes of Properties in Matter

1. Identify the elements most often found in living organisms (e.g., C, N, H, O, P, S, Ca, Fe) (PS-M-A9)

Life Science

Structure and Function in Living Systems

2. Compare the basic structures and functions of different types of cells (LS-M-A1)
3. Illustrate and demonstrate osmosis and diffusion in cells (LS-M-A1)
4. Compare functions of plant and animal cell structures (i.e., organelles) (LS-M-A2)
5. Compare complete and incomplete metamorphosis in insects (e.g., butterflies, mealworms, grasshoppers) (LS-M-A3)
6. Compare the life cycles of a variety of organisms, including non-flowering and flowering plants, reptiles, birds, amphibians, and mammals (LS-M-A3)
7. Construct a word equation that illustrates the processes of photosynthesis and respiration (LS-M-A4)
8. Distinguish between *aerobic* respiration and *anaerobic* respiration (LS-M-A4)
9. Relate structural features of organs to their functions in major systems (LS-M-A5)
10. Describe the way major organ systems in the human body interact to sustain life (LS-M-A5)
11. Describe the growth and development of humans from infancy to old age (LS-M-A6)
12. Explain how external factors and genetics can influence the quality and length of human life (e.g., nutrition, smoking, drug use, exercise) (LS-M-A6)
13. Identify and describe common communicable and noncommunicable diseases and the methods by which they are transmitted, treated, and prevented (LS-M-A7)

Reproduction and Heredity

14. Differentiate between sexual and asexual reproduction (LS-M-B1)

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15. Contrast the processes of mitosis and meiosis in relation to growth, repair, reproduction, and heredity (LS-M-B1)
16. Explain why chromosomes in body cells exist in pairs (LS-M-B2)
17. Explain the relationship of genes to chromosomes and genotypes to phenotypes (LS-M-B2)
18. Recognize genetic errors caused by changes in chromosomes (LS-M-B2)
19. Apply the basic laws of Mendelian genetics to solve simple monohybrid crosses, using a Punnett square (LS-M-B3)
20. Explain the differences among the inheritance of dominant, recessive, and incomplete dominant traits (LS-M-B3)
21. Use a Punnett square to demonstrate how sex-linked traits are inherited (LS-M-B3)
22. Give examples of the importance of selective breeding (e.g., domestic animals, livestock, horticulture) (LS-M-B3)

Populations and Ecosystems

23. Classify organisms based on structural characteristics, using a dichotomous key (LS-M-C1)
24. Analyze food webs to determine energy transfer among organisms (LS-M-C2)
25. Locate and describe the major biomes of the world (LS-M-C3)
26. Describe and compare the levels of organization of living things within an ecosystem (LS-M-C3)
27. Identify the various relationships among plants and animals (e.g., mutualistic, parasitic, producer/consumer) (LS-M-C4)
28. Differentiate between ecosystem components of habitat and niche (LS-M-C4)
29. Predict the impact changes in a species' population have on an ecosystem (LS-M-C4)

Adaptations of Organisms

30. Differentiate between structural and behavioral adaptations in a variety of organisms (LS-M-D1)
31. Describe and evaluate the impact of introducing nonnative species into an ecosystem (LS-M-D1)
32. Describe changes that can occur in various ecosystems and relate the changes to the ability of an organism to survive (LS-M-D2)
33. Illustrate how variations in individual organisms within a population determine the success of the population (LS-M-D2)
34. Explain how environmental factors impact survival of a population (LS-M-D2)

Science and the Environment

35. Identify resources humans derive from ecosystems (SE-M-A1)
36. Distinguish the essential roles played by biotic and abiotic components in various ecosystems (SE-M-A1)
37. Identify and describe the effects of limiting factors on a given population (SE-M-A2)
38. Evaluate the carrying capacity of an ecosystem (SE-M-A2)
39. Analyze the consequences of human activities on ecosystems (SE-M-A4)
40. Construct or draw food webs for various ecosystems (SE-M-A5)
41. Describe the nitrogen cycle and explain why it is important for the survival of organisms (SE-M-A7)
42. Describe how photosynthesis and respiration relate to the carbon cycle (SE-M-A7)
43. Identify and analyze the environmental impact of humans' use of technology (e.g., energy production, agriculture, transportation, human habitation) (SE-M-A8)