Science Grade-Level Expectations: Grade 6 Color Coded

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)
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. Measure and record the volume and mass of substances in metric system units (PS-M-A1)
2. Calculate the density of large and small quantities of a variety of substances (e.g., aluminum foil, water, copper, clay, rock) (PS-M-A1)
3. Construct models that replicate atomic structure for selected common elements from the periodic table (PS-M-A2)
4. Differentiate between the physical and chemical properties of selected substances (PS-M-A3)
5. Compare physical and chemical changes (PS-M-A3)
6. Draw or model the movement of atoms in solid, liquid, and gaseous states (PS-M-A4)
7. Simulate how atoms and molecules have kinetic energy exhibited by constant motion (PS-M-A4)
8. Determine the temperatures at which water changes physical phases (e.g., freezing point, melting point, boiling point) (PS-M-A5)
9. Describe the properties of reactants and products of chemical reactions observed in the lab (PS-M-A6)
10. Identify the average atomic masses of given elements using the periodic table (PS-M-A7)
11. Compare the masses of reactants and products of a chemical reaction (PS-M-A7)
12. Determine the effect of particle size of the same reactants on the rate of chemical reactions during a lab activity (e.g., powdered vs. solid forms) (PS-M-A8)

13. Use a variety of resources to identify elements and compounds in common substances (PS-M-A9)

Motions and Forces

14. Construct and analyze graphs that represent one-dimensional motion (i.e., motion in a straight line) and predict the future positions and speed of a moving object (PS-M-B1)
15. Explain why velocity is expressed in both speed and direction (PS-M-B1)
16. Compare line graphs of acceleration, constant speed, and deceleration (PS-M-B1)
17. Describe and demonstrate that friction is a force that acts whenever two surfaces or objects move past one another (PS-M-B2)
18. Explain how the resistance of materials affects the rate of electrical flow (PS-M-B2)
19. Identify forces acting on all objects (PS-M-B3)
20. Draw and label a diagram to represent forces acting on an object (PS-M-B4)
21. Determine the magnitude and direction of unbalanced (i.e., net) forces acting on an object (PS-M-B4)
22. Demonstrate that an object will remain at rest or move at a constant speed and in a straight line if it is not subjected to an unbalanced force (PS-M-B5) (PS-M-B3)
23. Predict the direction of a force applied to an object and how it will change the speed and direction of the object (PS-M-B5)

Transformations of Energy

24. Describe and give examples of how all forms of energy may be classified as potential or kinetic energy (PS-M-C1)
25. Compare forms of energy (e.g., light, heat, sound, electrical, nuclear, mechanical) (PS-M-C1)
26. Describe and summarize observations of the transmission, reflection, and absorption of sound, light, and heat energy (PS-M-C1)
27. Explain the relationship between work input and work output by using simple machines (PS-M-C2)
28. Explain the law of conservation of energy (PS-M-C2)
29. Compare and/or investigate the relationships among work, power, and efficiency (PS-M-C2)
30. Trace energy transformations in a simple system (e.g., flashlight) (PS-M-C2)
31. Compare types of electromagnetic waves (PS-M-C3)
32. Identify and illustrate key characteristics of waves (e.g., wavelength, frequency, amplitude) (PS-M-C4)
33. Predict the direction in which light will refract when it passes from one transparent material to another (e.g., from air to water, from prism to air) (PS-M-C4)
34. Apply the law of reflection and law of refraction to demonstrate everyday phenomena (e.g., how light is reflected from tinted windows, how light is refracted by cameras, telescopes, eyeglasses) (PS-M-C4)
35. Determine through experimentation whether light is reflected, transmitted, and/or absorbed by a given object or material (PS-M-C4)
36. Explain the relationship between an object's color and the wavelength of light reflected or transmitted to the viewer's eyes (PS-M-C4)
37. Compare how heat is transferred by conduction, convection, and radiation (PS-M-C5)
38. Identify conditions under which thermal energy tends to flow from a system of higher energy to a system of lower energy (PS-M-C5)

39. Describe how electricity can be produced from other types of energy (e.g., magnetism, solar, mechanical) (PS-M-C6)
40. Identify heat energy gains and losses during exothermic and endothermic chemical reactions (PS-M-C7)
41. Identify risks associated with the production and use of coal, petroleum, hydroelectricity, nuclear energy, and other energy forms (PS-M-C8)

Science and the Environment

42. Identify energy types from their source to their use and determine if the energy types are renewable, nonrenewable, or inexhaustible (SE-M-A6)
43. Explain how the use of different energy resources affects the environment and the economy (SE-M-A6)
44. Explain how an inexhaustible resource can be harnessed for energy production (SE-M-A6)
45. Describe methods for sustaining renewable resources (SE-M-A6)
46. Identify ways people can reuse, recycle, and reduce the use of resources to improve and protect the quality of life (SE-M-A6)
47. Illustrate how various technologies influence resource use in an ecosystem (e.g., forestry management, soil conservation, fishery improvement) (SE-M-A8)

Science as Inquiry – 42% of iLEAP (GLE #s: 1 – 40)
Physical Science – 42% of iLEAP (GLE #s: 1 – 41)
Life Science – 0% of iLEAP
Earth and Space Science – 0% of iLEAP
Science and the Environment – 16% of iLEAP (GLE #s: 42 – 47)