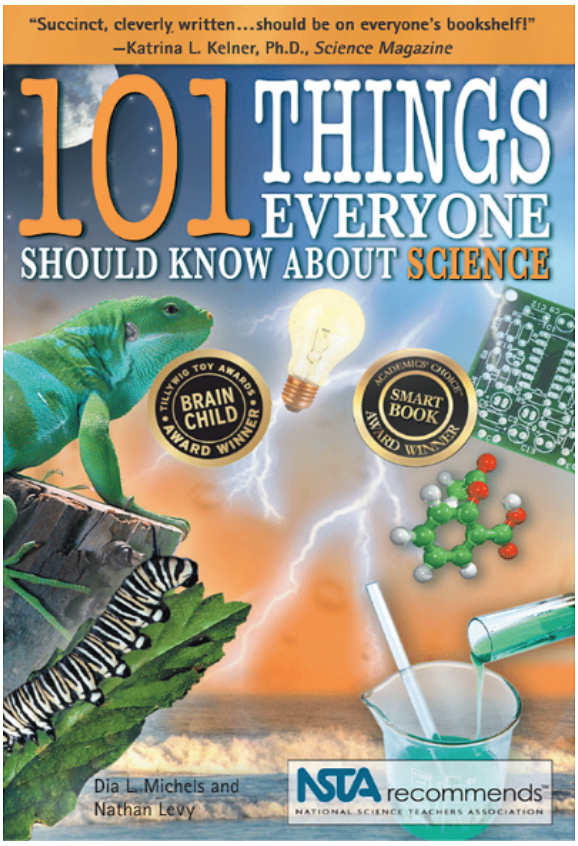
101 Things Everyone Should Know About Science

By Dia Michels and Nathan Levy
Published by Science Naturally, 2006
ISBN: 978-0-9678020-5-3
Ages 8-12 | Grades 3-8



Why do you see lightning before you hear thunder? What keeps the planets orbiting around the sun? Why do we put salt on roads when they are icy? What metal is a liquid at room temperature? And the burning question: Why do so many scientists wear white lab coats? Science affects everything—yet so many of us wish we understood it better. Using an accessible question-and-answer approach, 101 Things Everyone Should Know About Science expands a reader's knowledge, whether they are 8 or 108.

The National Science Education standards are addressed in the book's explanations of each question posed. Science as a human endeavor and the history of science are two standards that are particularly highlighted. Showing children the human nature of science supports an understanding of science as an evolving discipline subject to changes based on new observations and discoveries.

This book asks questions that will help develop some content science literacy. It is articulated to the standards noted in this document. The questions should encourage children to ask more questions and seek more explinations.

Articulated to the **National Science Education Standards** and the **Next Generation Science Standards**

Science curriculum standards were identified by Joan Wagner.

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Summary of National Science Education Standards

Below is a summary of the standards with their identifying code. For a more detailed description of each standard, go to: http://www.nap.edu/openbook.php?record_id=4962.

The standards noted below are a compilation of both the K-4 & 5-8 standards, since this book is recommended for ages 8-12.

Science as Inquiry (I) Standards, K-8

The inquiry standards address the following benchmarks:

- Understanding of scientific concepts
- An appreciation of how we know what we know in science
- Understanding of the nature of science

1I: Abilities necessary to do scientific inquiry
2I: Understanding of scientific inquiry

Physical Science (PS) Standards, K-4

1PS: Properties of objects and materials
2PS: Position and motion of objects
3PS: Light, heat, electricity and magnetism
4PS: Properties and changes of properties of matter
5PS: Motions and forces
6PS: Transfer of energy

Life Science (LS) Standards, K-8

1LS: Characteristics of organisms
2LS: Life cycles of organisms
3LS: Organisms and environments
4LS: Structure and function in living systems
5LS: Reproduction and heredity
6LS: Regulation and behavior
7LS: Population and ecosystems
8LS: Diversity and adaptations of organisms

Earth and Space Science (ES) Standards, K-8

1ES: Properties of earth materials
2ES: Objects in the sky
3ES: Changes in earth and sky
4ES: Structure of the earth system
5ES: Earth's history
6ES: Earth in the solar system

Science and Technology (TS) Standards, K-8

1TS: Abilities of technological design
2TS: Understanding science and technology
3TS: Abilities to distinguish between natural objects and objects made by humans

Science in Personal and Social Perspectives (PSPS) Standards, K-8

1PSPS: Personal health
2PSPS: Characteristics of and changes in populations
3PSPS: Types of resources
4PSPS: Changes in environment
5PSPS: Science and technology in local challenges
6PSPS: Populations, resources and environments
7PSPS: Natural hazards
8PSPS: Risks and benefits
9PSPS: Science and technology in society

History and Nature of Science (HNS) Standards

1HNS: Science as a human endeavor
2HNS: Nature of science
3HNS: History of science

Guide to Content (G) Standards

1G: Systems, order and organization
2G: Evidence, models and explanation
3G: Constancy, change and measurement

Articulation of National Science Education Standards

Biology questions

1. **1LS**
2. **8LS**
3. **1LS**
4. **1LS**
5. **1LS**
6. **6LS**
7. **1LS**
8. **1LS**
9. **2LS**
10. **1HNS; 7LS**
11. **5LS**
12. **1LS**
13. **1LS**
14. **7LS**
15. **4LS**
16. **4LS**
17. **6LS**
18. **6LS**
19. **1PSPS;1HNS**
20. **1PSPS; 1LS**
21. **6PSPS**
22. **1PSPS; 9PSPS**

Chemistry questions

23. **4PS**
24. **4PS**
25. **4PS**
26. **4PS**
27. **3HNS; 4PS**
28. **4PS**
29. **4PS**
30. **4LS; 6LS; 1PSPS**
31. **4PS**
32. **3PS; 1PSPS**
33. **3HNS; 4PS**
34. **4PS**
35. **4PS**
36. **4PS**
37. **4PS**
38. **3HNS; 3PSPS**
39. **4PS**
40. **4PS**

(con't)

41. **3HNS; 4PS; 9PSPS**
42. **3HNS, 9PSPS; 4PS**
43. **4PS; 9PSPS**
44. **4PS; 9PSPS**
45. **4PS**

Physics questions

46. **2PS**
47. **5PS**
48. **3HNS; 6PS**
49. **4PS**
50. **3HNS**
51. **6ES; 3PS; 5PS**
52. **6ES**
53. **3PS**
54. **9PSPS**
55. **3HNS; 6PS**
56. **5PS**
57. **9PSPS; 3PS; 6PS, 5PSPS**
58. **9PSPS; 6PS**
59. **3PS**
60. **2TS; 1TS; 3PS**
61. **1TS; 3PS**
62. **5PS; 6PS**
63. **1PS; 5PS; 2TS**
64. **3HNS; 1I; 4PS**
65. **6PS**
66. **4PS; 5PS**
67. **6PS**

Earth Science questions

68. **1ES; 3PS**
69. **6ES**
70. **2ES; 6ES**
71. **2ES**
72. **6ES; 2ES**
73. **4ES**
74. **6ES**
75. **4ES**
76. **3G**
77. **3HNS; 6ES; 3G**

(con't)

78. **4ES**
79. **4PSPS; 4ES**
80. **4ES**
81. **4ES; 6PSPS**
82. **6ES**
83. **3ES; 6ES**
84. **4ES**
85. **9PSPS**
86. **3PS; 7PSPS**
87. **1ES; 4ES**
88. **3ES; 3PS**
89. **3ES; 7PSPS**
90. **3HNS; 3G; 7PSPS; 9PSPS**

General Science questions

91. **1HNS**
92. **2I**
93. **3G**
94. **3G**
95. **3G**
96. **1I; 2I**
97. **8PSPS**
98. **1I; 2I**
99. **1I; 2I**
100. **1HNS; 3HNS; 9PSPS**
101. **1HNS; 3HNS**

Bonus questions

Biology: **1LS; 3G**
Physics: **3G**
Chemistry: **4PS**
Earth science: **6PSPS**
General science: **2ES; 6ES**

Summary and Articulation of Next Generation Science Standards

Life Science Standards

MS-LS1: From Molecules to Organisms: Structures and Processes

1. In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.
2. Animals engage in characteristic behaviors that increase the odds of reproduction.
3. Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction.

MS-LS2: Ecosystems: Interactions, Energy, and Dynamics

1. In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction.
2. Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling.
3. Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.

MS-LS4: Biological Evolution: Unity and Diversity

1. Natural selection leads to the predominance of certain traits in a population, and the suppression of others.

MS-ESS3: Earth and Human Activity

1. All human activity draws on both short and long-term consequences, positive as well as negative, for the health of people and the natural environment.

MS-PS1: Matter and Its Interactions

1. Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms.
2. In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do no change relative locations.
3. The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter.

4. In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations.
5. The term "heat" as used in everyday language refers both to thermal motion (the motion of atoms or molecules within a substance) and radiation (particularly infrared and light). In science, heat is used only for this second meaning; it refers to energy transferred when two objects or systems are at different temperatures.
6. Temperature is not a measure of energy; the relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present.

MS-PS2: Motion and Stability: Forces and Interactions

1. For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction. (Newton's third law).
2. Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun.
3. Forces that act at a distance (electric and magnetic) can be explained by fields that extend through space and can be mapped by their effect on a test object (a ball, a charged object, or a magnet, respectively).

MS-PS4: Waves and Their Applications in Technologies for Information Transfer

1. A sound wave needs a medium through which it is transmitted.
2. The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends.

MS-ESS1: Earth's Place in the Universe

1. Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models.
2. The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them.
3. Maps of ancient land and water patters, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart.
4. Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns.

Science and Engineering Practices

1. Asking Questions and defining problems.
2. Planning and carrying out investigations.

Note: This book also strongly supports the Language Arts and Science component of the Common Core State Standards/Reading for Science.