



EARTH SCIENCE

*Geology, the Environment,
and the Universe*

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STANDARDS

PAGE REFERENCES

STATE GOAL 11: Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.

Why This Goal Is Important: The inquiry process prepares learners to engage in science and apply methods of technological design. This understanding will enable students to pose questions, use models to enhance understanding, make predictions, gather and work with data, use appropriate measurement methods, analyze results, draw conclusions based on evidence, communicate their methods and results, and think about the implications of scientific research and technological problem solving.

A. Know and apply the concepts, principles and processes of scientific inquiry.

11.A.4a Formulate hypotheses referencing prior research and knowledge.

Student Edition:

GeoLab 70-71, 232-233, 292-293

Design Your Own GeoLab 92-93, 378-379, 798-799

Internet GeoLab 352-353, 488-489, 642-643, 852-853

Skill Review 363

Teacher Wraparound Edition:

A 12; P 13

STANDARDS	PAGE REFERENCES
<p>11.A.4b Conduct controlled experiments or simulations to test hypotheses.</p>	<p>Student Edition: <i>MiniLab</i> 12 <i>GeoLab</i> 70-71, 114-115, 174-175, 232-233, 292-293, 406-407 <i>Design Your Own GeoLab</i> 92-93, 378-379, 798-799 <i>Internet GeoLab</i> 352-353 Teacher Wraparound Edition: A 71, 163, 290</p>
<p>11.A.4c Collect, organize and analyze data accurately and precisely.</p>	<p>Student Edition: <i>GeoLab</i> 20-21, 70-71, 140-141, 174-175, 232-233, 292-293, 406-407 <i>Design Your Own GeoLab</i> 92-93, 378-379 <i>Internet GeoLab</i> 352-353, 488-489, 642-643, 852-853</p>
<p>11.A.4d Apply statistical methods to the data to reach and support conclusions.</p>	<p>Student Edition: <i>Problem-Solving Lab</i> 172, 350, 637 <i>Science & Math</i> 206 <i>GeoLab</i> 232-233, 292-293, 826-827 <i>MiniLab</i> 348 <i>Internet GeoLab</i> 852-853 Teacher Wraparound Edition: ACT 241; E 241</p>
<p>11.A.4e Formulate alternative hypotheses to explain unexpected results.</p>	<p>Student Edition: <i>Design Your Own GeoLab</i> 92-93, 378-379 <i>MiniLab</i> 127, 348 <i>GeoLab</i> 140-141, 232-233, 826-827 <i>Internet GeoLab</i> 852-853 Teacher Wraparound Edition: EC 568</p>
<p>11.A.4f Using available technology, report, display and defend to an audience conclusions drawn from investigations.</p>	<p>Student Edition: <i>Design Your Own GeoLab</i> 92-93 <i>Internet GeoLab</i> 352-353, 488-489, 642-643, 852-853 <i>Mapping GeoLab</i> 594-595 Teacher Wraparound Edition: A 163, 175, 379, 619, 827; DI 656; P 693</p>

STANDARDS	PAGE REFERENCES
B. Know and apply the concepts, principles and processes of technological design.	
<p>11.B.4a Identify a technological design problem inherent in a commonly used product.</p>	<p>Student Edition: 317-321 <i>MiniLab</i> 254 <i>Science & Technology</i> 324 <i>Design Your Own GeoLab</i> 676-677, 704-705</p> <p>Teacher Wraparound Edition: CFU 321; D 187; DI 656; M 692, 695, 702; P 685; R 321</p>
<p>11.B.4b Propose and compare different solution designs to the design problem based upon given constraints including available tools, materials and time.</p>	<p>Student Edition: <i>Design Your Own GeoLab</i> 676-677, 704-705</p> <p>Teacher Wraparound Edition: D 187; DI 656; M 692, 695, 702; P 685</p>
<p>11.B.4c Develop working visualizations of the proposed solution designs (e.g., blueprints, schematics, flowcharts, cad-cam, animations).</p>	<p>Student Edition: <i>Design Your Own GeoLab</i> 676-677, 704-705</p> <p>Teacher Wraparound Edition: M 692, 695, 702</p>
<p>11.B.4d Determine the criteria upon which the designs will be judged, identify advantages and disadvantages of the designs and select the most promising design.</p>	<p>Student Edition: <i>Design Your Own GeoLab</i> 676-677, 704-705</p> <p>Teacher Wraparound Edition: M 695; P 685</p>
<p>11.B.4e Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.</p>	<p>Student Edition: <i>Design Your Own GeoLab</i> 676-677, 704-705</p> <p>Teacher Wraparound Edition: M 692, 695</p>
<p>11.B.4f Evaluate the test results based on established criteria, note sources of error and recommend improvements.</p>	<p>Student Edition: <i>Design Your Own GeoLab</i> 676-677, 704-705</p> <p>Teacher Wraparound Edition: M 695</p>
<p>11.B.4g Using available technology, report to an audience the relative success of the design based on the test results and criteria.</p>	<p>Student Edition: <i>Design Your Own GeoLab</i> 676-677, 704-705</p> <p>Teacher Wraparound Edition: M 692, 695</p>

STANDARDS	PAGE REFERENCES
<p>STATE GOAL 12: Understand the fundamental concepts, principles and interconnections of the life, physical and earth/space sciences.</p>	
<p>Why This Goal Is Important: This goal is comprised of key concepts and principles in the life, physical and earth/space sciences that have considerable explanatory and predictive power for scientists and non-scientists alike. These ideas have been thoroughly studied and have stood the test of time. Knowing and being able to apply these concepts, principles and processes help students understand what they observe in nature and through scientific experimentation. A working knowledge of these concepts and principles allows students to relate new subject matter to material previously learned and to create deeper and more meaningful levels of understanding.</p>	
<p>A. Know and apply concepts that explain how living things function, adapt and change.</p>	
<p>12.A.4a Explain how genetic combinations produce visible effects and variations among physical features and cellular functions of organisms.</p>	<p>See Glencoe's <i>Biology</i> © 2007.</p>
<p>12.A.4b Describe the structures and organization of cells and tissues that underlie basic life functions including nutrition, respiration, cellular transport, biosynthesis and reproduction.</p>	<p>See Glencoe's <i>Biology</i> © 2007.</p>
<p>12.A.4c Describe processes by which organisms change over time using evidence from comparative anatomy and physiology, embryology, the fossil record, genetics and biochemistry.</p>	<p>Student Edition: 554-555, 589-593, 609-611, 615-617, 628-634, 639-641 <i>National Geographic Expeditions</i> 892-897 Teacher Wraparound Edition: A 593; CB 576D; DIS 632; R 617</p>
<p>B. Know and apply concepts that describe how living things interact with each other and with their environment.</p>	
<p>12.B.4a Compare physical, ecological and behavioral factors that influence interactions and interdependence of organisms.</p>	<p>Student Edition: <i>Science & Technology</i> 432 Teacher Wraparound Edition: A 439; CB 412D; TS 432</p>
<p>12.B.4b Simulate and analyze factors that influence the size and stability of populations within ecosystems (e.g., birth rate, death rate, predation, migration patterns).</p>	<p>Student Edition: 711-715 Teacher Wraparound Edition: A 715; CFU 715; DI 713; ITP 713; M 714</p>
<p>C. Know and apply concepts that describe properties of matter and energy and the interactions between them.</p>	
<p>12.C.4a Use kinetic theory, wave theory, quantum theory and the laws of thermodynamics to explain energy transformations.</p>	<p>Student Edition: 495-499, 505-508, 747-748, 809-810 <i>Problem-Solving Lab</i> 810 Teacher Wraparound Edition: A 692; CB 68</p>

STANDARDS	PAGE REFERENCES
<p>12.C.4b Analyze and explain the atomic and nuclear structure of matter.</p>	<p>Student Edition: 53-59, 60-66, 67-69, 562-563, 726</p> <p>Teacher Wraparound Edition: A 59; CB 56, 147; D 670; ITI 56; R 69</p>
<p>D. Know and apply concepts that describe force and motion and the principles that explain them.</p>	
<p>12.D.4a Explain and predict motions in inertial and accelerated frames of reference.</p>	<p>Student Edition: 776-779</p> <p>Teacher Wraparound Edition: CFU 779; IM 751; ITI 778</p>
<p>12.D.4b Describe the effects of electromagnetic and nuclear forces including atomic and molecular bonding, capacitance and nuclear reactions.</p>	<p>Student Edition: 60-66, 695-696, 809-810</p> <p><i>Problem-Solving Lab</i> 63</p> <p>Teacher Wraparound Edition: CB 61, 682C-D; CL 64; D 63; M 62</p>
<p>E. Know and apply concepts that describe the features and processes of the Earth and its resources.</p>	
<p>12.E.4a Explain how external and internal energy sources drive Earth processes (e.g., solar energy drives weather patterns; internal heat drives plate tectonics).</p>	<p>Student Edition: 101, 133-135, 275-277, 282, 290-291, 299-304, 305-311, 341-344, 361-363, 370, 460-463</p> <p><i>MiniLab</i> 302</p> <p>Teacher Wraparound Edition: CB 442C; DI 302; M 276</p>
<p>12.E.4b Describe how rock sequences and fossil remains are used to interpret the age and changes in the Earth.</p>	<p>Student Edition: 444-447, 557-561, 562-565, 566-569</p> <p><i>MiniLab</i> 558</p> <p><i>Problem-Solving Lab</i> 560</p> <p>Teacher Wraparound Edition: A 561; CB 552C-D; EC 568; M 559; P 650</p>
<p>F. Know and apply concepts that explain the composition and structure of the universe and Earth's place in it.</p>	
<p>12.F.4a Explain theories, past and present, for changes observed in the universe.</p>	<p>Student Edition: 775-779, 793-797, 842-846, 847-851</p> <p><i>MiniLab</i> 845</p> <p><i>GeoDigest</i> 860</p> <p>Teacher Wraparound Edition: A 851; CB 774C, 849; DIS 848; R 779, 851</p>

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<p>12.F.4b Describe and compare the chemical and physical characteristics of galaxies and objects within galaxies (e.g., pulsars, nebulae, black holes, dark matter, stars).</p>	<p>Student Edition: 805-812, 813-820, 821-825, 833-838, 839-846 <i>GeoLab</i> 826-827 <i>Internet GeoLab</i> 852-853</p> <p>Teacher Wraparound Edition: A 844; CB 836, 844; DI 822; R 820, 861</p>
<p>STATE GOAL 13: Understand the relationships among science, technology and society in historical and contemporary contexts.</p>	
<p>Why This Goal Is Important: Understanding the nature and practices of science such as ensuring the validity and replicability of results, building upon the work of others and recognizing risks involved in experimentation gives learners a useful sense of the scientific enterprise. In addition, the relationships among science, technology and society give humans the ability to change and improve their surroundings. Learners who understand this relationship will be able to appreciate the efforts and effects of scientific discovery and applications of technology on their own lives and on the society in which we live.</p>	
<p>A. Know and apply the accepted practices of science.</p>	
<p>13.A.4a Estimate and suggest ways to reduce the degree of risk involved in science activities.</p>	<p>Student Edition: 12-13 <i>GeoLab</i> 20-21, 70-71, 114-115, 174-175 <i>Design Your Own GeoLab</i> 92-93, 378-379, 704-705 <i>Appendix B</i> 910-911</p>
<p>13.A.4b Assess the validity of scientific data by analyzing the results, sample set, sample size, similar previous experimentation, possible misrepresentation of data presented and potential sources of error.</p>	<p>Student Edition: 13 <i>GeoLab</i> 20-21, 174-175, 232-233, 826-827 <i>Problem-Solving Lab</i> 110 <i>Internet GeoLab</i> 352-353 <i>Design Your Own GeoLab</i> 378-379, 676-677, 704-705, 798-799</p> <p>Teacher Wraparound Edition: A 21, 110; CB 15</p>
<p>13.A.4c Describe how scientific knowledge, explanations and technological designs may change with new information over time (e.g., the understanding of DNA, the design of computers).</p>	<p>Student Edition: 443-447, 448-454, 455-459, 460-463, 589-593, 775-779, 847-851 <i>Science & Technology</i> 22, 72, 324, 354, 854 <i>Science in the News</i> 142, 800, 828</p> <p>Teacher Wraparound Edition: CB 449, 849</p>

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<p>13.A.4d Explain how peer review helps to assure the accurate use of data and improves the scientific process.</p>	<p>Student Edition: 17-19</p> <p>Teacher Wraparound Edition: CB 4D</p>
<p>B. Know and apply concepts that describe the interaction between science, technology and society.</p>	
<p>13.B.4a Compare and contrast scientific inquiry and technological design as pure and applied sciences.</p>	<p>Student Edition: 10, 24 #8</p>
<p>13.B.4b Analyze a particular occupation to identify decisions that may be influenced by a knowledge of science.</p>	<p>Student Edition: 317-321</p> <p><i>Focus on Careers</i> 48, 148, 266, 438, 650, 742, 860</p> <p>Teacher Wraparound Edition: CD 313, 481; CFU 321; E 6, 90</p>
<p>13.B.4c Analyze ways that resource management and technology can be used to accommodate population trends.</p>	<p>Student Edition: 672-674, 711-715, 722-723, 728-729, 732-733</p> <p><i>Design Your Own GeoLab</i> 676-677</p> <p><i>Science & the Environment</i> 706</p> <p>Teacher Wraparound Edition: AC 671; CFU 715; E 712; EC 656</p>
<p>13.B.4d Analyze local examples of resource use, technology use or conservation programs; document findings; and make recommendations for improvements.</p>	<p>Student Edition: 89-91, 655-658, 659-663, 669-675, 683-689, 690-697, 698-703</p> <p><i>Science & Technology</i> 324</p> <p>Teacher Wraparound Edition: A 663; AC 686; CFU 675; E 90; EC 90; P 657; R 675</p>
<p>13.B.4e Evaluate claims derived from purported scientific studies used in advertising and marketing strategies.</p>	<p>Teacher Wraparound Edition: TPK 11</p>