

The beginning (preservice) **General Science 9-12** teacher will demonstrate knowledge of and/or competency in the following areas of study:

<p>1: Unifying Concepts and Processes The beginning teacher of science is familiar with, and teaches, the major concepts and principles that unify all scientific investigation and that are used in each of the science disciplines (1997 SSC: 1.2; CR III.D; NSTA [2001]: Standard 1; NSTA [1998], Standard 1; NSES: UCP-1-5)</p>	<p>1.1 Systems, Order, and Organization. 1.2 Evidence, Models, and Explanation. 1.3 Change, Constancy, and Measurement. 1.4 Evolution and Equilibrium. 1.5 Form and Function.</p>
<p>2: Science As Inquiry The beginning teacher of science understands and practices the science inquiry process. (1997 SSC: 1.1, 1.4; CR III.D; NSTA [2001]: Standard 3; NSTA [1998], Standard 3, 9; NSES: H-A1, A2; S 1, 2, 7-8¹; ETS 0435: 1)</p>	<p>2.1 Identify questions that can be answered through scientific investigations. 2.2 Design and conduct a scientific investigation, including general abilities, such as recognition of the principal elements in an experimental design (i.e., the hypothesis, independent and dependent variables, and controls); systematic observation, making accurate measurements, and identifying and controlling variables; clarifying ideas that are influencing and guiding the inquiry; and comparing ideas with current scientific knowledge 2.3 Use appropriate tools (e.g., hand tools, measuring instruments, calculators, and computers for the collection, summary, and display of evidence), techniques, and mathematics to gather, analyze, and interpret data, including selecting the scientific apparatus or instrument appropriate to a specified laboratory or field task and identifying proper operation of such equipment; using the metric system of measurement, recognizing equivalents within that system and selecting units appropriate to a given laboratory or field task; converting between scientific notation and conventional numerals and using scientific notation to perform calculations. 2.4 Develop descriptions, explanations, predictions, and models using evidence based on observation and the abilities to differentiate explanation from description, to provide causes for effects, and to establish relationships based on evidence and logical argument and connections between the content of science and the contexts within which new knowledge is developing. 2.5 Think critically and logically about relationships between evidence and explanations, including the ability to interpret and express the results of observation and experimentation. 2.6 Recognize, construct, and analyze alternative explanations, including the abilities to identify accurate verbal, graphic, and tabular expressions of data derived from observation and experimentation; draw conclusions and make inferences from observations or experimental results presented in verbal,</p>

¹ S = Show Me Science Content Standards

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	<p>graphic, or tabular form; and describe a scientific relationship in symbolic mathematical terms.</p> <p>2.7 Communicate scientific arguments and explanations.</p> <p>2.8 Use mathematics in all aspects of scientific inquiry to ask questions; to gather, organize, and present data; and to structure convincing explanations.</p> <p>2.9 handle, label, store, and dispose of chemicals, electrical equipment, and scientific apparatuses and take actions to prevent or report an emergencies, including, but not limited to, general first aid as it relates to incidents in the science classroom or laboratory. (NSTA 9.b)</p> <p>2.10 understand liability and negligence, especially as applied to science teaching and can take action to prevent potential problems. (NSTA 9.c)</p>
<p>3: Physical Science: The beginning teacher of science understands the central concepts, tools of inquiry, and structures of the physical sciences and makes these aspects of subject matter meaningful for students.</p> <p>(1997 SSC: 2.1-2.8, 3.1-3.7; CR III.D; NSTA [2001]: Rationale; Standard 1; NSTA [1998], Standard 1; NSES: H-B1, B2, B3, B4, B5; S 1, 2, 7-8; ETS 0435: II)</p>	<p>3.1 Structure of Atoms (1997 SSC: 2.1-.8; NSES: H-B1; ETS 0435: II.A.1)</p> <p>3.2 Structure and Properties of Matter (1997 SSC: 2.1-.8; NSES: H-B2; ETS 0435: II.A.1)</p> <p>3.3 Motion and Forces (1997 SSC 3.1-.7; NSES: H-B4; ETS 0435: II.B.1)</p> <p>3.4 Transfer of Energy (1997 SSC: 2.5-.7; NSES: H-B3; ETS 0435: II.A.1)</p> <p>3.5 General Chemistry and Chemical Reactions in the Physical and the Life Sciences (1997 SSC: 2.2-.5; NSES: H-B5; ETS 0435: II.C.1-5)</p> <p>3.6 Conservation of Energy and Increase in Disorder (1997 SSC: 2.7; NSES: H-B5; ETS 0435: II.A.2-3)</p>
<p>4: Life Science: The beginning teacher of science understands the central concepts, tools of inquiry, and structures of the life sciences and makes these aspects of subject matter meaningful for students.</p> <p>(1997 SSC 4.1-.7, 5.1-.6; CR III.D; NSTA [2001]: Rationale; Standard 1; NSTA [1998], Standard 1; NSES: H-C1, C2, C3, C4, C5, C6; S 3, 4, 7-8; ETS 0435: III)</p>	<p>4.1 Structure and Function in Living Systems (1997 SSC: 4.3-.7; ETS 0435: III.5-6)</p> <p>4.2 The Cell (1997 SSC: 4.4, NSES: H-C1; ETS 0435: III.1)</p> <p>4.3 Molecular Basis of Heredity (1997 SSC 4.2; NSES: H-C2; ETS 0435: III.1)</p> <p>4.4 Biological Evolution (1997 SSC 4.2-.3; NSES: H-C3; ETS 0435: III.2)</p> <p>4.5 Interdependence of Organisms (1997 SSC 4.1, 5.1-.6; NSES: H-C4; ETS 0435: III.7)</p> <p>4.6 Matter, Energy, and Organization in Living Systems (1997 SSC 5.1-.6; NSES: H-C5; ETS 0435: III.4)</p> <p>4.7 Behavior of Organisms (1997 SSC 5.1-6; NSES: H-C6; ETS 0435: III.5-6)</p>
<p>5: Earth and Space Science: The beginning teacher of science understands the central concepts, tools of inquiry, and structures of the earth and space sciences and makes these aspects of subject matter meaningful for students.</p> <p>(1997 SSC 6.1-.7, 7.1-.5; CR III.D;</p>	<p>5.1 Properties of Earth Materials (1997 SSC: 6.1-.3, 6.5-.6; ETS 0435: IV.1)</p> <p>5.2 Energy in the Earth System (1997 SSC: 6.1-.7; NSES: H-D1; ETS 0435: IV.3-4)</p> <p>5.3 Geochemical Cycles (1997 SSC: 6.5; NSES: H-D2; ETS 0435: IV.1,3)</p> <p>5.4 Earth in the Solar System</p>

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<p>NSTA [2001]: Rationale; Standard 1; NSTA [1998], Standard 1; NSES: H-D1, D2, D3, D4; S 5-8; ETS 0435: IV)</p>	<p>(1997 SSC: 7.1, 7.2; NSES: H-D3; ETS 0435: IV.5) 5.5 Origin and Evolution of the Earth System (1997 SSC: 6.2; NSES: H-D3; ETS 0435: IV.2) 5.6 Origin and Evolution of the Universe (1997 SSC: 7.3-.5; NSES: H-D4; ETS 0435: V)</p>
<p>6: Science and Technology: The beginning teacher of science understands the relationship between science and technology, can distinguish between natural objects and objects made by humans, and makes these aspects of subject matter meaningful for students by creating experiences in making models of useful things and by developing students' abilities to identify and communicate a problem and to design, implement, and evaluate a solution. (1997 SSC: 1.3, 1.4; NSTA [2001], Standards 4, 5.d; NSTA [1998] Standards 2, 4, 5; NSES: H-E1, E2; S 8; ETS 0435: V)</p>	<p>6.1 Compare/contrast scientific inquiry and technological design (NSES: H-E2; ETS 0435: V) 6.2 Explain the reciprocal relationship between science and technology (NSES: H-E2; ETS 0435: V) 6.3 Explain the intended and unintended consequences of technological designs. (NSES: H-E2; ETS 0435: V) 6.4 Identify appropriate problems for technological design (NSES: H-E2; ETS 0435: V) 6.5 Design a solution or product and use a variety of technologies to model phenomena (NSES: H-E1; ETS 0435: V) 6.6 Identify and organize materials and other resources, choose suitable tools and techniques, and work with appropriate measurement methods to ensure adequate accuracy in the implementation of a proposed design. (NSES: H-E1; ETS 0435: V) 6.7 Analyze and interpret data obtained from an experiment or investigation, including graphical data, and identify and demonstrate an understanding of sources of error in data that is presented (NSES: H-E1; ETS 0435: V) 6.8 Demonstrate understanding of scientific measurement and notation systems (NSES: H-E1; ETS 0435: V) 6.9 Collaborate as a team-member in the identification, communication, and resolution of scientific and technological problems. (NSES: H-E2; ETS 0435: V) 6.10 Use words, drawings, and simple models to communicate the process and products of technological design and scientific investigation (NSES: H-E1; ETS 0435: V) 6.11 Use criteria relevant to the original purpose or need to evaluate completed technological designs or products (NSES: H-E1; ETS 0435: V)</p>
<p>7. Science in Personal and Social Perspectives: The beginning teacher of science understands the context of science (i.e., relationships among systems of human endeavor including science and technology; relationships among scientific, technological, personal, social and cultural values; and the relevance and importance of science to the personal lives of students) and the social context of science teaching (i.e., the social and community support network within which science teaching and learning occur; relationship of science</p>	<p>7.1 Personal and Community Health (1997 SSC: 4.3, 4.6; NSES: H-F1; ETS 0435: V) 7.2 Population Growth (1997 SSC: 5.1, 5.4-.6; NSES: H-F2; ETS 0435: V) 7.3 Natural Resources (1997 SSC: 6.1; NSES: H-F3; ETS 0435: V) 7.4 Environmental Quality (1997 SSC: 5.1, 5.6; NSES: H-F4; ETS 0435: V) 7.5 Natural and Human-Induced Hazards (1997 SSC: 1.3; NSES: H-F5; ETS 0435: V) 7.6 Science and Technology in Local, National, and Global Challenges (1997 SSC: 1.3; NSES: H-F6; ETS 0435: V)</p>

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<p>teaching and learning to the needs and values of the community; and involvement of people and institutions from the community in the teaching of science) and uses this knowledge to enrich the science learning of all students. (1997 SSC: 1.3, 4.3, 4.6, 5.1, 5.4-.6, 6.1; NSTA [2001]: Standards 4, 7; NSTA [1998], Standards 4, 7, 9; NSES: H-F1, F2, F3, F4, F5, F6; S 1, 3-5; ETS 0435: V)</p>	
<p>8: History and Nature of Science: The beginning teacher of science understands the history and nature of science as a human endeavor and uses this knowledge to make subject matter meaningful for students. (1997 SSC: 1.3, 4.3, 4.6, 5.1, 5.4-.6, 6.1; NSTA [2001]: Standard 2.a & 2.b, 4; Standard 7; NSTA [1998], Standard 2.d, 4.b; NSES: H-G1, G2, G3; S 1-8; ETS 0435: I)</p>	<p>8.1 Science as a Human Endeavor (1997 SSC: 1.2, 1.5, 1.6; NSES: H-G1; ETS 0435: I) 8.2 Nature of Science (1997 SSC: 1.2, 1.5, 1.6; NSES: H-G2; ETS 0435: I) 8.3 History of Science (1997 SSC: 1.2, 1.5, 1.6; NSES: H-G3; ETS 0435: I)</p>