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

1. Unifying Concepts **(1997 SSC: 1.2, 1.4; NSTA [2003]: C.1; NSES: UCP-1-5)**	1. Multiple ways our perceptions of the world are organized and how we use systems to organize the studies and knowledge of science. 2. Nature of scientific evidence and the use of models for explanation. 3. Measurement as a way of knowing and organizing observations of constancy and change. 4. Evolution of natural systems and factors that result in evolution or equilibrium. 5. Interrelationships of form, function, and behaviors in living and nonliving systems.
2. Nature of Science **(1997 SSC: 1.3, 1.5; NSTA [2003]: 2.a, 2.b, 4; CR V.4.a; NSES: E-G1, G2, G3; NSES: H-G1, G2, G3; S 1-8; S 1-8; Praxis 0265: VI)**	1. The historical and cultural development of science and the evolution of knowledge across the four disciplines.. 2. The philosophical tenets, assumptions, goals, and values that distinguish science from technology and from other ways of knowing the world. 3. Strategies for engaging high-school students successfully in studies of the nature of science including, when possible, the critical analysis of false or doubtful assertions made in the name of science.
3. Inquiry **(1997 SSC: 1.1, 1.4; CR: see note RE: Methods course; 1.1; NSTA [2003] 3; NSES: H-A1, A2; S 1, 2, 7-8; Praxis 0265: VI); NSES (NRC, 2000)**	1. The processes, tenets, and assumptions of multiple methods of inquiry leading to scientific knowledge. 2. Strategies for engaging high school students in developmentally appropriate inquiries that require them to develop concepts and relationships from their observations, data, and inferences in a scientific manner. 3. Engage scientifically oriented questions, give priority to evidence, formulate explanations from evidence, connect explanations to scientific knowledge, and communicate and justify explanations to others.
4. Issues **(1997 SSC: 1.3, 1.6; NSTA [2003] 4; NSES: M-F1, F2, F3, F4, F5, F6; S 1, 3-5; NSES: H-F1, F2, F3, F4, F5, F6; S 1, 3-5; NSES: H-E1, E2, E3; Praxis 0265: VI)**	1. Understanding of socially important global and local issues related to science and technology across the four disciplines, as well as processes used to analyze and make decisions on such issues. 2. Strategies for engaging students successfully in the analysis of problems, including considerations of risks, costs, and benefits of possible solutions; and relating these issues to the knowledge, goals and values of the students. 3. Career opportunities in the life and physical sciences.
5. Safety and Welfare **(1997 SSC: 1.7; CR: see DESE CR note RE: Methods course; NSTA [2003] 9.b, 9.c, 9.a; Praxis 0265: VI)**	1. Handle, label, store, & dispose of chemicals, electrical equipment, & scientific apparatuses & take actions to prevent or report emergencies, including, but not limited to, general first aid as it relates to incidents in the science classroom or laboratory. 2. Understand liability, ethics, and negligence, especially as applied to science teaching and take action to prevent potential problems, including proper treatment of organisms.

6. Physics Core Competencies (1997 SSC: 2.1, 2.6, 3.1-.7; CR: V.4.d; NSTA [2003]: C.5; NSES: H-B1, B2, B3, B5, B6; S 1, 2, 7-8; Praxis 0265: I, II, III, IV)	1. Energy, work, and power. 2. Motion, major forces, and momentum. 3. Newtonian principles and laws including engineering applications. 4. Conservation of mass, momentum, energy, and charge. 5. Physical properties of matter. 6. Kinetic-molecular motion and atomic models. 7. Radioactivity, nuclear reactors, fission, and fusion. 8. Wave theory, sound, light, the electromagnetic spectrum and optics. 9. Electricity and magnetism 10. Fundamental processes of investigating in physics, including laboratory skills. 11. Applications of physics in environmental quality and to personal and community health in Missouri, the U.S., and the world.
7. Biology Core Competencies (1997 SSC 4.1-.7, 5.1-.6; CR: V.4.b; NSTA [2003] C.2.a; NSES: H-C1, C2, C3, C4, C5, C6; S 3, 4, 7-8; S 3, 4, 7-8; ETS 0265: not addressed by 0265)	1. Life processes in living systems including organization of matter and energy. 2. Similarities and differences among animals, plants, fungi, microorganisms, and viruses. 3. Principles and practices of biological classification. 4. Scientific theory and principles of biological evolution. 5. Ecological systems, biomes, and ecosystem dynamics, including the interrelationships and dependencies of organisms with each other and their environments. 6. Population dynamics and the impact of a population on its environment. 7. General concepts of genetics and heredity (e.g., DNA/RNA, protein synthesis, mutations, adaptations). 8. Organization and functions of cells and multicellular systems. 9. Behavior of organisms and their relationships to social systems. 10. Regulation of biological systems including homeostatic mechanisms. 11. Fundamental processes of modeling and investigating in the biological sciences, including laboratory skills. 12. Applications of biology in environmental quality and in personal and community health.
8. Chemistry Core Competencies (1997 SSC: 2.1-.8; NSTA C.1.; CR: 4.c; NSES: H-B1, B2, B3, B5, B6; S 1, 2, 7-8; Praxis 0265: not overtly addressed by 0265)	1. Fundamental structures of atoms and molecules. 2. Basic principles of ionic, covalent, and metallic bonding. 3. Physical and chemical properties and classification of elements including periodicity. 4. Chemical kinetics and thermodynamics. 5. Principles of electrochemistry. 6. Mole concept, stoichiometry, and laws of composition. 7. Transition elements and coordination compounds. 8. Acids and bases; oxidation-reduction chemistry; solutions; chemical equilibrium; acid base titration/pH/; instrumentation. 9. Fundamental biochemistry. 10. Functional and polyfunctional group chemistry. 11. Environmental and atmospheric chemistry. 12. Fundamental processes of investigating in chemistry, including laboratory skills.

	13. Applications of chemistry in personal and community health and environmental quality in Missouri, the U.S., and the world.
9. Earth Science and Space Sciences Core Competencies (1997 SSC: 6.1-.7, 7.1-.5; CR: V.4.e, .f; NSTA [2003] C.4.a; NSES: H-D1, D2, D3, D4; S 5-8; S 5-8; ETS 0265: not overtly addressed by 0265)	1. Characteristics of and interactions among land, atmosphere, and ocean systems on Earth. 2. Properties, measurement, and classification of Earth materials. 3. Local and global changes in the Earth including land formation and erosion. 4. Local and global geochemical and biogeochemical cycles including biotic and abiotic systems. 5. Local and global energy flow and transformation in Earth systems. 6. Local and global hydrological features of the Earth. 7. Local and global patterns and changes in the atmosphere, weather, and climate. 8. Origin, evolution, and planetary behaviors of Earth. 9. Origin, evolution, and properties of the universe. 10. Fundamental processes of investigating in the Earth and space sciences, including laboratory skills. 11. Sources and limits of natural resources in Missouri, the U.S., and the world. 12. Applications of Earth and space sciences to environmental quality and to personal and community health and welfare (e.g., natural disasters, global climate change, acid rain, etc.) in Missouri, the U.S., and the world.
10. Physics Advanced Competencies (1997 SSC: 2.1-.8, 3.1-.7; CR: V.4.d, .g; NSTA [2003] C.5; Praxis 0265: I, II, III, IV, V)	1. Thermodynamics and relationships between energy and matter. 2. Nuclear physics including matter-energy duality and reactivity. 3. Angular rotation and momentum, centripetal forces, and vector analysis. 4. Conceptual understanding of quantum mechanics, space-time relationships, and special relativity. 5. Models of nuclear and subatomic structures and behavior. 6. Light behavior, including wave-particle duality and models. 7. Electrical phenomena including electric fields, vector analysis, energy, potential, capacitance, and inductance. 8. Issues related to physics such as disposal of nuclear waste, light pollution, shielding communication systems and weapons development. 9. Historical development and cosmological perspectives in physics including contributions of significant figures and underrepresented groups, and evolution of theories in physics. 10. How to design, conduct, and report research in physics. 11. Applications of physics and engineering in society, business, industry, and health fields.
11. Physics Supporting Competencies (1997 SSC: 1.4, 2.1-.8, 3.1-.7; 4.1.-.7; NSTA [2003] C.5; CR: V.1.b-.f; Praxis 0265: VI)	1. Biology, including organization of life, bioenergetics, biomechanics, and cycles of matter. 2. Chemistry, including organization of matter and energy, electrochemistry, thermo dynamics, and bonding. 3. Earth sciences or astronomy related to structure of the universe, energy, and interactions of matter. 4. Mathematics, including statistics, probability, calculus and

	differential equations.