

Provide a curriculum matrix that shows alignment of the program's prescribed courses and experiences with the standards of the corresponding NCATE Specialized Professional Association (SPA) and/or the ADE for the content area or category of licensure.

Standard 1: Content							
C.1. Recommendations for All Secondary Science Teachers							
All secondary teachers should also be prepared to lead students to understand the unifying concepts of science including:	EDUC 290	EDUC 438	BIOL 150	CHEM 110	CHEM 120	PHYS 210/230	PHYS 220/240
1. Multiple ways we organize our perceptions of the world and how systems organize the studies and knowledge of science.		X	X			X	
2. Nature of scientific evidence and the use of models for explanation.	X	X	X	X		X	X
3. Measurement as a way of knowing and organizing observations of constancy and change.			X	X	X	X	X
4. Evolution of natural systems and factors that result in evolution or equilibrium.			X				
5. Interrelationships of form, function, and behaviors in living and nonliving systems.			X	X	X		

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Standard 1: Content				
C.3. Recommendations for Teachers of Chemistry				
C.3.a. Core Competencies. All teachers of chemistry should be prepared to lead students to understand:	CHEM 110	CHEM 120	CHEM 240	CHEM 310
1. Fundamental structures of atoms and molecules.	X		X	
2. Basic principles of ionic, covalent, and metallic bonding.	X			
3. Physical and chemical properties and classification of elements including periodicity.	X		X	
4. Chemical kinetics and thermodynamics.		X	X	X
5. Principles of electrochemistry.		X		
6. Mole concept, stoichiometry, and laws of composition.	X	X		
7. Transition elements and coordination compounds.		X		
8. Acids and bases, oxidation-reduction chemistry, and solutions.		X		
9. Fundamental biochemistry.		X		
10. Functional and polyfunctional group chemistry.			X	X
11. Environmental and atmospheric chemistry.	X	X		
12. Fundamental processes of investigating in chemistry.	X	X	X	X
13. Applications of chemistry in personal and community health and environmental quality.	X	X	X	

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<i>Standard 2: Nature of Science</i>				
To show they are prepared to teach the nature of science, teachers of science must demonstrate that they:	EDUC 290	EDUC 438	EDUC 460	EDUC 461
a. Understand the historical and cultural development of science and the evolution of knowledge in their discipline.		X		
b. Understand the philosophical tenets, assumptions, goals, and values that distinguish science from technology and from other ways of knowing the world.	X			
c. Engage 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.		X	X	X

<i>Standard 3: Inquiry</i>				
To show that they are prepared to teach through inquiry, teachers of science must demonstrate that they:	EDUC 438	EDUC 460	EDUC 461	
a. Understand the processes, tenets, and assumptions of multiple methods of inquiry leading to scientific knowledge.	X			
b. Engage students successfully in developmentally appropriate inquiries that require them to develop concepts and relationships from their observations, data, and inferences in a scientific manner.		X	X	X

<i>Standard 4: Issues</i>				
To show that they are prepared to engage students in studies of issues related to science, teachers of science must demonstrate that they:	EDUC 290	EDUC 438	EDUC 460	EDUC 461
a. Understand socially important issues related to science and technology in their field of licensure, as well as processes used to analyze and make decisions on such issues.	X			
b. Engage students successfully in the analysis of problems, including considerations of risks, costs, and benefits of alternative solutions, relating these to the knowledge, goals and values of the students.		X	X	X

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<i>Standard 5: General Skills of Teaching</i>				
To show that they are prepared to create a community of diverse learners, teachers of science must demonstrate that they:	EDUC 438	EDUC 460	EDUC 461	
a. Vary their teaching actions, strategies, and methods to promote the development of multiple student skills and levels of understanding.	X	X	X	
b. Successfully promote the learning of science by students with different abilities, needs, interests, and backgrounds.	X	X	X	
c. Successfully organize and engage students in collaborative learning using different student group learning strategies.	X	X	X	
d. Successfully use technological tools, including but not limited to computer technology, to access resources, collect and process data, and facilitate the learning of science.	X	X	X	
e. Understand and build effectively upon the prior beliefs, knowledge, experiences, and interests of students.	X	X	X	
f. Create and maintain a psychologically and socially safe and supportive learning environment.	X	X	X	

<i>Standard 6: Curriculum</i>				
To show that they are prepared to plan and implement an effective science curriculum, teachers of science must demonstrate that they:	EDUC 438	EDUC 460	EDUC 461	
a. Understand the curricular recommendations of the National Science Education Standards, and can identify, access, and/or create resources and activities for science education that are consistent with the standards.	X	X	X	
b. Plan and implement internally consistent units of study that address the diverse goals of the National Science Education Standards and the needs and abilities of students.				X

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<i>Standard 1: Content</i>	
<u>C.4. Recommendations for Teachers of the Earth and Space Sciences</u>	
C.4.a. <i>Core Competencies.</i> All teachers of the Earth and space sciences should be prepared to lead students to understand:	<u>Earth Science</u>
1. Characteristics of land, atmosphere, and ocean systems on Earth.	X
2. Properties, measurement, and classification of Earth materials.	X
3. Changes in the Earth including land formation and erosion.	X
4. Geochemical cycles including biotic and abiotic systems.	X
5. Energy flow and transformation in Earth systems.	X
6. Hydrological features of the Earth.	X
7. Patterns and changes in the atmosphere, weather, and climate.	X
8. Origin, evolution, and planetary behaviors of Earth.	X
9. Origin, evolution, and properties of the universe.	X
10. Fundamental processes of investigating in the Earth and space sciences.	X
11. Sources and limits of natural resources.	X
12. Applications of Earth and space sciences to environmental quality and to personal and community health and welfare.	X

<i>Standard 1: Content</i>		
<u>C.4. Recommendations for Teachers of the Earth and Space Sciences</u>		
C.4.b. <i>Advanced Competencies.</i> Teachers of the Earth and space sciences as a primary field should be prepared to effectively lead students to understand:	BIOL 365	PHYS 460
	<u>BIOL 150</u>	<u>Earth Science</u>
13. Gradual and catastrophic changes in the Earth.	X	X
14. Oceans and their relationship to changes in atmosphere and climate.	X	X
15. Hydrological cycles and problems of distribution and use of water.	X	X
16. Dating of the Earth and other objects in the universe.	X	X
17. Structures and interactions of energy and matter in the universe.		X
18. Impact of changes in the Earth on the evolution and distribution of living things.	X	
19. Issues related to changes in Earth systems such as global climate change, mine subsidence, and channeling of waterways.	X	X
20. Historical development and perspectives in the Earth and space sciences, including contributions of significant figures and underrepresented groups, and the evolution of theories in these fields.	X	X
21. How to design, conduct, and report research in the Earth and space sciences.	X	X
22. Applications of the Earth and space sciences and related technologies in society, business, industry, and health fields.	X	X

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Standard 1: Content					
C.4. Recommendations for Teachers of the Earth and Space Sciences					
C.4.c. <i>Supporting Competencies</i> . All teachers of Earth and space sciences should be prepared to effectively apply concepts from other sciences and mathematics to the teaching of Earth and space sciences including concepts of:	BIOL 365 BIOL 150	CHEM 110 & 120	MATH 130 & 140	PHYS 210/230/ & 230/40	STAT
23 Biology, including evolution, ecology, population dynamics, and the flow of energy and materials through Earth systems.	X				
24 Chemistry, including broad concepts and basic laboratory techniques of inorganic and organic chemistry, physical chemistry, and biochemistry.		X			
25 Physics, including electricity, forces and motion, energy, magnetism, thermodynamics, optics, and sound; as well as basic quantum theory.				X	
26 Mathematics, including statistics and probability.			X		X

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Standard 1: Content				
C.5. Recommendations for Teachers of Physics				
C.5.a. <i>Core Competencies</i> . All teachers of physics should be prepared to lead students to understand:	EDUC 290	PHYS 210/230	PHYS 220/240	PHYS 315
1. Energy, work, and power.		X		
2. Motion, major forces, and momentum.		X		
3. Newtonian principles and laws including engineering applications.		X		
4. Conservation of mass, momentum, energy, and charge.		X		
5. Physical properties of matter.		X		
6. Kinetic-molecular motion and atomic models.		X	X	X
7. Radioactivity, nuclear reactors, fission, and fusion.			X	X
8. Wave theory, sound, light, the electromagnetic spectrum and optics.		X	X	
9. Electricity and magnetism.		X	X	
10. Fundamental processes of investigating in physics.		X	X	
11. Applications of physics in environmental quality and to personal and community health.	X			

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<i>Standard 1: Content</i>				
<i>C.5. Recommendations for Teachers of Physics</i>				
C.5.b. <i>Advanced Competencies.</i> Teachers of physics as a primary field should be prepared to effectively lead students to understand:	EDUC 290	PHYS 210/230	PHYS 220/240	PHYS 315
12. Thermodynamics and relationships between energy and matter.		X		X
13. Nuclear physics including matter-energy duality and reactivity.			X	X
14. Angular rotation and momentum, centripetal forces, and vector analysis.		X		
15. Quantum mechanics, space-time relationships, and special relativity.				X
16. Models of nuclear and subatomic structures and behavior.			X	X
17. Light behavior, including wave-particle duality and models.			X	X
18. Electrical phenomena including electric fields, vector analysis, energy, potential, capacitance, and inductance.			X	
19. Issues related to physics such as disposal of nuclear waste, light pollution, shielding communication systems and weapons development.	X			
20. Historical development and cosmological perspectives in physics including contributions of significant figures and underrepresented groups, and evolution of theories in physics.				X
21. How to design, conduct, and report research in physics.		X	X	X
22. Applications of physics and engineering in society, business, industry, and health fields.	X			

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<i>Standard 1: Content</i>				
<i>C.5. Recommendations for Teachers of Physics</i>				
C.5.c. <i>Supporting Competencies.</i> All teachers of physics should be prepared to effectively apply concepts from other sciences and mathematics to the teaching of physics including concepts of:	BIOL 365 BIOL 150	CHEM 110 & 120	MATH 130 & 140	STAT Earth Science
23. Biology, including organization of life, bioenergetics, biomechanics, and cycles of matter.	X			
24. Chemistry, including organization of matter and energy, electrochemistry, thermodynamics, and bonding.		X		
25. Earth sciences or astronomy related to structure of the universe, energy, and interactions of matter.	X			X
26. Mathematical and statistical concepts and skills including statistics and the use of differential equations and calculus.			X	X

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<i>Standard 1: Content</i>				
C.3. Recommendations for Teachers of Chemistry				
C.3.b. <i>Advanced Competencies.</i> Teachers of chemistry as a primary field should also be prepared to effectively lead students to understand	CHEM 110	CHEM 120	CHEM 240	CHEM 310
14. Molecular orbital theory, aromaticity, metallic and ionic structures, and correlation to properties of matter.	X	X	X	X
15. Superconductors and principles of metallurgy	Chemistry majors are required to take CHEM 340, which covers this objective.			
16. Advanced concepts of chemical kinetics, and thermodynamics.		X		
17. Lewis adducts and coordination compounds.		X		
18. Solutions, colloids, and colligative properties.		X		
19. Major biological compounds and natural products.			X	
20. Solvent system concepts including non-aqueous solvents.	X	X		
21. Chemical reactivity and molecular structure including electronic and steric effects.	X		X	
22. Organic synthesis and organic reaction mechanisms.			X	
23. Energy flow through chemical systems.	X	X		
24. Issues related to chemistry including ground water pollution, disposal of plastics, and development of alternative fuels.	X			
25. Historical development and perspectives in chemistry including contributions of significant figures and underrepresented groups, and the evolution of theories in chemistry.				X
26. How to design, conduct, and report research in chemistry.	X	X	X	X
27. Applications of chemistry and chemical technology in society, business, industry, and health fields.	X	X	X	

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C.3. Recommendations for Teachers of Chemistry					
C.3.c. <i>Supporting Competencies.</i> All teachers of chemistry should be prepared to effectively apply concepts from other sciences and mathematics to the teaching of chemistry including:	BIOL 150/365	MATH 130 & 140	EARTH SCI PHYS 460	PHYS 210/300 & 230/40	STAT
28. Biology, including molecular biology, bioenergetics, and ecology.	X				
29. Earth science, including geochemistry, cycles of matter, and energetics of Earth systems.	X		X		
30. Physics, including energy, stellar evolution, properties and functions of waves, motions and forces, electricity, and magnetism.			XX	X	
31. Mathematical and statistical concepts and skills including statistics and the use of differential equations and calculus.		X			X

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<i>Standards 7: Science in the Community</i>			
To show that they are prepared to relate science to the community, teachers of science must demonstrate that they:	EDUC 290	EDUC 460	EDUC 461
a. Identify ways to relate science to the community, involve stakeholders, and use community resources to promote the learning of science.	X		
b. Involve students successfully in activities that relate science to resources and stakeholders in the community or to the resolution of issues important to the community.		X	X

<i>Standards 8: Assessment</i>			
To show that they are prepared to use assessment effectively, teachers of science must demonstrate that they:	EDUC 438	EDUC 460	EDUC 461
a. Use multiple assessment tools and strategies to achieve important goals for instruction that are aligned with methods of instruction and the needs of students.	X	X	X
b. Use the results of multiple assessments to guide and modify instruction, the classroom environment, or the assessment process.	X	X	X
c. Use the results of assessments as vehicles for students to analyze their own learning, engaging students in reflective self-analysis of their own work.			X

<i>Standard 9: Safety and Welfare</i>			
To show that they are prepared, teachers of science must demonstrate that they:	EDUC 438	EDUC 460	EDUC 461
a. Understand the legal and ethical responsibilities of science teachers for the welfare of their students, the proper treatment of animals, and the maintenance and disposal of materials.	X		
b. Know and practice safe and proper techniques for the preparation, storage, dispensing, supervision, and disposal of all materials used in science instruction.	X	X	X
c. Know and follow emergency procedures, maintain safety equipment, and ensure safety procedures appropriate for the activities and the abilities of students.	X	X	X
d. Treat all living organisms used in the classroom or found in the field in a safe, humane, and ethical manner and respect legal restrictions on their collection, keeping, and use.	X	X	X

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<i>Standard 10: Professional Growth</i>			
To show their disposition for growth, teachers of science must demonstrate that they:	EDUC 438	EDUC 460	EDUC 461
a. Engage actively and continuously in opportunities for professional learning and leadership that reach beyond minimum job requirements.			X
b. Reflect constantly upon their teaching and identify ways and means through which they may grow professionally.	X	X	X
c. Use information from students, supervisors, colleagues and others to improve their teaching and facilitate their professional growth.	X	X	X
d. Interact effectively with colleagues, parents, and students; mentor new colleagues; and foster positive relationships with the community.	X	X	X

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