

Conceptual Framework References	Alabama Standard/Rule 290-3-3-.14	Institution: University of North Alabama	Assessment	
		All Standards Met, October 2013	When/Where to be Assessed	Score
		290-3-2-.14 General Rules for All Science Teaching Fields		
	(1)	Rationale. The main goal of these standards is to promote quality teacher education programs that will lead to the development of scientific literacy among all Grade 6-12 students in Alabama. The standards include process and application skills which are embedded within the three domains of science. The standards correlate the <i>Alabama Course of Study: Science</i> , the National Science Education Standards from the National Research Council, and the teacher preparation standards of the National Science Teachers Association. The standards build upon the Alabama Quality Teaching Standards.	#DIV/0!	
	(2)	Program Curriculum.		
	(2)(a)	Content. Teachers of science understand and can articulate the knowledge and practices of contemporary science. They can interrelate and interpret important concepts, ideas, and applications in their fields of certification; and can conduct scientific investigations. To show they are prepared to teach science content, prospective teachers of science must demonstrate:		
	(2)(a)1.	Meeting the Alabama Quality Teaching Standard 1, Content Knowledge, in Rule 290-3-3-.03(1), including academic discipline(s).		
	(2)(a)2.	<u>Knowledge of:</u>	#DIV/0!	
CF 1,5,6	(2)(a)2.(i)	Contemporary scientific facts, principles, issues, generalizations, and laws of the target science, and the relationship of each science to the other sciences and their implications and applications.		
CF 1	(2)(a)2.(ii)	The unifying concepts of science delineated by National Science Education standards:		
CF 1,2,6	(2)(a)2.(I)	Multiple ways to organize perceptions of the world and how systems organize the studies and knowledge of science.		
CF 1	(2)(a)2.(II)	Nature of scientific evidence and the use of models for explanation.	SCED 480	MET

CF 1,2,4,6	(2)(a)2.(III)	Measurement as a way of knowing and organizing observations of constancy and change.	SCED 480	MET
CF 1,6	(2)(a)2.(IV)	Evolution of natural systems and factors that result in evolution or equilibrium.	SCED 480	MET
CF 1	(2)(a)2.(V)	Interrelationships of form, function, and behaviors in living and nonliving systems.	SCED 480	MET
CF 1,4	(2)(a)2.(iii)	Personal and technological applications of science in their field(s) of certification.	SCED 480	MET
CF 1,2,4,6	(2)(a)2.(iv)	Research and how to successfully design, conduct, report, and evaluate investigations in science.	SCED 480	MET
	(2)(a)3.	<u>Ability to:</u>		
CF 1	(2)(a)3.(i)	Convey to students the unifying concepts of science delineated by National Science Education standards and listed above in Rule 290-3-3-.14(2)(a)(ii).	SCED 480	MET
CF 1,2,4	(2)(a)3.(ii)	Convey to students the use of mathematics to process and report data and solve problems in their fields.	SCED 480	MET
CF 1,3,4,6	(2)(a)3.(iii)	Convey to student the important personal and technological applications of science.	SCED 480	MET
	(2)(b)	The nature of science. Teachers of science engage students effectively in studies of the history, philosophy, and practice of science. They enable students to distinguish science from nonscience, understand the evolution and practice of science as a human endeavor, and critically analyze assertions made in the name of science. To show they are prepared to teach the nature of science, prospective teachers of science must demonstrate:		#DIV/0!
CF 1	(2)(b)1.	<u>Knowledge of</u> the practice of science as a human endeavor, to include its historical development, philosophical tenets, assumptions, goals, and values that distinguish pure science from non-science, from technology, and from other ways of understanding the world.	SCED 480	MET

CF 1,2,5,6	(2)(b)2.	<u>Ability to</u> 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.	SCED 480	MET
	(2)(c)	Inquiry. Teachers of science engage students both in studies of various methods of scientific inquiry and in active learning through scientific inquiry. They encourage students, individually and collaboratively, to observe, ask questions, design inquiries, and collect and interpret data in order to develop concepts and relationships from empirical experiences. To show that they are prepared to teach through inquiry, prospective teachers of science must demonstrate:		#DIV/0!
	(2)(c)1.	<u>Knowledge of:</u>		
CF 1,6	(2)(c)1.(i)	The processes, tenets, and assumptions of multiple methods of inquiry leading to scientific knowledge.	SCED 480	MET
CF 1	(2)(c)1.(ii)	The role of hands-on experiences upon which learning is constructed.	SCED 480	MET
CF 1	(2)(c)1.(iii)	Developmentally appropriate inquiry strategies for teaching science, including those advocated by the Alabama Math, Science, and Technology Initiative (AMSTI).	SCED 480	MET
CF 1	(2)(c)2.	<u>Ability to</u> engage students in developmentally appropriate inquiries that require them to develop concepts and relationships from the observations, data, and inferences in a scientific manner.	SCED 480	MET
	(2)(d)	Issues. Teachers of science recognize that informed citizens must be prepared to make decisions and take action on contemporary science-related and technology-related issues of interest to the general society. They require students to conduct inquiries into the factual basis of such issues and to assess possible actions and outcomes based upon their goals and values. To show that they are prepared to engage students in studies of issues related to science, prospective teachers of science must demonstrate:		#DIV/0!
	(2)(d)1.	<u>Knowledge of:</u>		
CF 1,4	(2)(d)1.(i)	Contemporary issues related to science and technology in their field of certification.	SCED 480	MET

CF 1,2,4	(2)(d)1.(ii)	Processes used to analyze and to make decisions, including appropriate actions for addressing contemporary issues related to science and technology.	SCED 480	MET
CF 1,2,4	(2)(d)2.	<u>Ability to</u> engage students in the analysis of contemporary issues related to science and technology, including consideration of risks, costs, and benefits of alternative solutions.	SCED 480	MET
	(2)(e)	General skills of teaching. Teachers of science foster a community of diverse learners who construct meaning from their science experiences and possess a disposition for further exploration and learning. Prospective teachers of science must demonstrate:		#DIV/0!
	(2)(e)1.	Meeting the Alabama Quality Teaching Standards (AQTS) in Rule 290-3-3-.03:		
	(2)(e)1.(i)	AQTS 2, Teaching and Learning, in Rule 290-3-3-.03(2), including learning environment and instructional strategies.		
	(2)(e)1.(ii)	AQTS 3, Literacy, in Rule 290-3-3-.03(3), including technology.		
	(2)(e)2.	<u>Knowledge of:</u>		
CF 1,5	(2)(e)2.(i)	A variety of classroom arrangements, groups, actions, strategies, and methodologies to show that they are prepared to foster a community of diverse learners.	SCED 480	MET
CF 1,4	(2)(e)2.(ii)	The role, nature, limitations, and use of media and technology for instruction and scientific investigation, including the use of virtual labs, computers, probeware, and other emerging technologies.	SCED 480	MET
	(2)(e)3.	<u>Ability to:</u>		
CF 1,4	(2)(e)3.(i)	Organize, coordinate, and maintain the science classroom laboratory.	SCED 480	MET
CF 1,2,6	(2)(e)3.(ii)	Create a material-rich and an experience-rich environment that develops and extends students' desire to reason, problem-solve, and engage in hands-on learning.	SCED 480	MET

CF 1,5,6	(2)(e)3.(iii)	Use and justify a variety of classroom arrangements, groups, actions, strategies, and methodologies to show that they are prepared to foster a community of diverse learners.	SCED 480	MET
CF 1,4	(2)(e)3.(iv)	Introduce students to career opportunities in science and technology.	SCED 480	MET
	(2)(f)	Curriculum. Teachers of science plan and implement an active, coherent, and effective curriculum that is consistent with the goals and recommendations of the National Science Education Standards. They begin with the end in mind and effectively incorporate contemporary practices and resources into their planning and teaching. To show that they are prepared to plan and implement an effective science curriculum, prospective teachers of science must demonstrate: □		#DIV/0!
	(2)(f)1.	Meeting the Alabama Quality Teaching Standards (AQTs) in Rule 290-3-3-.03(2):		
	(2)(f)1.(i)	AQTs 1, Content Knowledge, in Rule 290-3-3-.03(1), including content knowledge.		
	(2)(f)1.(ii)	AQTs 5, Professionalism, in Rule 290-3-3-.03(5), including Alabama-specific improvement initiatives.		
CF 1	(2)(f)2.	<u>Knowledge of</u> content standards in the current edition of the <i>Alabama Course of Study: Science</i> and the National Science Education Standards.	SCED 480	MET
CF 1,2,5	(2)(f)3.	<u>Ability to</u> plan and implement units of study that address the needs and abilities of students, consistent with the <i>Alabama Course of Study: Science</i> and the National Science Education Standards.	SCED 480	MET
	(2)(g)	Science in the community. Teachers of science relate their discipline to the local and regional communities, involving stakeholders and using the individual, institutional, and natural resources of the community in their teaching. They actively engage students in science-related studies or activities related to locally important issues. To show that they are prepared to relate science to the community, prospective teachers of science must demonstrate:		#DIV/0!

CF 1,3	(2)(g)1.	<u>Knowledge of</u> ways to relate science to the community, involve stakeholders, and use community resources to promote the learning of science.	SCED 480	MET
CF 1,3	(2)(g)2.	<u>Ability to</u> involve students in activities that relate science to resources and stakeholders in the community or to the resolution of issues important to the community.	SCED 480	MET
	(2)(h)	Assessment. Teachers of science construct and use effective assessment strategies to determine the backgrounds and achievements of learners and facilitate their intellectual, social, and personal development. They assess students fairly and equitably, and require that students engage in ongoing self-assessment. To show that they are prepared to use assessment effectively, prospective teachers of science must demonstrate:		#DIV/0!
	(2)(h)1.	Meeting the Alabama Quality Teaching Standard 2, Teaching and Learning, in Rule 290-3-3-.03(2), including assessment.		
CF 1,2,4,6	(2)(h)2.	<u>Ability to</u> use multiple assessment tools and strategies to achieve goals that are aligned with methods of instruction, including inquiry learning and laboratory experiences.	SCED 480	MET
	(2)(i)	Safety and welfare. Teachers of science organize safe and effective learning environments that promote the success of students and the welfare of all living things. They require and promote knowledge and respect for safety, and oversee the welfare of all living things used in the classroom or found in the field. To show that they are prepared, prospective teachers of science must demonstrate:		#DIV/0!
	(2)(i)1.	<u>Knowledge of:</u>		
CF 1	(2)(i)1.(i)	Current science safety policies according to the Alabama State Department of Education.	SCED 480	MET
CF 1,6	(2)(i)1.(ii)	The legal and ethical responsibilities of science teachers for the welfare of their students and the proper treatment of animals.	SCED 480	MET
CF 1,2	(2)(i)1.(iii)	Safe and proper techniques for the preparation, storage, dispensing, supervision, and disposal of all materials used in science instruction.	SCED 480	MET
	(2)(i)2.	<u>Ability to:</u>		

CF 1	(2)(i)2.(i)	Treat all living organisms used in the classroom or found in the field in a safe, humane, and ethical manner and respect legal restriction on their collection, keeping, and use.	SCED 480	MET
CF 1	(2)(i)2.(ii)	Implement safety policies appropriate for the activity.	SCED 480	MET
	(2)(j)	Professional growth. Teachers of science strive continuously to grow and change, personally and professionally, to meet the diverse needs of their students, school, community, and profession. They have a desire and disposition for growth and betterment. To show their disposition for growth, prospective teachers of science must demonstrate that they meet the Alabama Quality Teaching Standard 5, Professionalism, in Rule 290-3-3-.03(5), including collaboration and continuous, lifelong professional learning.		

Conceptual Framework References	Alabama Standard/Rule 290-3-3-.15	Institution: 290-3-3-.15 General Science	Assessment	
			When/Where to be Assessed	Score
	(1)	Program Curriculum.		
	(1)(a)	Biology. Prior to program completion, prospective teachers of general science shall demonstrate knowledge and abilities related to:		#DIV/0!
	(1)(a)1.	Core competencies for biology. Knowledge of:		
CF 1	(1)(a)1.(i)	Life processes in living systems including organization of matter and energy.	BI 111, BI 112	MET
CF 1,2	(1)(a)1.(ii)	Similarities and differences among animals, plants, fungi, microorganisms, and viruses.	BI 112	MET
CF 1	(1)(a)1.(iii)	Principles and practices of biological classification.	BI 112	MET
CF 1	(1)(a)1.(iv)	Scientific theory and principles of the origin and development of life.	BI 111, BI 112	MET
CF 1	(1)(a)1.(v)	Ecological systems including the interrelationships and dependencies of organisms with each other and their environments.	BI 112	MET
CF 1,6	(1)(a)1.(vi)	Population dynamics and the impact of population on its environment.	BI 112	MET
CF 1	(1)(a)1.(vii)	General concepts of genetics and heredity.	BI 306	MET
CF 1	(1)(a)1.(viii)	Organization and functions of cells and multicellular systems.	BI 305	MET
CF 1	(1)(a)1.(ix)	Behavior of organisms and their relationships to social systems.	BI 112	MET
CF 1	(1)(a)1.(x)	Regulation of biological systems including homeostatic mechanisms.	BI 112	MET
CF 1,2	(1)(a)1.(xi)	Fundamental process of modeling and investigating in the biological sciences.	BI 111	MET
CF 1,6	(1)(a)1.(xii)	Applications of biology in environmental quality and in personal and community health.	BI 111	MET
CF 1	(1)(a)1.(xiii)	Historical development and perspectives in biology including contributions of significant figures and underrepresented groups, and the evolution of theories in biology.	BI 111	MET
CF 1,2,4	(1)(a)1.(xiv)	How to design, conduct, and report research in biology.	BI 200W	MET
CF 1,2,4	(1)(a)1.(xv)	Applications of biology and biotechnology in society, business, industry, and health fields.	BI 111	MET
	(1)(a)2.	Supporting competencies for biology. Knowledge of:		

CF 1	(1)(a)2.(i)	Chemistry, including general chemistry and biochemistry with basic laboratory techniques.	CH 111, CH 112	MET
CF 1	(1)(a)2.(ii)	Physics including light, sound , optics, electricity, energy and order, magnetism, and thermodynamics .	PH 251, PH 252,	MET
CF 1	(1)(a)2.(iii)	Earth and space sciences including energy and geochemical cycles, climate, oceans, weather, natural resources, and changes in the Earth.	ES 131	MET
CF 1,2	(1)(a)2.(iv)	Mathematics, at least to the pre-calculus level, including probability and statistics.	MA 112, MA 113, MA 125	MET
	(1)(b)	Chemistry. Prior to program completion, prospective teachers of general science shall demonstrate knowledge and abilities related to:		0.00
	(1)(b)1.	Core competencies for chemistry. <u>Knowledge of:</u>		0
CF 1	(1)(b)1.(i)	Fundamental structures of atoms and molecules.	CH 111, CH 112	MET
CF 1	(1)(b)1.(ii)	Basic principles of ionic, covalent, and metallic bonding.	CH 111, CH 112	MET
CF 1	(1)(b)1.(iii)	Physical and chemical properties and classification of elements including periodicity.	CH 111	MET
CF 1	(1)(b)1.(iv)	Chemical kinetics and thermodynamics.	CH 111, CH 112	MET
CF 1	(1)(b)1.(v)	Mole concept, stoichiometry, and laws of composition.	CH 111	MET
CF 1	(1)(b)1.(vi)	Transition elements and coordination compounds.	CH 112	MET
CF 1	(1)(b)1.(vii)	Acids and bases, oxidation-reduction chemistry, and solutions.	CH 111, CH 112	MET
CF 1	(1)(b)1.(viii)	Fundamental biochemistry.	CH 311	MET
CF 1	(1)(b)1.(ix)	Functional and polyfunctional group chemistry.	CH 311	MET
CF 1	(1)(b)1.(x)	Environmental and atmospheric chemistry.	CH 111, CH 112	MET
CF 1	(1)(b)1.(xi)	Fundamental process of investigating in chemistry.	CH 111, CH 112	MET
CF 1	(1)(b)1.(xii)	Applications of chemistry in personal and community health and environmental quality.	CH 111, CH 112	MET
CF 1	(1)(b)1.(xiii)	Radioactivity, nuclear reactors, fission, and fusion.	CH 111, CH 112	MET
CF 1	(1)(b)1.(xiv)	Models of nuclear and subatomic structures and behaviors.	CH 111, CH 112, CH 311	MET
CF 1	(1)(b)1.(xv)	Solutions, colloids, and colligative properties.	CH 112	MET
	(1)(b)2.	Supporting competencies for chemistry. <u>Knowledge of:</u>		
CF 1	(1)(b)2.(i)	Biology, including molecular biology, bioenergetics, and ecology.	BI 111, BI 112	MET

CF 1	(1)(b)2.(ii)	Earth science, including geochemistry, cycles of matter, and energetics of Earth systems.	ES 131	MET
CF 1	(1)(b)2.(iii)	Physics, including energy, stellar evolution, properties and functions of waves, motions and forces, electricity, and magnetism.	PH 251, PH 252, PH 343	MET
CF 1	(1)(b)2.(iv)	Mathematics, at least to the pre-calculus level, including statistical concepts and skills.	MA 112, MA 125	MET
CF 1,2	(1)(c)1	Earth and space science. Prior to program completion, prospective teachers of general science shall demonstrate knowledge and abilities related to:		#DIV/0!
	(1)(c)1.	Core competencies for Earth and space science. <u>Knowledge of:</u>		
CF 1	(1)(c)1.(i)	Characteristics of land, atmosphere, and ocean systems on Earth.	ES 131	MET
CF 1	(1)(c)1.(ii)	Properties, measurement, and classification of Earth materials.	ES 131, ES 132	MET
CF 1	(1)(c)1.(iii)	Changes in the Earth including land formation, erosion, and plate tectonics.	ES 131, ES 132	MET
CF 1	(1)(c)1.(iv)	Geochemical cycles including biotic and abiotic systems.	ES 131	MET
CF 1	(1)(c)1.(v)	Energy flow and transformation in Earth and stellar systems.	ES 131	MET
CF 1	(1)(c)1.(vi)	Hydrological features of the Earth.	ES 131	MET
CF 1	(1)(c)1.(vii)	Patterns and changes in the atmosphere, weather, and climate.	ES 131	MET
CF 1	(1)(c)1.(viii)	Origin, change over time, and planetary behaviors of Earth.	ES 132	MET
CF 1	(1)(c)1.(ix)	Origin, change over time, and properties of the universe.	ES 132	MET
CF 1,2	(1)(c)1.(x)	Fundamental processes of investigation in the Earth and spaces sciences.	ES 131	MET
CF 1	(1)(c)1.(xi)	Sources and limits of natural resources.	ES 131	MET
CF 1,6	(1)(c)1.(xii)	Application of Earth and space sciences to environmental quality and to personal and community health and welfare.	ES 131	MET
CF 1,4	(1)(c)1.(xiii)	Challenges and required technologies for space exploration.	ES 131	MET
CF 1	(1)(c)1.(xiv)	Earth or space scientists and their contributions.	ES 131	MET
	(1)(c)2.	Supporting competencies for Earth and space science. <u>Knowledge of:</u>		
CF 1	(1)(c)2.(i)	Biology, including origin and development of life, ecology, population dynamics, and the flow of energy and materials through Earth systems.	BI 112	MET
CF 1	(1)(c)2.(ii)	Chemistry, including broad concepts and basic laboratory techniques of inorganic and organic chemistry, physical chemistry, and biochemistry.	CH 112, CH 311	MET

CF 1	(1)(c)2.(iii)	Physics, including electricity, forces and motion, energy, magnetism, thermodynamics, optics, and sound; as well as basic quantum theory.	PH 251, PH 252, PH 343	MET
CF 1,2	(1)(c)2.(iv)	Mathematics, including statistics and probability.	MA 112, MA 125	MET
	(1)(d)	Physics. Prior to program completion, prospective teachers of general science shall demonstrate knowledge and abilities related to:		#DIV/0!
	(1)(d)1.	Core competencies for physics. <u>Knowledge of:</u>		
CF 1	(1)(d)1.(i)	Energy, work, and power.	PH 251	MET
CF 1	(1)(d)1.(ii)	Motion, major forces, and momentum.	PH 251	MET
CF 1	(1)(d)1.(iii)	Newtonian principles and laws including engineering applications.	PH 251	MET
CF 1	(1)(d)1.(iv)	Conservation of mass, momentum, energy, and charge.	PH 251	MET
CF 1	(1)(d)1.(v)	Physical properties of matter.	PH 251	MET
CF 1	(1)(d)1.(vi)	Kinetic-molecular motion and atomic models.	PH 343	MET
CF 1	(1)(d)1.(vii)	Radioactivity, nuclear reactors, fission, and fusion.	PH 343	MET
CF 1	(1)(d)1.(viii)	Wave theory, sound, light, the electromagnetic spectrum, and optics.	PH 251, PH 252	MET
CF 1	(1)(d)1.(ix)	Electricity and magnetism, including charge, current, electrical potential energy, potential difference, resistance, and electrical power for simple series, parallel, or combination direct current circuits.	PH 252	MET
CF 1,2	(1)(d)1.(x)	Fundamental processes of investigating in physics.	PH 251, PH 252	MET
CF 1,6	(1)(d)1.(xi)	Applications of physics in environmental quality and to personal and community health.	SCED 480	MET
CF 1	(1)(d)1.(xii)	Light behavior, including wave-particle duality and models.	PH 343	MET
CF 1	(1)(d)1.(xiii)	Thermodynamics and relationships between energy and matter.	PH 251	MET
CF 1	(1)(d)1.(xiv)	Angular rotation and momentum, centripetal forces, and vector analysis.	PH 251	MET
CF 1,4	(1)(d)1.(xv)	Applications of physics and engineering in society, business, industry, and health fields.	PH 343	MET
	(1)(d)2.	Supporting competencies for physics. <u>Knowledge of:</u>		

CF 1	(1)(d)2.(i)	Biology, including organization of life, bioenergetics, biomechanics, and cycles of matter.	BI 111, BI 112	MET
CF 1	(1)(d)2.(ii)	Chemistry, including organization of matter and energy, electrochemistry, thermodynamics, and bonding.	CH 111, CH 112	MET
CF 1	(1)(d)2.(iii)	Earth sciences or astronomy related to structure of the universe, energy, and interactions of matter.	ES 131	MET
CF 1,2	(1)(d)2.(iv)	Mathematical and statistical concepts and skills including statistics and the use of differential equations and calculus.	MA 112, MA 125	MET