

## ASOL SCIENCE SCOPE AND SEQUENCE MATRIX: GRADE 8

<b>ASOL SCIENCE – MATRIX</b>			
<b>Based on the 2010 Science Standards of Learning</b>			
<b>Reporting Category</b>	<b>Grade 5</b>	<b>Grade 8</b>	<b>High School</b>
Scientific Investigation	5S-SI 1 5S-SI 2	8S-SI 1 8S-SI 2 8S-SI 3	
Scientific Investigation and the Nature of Science			HSS-SI 1 HSS-SI 2
Force, Motion, Energy and Matter	5S-FME 1 5S-FME 2 5S-FME 3 5S-FME 4 5S-FME 5	8S-FME 1 8S-FME 2 8S-FME 3 8S-FME 4 8S-FME 5	
Life Processes and Living Systems	5S-LPS 1 5S-LPS 2 5S-LPS 3 5S-LPS 4		
Life Systems		8S-LS 1 8S-LS 2 8S-LS 3 8S-LS 4 8S-LS 5 8S-LS 6	
Earth/Space Systems and Cycles	5S-ESS 1 5S-ESS 2 5S-ESS 3 5S-ESS 4 5S-ESS 5 5S-ESS 6		
Ecosystems		8S-ECO 1 8S-ECO 2	

		8S-ECO 3 8S-ECO 4 8S-ECO 5 8S-ECO 6 8S-ECO 7	
Earth and Space Systems		8S-ESS 1 8S-ESS 2 8S-ESS 3 8S-ESS 4 8S-ESS 5 8S-ESS 6 8S-ESS 7	HSS-ESS 1 HSS-ESS 2 HSS-ESS 3
Earth Materials and Processes			HSS-EMP 1 HSS-EMP 2 HSS-EMP 3 HSS-EMP 4
Cosmology, Origins, and Time			HSS-COT 1
Earth Resources and Human Interactions			HSS-ERH 1 HSS-ERH 2 HSS-ERH 3

REPORTING CATEGORIES	GRADE 8 ASOL BLUEPRINT	UNDERSTANDING THE STANDARD
<b>Scientific Investigation</b>	8S-SI 1 (SOL 6.1)	The skills described in this standard are intended to define the “investigate” component of all of the other science standards. The intent of this standard is that students will continue to develop a range of inquiry skills and achieve proficiency with those skills in the context of the concepts developed at the sixth grade. This standard does not require a discrete unit on scientific investigation because the inquiry skills that make up the standard should be incorporated in all the other sixth-grade standards. It is also intended that by developing these skills, students will achieve greater understanding of scientific inquiry and the nature of science, as well as more fully grasp the content-related concepts in the standards. It is also intended that models, simulations and current applications are used throughout the course in order to learn and reinforce science concepts.
	8S-SI 2 (SOL LS.1)	<p>The skills described in this standard are intended to define the “investigate” component of all of the other Life Science standards. The intent of this standard is that students will continue to develop a range of inquiry skills and achieve proficiency with those skills in the context of the concepts developed in the Life Science course. This does not preclude explicit instruction on a particular inquiry skill or skills, but the standard does not require a discrete unit on scientific investigation. It is also intended that by developing these skills, students will achieve greater understanding of scientific inquiry and the nature of science, as well as more fully grasp the content-related concepts. Models, simulations and current applications should be used throughout the course in order to learn and reinforce science concepts.</p> <p>Across the grade levels, kindergarten through high school, the skills in the first standards form a nearly continuous sequence. It is very important that the teacher be familiar with the skills in the sequence leading up to standard LS.1 (6.1, 5.1, 4.1).</p>
	8S-SI 3 (SOL PS.1)	<p>The skills described in the standard are intended to define the “investigate” component of all of the other Physical Science standards. The intent of the standard is that students will continue to develop a range of inquiry skills and achieve proficiency with those skills in the context of the concepts developed in the Physical Science curriculum. The standard does not require a discrete unit on scientific investigation because the inquiry skills that make up the standard should be incorporated in all the other Physical Science standards. It is also intended that by developing these skills, students will achieve greater understanding of scientific inquiry and the nature of science, as well as more fully grasp the content-related Standards of Learning concepts. Models, simulations, and current applications are used throughout the course in order to learn and reinforce science concepts.</p> <p>Across the grade levels, kindergarten through high school, the skills in the first standards form a nearly continuous sequence. It is very important that the teacher be familiar with the skills in the sequence leading up to standard PS.1 (LS.1, 6.1, 5.1, 4.1).</p>
	8S-FME1 (SOL 6.2)	Many sources of energy on Earth are the result of solar radiation. This can be energy Earth is currently receiving or energy that has been stored as fossil fuels. All energy exists in two basic forms — kinetic and potential. Understanding the forms of energy and their transformations will provide the foundation for students to investigate the transfer of energy within living

<b>Force, Motion, Energy and Matter</b>		and Earth systems as well as to understand chemical reactions, force, and motion. This standard builds upon concepts of energy sources introduced in science standard 3.11. It is intended that students will actively develop scientific investigation, reasoning, and logic skills, and an understanding of the nature of science in the context of the key concepts presented in this standard.
	8S-FME 2 (SOL 6.4)	This standard focuses on an understanding of the basic structure of the atom, including electrons, protons, and neutrons. The concepts defined in the standard build on students' basic understanding of the concept of matter as introduced in science standards 3.3 and 5.4. Knowledge of basic chemistry concepts is fundamental to understanding the physical sciences, life processes, and Earth and environmental science ideas. It is intended that students will actively develop scientific investigation, reasoning, and logic skills, and the nature of science in the context of the key concepts presented in this standard.
	8S-FME 3 (SOL 6.5)	This standard is intended to develop student understanding of the unique properties of water and the importance of protecting and managing water resources. Understanding the structure, properties, and behavior of the water molecule is fundamental to understanding more complex environmental systems. Concepts like solubility, surface tension, cohesion, adhesion, density, condensation, and evaporation can be investigated to appreciate why the properties of water are critical to life processes and living things. This standard also introduces the concept of the ability of large bodies of water to moderate the climate on land. The connections between water resources and agriculture, power generation, and public health are also investigated. It is intended that students will actively develop scientific investigation, reasoning, and logic skills, and an understanding of the nature of science in the context of the key concepts presented in this standard.
	8S-FME 4 (SOL 6.6)	This standard is intended to provide students with a basic understanding of the properties of air, the structure of the atmosphere, weather, and air quality. Students need to understand there are both natural and human-caused changes to the atmosphere and that the results of these changes are not yet fully known. A basic understanding of weather and weather prediction builds on the key concepts in standard 4.6. This standard also focuses on student understanding of air quality as an important parameter of human and environmental health. It is important to make the obvious connections between this standard and the other sixth-grade standards. It is intended that students will actively develop scientific investigation, reasoning, and logic skills, and an understanding of the nature of science in the context of the key concepts presented in this standard.
	8S-FME 5 (SOL PS.2)	The concepts in this standard build upon several science standards from previous grades, including K.4, 1.3, 2.3, 3.3, 5.4, and 6.4. These standards introduce and develop basic ideas about the characteristics and structure of matter. In this standard, the ideas and terminology continue to be expanded and treated in greater depth, including more mathematical application. It is intended that students will actively develop scientific investigation, reasoning, and logic skills, and the nature of science in the context of the key concepts presented in this standard.
	8S-LS 1 (SOL LS.2)	This standard builds on the general concept in science standard 5.5 that states that living things are made of cells. The emphasis here is on the concept that cells are the unit of structure and function of living things and on the concept of subcellular components, or organelles, each with a particular structure and function. The historical contributions of many scientists to the establishment of the cell theory are also important for students to understand. This standard also introduces students to the concept of cell division. It is intended that students

<b>Life Systems</b>		will actively develop scientific investigation, reasoning, and logic skills, and the nature of science in the context of the key concepts presented in this standard.
	8S-LS 2 (SOL LS.3)	This standard emphasizes the fact that among living organisms, there is a universality of the functions that maintain life. This standard continues to build upon students' knowledge of these functions and introduces students to the process of cellular transport. With the exception of the structures associated with plant reproduction, which are highlighted in 4.4, this is the students' introduction to the specific structures of plants and animals that enable them to perform life functions. Students are introduced to the concepts of unicellular and multicellular organisms and division of labor. This standard is not intended to require student understanding of the details of human body systems. It is intended that students will actively develop scientific investigation, reasoning, and logic skills, and the nature of science in the context of the key concepts presented in this standard.
	8S-LS 3 (SOL LS.4)	<p>Classifying and grouping is a key inquiry skill, as described in the K–12 “Investigate and Understand” section of the Introduction to the <i>Science Standards of Learning</i>. Classifying is an important skill in the K–6 “Scientific Investigation, Reasoning and Logic” strand. The use of a classification key is introduced in 5.1.</p> <p>This standard focuses on students practicing classification skills within a hierarchical biological classification system. This is accomplished by analyzing similarities and differences between the structures and functions of organisms. Students should understand that scientists use classification as a tool to organize information about organisms and to gain information about related organisms. This standard does not require a detailed survey of each domain, kingdom or phylum, but rather a general overview of how organisms are grouped and a focus on a few key groups. It is intended that students will actively develop scientific investigation, reasoning, and logic skills, and the nature of science in the context of the key concepts presented in this standard.</p>
	8S-LS 4 (SOL LS.5)	Students learn in 4.4 that photosynthesis is a basic life process of plants requiring chlorophyll and carbon dioxide. This standard pulls these ideas together to demonstrate the complexity and importance of photosynthesis. Energy enters food webs through photosynthesis and is then transferred throughout the food web. It is crucial that students understand the importance of plants (and other photosynthesizing organisms) in this role of providing energy to all other living things. It is intended that students will actively develop scientific investigation, reasoning, and logic skills, and the nature of science in the context of the key concepts presented in this standard.
	8S-LS 5 (SOL LS.12)	In science standard 2.7, students are introduced to the general notion that plants and animals resemble their parents. This Life Science standard is the students' introduction to genetics. It is important for the teacher to understand that the intent of this standard is to provide students with a general overview of the nature of DNA, genes, and chromosomes and the important role they play in the transmission of traits from one generation to another. Students are not expected to understand the specific chemical composition of DNA or the mechanics of transcription and translation. It is intended that students will actively develop scientific investigation, reasoning, and logic skills, and the nature of science in the context of the key concepts presented in this standard.
	8S-LS 6	This standard explores the concept of evolution through natural selection. Species respond to changes in their

	(SOL LS.13)	<p>environments through adaptation, which is a gradual process that occurs over long periods of time. The progression of these long-term changes is well documented in the fossil record. Evolution, as a big organizing principle of the life sciences, establishes order among the great variety of living things.</p> <p>There are many misconceptions about evolution; therefore, teachers must be careful to be accurate in their presentation of this scientific theory. One common misconception among students is that they believe that environmental influences on an organism produce changes in that organism that can be passed on to offspring. However, natural selection can only work through the genetic variation that is already present in the population. It is intended that students will actively develop scientific investigation, reasoning, and logic skills, and the nature of science in the context of the key concepts presented in this standard.</p>
<b>Ecosystems</b>	8S-ECO 1 (SOL 6.7)	This standard is intended to provide students with a basic understanding of how natural processes and human interactions impact watershed systems. This includes an understanding of the physical geography of Virginia’s portions of the three major watershed systems (the Chesapeake Bay, the North Carolina sounds, and the Gulf of Mexico) and the various features associated with moving water (surface and groundwater). Wetlands have become an important focus of scientists as we learn their role in flood and erosion control as well as their importance as habitat for many species of living things. Students are introduced to major safety and conservation issues associated with watersheds and become familiar with the testing parameters and tools used in the field. It is intended that students will actively develop scientific investigation, reasoning, and logic skills, and an understanding of the nature of science in the context of the key concepts presented in this standard.
	8S-ECO 2 (SOL LS.6)	This standard explores the application of the concept of interdependence between organisms and their physical environment. This concept is covered thoroughly in the K–6 standards of the Living Systems strand. The K–6 standards include the concept of interdependence (2.5); relationships in aquatic and terrestrial food chains, trophic levels, food webs, food pyramids, and cycles (3.5 and 4.5); and interactions between the living and nonliving components of an ecosystem (4.5). Terminology used in previous standards includes producer, consumer, decomposer, herbivore, omnivore, carnivore (3.5), and niche (4.5). It is intended that students will actively develop scientific investigation, reasoning, and logic skills, and the nature of science in the context of the key concepts presented in this standard.
	8S-ECO 3 (SOL LS.7)	This standard applies the concept that each organism exists as a member of a population and interacts with other members of that population in a variety of ways. The term population is introduced in standard 3.6 (“Living Systems” strand). Individuals of a population demonstrate various behavioral adaptations (competition, cooperation, establishment of a social hierarchy, territorial imperative), which allow the population to survive. It is intended that students will actively develop scientific investigation, reasoning, and logic skills, and the nature of science in the context of the key concepts presented in this standard.
	8S-ECO 4 (SOL LS.8)	This Life Science standard applies the concept of interactions between populations of different species. This standard extends the concepts of prior K–6 standards, including those concerning producers, consumers, and decomposers (3.5); predator and prey (3.6); and niches (4.5). This standard introduces the concept of symbiosis and focuses on the symbiotic relationship between parasite and host. It is intended that students will actively develop scientific investigation, reasoning, and logic skills, and the nature of science in the context of the key

		concepts presented in this standard.
	8S-ECO 5 (SOL LS.9)	In this standard, students explore the scheme of Earth as a group of living systems. Students are asked to distinguish between ecosystems and biomes. The teacher should be aware that in previous standards, students have explored environments as discrete units or have examined individual components. In standard 3.6 students are introduced to the concept of water environments (pond, marshland, swamp, stream, river, and ocean) and land environments (desert, grassland, rainforest, and forest). It is intended that students will actively develop scientific investigation, reasoning, and logic skills, and the nature of science in the context of the key concepts presented in this standard.
	8S-ECO 6 (SOL LS.10)	<p>In this standard, students apply the concept of change over time to several specific situations. As conditions change, organisms, populations, communities, and ecosystems respond to those changes in order to survive. The key concepts are given in a sequence from responses of individual organisms (phototropism, hibernation, and dormancy) to responses of populations (factors that increase or decrease population size) to responses of communities or ecosystems (eutrophication, climate change, and catastrophic disturbances).</p> <p>The concepts of this standard focus on the theme of change. Living units respond in various ways to change. A key concept is the understanding of the dynamic nature of living systems as they constantly respond to change. Change is referenced several times in the K–6 standards. In the “Earth Patterns, Cycles, and Change” strand, the following concepts are introduced: natural and human-made things may change over time (K.10); temperature, light, and precipitation bring about changes (1.7); and weather and seasonal changes affect plants, animals, and their surroundings (2.7). The “Life Processes” strand introduces the concept that plants (3.4) and animals (4.4) satisfy life needs and respond to the environment. It is intended that students will actively develop scientific investigation, reasoning, and logic skills, and the nature of science in the context of the key concepts presented in this standard.</p>
	8S-ECO 7 (SOL LS.11)	In this standard, students are called upon to apply their knowledge of human interactions to interpret how these interactions affect ecosystem dynamics. In prior standards in the “Earth Resources” strand of the K–6 standards, students explore a variety of ways in which humans interact with the environment. These include the concepts of waste management (K.11, 1.8); limitations of natural resources and factors that affect environmental quality (1.8, 3.10); Virginia’s natural resources (4.8); and public policy decisions relating to the environment (6.9). In this Life Science standard, the student must interpret how human populations can change the balance of nature in ecosystems. They must use their prior knowledge of resources as well as the concepts and skills learned in Life Science standards LS.6 – LS.10. It is intended that students will actively develop scientific investigation, reasoning, and logic skills, and the nature of science in the context of the key concepts presented in this standard.
	8S-ESS 1 (SOL 6.2)	Many sources of energy on Earth are the result of solar radiation. This can be energy Earth is currently receiving or energy that has been stored as fossil fuels. All energy exists in two basic forms — kinetic and potential. Understanding the forms of energy and their transformations will provide the foundation for students to investigate the transfer of energy within living

<b>Earth and Space Systems</b>		and Earth systems as well as to understand chemical reactions, force, and motion. This standard builds upon concepts of energy sources introduced in science standard 3.11. It is intended that students will actively develop scientific investigation, reasoning, and logic skills, and an understanding of the nature of science in the context of the key concepts presented in this standard.
	8S-ESS 2 (SOL 6.3)	The key concepts defined in this standard are intended to expand student understanding of the effects of solar radiation entering Earth's atmosphere on weather and ocean current patterns. The distribution of energy through convection and radiation are explored as students study cloud formation and movement patterns of the atmosphere and the world's oceans. This standard is closely related to standards 6.2 and 6.6 and builds on the weather concepts developed in standard 4.6 and concepts of visible light in standard 5.3. It is intended that students will actively develop scientific investigation, reasoning, and logic skills, and an understanding of the nature of science in the context of the key concepts presented in this standard.
	8S-ESS 3 (SOL 6.5)	This standard is intended to develop student understanding of the unique properties of water and the importance of protecting and managing water resources. Understanding the structure, properties, and behavior of the water molecule is fundamental to understanding more complex environmental systems. Concepts like solubility, surface tension, cohesion, adhesion, density, condensation, and evaporation can be investigated to appreciate why the properties of water are critical to life processes and living things. This standard also introduces the concept of the ability of large bodies of water to moderate the climate on land. The connections between water resources and agriculture, power generation, and public health are also investigated. It is intended that students will actively develop scientific investigation, reasoning, and logic skills, and an understanding of the nature of science in the context of the key concepts presented in this standard.
	8S-ESS 4 (SOL 6.6)	This standard is intended to provide students with a basic understanding of the properties of air, the structure of the atmosphere, weather, and air quality. Students need to understand there are both natural and human-caused changes to the atmosphere and that the results of these changes are not yet fully known. A basic understanding of weather and weather prediction builds on the key concepts in standard 4.6. This standard also focuses on student understanding of air quality as an important parameter of human and environmental health. It is important to make the obvious connections between this standard and the other sixth-grade standards. It is intended that students will actively develop scientific investigation, reasoning, and logic skills, and an understanding of the nature of science in the context of the key concepts presented in this standard.
	8S-ESS 5 (SOL 6.8)	This standard is intended to provide students with a basic understanding of the solar system and the relationships among bodies within the solar system. This standard develops an understanding of Earth as part of the solar system and builds significantly on standards 3.8, 4.7, and 4.8. It is intended that students will actively develop scientific investigation, reasoning, and logic skills, and an understanding of the nature of science in the context of the key concepts presented in this standard.
	8S-ESS 6 (SOL 6.9)	This standard is intended to develop student understanding of the importance of Earth's natural resources, the need to manage them, how they are managed, and the analysis of costs and benefits in making decisions about those resources. It applies and builds on the concepts described in several lower grades, especially science standard 4.9. Knowledge gained from this standard will be important to understanding numerous concepts in Life Science and Earth Science. It is intended that students will actively develop scientific investigation,

		reasoning, and logic skills, and an understanding of the nature of science in the context of the key concepts presented in this standard.
	8S-ESS 7 (SOL LS.13)	<p>This standard explores the concept of evolution through natural selection. Species respond to changes in their environments through adaptation, which is a gradual process that occurs over long periods of time. The progression of these long-term changes is well documented in the fossil record. Evolution, as a big organizing principle of the life sciences, establishes order among the great variety of living things.</p> <p>There are many misconceptions about evolution; therefore, teachers must be careful to be accurate in their presentation of this scientific theory. One common misconception among students is that they believe that environmental influences on an organism produce changes in that organism that can be passed on to offspring. However, natural selection can only work through the genetic variation that is already present in the population. It is intended that students will actively develop scientific investigation, reasoning, and logic skills, and the nature of science in the context of the key concepts presented in this standard.</p>