Wyoming Science Academic Content Standards
GRADE SPAN 9 - 12

CONTENT STANDARD: 1. CONCEPTS AND PROCESSES **In the context of unifying concepts and processes, students develop an understanding of scientific content through inquiry. Science is a dynamic process; concepts and content are best learned through inquiry and investigation.** ACADEMIC CONTENT STANDARD: 1. CONCEPTS AND PROCESSES **Students learn about scientific content through inquiry.**		
Grade 11 Benchmark	**Grade 11 Academic Benchmark**	**Grade 11 Levels of Complexity**
<u>Life Systems</u> 1. **<u>The Cell</u>: Students explain the processes of life, which necessitates an understanding of relationship between structure and function of the cell and cellular differentiation. They identify activities taking place in an organism related to metabolic activities in cells, including growth, regulation, transport, and homeostasis. Students differentiate between asexual and sexual reproduction.**	**<u>Life Systems</u>** **11.A.S.1.1 Students identify activities taking place in an organism related to metabolic activities in cells.**	**Level IV** *Students consistently and independently perform in unfamiliar settings using natural supports.* **Students describe the activities taking place in an organism related to metabolic activities in cells.** Ex. Students describe the metabolic process of a cut or wound healing in terms of the growth of new skin cells.
		Level III *Students consistently perform in several familiar settings.* **Students identify activities taking place in an organism related to metabolic activities in cells.** Ex. Students identify the growth process of an organism as an increase in both the size and the number of its cells.
		Level II *Students require external support and multiple prompts in limited familiar settings.* **Students list metabolic processes as activities which take place in the human body.** Ex. Students match process such as growth, healing,

		and digestion as things that the human body does to maintain itself.
		Level I *Students require external support and multiple prompts in a structured setting.* **Students recognize the association of eating to growth and maintenance of the human body.** Ex. Students use eye movement or verbalization when presented with a representation of food and a human to indicate that the body needs food to maintain physical health.

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<u>Life Systems</u> **2. <u>Molecular Basis of Heredity</u>: Students demonstrate an understanding that organisms ensure species continuation by passing genetic information from parent to offspring. They utilize genetic information to make predictions about possible offspring. Students apply concepts of molecular biology (DNA and genes) to recent discoveries.** **3. <u>Biological Evolution</u>: Students explain how species evolve over time. They understand that evolution is the consequence of various interactions, including the genetic variability of offspring due to mutation and recombination of genes, and the ensuing selection by the environment of those offspring better able to survive and leave additional offspring. Students discuss natural selection and that its evolutionary consequences provide a scientific explanation for the great diversity of organisms as evidenced by the fossil record. They examine how different species are related by descent from common ancestors. Students are able to explain how organisms are classified based on similarities that reflect their evolutionary relationships, with species being the most**	**<u>Life Systems</u>** **11.A.S.1.2 Students demonstrate the connections between natural selection and survival.**	**Level IV** *Students consistently and independently perform in unfamiliar settings using natural supports.* **Students explain how traits of living organisms serve specific functions in natural selection within different habitats.** Ex. Students explain how organisms that are better adapted to their environment are more likely to survive and pass their traits to their offspring. **Level III** *Students consistently perform in several familiar settings.* **Students demonstrate the connections between natural selection and survival.** Ex. Students demonstrate how it is easier to find certain colors of paper in grass than other colors of paper in grass. **Level II** *Students require external support and multiple prompts in limited familiar settings.* **Students recognize traits of living organisms related to survival within different habitats** Ex. Students match pictures of animals' features (polar bear fur, dolphin fin, lion teeth, monkey tail, etc.) to how they live or what they eat. **Level I** *Students require external support and multiple prompts in a structured setting.* **Students recognize traits of organisms.** Ex. Students recognize that lions have sharp teeth.

fundamental unit of classification. **6. <u>Behavior and Adaptation</u>: Students examine behavior as the sum of responses of an organism to stimuli in its environment, which evolves through adaptation, increasing the potential for species survival. They identify adaptations as characteristics and behaviors of an organism that enhance the chance for survival and reproductive success in a particular environment.**		

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<u>Life Systems</u> **4. <u>Interdependence of Organisms</u>: Students investigate the inter-relationships and interdependence of organisms, including the ecosystem concept, energy flow, competition for resources, and human effects on the environment.** **5. <u>Matter, Energy, and Organization in Living Systems</u>: Students describe the need of living systems for a continuous input of energy to maintain chemical and physical stability. They explain the unidirectional flow of energy and organic matter through a series of trophic levels in living systems. Students investigate the distribution and abundance of organisms in ecosystems, which are limited by the availability of matter and energy and the ability of the living system to recycle materials.**	**<u>Life Systems</u>** **11.A.S.1.3 Students demonstrate the inter-relationships of organisms and the ecosystem (including the ecosystem concept and competition for resources).**	**Level IV** *Students consistently and independently perform in unfamiliar settings using natural supports.* **Students organize the inter-relationships of organisms by identifying energy flow within an ecosystem (availability of matter and energy).** Ex. Students organize a simple food chain in terms of an organism's energy role as producer, consumer or decomposer.
		Level III *Students consistently perform in several familiar settings.* **Students demonstrate the inter-relationships of organisms and the ecosystem (including the ecosystem concept and competition for resources).** Ex. Students follow the steps that show how losing prairie will lead to fewer squirrels for a hawk to eat.
		Level II *Students require external support and multiple prompts in limited familiar settings.* **Students list the habitat needs of an organism.** Ex. Students match the aspects of a habitat an organism relies upon for its survival.
		Level I *Students require external support and multiple prompts in a structured setting.* **Students recognize representations of animals in appropriate habitats.** Ex. Students recognize a match between an animal and an appropriate habitat (fish with a lake).

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<u>Earth and Space Systems</u> **7. <u>Geochemical Cycles</u>: Students describe the Earth as a closed system and demonstrate a conceptual understanding of the following systems: geosphere, hydrosphere, atmosphere, and biosphere. Students explain the role of energy in each of these systems, such as weather patterns, global climate, weathering, and plate tectonics.**	**<u>Earth and Space Systems</u>** **11.A.S.1.4 Students describe a model of Earth as a closed system.**	**Level IV** *Students consistently and independently perform in unfamiliar settings using natural supports.* **Students explain a model of Earth in terms of a closed system.** Ex. Students use a sealed bottle with a moist paper towel inside and explain that as water goes through its cycle, it can be a solid, liquid or gas by adding or subtracting heat.
		Level III *Students consistently perform in several familiar settings.* **Students describe a model of Earth as a closed system.** Ex. Students use a sealed bottle with a moist paper towel inside and describe how the moisture trapped inside the bottle is like the moisture trapped inside Earth's atmosphere.
		Level II *Students require external support and multiple prompts in limited familiar settings.* **Students recognize a repetitive process as a cycle.** Ex. Students identify the sequence of a school-related routine such as coming to school and returning home as a cycle.
		Level I *Students require external support and multiple prompts in a structured setting.* **Students recognize aspects of a weather system (temperature, moisture, wind).** Ex. Students respond to a warm or cool stimulus.

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<u>Earth and Space Systems</u> **8. <u>Origin and Evolution of the Earth System</u>: Students investigate geologic time through comparing rock sequences, the fossil record, and decay rates of radioactive isotopes.** **9. <u>Origin and Evolution of the Universe</u>: Students examine evidence for the Big Bang Theory and recognize the immense time scale involved in comparison to human-perceived time. They describe the process of star and planet formation, planetary and stellar evolution including the fusion process, element formation, and dispersion.**	**<u>Earth and Space Systems</u>** **11.A.S.1.5 Students recognize the time scale involved in the gradual changes which occur during planetary evolution.**	**Level IV** *Students consistently and independently perform in unfamiliar settings using natural supports.* **Students distinguish the processes involved in the gradual changes which occur during planetary evolution and the time scale involved.** Ex. Students explore the different processes which result in a planet's current features (e.g. erosion, sedimentation, volcanic eruptions) and the gradual rates of change involved.
		Level III *Students consistently perform in several familiar settings.* **Students recognize the time scale involved in the gradual changes which occur during planetary evolution.** Ex. Students examine a representation of a geologic cross-section and describe the lowest layers as the oldest layers and recognize that the Earth's surface changes over time.
		Level II *Students require external support and multiple prompts in limited familiar settings.* **Students identify changes in the Earth's surface.** Ex. Students identify a change in a feature of Earth when shown a before and after photograph or representation of a volcanic event.
		Level I *Students require external support and multiple*

		prompts in a structured setting. **Students recognize that two representations of the Earth's surface are different.** Ex. Students recognize a change in a feature of Earth when presented with tactile graphics of before and after representations of a volcanic event.

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<u>Physical System</u> **10. <u>Structure and Properties of Matter</u>: Students describe the atomic structure of matter including subatomic particles, their properties, and interactions. They recognize that elements are organized into groups in the periodic table based on their outermost electrons and these groups have similar properties. They explain chemical bonding in terms of the transfer or sharing of electrons between atoms. Students describe physical states of matter and phase changes. Students differentiate between chemical and physical properties, and chemical and physical changes.** **11. <u>Chemical Reactions</u>: Students recognize that chemical reactions take place all around us. They realize that chemical reactions may release or consume energy, occur at different rates, and result in the formation of different substances. They identify the factors that affect reaction rates.** **12. <u>Conservation of Energy and Increase in Disorder</u>: Students demonstrate and understanding of the laws of conservation of mass and energy within the context of physical and chemical changes. They realize the tendency for systems to increase in disorder.**	**<u>Physical System</u>** **11.A.S.1.6 Students distinguish between chemical and physical changes.**	**Level IV** *Students consistently and independently perform in unfamiliar settings using natural supports.* **Students describe the differences between chemical and physical changes.** Ex. Students state that a substance cannot be retrieved following a chemical change. **Level III** *Students consistently perform in several familiar settings.* **Students distinguish between chemical and physical changes.** Ex. Students choose a burned match as a chemical change and melting ice as a physical change. **Level II** *Students require external support and multiple prompts in limited familiar settings.* **Students identify that heating some mixtures results in a chemical change.** Ex. Students know that when cake batter is cooked, the batter cannot be retrieved. **Level I** *Students require external support and multiple prompts in a structured setting.* **Students recognize a substance as different after undergoing a chemical change.** Ex. Students vocalize or indicate a raw egg is not the same as a cooked egg.

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Physical System **13. Energy and Matter: Students demonstrate an understanding of types of energy, energy transfer and transformations, and the relationship between energy and matter.** **14. Force and Motion: Students develop a conceptual understanding of Newton's Laws of Motion, gravity, electricity, and magnetism.**	**Physical System** **11.A.S.1.7 Students describe an object in motion in terms of distance and time.**	**Level IV** *Students consistently and independently perform in unfamiliar settings using natural supports.* **Students predict the change in an object's speed or distance traveled as a result of an applied force.** Ex. Students predict how the steepness of a ramp affects how fast an object moves across the floor.
		Level III *Students consistently perform in several familiar settings.* **Students describe an object in motion in terms of distance and time.** Ex. Given a situation involving two objects in motion, students indicate the object traveling faster will cover the same distance in less time.
		Level II *Students require external support and multiple prompts in limited familiar settings.* **Students identify that pushing and pulling can cause an object to travel a distance.** Ex. Students indicate the direction of an applied force required to move a stationary abject to a given point.
		Level I *Students require external support and multiple prompts in a structured setting.* **Students recognize a distance between objects.** Ex. Students use eye gaze, vocalizations or gestures to attend to distance between objects such as near or far.

CONTENT STANDARD: SCIENCE AS INQUIRY Students demonstrate knowledge, skills, and habits of mind necessary to safely perform scientific inquiry. Inquiry is the foundation for the development of content, teaching students the use of processes of science that enable them to construct and develop their own knowledge. Inquiry requires appropriate field, classroom, and laboratory experiences with suitable facilities and equipment. ACADEMIC CONTENT STANDARD: SCIENCE AS INQUIRY Students use inquiry to better understand the world in which they live.		
Grade 11 Benchmark	**Grade 11 Academic Benchmark**	**Grade 11 Levels of Complexity**
1. Students research scientific information and present findings through appropriate means.	**11.A.S.2.1 Students use science reference materials to answer science questions and present findings.**	**Level IV** *Students consistently and independently perform in unfamiliar settings using natural supports.* **Students use science reference materials to answer science questions and present findings with an explanation.**
		Level III *Students consistently perform in several familiar settings.* **Students use science reference materials to answer science questions and present findings.**
		Level II *Students require external support and multiple prompts in limited familiar settings.* **Students use science reference materials to match answers to science questions.**
		Level I *Students require external support and multiple prompts in a structured setting.* **Students recognize a picture or object as referenced within a scientific question.**

Grade 11 Benchmark	Grade 11 Academic Benchmark	Grade 11 Levels of Complexity
2. Students use inquiry to conduct scientific investigations. **• Pose problems and identify questions and concepts to design and conduct an investigation.**	**2. Students use inquiry to conduct scientific investigations.** **11.A.S.2.2.a Students ask questions about objects, organisms or events in the environment.**	**Level IV** *Students consistently and independently perform in unfamiliar settings using natural supports.* **Students ask questions about objects, organisms or events in the environment and make predictions.**
		Level III *Students consistently perform in several familiar settings.* **Students ask questions about objects, organisms or events in the environment.**
		Level II *Students require external support and multiple prompts in limited familiar settings.* **Students identify given questions related to an object, organism or event in the environment.** Ex. Students match one presented hypothesis to a given scenario given two choices.
		Level I *Students require external support and multiple prompts in a structured setting.* **Students indicate their preference for an object, organisms or event in the environment.**

Grade 11 Benchmark	Grade 11 Academic Benchmark	Grade 11 Levels of Complexity
2. Students use inquiry to conduct scientific investigations. **• Collect, organize, analyze and appropriately represent data.** **4. Students investigate the relationships between science and technology and the role of technological design in meeting human needs.**	**2. Students use inquiry to conduct scientific investigations.** **11.A.S.2.2.b Students collect, organize, and compare data related to a scientific question through measurement or observation given a science-based scenario.**	**Level IV** *Students consistently and independently perform in unfamiliar settings using natural supports.* **Students collect, organize, and compare data related to a scientific question through measurement and observation.**
		Level III *Students consistently perform in several familiar settings.* **Students collect, organize, and compare data related to a scientific question through measurement or observation given a science-based scenario.**
		Level II *Students require external support and multiple prompts in limited familiar settings.* **Students match the appropriate data collection method to a given procedure related to an investigation.**
		Level I *Students require external support and multiple prompts in a structured setting.* **Students attend to the presentation of organized data.**

Grade 11 Benchmark	Grade 11 Academic Benchmark	Grade 11 Levels of Complexity
2. Students use inquiry to conduct scientific investigations. • **Give priority to evidence in drawing conclusions and making connections to scientific concepts.** • **Clearly and accurately communicate the result of the investigation.** **3. Students clearly and accurately communicate the result of their own work as well as information from other sources.**	**2. Students use inquiry to conduct scientific investigations.** **11.A.S.2.2.c Students communicate results of an investigation and make connections to scientific concepts.**	**Level IV** *Students consistently and independently perform in unfamiliar settings using natural supports.* **Students explain the results of an investigation and make connections to scientific concepts.**
		Level III *Students consistently perform in several familiar settings.* **Students communicate results of an investigation and make connections to scientific concepts.**
		Level II *Students require external support and multiple prompts in limited familiar settings.* **Students state the results of an investigation.**
		Level I *Students require external support and multiple prompts in a structured setting.* **Students indicate attention through eye gaze, verbalizations, and/or respond to a presentation of the results of an investigation.**

Grade 11 Benchmark	Academic Benchmark	Grade 11 Levels of Complexity
5. Students properly use appropriate scientific and safety equipment, recognize hazards and safety symbols, and observe standard safety procedures.	**11.A.S.2.3 Students identify safety symbols and the associated concept.**	**Level IV** *Students consistently and independently perform in unfamiliar settings using natural supports.* **Students identify safety symbols, the associated concept, and identify a related safety procedure.**
		Level III *Students consistently perform in several familiar settings.* **Students identify safety symbols and the associated concept.**
		Level II *Students require external support and multiple prompts in limited familiar settings.* **Students match a safety symbol and its associated concept.**
		Level I *Students require external support and multiple prompts in a structured setting.* **Students recognize a safety symbol as a warning.**

CONTENT STANDARD: <u>HISTORY AND NATURE OF SCIENCE IN PERSONAL AND SOCIAL DECISIONS</u> **Students recognize the nature of science, its history, and its connections to personal, social, economic, and political decisions. Historically, scientific events have had significant impacts on our cultural heritage.** **ACADEMIC CONTENT STANDARD: <u>HISTORY AND NATURE OF SCIENCE IN PERSONAL AND SOCIAL DECISIONS</u>** **Students use scientific knowledge to make personal decisions.**		
Grade 11 **Benchmark**	**Grade 11** **Academic Benchmark**	**Grade 11** **Levels of Complexity**
1. Students examine the nature and history of science. • **As scientific knowledge evolves, it impacts personal, social, economic, and political decisions.** • **The historical misuse of scientific information to make personal, social, economic, and political decisions.**	**1. Students recognize the nature and history of science.** **11.A.S.3.1 Students identify how scientific information impacts personal decisions.**	**Level IV** *Students consistently and independently perform in unfamiliar settings using natural supports.* **Students develop a personal plan connecting scientifically related information to a healthy lifestyle choice.** Ex. Students develop a dental hygiene plan and explain why it is important to take care of their teeth.
		Level III *Students consistently perform in several familiar settings.* **Students identify how scientific information impacts personal decisions.** Ex. Students identify the necessity of brushing teeth in order to prevent cavities.
		Level II *Students require external support and multiple prompts in limited familiar settings.* **Students identify ways to keep healthy.** Ex. Students select a healthy lifestyle practice when presented with a choice of healthy and unhealthy practices.
		Level I *Students require external support and multiple prompts in a structured setting.* **Students engage in a healthy practice.** Ex. Students will respond to a healthy practice such as having their teeth brushed.

Grade 11 Benchmark	Grade 11 Academic Benchmark	Grade 11 Levels of Complexity
2. Students examine how scientific information is used to make decisions. • **The role of science in solving personal, local, national, and global problems.** • **The origins, limitations, and conservation of natural resources, including Wyoming examples.**	**2. Students examine how scientific information is used to make decisions.** **11.A.S.3.2.a Students identify and perform a task associated with a local problem regarding limited natural resources.**	**Level IV** *Students consistently and independently perform in unfamiliar settings using natural supports.* **Students identify and plan a way to perform a task associated with a local problem regarding limited natural resources.** Ex. Students communicate a local problem and design a plan and solution such as recycling cans.
		Level III *Students consistently perform in several familiar settings.* **Students identify and perform a task associated with a local problem regarding limited natural resources.** Ex. Students implement a proposed solution such as recycling cans.
		Level II *Students require external support and multiple prompts in limited familiar settings.* **Students identify a local problem regarding natural resources.** Ex. Students identify that some man-made changes in the environment can be bad.
		Level I *Students require external support and multiple prompts in a structured setting.* **Students respond to a representation of a polluted resource.** Ex. Students respond to a representation of a polluted lake as a problem.

Grade 11 Benchmark	Academic Benchmark	Grade 11 Levels of Complexity
2. Students examine how scientific information is used to make decisions • **Interdisciplinary connections of the sciences and connections to other subject areas and career opportunities.**	**2. Students examine how scientific information is used to make decisions.** **11.A.S.3.2.b Students group science topics with careers in science.**	**Level IV** *Students consistently and independently perform in unfamiliar settings using natural supports.* **Students connect science topics to careers in science.** Ex. Students match science vocabulary words or topics to a career in medicine.
		Level III *Students consistently perform in several familiar settings.* **Students group science topics with careers in science.** Ex. Students match careers such as doctors and nurses to a career in health or first aid.
		Level II *Students require external support and multiple prompts in limited familiar settings.* **Students identify jobs in science.** Ex. Students identify a job in the science field associated with related objects, such as stethoscope, microscope or blood pressure cuff to the health sciences.
		Level I *Students require external support and multiple prompts in a structured setting.* **Students respond to the presence of a school nurse.** Ex. Students identify a representation of a school nurse as the nurse.