Arizona Science Standards - High School Essential Standards

Physical Science Standards	
HS.P1U1.1	Develop and use models to explain the relationship of the structure of atoms to patterns and properties observed within the Periodic Table and describe how these models are revised with new evidence.
HS.P1U1.2	Develop and use models for the transfer or sharing of electrons to predict the formation of ions, molecules, and compounds in both natural and synthetic processes.
HS.P1U1.3	Ask questions, plan, and carry out investigations to explore the cause and effect relationship between reaction rate factors.
HS.P1U3.4	Obtain, evaluate, and communicate information about how the use of chemistry related technologies have had positive and negative ethical, social, economic, and/or political implications.
HS.P2U1.5	Construct an explanation for a field's strength and influence on an object (electric, gravitational, magnetic).
HS.P3U1.6	Collect, analyze, and interpret data regarding the change in motion of an object or system in one dimension, to construct an explanation using Newton's Laws.
HS.P3U2.7	Use mathematics and computational thinking to explain how Newton's laws are used in engineering and technologies to create products to serve human ends.
HS.P4U1.8	Engage in argument from evidence that the net change of energy in a system is always equal to the total energy exchanged between the system and the surroundings.
HS.P4U3.9	Engage in argument from evidence regarding the ethical, social, economic, and/or political benefits and liabilities of energy usage and transfer.
HS.P4U1.10	Construct an explanation about the relationships among the frequency, wavelength, and speed of waves traveling in various media, and their applications to modern technology.

Earth and Space Science Standards	
HS.E1U1.11	Analyze and interpret data to determine how energy from the Sun affects weather patterns and climate.
HS.E1U1.12	Develop and use models of the Earth that explains the role of energy and matter in Earth's constantly changing internal and external systems (geosphere, hydrosphere, atmosphere, biosphere).
HS.E1U1.13	Evaluate explanations and theories about the role of energy and matter in geologic changes over time.
HS.E1U3.14	Engage in argument from evidence about the availability of natural resources, occurrence of natural hazards, changes in climate, and human activity and how they influence each other.
HS.E2U1.15	Construct an explanation based on evidence to illustrate the role of nuclear fusion in the life cycle of a star.
HS.E2U1.16	Construct an explanation of how gravitational forces impact the evolution of planetary motion, structure, surfaces, atmospheres, moons, and rings.
HS.E2U1.17	Construct an explanation of the origin, expansion, and scale of the universe based on astronomical evidence.

Life Science Standards	
HS.L2U3.18	Obtain, evaluate, and communicate about the positive and negative ethical, social, economic, and political implications of human activity on the biodiversity of an ecosystem.
HS.L2U1.19	Develop and use models that show how changes in the transfer of matter and energy within an ecosystem and interactions between species may affect organisms and their environment.
HS.L1U1.20	Ask questions and/or make predictions based on observations and evidence to demonstrate how cellular organization, structure, and function allow organisms to maintain homeostasis.
HS.L2U1.21	Obtain, evaluate, and communicate data showing the relationship of photosynthesis and cellular respiration; flow of energy and cycling of matter.
HS.L1U1.22	Construct an explanation for how cellular division (mitosis) is the process by which organisms grow and maintain complex, interconnected systems.
HS.L1U3.23	Obtain, evaluate, and communicate the ethical, social, economic and/or political implications of the detection and treatment of abnormal cell function.
HS.L3U1.24	Construct an explanation of how the process of sexual reproduction contributes to genetic variation.
HS.L3U1.25	Obtain, evaluate, and communicate information about the causes and implications of DNA mutation.
HS.L3U3.26	Engage in argument from evidence regarding the ethical, social, economic, and/or political implications of a current genetic technology.
HS.L4U1.27	Obtain, evaluate, and communicate evidence that describes how changes in frequency of inherited traits in a population can lead to biological diversity.
HS.L4U1.28	Gather, evaluate, and communicate multiple lines of empirical evidence to explain the mechanisms of biological evolution.

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Three Dimensions of Science

Sensemaking in science occurs with the integration of three essential dimensions.

Science and Engineering Practices

The science and engineering practice describe a robust process for how scientists investigate and build models and theories of the natural world or how engineers design and build systems.

- ask questions and define problems
- develop and use models
- plan and carry out investigations
- analyze and interpret data
- use mathematics and computational thinking
- construct explanations and design solutions
- engage in argument from evidence
- obtain, evaluate, and communicate information

Crosscutting Concepts

Crosscutting concepts cross boundaries between science disciplines and provide an organizational framework to connect knowledge from various disciplines into a coherent and scientifically based view of the world. They build bridges between science and other disciplines and connect core ideas and practices throughout the fields of science and engineering. Their purpose is to provide a lens to help students deepen their understanding of the core ideas as they make sense of phenomena in the natural and designed worlds.

- patterns
- cause and effect
- structure and function
- systems and system models
- stability and change
- scale, proportion, and quantity
- energy and matter

Core Ideas

Core Ideas for Knowing Science

Physical Science

Physical science encompasses physical and chemical sub-processes that occur within systems. At the high school level, students gain an understanding of these processes at both the micro and macro levels through the intensive study of matter, energy, and forces.

P1: All matter in the Universe is made of very small particles.
P2: Objects can affect other objects at a distance.
P3: Changing the movement of an object requires a net force to be acting on it.
P4: The total amount of energy in a closed system is always the same but can be transferred from one energy store to another during an event.

Life Science

Life science focuses on the patterns, processes, and relationships of living organisms. The standards for life science encompass the areas of cells and organisms; ecosystems, interactions, energy and dynamics; heredity; and biological diversity.

L1: Organisms are organized on a cellular basis and have a finite life span.
L2: Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms.
L3: Genetic information is passed down from one generation of organisms to another.
L4: The unity and diversity of organisms, living and extinct, is the result of evolution.

Earth and Space Science

Earth and space science encompass processes that occur on Earth while also addressing Earth's place within our solar system and galaxy. At the high school level, students gain an understanding of these processes through a wide scale: unimaginably large to invisibly small.[1] Earth and Space Sciences, more than any other discipline, are rooted in other scientific disciplines. Students, through the close study of earth and space, will find clear applications for their knowledge of gravitation, energy, magnetics, cycles, and biological processes.

E1: The composition of the Earth and its atmosphere and the natural and human processes occurring within them shape the Earth's surface and its climate.
E2: The Earth and our solar system are a very small part of one of many galaxies within the Universe.

Core Ideas for Using Science

The three core ideas for **Using Science** connect scientific principles, theories, and models; engineering and technological applications; and societal implications to the content knowledge to support that understanding.

U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised.
U2: The knowledge produced by science is used in engineering and technologies to solve problems and/or create products.
U3: Applications of science often have both positive and negative ethical, social, economic, and/or political implications.

Phenomena are observable events that can be explained or explored. Science aims to explain the causes of these events, or phenomena, using scientific ideas, concepts, and practices (3-dimensions).

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