

## 6<sup>th</sup> through 8<sup>th</sup> Grade

### 6<sup>th</sup> Grade

#### Standard 1: Physical Science

6.1.1: Construct models to depict subatomic particles, atoms, simple molecules. Simulate the behavior of matter in motion.
6.1.2: Create models to predict how particle motion changes when heat energy is added or subtracted to different states of matter (solids, liquids and gases).
6.1.3: Investigate a substance undergoing a change in state. Measure and compare the mass of a substance before and after a change in state. (Design and test a model that verifies the Law of Conservation of Mass)
6.1.4: Investigate if an object is demonstrating potential or kinetic energy by analyzing its mass and motion. (Graphical displays of data relating kinetic energy to the mass and speed of an object would enhance the learning experience.)
6.1.5: Conduct investigations to differentiate between the types of potential energy that exist including: gravitational potential energy, elastic potential energy and chemical potential energy.
6.1.6: Compare and contrast how potential and kinetic energy can be transformed from one form to another.
6.1.7: Investigate how work can be performed using different forms of energy such as heat, light, electricity, mechanical motion, chemical energy and sound.

#### Standard 2: Earth and Space Science

6.2.1: Design a model to describe how the position, the size and motions of the earth, moon and sun cause time of day, seasons, tide cycles, eclipses and phases of the moon.
6.2.2: Describe the role of gravity as being the force that maintains regular and predictable motion of celestial bodies, holds objects to planetary surfaces, and is responsible for Earth's tides.
6.2.3: Use evidence to explain that our solar system is heliocentric and that nuclear energy is the source of the Sun's energy.
6.2.4: Compare and contrast the Earth, its Moon, and other planets in the solar system, including comets and asteroids. (Comparisons should be made in regard to size, surface features, atmospheric characteristics, and the ability to support life.)
6.2.5: Design a model and demonstrate that the changes of seasons, changes in areas of sunlight intensity and the length of daylight in each hemisphere of the earth are the result of the inclination of the earth on its axis, as well as, its revolution around the Sun.

### Standard 3: Life Science

6.3.1: Describe specific relationships including: predator/prey, consumer/producer, parasite/host and symbiotic relationships between organisms. Construct an explanation that predicts why patterns of interactions develop between organisms in an ecosystem.
6.3.2: Using empirical evidence, explain how changes in biotic and abiotic components in a given habitat can be beneficial or detrimental to native plants and animals. Investigate invasive species and discuss their impact on local ecosystems.
6.3.3: Analyze and interpret data to identify the effects various biotic and abiotic factors can have on populations in an ecosystem.
6.3.4: Describe the vital role of photosynthesis and the flow of energy through ecosystems.
6.3.5: Describe how nutrients, obtained from consuming other organisms, are used to grow, repair, move and maintain homeostasis within a given organism.

### Standard 4: Engineering and Technology

6.4.1: Apply potential and kinetic energy to power a simple device.
6.4.2: Construct a simple device that uses potential or kinetic energy to perform work.
6.4.3: Describe how energy is transferred from one object to another.

## 7<sup>th</sup> Grade

### Standard 1: Physical Science

7.1.1: Investigate a process in which energy is transferred from one system to another, provide evidence that the total amount of energy does not change during the transfer. (Law of Conservation of Energy).
7.1.2: Compare and contrast the three types of heat transfer: radiation, convection and conduction.
7.1.3: Describe the environmental impacts of obtaining and utilizing various energy resources in Indiana. Determine which energy resources are the most beneficial and efficient. (Essential to discuss renewable energy and nonrenewable energy resources.)
7.1.4: Investigate the properties of light, sound and other energy waves and how they are reflected, absorbed and transmitted through materials and space.
7.1.5: Plan and carry out an investigation to determine which of the common forces require contact (i.e.: gravity, magnetic, electric, and electromagnetic).
7.1.6: Apply Newton's Laws of Motion to demonstrate and describe the relationships between net force, speed and direction of motion.

### Standard 2: Earth and Space Systems

7.2.1: Construct a model of the earth that illustrates how the earth is a layered structure of lithospheric plates, a mantle and a core.
7.2.2: Investigate the magnetic field of the earth and demonstrate that it is detectable with a compass.
7.2.3: Construct a scientific explanation, based on evidence from rock strata and fossil records, for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.
7.2.4: Demonstrate how the earth is a layered structure with lithospheric plates that are in constant motion which have changed the earth's surface at varying time and spatial scales. (Earthquakes, volcanic activity, creation of mountains, movement of tectonic plates, sea floor spreading)
7.2.5: Identify and classify a variety of rocks based on physical characteristics from their origin, and explain how they are related using the rock cycle. (i.e.: Sedimentary, igneous, and metamorphic rocks)
7.2.6: Construct an explanation, based on evidence found in Indiana, how large-scale physical processes have shaped the land. (i.e.: karst topography, glaciation, erosion, weathering)
7.2.7: Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.

### Standard 3: Life Science

7.3.1: Investigate and observe cells in living organisms collecting evidence showing that living things are made of cells, recognizing that some organisms are single-celled and others are made up of multiple cells.
7.3.2: Investigate the importance of water within all cells and how it is required to carry out many cellular functions.
7.3.3: Investigate specialized cells in multicellular organisms relate their structure to their functions.
7.3.4: Compare and contrast the form and function of the organelles found in plant and animal cells.
7.3.5: Create a model to show how the cells in multicellular organisms repeatedly divide to make more cells for growth and repair as a result of mitosis.
7.3.6: Investigate how cells develop into specialized tissues and organs in multicellular organisms.
7.3.7: Investigate the functions of various cell types, tissues and organ systems in the body.

### Standard 4: Engineering and Technology

7.4.1: Demonstrate or investigate how energy is the capacity to do work.
7.4.2: Demonstrate that energy can be used to do work using many processes. (i.e.: building windmills, using solar panels, using hydroelectric or geothermal energy)
7.4.3: Investigate how power is the rate that energy is converted from one form to another. (i.e.: solve problems using $P = W/t$ , measure the kilowatts of electricity used per minute (or hour) by a device).

## 8<sup>th</sup> Grade

### Standard 1: Physical Science

8.1.1: Create models to represent the arrangement of subatomic particles in an atom (protons, neutrons and electrons). Understand the significance that there are currently 118 known chemical elements.
8.1.2: Using basic information provided for each chemical element including atomic number, atomic mass, symbol and name, determine how the elements are arranged properly on the Periodic Table.
8.1.3 Develop a model to explain why substances exist as gases, liquids or solids at a given temperature.
8.1.4: Investigate how the electron arrangements (electron configurations) determine the chemical and physical properties of chemical elements.
8.1.5: Draw and explain how valence electrons of atoms of different elements form chemical bonds based on the arrangement of electrons in the atoms. (Ionic and Covalent Bonding)
8.1.6: Illustrate with diagrams (drawings) how atoms are arranged in simple molecules. Distinguish between atoms, elements, molecules and compounds.
8.1.7: Investigate the properties of density, melting point, boiling point, and solubility to gain an understanding that physical properties do not change for a pure substance.
8.1.8: Produce and evaluate evidence that supports a conclusion of whether a chemical reaction has occurred based on physical and chemical properties of the reactants and products.
8.1.9: Develop and use models to describe how the total number of atoms do not change in chemical reactions and as a result, mass is always conserved. (Investigate the Law of Conservation of Mass.)

### Standard 2: Earth and Space Systems

8.2.1: Create models to describe how unequal heating, and the rotation of the earth, cause patterns of atmospheric and oceanic circulation that determine regional climates and weather patterns throughout the world.
8.2.2: Create models to describe the cycling of water through the earth's crust, atmosphere and oceans driven by the energy from the sun and the force of gravity.
8.2.3: Analyze and interpret ocean temperature, direction and relative speed of ocean currents, and prevailing weather patterns to make predictions about regional (and global) climates.
8.2.4: Create a model of the atmosphere, analyze the physical and chemical composition of the atmosphere at various elevations.

8.2.5: Collect data to provide evidence of the conditions that cause Indiana weather and weather-related events such as thunderstorms, tornadoes, lake effect snow, snow storms and localized flooding.
8.2.6: Identify, explain and discuss the multiple effects that human activities (e.g.: air, soil, light, noise and water pollution) have on local ecosystems and the biosphere as a whole.
8.2.7: Investigate the relationship of how human population growth and per-capita consumption of finite natural resources (i.e.: coal, oil natural gas and clean water) impact Earth's various ecosystems.
8.2.8: Investigate human activities over the past few centuries that have drastically changed the environment and have had an impact on the capacity of the environment to support native species. Create a sustainability plan to reduce and eliminate these impacts and encourage sustainability.
8.2.9: Develop a model to describe the cycling of matter and flow of energy through the abiotic and biotic components of an ecosystem.
8.2.10: Investigate and provide evidence that supports the theory that there has been a rise in global temperatures over the past century.

### Standard 3: Life Science

8.3.1: Differentiate between sexually and asexually reproducing organisms. Investigate organisms that undergo these two types of reproduction.
8.3.2: Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
8.3.3: Demonstrate how genetic information is transmitted from parent to offspring through chromosomes. (Meiosis)
8.3.4: Create models to show the structures of chromosomes, chromatids, genes, chromatin and deoxyribonucleic acid (DNA) molecules.
8.3.5: Investigate inherited traits, learned and behavioral traits, give examples of each and describe their differences.
8.3.6: Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.
8.3.7: Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.
8.3.8: Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.

8.3.9: Construct an argument, supported by empirical evidence, that changes to physical or biological components of an ecosystem affect populations.

8.3.10: Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

#### Standard 4: Engineering and Technology

8.4.1: Investigate the properties (i.e.: mechanical, chemical, electrical, thermal, magnetic and optical) of natural and engineered materials.

8.4.2: Investigate common synthetic materials (i.e.: plastics, composites, polyester, and alloys) to gain an understanding that synthetic materials do come from natural resources and have an impact on society.

8.4.3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.