Oakwood City School District
Junior High Science Standards

Ohio's Learning Standards and Model Curriculum for Science outlines what all students should know and be able to do to become scientifically literate citizens. This includes the knowledge and skills they need for the 21st century workforce and higher education.

The standards provide Ohio educators with the content and expectations for learning through the following cognitive systems:

DESIGNING TECHNOLOGICAL/ENGINEERING SOLUTIONS USING SCIENCE CONCEPTS
Requires students to solve science-based engineering or technological problems through application of scientific inquiry. Within given scientific constraints, propose or critique solutions, analyze and interpret technological and engineering problems, use science principles to anticipate effects of technological or engineering design, find solutions using science and engineering or technology, consider consequences and alternatives, and/or integrate and synthesize scientific information.

DEMONSTRATING SCIENCE KNOWLEDGE
Requires student to use scientific practices and develop the ability to think and act in ways associated with inquiry, including asking questions, planning and conducting investigations, using appropriate tools and techniques to gather and organize data, thinking critically and logically about relationships between evidence and explanations, constructing and analyzing alternative explanations, and communicating scientific arguments.

INTERPRETING AND COMMUNICATING SCIENCE CONCEPTS
Requires students to use subject-specific conceptual knowledge to interpret and explain events, phenomena, concepts and experiences using grade-appropriate scientific terminology, technological knowledge and mathematical knowledge. Communicate with clarity, focus and organization using rich, investigative scenarios, real-world data and valid scientific information.

RECALLING ACCURATE SCIENCE
Requires students to provide accurate statements about scientifically valid facts, concepts and relationships. Recall only requires students to provide a rote response, declarative knowledge or perform routine mathematical tasks. This cognitive demand refers to students' knowledge of science fact, information, concepts, tools, procedures (being able to describe how) and basic principles.

Seventh Grade Science Standards

Earth and Space Science: Cycles and Patterns of Earth and Moon

A. The hydrologic cycle illustrates the changing states of water as it moves through the lithosphere, biosphere, hydrosphere and atmosphere.
    a. Describe the movement of water through all four spheres of Earth (lithosphere, hydrosphere, atmosphere, biosphere).
    b. Identify the changes in thermal energy as water changes state in the hydrologic cycle.
    c. Explain the roles of the sun and gravity in the hydrologic cycle.

B. Thermal-energy transfers in the ocean and the atmosphere contribute to the formation of currents, which influence global climate patterns.
    a. Identify the general patterns of the Jet Stream and the Gulf Stream using a world map.

C. The atmosphere has different properties at different elevations and contains a mixture of gasses that cycle through the lithosphere, biosphere, hydrosphere and atmosphere.
    a. Identify the general properties of the different layers of the atmosphere.
    b. Recognize human-made and natural factors that can change the properties of the atmosphere.
    c. Identify the different gasses that are present in Earth's atmosphere.
    d. Trace the different biogeochemical cycles through each of Earth's spheres.

D. The relative patterns of motion and positions of Earth, moon and sun cause solar and lunar eclipses, tides and phases of the moon.
    a. Map the different phases of the moon during a cycle.
    b. Differentiate between a solar eclipse and a lunar eclipse.
    c. Describe the relationship between gravity and tidal movement.

E. The relative positions of Earth and the sun cause patterns we call seasons.
    a. Demonstrate that Earth's spin axis is fixed and tilted at 23.5° relative to its orbit around the sun.
    b. Explain that the rotation of Earth on its tilted axis, in conjunction with its revolution around the sun, affects the amount of direct sunlight that each portion of Earth receives in a single day and throughout the year.

c. Explain that seasons are a result of Earth's tilted axis and are caused by the differential intensity of sunlight on different areas of Earth throughout the year.

Life Science: Matter and Energy Transfer in an Ecosystem

A. Energy flows and matter is transferred continuously from one organism to another and between organisms and their physical environments.
   a. Identify the cellular structures primarily responsible for photosynthesis and respiration.
   b. Trace and explain how matter and energy are transferred through an ecosystem.
   c. Explain that the total amount of matter and energy remains constant, even though its form and location change.

B. In any particular biome, the number, growth and survival of organisms and populations depend on biotic and abiotic factors.
   a. Identify the biotic and abiotic elements of the major biomes and describe how these elements impact each other.
   b. Explain how the abiotic factors support the types of organisms that can survive in an environment.
   c. Explain the differences between the environment, a biome, an ecosystem and a habitat.
   d. Examine how disruptions, deliberate or inadvertent, to the physical (abiotic) or biological (biotic) components of an ecosystem impact the composition of an ecosystem.

Physical Science: Conservation of Mass and Energy

A. Elements can be organized by properties.
   a. Explain that the periodic table is organized based on physical and chemical properties.
   b. Identify characteristics of metals, nonmetals and metalloids.
   c. Given a set of elements, identify similar properties (e.g., melting and/or boiling points, conductors of heat and electricity, luster, brittle) and classify these elements as metals, nonmetals and metalloids.

B. Matter can be separated or changed, but in a closed system, the number and types of atoms remains constant.
   a. Compare the properties of different elements and the compounds formed from them.

b. Identify properties of compounds, molecules and mixtures.
c. Display a simple balanced equation using pictorial representations of reactants and products. Define open and closed systems.
d. Identify and provide examples of types of mixtures.

C. Energy can be transformed or transferred but is never lost.
    a. Identify where energy has been dissipated to the environment.
    b. Describe two ways that energy can leave a system so it may appear to disappear.
    c. Recognize that energy or matter cannot enter or leave a closed system.
    d. Recognize that energy can change forms but the total amount of energy remains constant.

D. Energy can be transferred through a variety of ways.
    a. Explain how mechanical energy is transferred in a system.
    b. Demonstrate how mechanical and electromagnetic waves transfer energy when they interact with matter.
    c. Recognize that thermal energy can be converted to mechanical energy.
    d. Use a particle model of matter to explain how energy can be transferred through convection.

E. An electrical circuit transfers energy from a source to a device.
    a. Explain why current is the same at all parts of a series circuit.
    b. Explain why the flow of current varies in different parts of a parallel circuit.

Eighth Grade
Science Standards

Earth and Space Science: Physical Earth

A. The composition and properties of Earth's interior are identified by the behavior of seismic waves.
    a. Compare Earth's chemical layers with the physical layers. Include their properties and how they interact.
    b. Show how seismic data is used to determine the composition of the interior of Earth.
    c. Explain how gravitational potential energy is converted to heat.
    d. Explain how thermal energy generated from Earth's core drives convection currents in the asthenosphere.

B. Earth's lithosphere consists of major and minor tectonic plates that move relative to each other.
    a. Describe the historical evidence for plate tectonics, including the early observations, discoveries and ideas that combined to eventually lead to the modern theory of plate tectonics.
    b. Differentiate between plate tectonics and continental drift.
    c. Explain the mechanism for plate movement (convection currents in the asthenosphere).
    d. Recognize that oceanic crust is more dense and thinner than continental crust.
    e. Determine types of plate boundaries based on geologic data (e.g., location and magnitude of earthquakes and volcanoes, elevation and age of ocean crust).

C. A combination of constructive and destructive geologic processes formed Earth's surface.
    a. Label sets of images as erosion or deposition.
    b. Identify examples of destructive geologic processes.
    c. Identify features of a surface using a topographic map.

D. Evidence of the dynamic changes of Earth's surface through time is found in the geologic record.
    a. Recognize the immensity of the geologic time scale.
    b. Explain uniformitarianism including information about James Hutton and Siccar Point, Scotland.

Life Science: Species and Reproduction

A. Diversity of species, a result of variation of traits, occurs through the process of evolution and extinction over many generations. The fossil records provide evidence that changes have occurred in number and types of species.
    a. Define and give examples of index fossils.
    b. Describe how to determine the relative age of fossils found in sedimentary rock.
    c. Explain why variation within a population can be advantageous for a population of organisms.
    d. Map the multiple mass extinction events that have occurred throughout Earth's history.
    e. Explain why 99% of all species that have ever existed on Earth are extinct.

B. Every organism alive today comes from a long line of ancestors who reproduced successfully every generation.
    a. Predict the number of chromosomes in a body cell when given the number in a gamete. Predict the number of chromosomes in a gamete when given the number in a body cell.
    b. Explain how the number of chromosomes in a daughter cell is related to the number of chromosomes in the parent cell for mitosis and meiosis.
    c. Describe the features of sexual and asexual reproduction related to the transfer of genetic information from parent to offspring.

C. The characteristics of an organism are a result of inherited traits received from parent(s).
    a. Describe how DNA, genes, chromosomes and inherited traits are connected.
    b. Select a genetic condition and show its inheritance pattern through multiple generations on a pedigree or other graphic representation
    c. Select a variety of genetic conditions to explore autosomal dominant, autosomal recessive and codominant inheritance patterns.

Physical Science: Forces and Motion

A. Objects can experience a force due to an external field such as magnetic, electrostatic, or gravitational fields.
    a. Differentiate between electric charges and magnetic poles.
    b. Identify the behavior of charged objects in an electric field (include examples of repulsion and attraction).
    c. Explain that the magnetic force exerted on other objects located in a magnetic field increases as the strength of the magnet increases and decreases as the distance from the magnet increases.
    d. Differentiate between the concepts of mass and weight.
    e. Explain how mass and distance affect the magnitude of the gravitational force between two objects.

f. Recognize that free fall results from the gravitational attraction between Earth and an object.

B. Forces can act to change the motion of objects.
   a. Recognize that the motion of objects is determined with respect to a fixed reference point.
   b. Given a simple interaction between two objects that are not touching (e.g., a ball falling to the ground, a magnet and a steel cabinet, hair and a brush experiencing static), identify the objects involved in the interaction and give the direction of the force on each object.
   c. Create a force diagram to illustrate the combined forces acting on an object.
   d. Explain how the force of gravity can be acting on a book at rest on a table and yet the book does not move.
   e. Explain that friction opposes the motion of objects.