

# NEW MEXICO Grade 8 SCIENCE STANDARDS

## **Strand I: Scientific Thinking and Practice**

**Standard I:** Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.

**5-8 Benchmark I:** Use scientific methods to develop questions, design and conduct experiments using appropriate technologies, analyze and evaluate results, make predictions, and communicate findings.

1. Evaluate the accuracy and reproducibility of data and observations.
2. Use a variety of technologies to gather, analyze and interpret scientific data.
3. Know how to recognize and explain anomalous data.

**5-8 Benchmark II:** Understand the processes of scientific investigation and how scientific inquiry results in scientific knowledge.

1. Examine alternative explanations for observations.
2. Describe ways in which science differs from other ways of knowing and from other bodies of knowledge (e.g., experimentation, logical arguments, skepticism).
3. Know that scientific knowledge is built on questions posed as testable hypotheses, which are tested until the results are accepted by peers.

**5-8 Benchmark III:** Use mathematical ideas, tools, and techniques to understand scientific knowledge.

1. Use mathematical expressions and techniques to explain data and observations and to communicate findings (e.g., formulas and equations, significant figures, graphing, sampling, estimation, mean).
2. Create models to describe phenomena.

# NEW MEXICO Grade 8 SCIENCE STANDARDS

## **Strand II: Content of Science**

**Standard I (Physical Science):** Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.

### **5-8 Benchmark I: Know the forms and properties of matter and how matter interacts.**

#### **Properties of Matter**

1. Know how to use density, boiling point, freezing point, conductivity, and color to identify various substances.
2. Distinguish between metals and non-metals.
3. Understand the differences among elements, compounds, and mixtures by:
  - classification of materials as elements, compounds, or mixtures
  - interpretation of chemical formulas
  - separation of mixtures into compounds by methods including evaporation, filtration, screening, magnetism.

#### **Structure of Matter**

4. Identify the protons, neutrons, and electrons within an atom and describe their locations (i.e., in the nucleus or in motion outside the nucleus).
5. Explain that elements are organized in the periodic table according to their properties.
6. Know that compounds are made of two or more elements, but not all sets of elements can combine to form compounds.

#### **Changes in Matter**

7. Know that phase changes are physical changes that can be reversed (e.g., evaporation, condensation, melting).
8. Describe various familiar physical and chemical changes that occur naturally (e.g., snow melting, photosynthesis, rusting, burning).
9. Identify factors that influence the rate at which chemical reactions occur (e.g., temperature, concentration).
10. Know that chemical reactions can absorb energy (endothermic reactions) or release energy (exothermic reactions).

# NEW MEXICO Grade 8 SCIENCE STANDARDS

**5-8 Benchmark II:** Explain the physical processes involved in the transfer, change, and conservation of energy.

## Energy Transformation

1. Know that energy exists in many forms and that when energy is transformed some energy is usually converted to heat.
2. Know that kinetic energy is a measure of the energy of an object in motion and potential energy is a measure of an object's position or composition, including:
  - transformation of gravitational potential energy of position into kinetic energy of motion by a falling object.
3. Distinguish between renewable and nonrenewable sources of energy.
4. Know that electrical energy is the flow of electrons through electrical conductors that connect sources of electrical energy to points of use, including:
  - electrical current paths through parallel and series circuits
  - production of electricity by fossil-fueled and nuclear power plants, wind generators, geothermal plants, and solar cells
  - use of electricity by appliances and equipment (e.g., calculators, hair dryers, light bulbs, motors).

## Waves

5. Understand how light and radio waves carry energy through vacuum or matter by:
  - straight-line travel unless an object is encountered
  - reflection by a mirror, refraction by a lens, absorption by a dark object
  - separation of white light into different wavelengths by prisms
  - visibility of objects due to light emission or scattering.
6. Understand that vibrations of matter (e.g., sound, earthquakes, water waves) carry wave energy, including:
  - sound transmission through solids, liquids, and gases
  - relationship of pitch and loudness of sound to rate and distance (amplitude) of vibration
  - ripples made by objects dropped in water.

# NEW MEXICO Grade 8 SCIENCE STANDARDS

## **5-8 Benchmark III:** Describe and explain forces that produce motion in objects.

### **Forces**

1. Know that there are fundamental forces in nature (e.g., gravity, electromagnetic forces, nuclear forces).
2. Know that a force has both magnitude and direction.
3. Analyze the separate forces acting on an object at rest or in motion (e.g., gravity, elastic forces, friction), including how multiple forces reinforce or cancel one another to result in a net force that acts on an object.
4. Know that electric charge produces electrical fields and magnets produce magnetic fields.
5. Know how a moving magnetic field can produce an electric current (generator) and how an electric current can produce a magnetic field (electromagnet).
6. Know that Earth has a magnetic field.

### **Motion**

7. Know that an object's motion is always described relative to some other object or point (i.e., frame of reference).
8. Understand and apply Newton's Laws of Motion:
  - Objects in motion will continue in motion and objects at rest will remain at rest unless acted upon by an unbalanced force (inertia).
  - If a greater force is applied to an object a proportionally greater acceleration will occur.
  - If an object has more mass the effect of an applied force is proportionally less.

# NEW MEXICO Grade 8 SCIENCE STANDARDS

## **Strand II: Content of Science**

**Standard II (Life Science):** Understand the properties, structures, and processes of living things and the interdependence of living things and their environments.

**5-8 Benchmark I:** Explain the diverse structures and functions of living things and the complex relationships between living things and their environments.

1. Describe how matter moves through ecosystems (e.g., water cycle, carbon cycle).
2. Describe how energy flows through ecosystems (e.g., sunlight, green plants, food for animals).
3. Explain how a change in the flow of energy can impact an ecosystem (e.g., the amount of sunlight available for plant growth, global climate change).

**5-8 Benchmark II:** Understand how traits are passed from one generation to the next and how species evolve.

1. Understand that living organisms are made mostly of molecules consisting of a limited number of elements (e.g., carbon, hydrogen, nitrogen, oxygen).
2. Identify DNA as the chemical compound involved in heredity in living organisms.
3. Describe the widespread role of carbon in the chemistry of living systems.

**5-8 Benchmark III:** Understand the structure of organisms and the function of cells in living systems.

1. Describe how cells use chemical energy obtained from food to conduct cellular functions (i.e., respiration).
2. Explain that photosynthesis in green plants captures the energy from the sun and stores it chemically.
3. Describe how chemical substances can influence cellular activity (e.g., pH).

# NEW MEXICO Grade 8 SCIENCE STANDARDS

## **Strand II: Content of Science**

**Standard III (Earth and Space Science):** Understand the structure of Earth, the solar system, and the universe, the interconnections among them, and the processes and interactions of Earth's systems.

**5-8 Benchmark I:** Describe how the concepts of energy, matter, and force can be used to explain the observed behavior of the solar system, the universe, and their structures.

1. Understand how energy from the sun and other stars, in the form of light, travels long distances to reach Earth.
2. Explain how the properties of light (e.g., emission, reflection, refraction) emitted from the sun and stars are used to learn about the universe, including:
  - distances in the solar system and the universe
  - temperatures of different stars.
3. Understand how gravitational force acts on objects in the solar system and the universe, including:
  - similar action on masses on Earth and on other objects in the solar system
  - explanation of the orbits of the planets around the sun.

**5-8 Benchmark II:** Describe the structure of Earth and its atmosphere and explain how energy, matter, and forces shape Earth's systems.

1. Describe the role of pressure (and heat) in the rock cycle.
2. Understand the unique role water plays on Earth, including:
  - ability to remain liquid at most Earth temperatures
  - properties of water related to processes in the water cycle: evaporation, condensation, precipitation, surface run-off, percolation
  - dissolving of minerals and gases and transport to the oceans
  - fresh and salt water in oceans, rivers, lakes, and glaciers
  - reactant in photosynthesis.
3. Understand the geologic conditions that have resulted in energy resources (e.g., oil, coal, natural gas) available in New Mexico.

# NEW MEXICO Grade 8 SCIENCE STANDARDS

## **Strand III: Science and Society**

**Standard I:** Understand how scientific discoveries, inventions, practices, and knowledge influence, and are influenced by, individuals and societies.

### **5-8 Benchmark I:** Explain how scientific discoveries and inventions have changed individuals and societies.

1. Analyze the interrelationship between science and technology (e.g., germ theory, vaccines).
2. Describe how scientific information can help to explain environmental phenomena (e.g., floods, earthquakes, volcanoes, fire, extreme weather).
3. Describe how technological revolutions have significantly influenced societies (e.g., energy production, warfare, space exploration).
4. Critically analyze risks and benefits associated with technologies related to energy production.