



## MIDDLE SCHOOL PHYSICAL SCIENCE

### Middle School Physical Science Standards:

#### PS1: Matter and its Interactions

- 1-1 Develop models to describe the atomic composition of simple molecules and extended structures.
- 1-2 Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
- 1-3 Gather and make sense of information to describe that synthetic materials come from natural resources.
- 1-4. Develop a model that predicts and describes changes in particle motion, temperature and state of pure substances when thermal energy is added or removed.
- 1-5. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.
- 1-6. Undertake a design project to construct, test and modify a device that either releases or absorbs thermal energy.

#### PS2: Motion and Stability: Forces and Interactions

- 2-1 Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
- 2-2 Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.
- 2-3 Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
- 2-4 Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.
- 2-5. Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.



### **PS3: Energy**

- 3-1.** Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.
- 3-2.** Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.
- 3-3.** Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.
- 3-4.** Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.
- 3-5.** Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.

### **PS4: Waves and Their Applications in Technologies for Information Transfer**

- 4-1.** Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.
- 4-2.** Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.
- 4-3.** Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.

## **Middle School Earth Science Standards:**

### **ESS1: Earth's Place in the Universe**

- 1-1.** Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.
- 1-2.** Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
- 1-3.** Analyze and interpret data to determine scale properties of objects in the solar system.



- 1-4. Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history

## **ESS2: Earth's Systems**

- 2-1 Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
- 2-2 Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales
- 2-3 Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions..
- 2-4 Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
- 2-5. Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.
- 2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

## **ESS3: Earth and Human Activity**

- 3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geosciences processes.
- 3-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
- 3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
- 3-4 Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
- 3-5 Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

Unit	Lesson Outline	NGSS
<b>Unit 1:</b> Lab Skills	1-1 Lab equipment 1-2 Safety 1-3 Lab Procedures 1-4 The Scientific Method 1-5 Making Observations 1-6 Measuring 1-7 Reporting	
<b>Unit 2:</b> Structure and Properties of Matter	2-1 Nature of Matter 2-2 Mass 2-3 Density 2-4 Properties and uses of substances 2-5 Changes of State 2-6 Particle Theory of Matter 2-7 Using Particle Theory 2-8 Mixtures 2-9 Solubility 2-10 Separating Techniques	MS-PS1-1 MS-PS1-3 MS-PS1-4
<b>Unit 3:</b> Chemical Reactions	3-1 Atoms and Molecules 3-2 Elements and the Periodic Table 3-3 Compounds 3-4 Chemical and Physical Change 3-5 Properties of Acids and Bases 3-6 Indicators 3-7 The pH Scale 3-8 Reactions of Acids and Bases	MS-PS1-1 MS-PS1-2 MS-PS1-3 MS-PS1-5 MS-PS1-6
<b>Unit 4:</b> Forces and Interactions	4-1 Speed and Acceleration 4-2 Force, mass and motion 4-3 Forces 4-4 Balanced and Unbalanced Forces 4-5 Work and Energy 4-6 Simple Machines 4-7 Electrical Charge 4-8 Electrical Current 4-9 Electrical Circuits 4-10 Resistance and Power 4-11 Magnetism and Electricity	MS-PS2-1 MS-PS2-2 MS-PS2-3 MS-PS2-4 MS-PS2-5
<b>Unit 5:</b> Energy	5-1 The Nature of Energy 5-2 Measuring Energy 5-3 Transforming Energy 5-4 Heat Energy 5-5 Heat Transfer 5-6 Heat and Particle Theory	MS-PS3-1 MS-PS3-2 MS-PS3-3 MS-PS3-4 MS-PS3-5

<b>Unit 6:</b> Waves and Electromagnetic Radiation	6-1 The Electromagnetic Spectrum 6-2 The Nature of Light 6-3 Reflection 6-4 Refraction 6-5 Color 6-6 The Eye 6-7 The Nature of Sound 6-8 The Ear 6-9 Waves for Communication	MS-PS4-1 MS-PS4-2 MS-PS4-3
<b>Unit 7:</b> Space Systems	7-1 Earth's Place in the Solar System 7-2 Earth's Cycles 7-3 Eclipses 7-4 The Planets of the Solar System 7-5 Stars 7-6 Galaxies 7-7 Conditions for Life	MS-ESS1-1 MS-ESS1-2 MS-ESS1-3
<b>Unit 8:</b> History of Earth	8-1 Ancient Earth 8-2 Earth's Changing Surface 8-3 Plate Tectonics 8-4 Volcanoes 8-5 Earthquakes 8-6 Meteorites	MS-ESS1-4  MS-ESS2-2 MS-ESS2-3  MS-ESS3-2
<b>Unit 9:</b> Earth's Systems	9-1 The Structure of the Earth 9-2 Chemical and Physical Weathering 9-3 Erosion 9-4 Classifying Rocks 9-5 The Rock cycle 9-6 Nutrient Cycling	MS-ESS1-4  MS-ESS2-1 MS-ESS2-2
<b>Unit 10:</b> Weather and Climate	10-1 The Atmosphere 10-2 The Water Cycle 10-3 Weather Patterns 10-4 Climate and Climate Change 10-5 Effects of Climate Change	MS-ESS2-4 MS-ESS2-5 MS-ESS2-6  MS-ESS3-5
<b>Unit 11:</b> Human Impact	11.1 Human Activities Affecting the Earth's Surface 11.2 Pollution 11.3 Acid Rain 11.4 Resource Extraction 11.5 Quarrying, Mining and Drilling	MS-ESS3-1 MS-ESS3-2 MS-ESS3-3 MS-ESS3-4