

# Physical Science Strand

## Grades K-8

### KINDERGARTEN

#### Forces and Motion

K.P.1: Understand the positions and motions of objects and organisms observed in the environment.

- K.P.1.1: Compare the relative position of various objects observed in the classroom and outside, using position words such as *in front of*, *behind*, *between*, *on top of*, *under*, *above*, *below*, and *beside*.
- K.P.1.2: Give examples of different ways objects and organisms move (to include falling to the ground when dropped): straight, zigzag, round and round, back and forth, fast and slow.

#### Matter: Properties and Change

K.P.2: Understand how objects are described based on their physical properties and how they are used.

- K.P.2.1: Classify objects by observable physical properties (including size, color, shape, texture, weight, and flexibility).
- K.P.2.2: Compare the observable physical properties of different kinds of materials (clay, wood, cloth, paper, etc.) from which objects are made and how they are used.

### FIRST GRADE

#### Forces and Motion

1.P.1: Understand how forces (pushes or pulls) affect the motion of an object.

- 1.P.1.1: Explain the importance of a push or pull to changing the motion of an object.
- 1.P.1.2: Explain how some forces (pushes and pulls) can be used to make things move without touching them, such as magnets.
- 1.P.1.3: Predict the effect of a given force on the motion of an object, including balanced forces.

### SECOND GRADE

#### Forces and Motion

2.P.1: Understand the relationship between sound and vibrating objects.

- 2.P.1.1: Illustrate how sound is produced by vibrating objects and columns of air.
- 2.P.1.2: Summarize the relationship between sound and objects of the body that vibrate (eardrum and vocal cords).

### **Matter, Properties, and Change**

2.P.2: Understand properties of solids and liquids and the changes they undergo.

- 2.P.2.1: Give examples of matter that change from a solid to a liquid and from a liquid to a solid by heating and cooling.
- 2.P.2.2: Compare the amount (volume and weight) of water in a container before and after freezing.
- 2.P.2.3: Compare what happens to water left in an open container over time as opposed to water left in a closed container.

## **THIRD GRADE**

### **Forces and Motion**

3.P.1: Understand motion and factors that affect motion.

- 3.P.1.1: Infer changes in speed or direction resulting from forces acting on an object.
- 3.P.1.2: Compare the relative speeds (faster or slower) of objects that travel the same distance in different amounts of time.
- 3.P.1.3: Explain the effects of Earth's gravity on the motion of any object on or near the Earth.

### **Matter, Properties, and Change**

3.P.2: Understand the structure and properties of matter before and after they undergo a change.

- 3.P.2.1: Recognize that air is a substance that surrounds us, takes up space, and has mass.
- 3.P.2.2: Compare solids, liquids, and gases based on their basic properties.
- 3.P.2.3: Summarize changes that occur to the observable properties of materials when different degrees of heat are applied to them, such as melting ice or ice cream, boiling water or an egg, or freezing water.

### **Energy: Conservation and Transfer**

3.P.3: Recognize how energy can be transferred from one object to another.

- 3.P.3.1: Recognize that energy can be transferred from one object to another by rubbing them against each other.
- 3.P.3.2: Recognize that energy can be transferred from a warmer object to a cooler one by contact or at a distance and the cooler object gets warmer.

## **FOURTH GRADE**

### **Forces and Motion**

4.P.1: Explain how various forces affect the motion of an object.

- 4.P.1.1: Explain how magnets interact with all things made of iron and with other magnets to produce motion without touching them.
- 4.P.1.2: Explain how electrically charged objects push or pull on other electrically charged objects and produce motion.

### **Matter, Properties, and Change**

4.P.2: Understand the composition and properties of matter before and after they undergo a change or interaction.

- 4.P.2.1: Compare the physical properties of samples of matter: strength, hardness, flexibility, ability to conduct heat, ability to conduct electricity, ability to be attracted by magnets, reactions to water and fire.
- 4.P.2.2: Explain how minerals are identified using tests for the physical properties of hardness, color, luster, cleavage, and streak.
- 4.P.2.3: Classify rocks as metamorphic, sedimentary or igneous based on their composition, how they are formed, and the processes that create them.

### **Energy: Conservation and Transfer**

4.P.3: Recognize that energy takes various forms that may be grouped based on their interaction with matter.

- 4.P.3.1: Recognize the basic forms of energy (light, sound, heat, electrical, and magnetic) as the ability to cause motion or create change.
- 4.P.3.2: Recognize that light travels in a straight line until it strikes an object or travels from one medium to another, and that light can be reflected, refracted, and absorbed.

## **FIFTH GRADE**

### **Forces and Motion**

5.P.1: Understand force, motion, and the relationship between them.

- 5.P.1.1: Explain how factors such as gravity, friction, and change in mass affect the motion of objects.
- 5.P.1.2: Infer the motion of objects in terms of how far they travel in a certain amount of time and the direction in which they travel.
- 5.P.1.3: Illustrate the motion of an object, using a graph to show a change in position over a period of time.
- 5.P.1.4: Predict the effect of a given force or a change in mass on the motion of an object.

### **Matter, Properties, and Change**

5.P.2: Understand the interactions of matter and energy and the changes that occur.

- 5.P.2.1: Explain how the sun's energy impacts the processes of the water cycle (including evaporation, transpiration, condensation, precipitation, and runoff).
- 5.P.2.2: Compare the weight of an object to the sum of the weight of its parts before and after an interaction.
- 5.P.2.3: Summarize properties of original materials, and the new material(s) formed, to demonstrate that a change has occurred.

### **Energy: Conservation and Transfer**

5.P.3: Explain how the properties of some materials change as a result of heating and cooling.

- 5.P.3.1: Explain the effects of the transfer of heat (either by direct contact or at a distance) that occurs between objects at different temperatures. (conduction, convection, or radiation)
- 5.P.3.2: Explain how heating and cooling affect some materials and how this relates to their purpose and practical applications.

## SIXTH GRADE

### Forces and Motion

6.P.1: Understand the properties of waves and the wavelike property of energy in earthquakes, light, and sound waves.

- 6.P.1.1: Compare the properties of waves to the wavelike property of energy in earthquakes, light, and sound.
- 6.P.1.2: Explain the relationship among visible light, the electromagnetic spectrum, and sight.
- 6.P.1.3: Explain the relationship among the rate of vibration, the medium through which vibrations travel, sound, and hearing.

### Matter, Properties, and Change

6.P.2: Understand the structure, classifications, and physical properties of matter.

- 6.P.2.1: Recognize that all matter is made up of atoms and that atoms of the same element are all alike but are different from the atoms of other elements.
- 6.P.2.2: Explain the effect of heat on the motion of atoms through a description of what happens to particles during a change in phase.
- 6.P.2.3: Compare the physical properties of pure substances that are independent of the amount of matter present including density, melting point, boiling point, and solubility to properties that are dependent on the amount of matter present to include volume, mass, and weight.

### Energy: Conservation and Transfer

6.P.3: Understand characteristics of energy transfer and interactions of matter and energy.

- 6.P.3.1: Illustrate the transfer of heat energy from warmer objects to cooler ones using examples of conduction, radiation, and convection, and the effects that may result.
- 6.P.3.2: Explain the effects of electromagnetic waves on various materials to include absorption, scattering, and change in temperature.
- 6.P.3.3: Explain the suitability of materials for use in technological design based on a response to heat (to include conduction, expansion, and contraction) and electrical energy (conductors and insulators).

## SEVENTH GRADE

### Forces and Motion

7.P.1: Understand motion, the effects of forces on motion, and the graphical representations of motion.

- 7.P.1.1: Explain how the motion of an object can be described by its position, direction of motion and speed with respect to some other object.
- 7.P.1.2: Explain the effects of balanced and unbalanced forces acting on an object (including friction, gravity, and magnets).
- 7.P.1.3: Illustrate the motion of an object, using a graph to show a change in position over a period of time.
- 7.P.1.4: Interpret distance versus time graphs for constant speed and variable motion.

### **Energy: Conservation and Transfer**

7.P.2: Understand forms of energy, energy transfer, and transformation and conservation in mechanical systems.

- 7.P.2.1: Explain how kinetic and potential energy contribute to the mechanical energy of an object.
- 7.P.2.2: Explain how energy can be transformed from one form to another (specifically potential energy and kinetic energy) using a model or diagram of a moving object (roller coaster, pendulum, or cars on ramps as examples).
- 7.P.2.3: Recognize that energy can be transferred from one system to another when two objects push or pull on each other over a distance (work) and electrical circuits require a complete loop through which an electrical current can pass.
- 7.P.2.4: Explain how simple machines such as inclined planes, pulleys, levers, and wheel and axles are used to create mechanical advantage and increase efficiency.

## **EIGHTH GRADE**

### **Matter: Properties and Change**

8.P.1: Understand the properties of matter and changes that occur when matter interacts in an open and closed container.

- 8.P.1.1: Classify matter as elements, compounds, or mixtures based on how the atoms are packed together in arrangements.
- 8.P.1.2: Explain how the physical properties of elements and their reactivity have been used to produce the current model of the Periodic Table of elements.
- 8.P.1.3: Compare physical changes such as size, shape, and state to chemical changes that are the result of a chemical reaction to include changes in temperature, color, formation of a gas, or precipitate.
- 8.P.1.4: Explain how the idea of atoms and a balanced chemical equation support the law of conservation of mass.

### **Energy: Conservation and Transfer**

8.P.2: Explain the environmental implications associated with the various methods of obtaining, managing, and using energy resources.

- 8.P.2.1: Explain the environmental consequences of the various methods of obtaining, transforming, and distributing energy.
- 8.P.2.2: Explain the implications of the depletion of renewable and nonrenewable energy resources and the importance of conservation.