

### Key Idea 3:

**Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.**

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Students should describe, categorize, compare, and measure observable physical properties of matter and objects. Students' initial efforts in performing these processes may yield simple descriptions and sketches, which may lead to increasingly more detailed drawings and richer verbal descriptions. Things can be done to materials to change their properties, but not all materials respond in the same way to what is done to them. Younger students emphasize physical properties while older students will recognize chemical changes. Appropriate tools can aid students in their efforts.

#### **PERFORMANCE INDICATOR 3.1**

Observe and describe properties of materials, using appropriate tools.

Major Understandings:

3.1a Matter takes up space and has mass. Two objects cannot occupy the same place at the same time.

3.1b Matter has properties (color, hardness, odor, sound, taste, etc.) that can be observed through the senses.

3.1c Objects have properties that can be observed, described, and/or measured: length, width, volume, size, shape, mass or weight, temperature, texture, flexibility, reflectiveness of light.

3.1d Measurements can be made with standard metric units and nonstandard units. (*Note: Exceptions to the metric system usage are found in meteorology.*)

3.1e The material(s) an object is made up of determine some specific properties of the object (sink/float, conductivity, magnetism). Properties can be observed or measured with tools such as hand lenses, metric rulers, thermometers, balances, magnets, circuit testers, and graduated cylinders.

3.1f Objects and/or materials can be sorted or classified according to their properties.

3.1g Some properties of an object are dependent on the conditions of the present surroundings in which the object exists. For example:

- temperature - hot or cold
- lighting - shadows, color
- moisture - wet or dry

#### **PERFORMANCE INDICATOR 3.2**

Describe chemical and physical changes, including changes in states of matter.

Major Understandings:

3.2a Matter exists in three states: solid, liquid, gas.

- solids have a definite shape and volume
- liquids do not have a definite shape but have a definite volume
- gases do not hold their shape or volume

3.2b Temperature can affect the state of matter of a substance.

3.2c Changes in the properties or materials of objects can be observed and described.

## Key Idea 4:

Energy exists in many forms, and when these forms change energy is conserved.

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Students should understand that energy exists in a variety of forms. Students should observe the results of simple energy transformations from one form to another in their physical environment. The safe use and respect of various energy forms should be stressed in the classroom.

Note: Attempting to understand heat and its difference from temperature is too abstract a concept for elementary students. Energy is a subject that is difficult for students to understand. Students cannot hold it in their hands and, with the exception of light, they cannot see it.

**PERFORMANCE INDICATOR 4.1** Describe a variety of forms of energy (e.g., heat, chemical, light) and the changes that occur in objects when they interact with those forms of energy.

Major Understandings:

- 4.1a Energy exists in various forms: heat, electric, sound, chemical, mechanical, light.
- 4.1b Energy can be transferred from one place to another.
- 4.1c Some materials transfer energy better than others (heat and electricity).
- 4.1d Energy and matter interact: water is evaporated by the Sun's heat; a bulb is lighted by means of electrical current; a musical instrument is played to produce sound; dark colors may absorb light, light colors may reflect light.
- 4.1e Electricity travels in a closed circuit.
- 4.1f Heat can be released in many ways, for example, by burning, rubbing (friction), or combining one substance with another.
- 4.1g Interactions with forms of energy can be either helpful or harmful.

**PERFORMANCE INDICATOR 4.2** Observe the way one form of energy can be transferred into another form of energy present in common situations (e.g., mechanical to heat energy, mechanical to electrical energy, chemical to heat energy).

Major Understandings:

- 4.2a Everyday events involve one form of energy being changed to another.
  - animals convert food to heat and motion
  - the Sun's energy warms the air and water
- 4.2b Humans utilize interactions between matter and energy.
  - chemical to electrical, light, and heat: battery and bulb
  - electrical to sound (e.g., doorbell buzzer)
  - mechanical to sound (e.g., musical instruments, clapping)
  - light to electrical (e.g., solar-powered calculator)