

## Teacher's Guide

### Grade 5: Physical Properties of Matter



**TEKS 5.5 Matter and Energy:** The student knows that matter has measurable physical properties and those properties determine how matter is classified, changed, and used. The student is expected to:

**A)** classify matter based on physical properties, including mass, magnetism, physical state (solid, liquid, and gas), relative density (sinking and floating), solubility in water, and the ability to conduct or insulate thermal energy or electric energy;

**B)** identify the boiling and freezing points of water on the Celsius scale.



**Background Information:** In this unit, students continue to focus on using the physical properties of matter to classify matter, including mass, magnetism, volume and physical state. This year, students learn that the ability of matter to sink or float indicates relative density. In addition, they learn about the property of solubility, which determines whether or not a substance dissolves in water. They also learn to classify matter as a thermal insulator or conductor based on its ability to insulate or conduct thermal energy and as an electrical insulator or conductor based on its ability to insulate or conduct electrical energy.

In this unit, students are presented with more indepth information about the properties of solids, liquids, and gases and recognize that mass is a constant property. They recognize the boiling and freezing/melting points of water, in degrees Celsius. They also learn that these temperature points are constant for water and understand how these temperature points relate to changes in the physical state of water.

The concepts presented during this unit reinforce the big idea that the physical properties of matter can be used to determine how matter is classified, how it can be changed and how matter can be used.



**Prerequisite Knowledge:** Prior to this year, student learned that all objects are made of matter and have physical properties. They know that physical properties can be observed and identified, using their senses, or measured using tools, and then compared in order to to classify matter. They have

experience identifying and comparing the physical properties of color, shape, relative size, state, texture and the ability to sink or float. They also have experience measuring (in metric units) and comparing the physical properties of temperature, mass, weight and volume. Students can also recognize the difference between observable and measured data.

By now, students know and are able to predict changes in matter caused by cooling and heating, including the melting, freezing and evaporation of water.



**Common Misconceptions:** Due to lack of experience comparing solids and liquids, students may believe that all solids are denser than all liquids.

Students may be confused about the apparent ability of both liquids and solids to be poured. However, when liquids are poured, they spread out and the surface becomes level. When solids, such as sand or sugar, are poured the small pieces of solids pile up to form a mound.

Students may also believe that heat and cold are different types of energy and that cold is transferred from one object to another. It is important to help students understand that cold describes the absence or loss of heat energy. Heat is thermal energy that is transferred from one object or substance to another. Heat energy always moves from a warmer object or substance to a cooler one until both are the same temperature.

Students may not understand that conductors and insulators are opposites. A material that is a good conductor is also a poor insulator and vice versa. Both conductors and insulators are useful and serve different purposes.



**Essential Questions:**

1. Why is it important to identify and measure the physical properties of matter?

*Once identified and measured, the physical properties of matter can be used to compare matter, to classify matter and to determine how matter can be changed and used.*

2. How does the physical property of density determine whether an object will sink or float when placed in water?

*Density is a physical property that measures the amount of matter an object contains compared to its volume, or the amount of space it takes up. An object that is denser than water has more mass than does the same volume*

*of water. A metal cube and a glass marble will both sink when placed in water because they contain more matter than the same volume of water. They are denser than water. Items such as a cork or a foam cube are less dense than water, and will float when placed in water. They are less dense than water.*

**3.** Why is an oven mitt made of thick cloth useful when picking up hot objects?

*The thick cloth of an oven mitt will not allow heat energy to pass through it and reach your hand. So, thick cloth is a good insulator of heat energy. This makes thick cloth a useful material for making oven mitts used to pick up hot objects.*

**4.** What is the importance of the temperatures, 0 °C and 100 °C, when changing the physical state of water?

*These temperatures are important because they pinpoint the temperatures when water begins to change state. At 0 °C liquid water begins to freeze to form solid ice as heat energy is removed. It is also the temperature at which solid ice begins to melt to form liquid water as heated energy is added. 0 °C is known as the freezing/ melting point of water. 100 °C is the temperature at which liquid water begins to boil and change to water vapor, or steam. It is known as the boiling point of water.*

**5.** What is the best way to determine whether a material is a conductor or an insulator of electrical energy?

*The best way to determine whether a material is an electrical conductor or an electrical insulator is to place the material within the path of an electric circuit that contains a light bulb or buzzer. If the material is an electrical conductor, it will close the circuit and the light bulb or buzzer will work. If the material is an electrical insulator, it will open the circuit and the light bulb or buzzer will not work.*

**6.** What is the best way to determine whether a substance is soluble or insoluble when placed in water?

*If a substance is soluble in water, it will mix and remain completely and*

*evenly mixed in the water. If insoluble, it will not mix completely when placed in water and will either float on the top of the water, if less dense, or if denser than water, it will soon settle to the bottom of the container.*



**Notes:**