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**TEKS 1.5 Matter and energy. The student knows that objects have properties and patterns. The student is expected to:**

- (A) classify objects by observable properties of the materials from which they are made, such as larger and smaller, heavier and lighter, shape, color, and texture; and
  - (B) predict and identify changes in materials caused by heating and cooling, such as ice melting, water freezing, and water evaporating.
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**Background Knowledge**

Objects and substances can be sorted, grouped, and classified by their observable physical properties. Properties are features in appearance which can be sensed or scientifically measured. Properties include size, weight, shape, color, and texture. Physical properties are largely determined by the composition of materials in the object or substance. Students must understand that the materials that are used to make objects and substances are chosen for their properties. For instance, many things, such as eyeglasses and frames, are currently made of plastic, because plastic has many of the same properties of glass, but weighs much less. Students should be able to classify objects by properties and identify the property used.

Students should be able to recognize and describe the changes that happen to water and ice with the addition or removal of heat. When enough heat is removed from water (in the freezer), the water changes state and turns into a solid crystalline substance we call ice. This process is called freezing. If heat energy is added to ice, its state changes, and the ice becomes liquid water. This process is called melting. Melting happens to many substances when heat is added. When enough heat is added to liquid water, its state changes to a gas we call water vapor. This process is called evaporation, and explains why a water puddle seems to disappear after a rain, and the water level drops in a pan of water that is heating on the stove.

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**Essential Questions**

Name some observable properties of objects that can be used to describe and identify the objects.

(Color, relative mass, relative sizes, shape, state, taste, scent, texture, relative weight, relative temperature)

What other materials change state when heat is added or removed?

(Chocolate melts, butter melts, crayons melt; Kool-Aid becomes a popsicle when put in the freezer; cream and sugar become ice cream when heat energy is removed and they freeze.)

What tool would I use to determine the mass of an object?

(Scale)

What sense would I use to determine the texture of this object?

(Touch)

What tool would I use to determine how much heat energy a substance contains?

(Thermometer)

What other changes occur when a substance is heated besides melting?

(Water changes to water vapor when enough heat energy is added.)

## Disappearing Water



### **Background Information:**

The difference between solids, liquids, and gases is how their molecules are arranged. Molecules are the tiny particles that make up all matter. Solids have tightly packed molecules that can only vibrate in place. Liquids have molecules that are not as tightly packed as solids so they have room to slide past one another. They have more heat energy and are able to move faster and farther than the molecules in solids. Gases are made up of molecules that are spread very far apart and move very fast because gases contain more heat energy than liquids or solids. When water evaporates, liquid water molecules speed up and move farther apart from one another. When they do this, some of the molecules escape into the air as a gas called water vapor. Even though we cannot see it, water vapor is a part of the air that surrounds us.

### **Objective:**

- to predict and identify changes in materials caused by heating and cooling such as ice melting, water freezing, and water evaporating.

### **Materials:**

- Construction paper
- A small cup or bowl of water
- Paper towels

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**How to Conduct:**

- Give students a piece of construction paper and a small cup of water.
- Have the students dip one finger in a cup of water, and draw a circle in the middle of the construction paper with their wet finger.
- Ask the students to set the construction paper off to the side and tell them to predict what they think will happen to the water.
- Once the water has evaporated, ask students “Where did the water go?”
- If students think the construction paper absorbed the water, have them tear the paper in half where they made the circle of water so they can see that the paper is dry.
- Explain that the water went into the air as an invisible gas called water vapor.

### Sorting Natural Objects



#### **Objective:**

- to classify objects by observable properties of the materials from which they are made, such as larger and smaller, heavier and lighter, shape, color, and texture.

#### **Materials:**

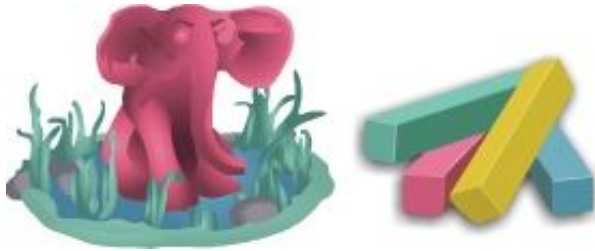
- An assortment of natural objects such as rocks, twigs, flowers, leaves, etc.
- Primary balances and some type of non-standard unit like paper clips or unsharpened pencils

#### **How to Conduct:**

- Collect an assortment of objects found in nature (rocks, twigs, flowers, leaves, etc.), and display them on a large table in the classroom.
- Encourage students to sort the objects using their own criteria. For example, students may choose to sort the objects based on whether they are living or nonliving or by color. Once finished, have each student explain to the class how they sorted the objects. At the conclusion, have the students explain why they must wash their hands.
- For a challenge, display just the rocks, and encourage the students to sort just the rocks using their own criteria. They may sort according to color, texture, or size. If they sort by size, then allow the students to use the primary balances to record mass and use the non-standard units to measure dimensions.
- At the conclusion, have the students explain why they must wash their hands.

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### Changing Properties Using Modeling Clay



#### **Materials:**

- Modeling clay
- Moist sand
- Non-standard units of measure (i.e. paper clips, unsharpened pencils)

#### **How to Conduct:**

- Give students a piece of modeling clay and a pile of moist sand, and ask them to describe the properties of the clay and the sand. Have the students measure the dimensions of the piece of modeling clay using the non-standard units before starting.
- Then challenge students to create the shape of an animal by using the clay or the sand.
- Once they have finished, ask:
  - Which material did you choose to use to make your animal?
  - Why did you choose this material over the other material?
  - How are the properties of what you made different from the properties of the material you chose to use? Have the students measure the dimensions of the finished animal using the non-standard units. (Students should recognize that all the properties remained the same, except for shape.)

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## Measuring and Comparing the Volume of Rocks

### **Objective:**

- to observe that matter takes up space, or has volume, that can be observed, measured, recorded and compared.
- to observe that different sized objects have different volumes that can be measured and compared.

### **Materials:** (per group of three students)

- 1 small clear or transparent plastic bowl, with a strip of masking tape that goes up the side of the bowl from top to bottom



**Masking Tape Strip**

- 3 dark colored markers
- a container of water
- 2 different sized rocks that will easily fit in the bowl
- paper towels
- safety goggles (per student)

**Safety:** Discuss with students the need to wear safety goggles during the investigation.

### **How to Conduct:**

1. Have one student in each group fill approximately half the bowl with water.
  2. Have another student use one of the colored markers to mark the level of the water in the bowl on the masking tape strip. (Choose the color so that each group is using the same color to mark the different levels.)
  3. Have students observe, draw and label a picture in their journals of the bowl with water and the tape showing the level of the water.
  4. Have another student pick up the smaller rock and place it carefully into the water in the bowl without touching the water and mark the water level on the masking tape with a different colored marker.
  5. Discuss what happened with students and why. (The rock is made of matter and matter takes up space. The amount of space it takes up is called its volume. The volume of the rock caused the water level to rise.)
  6. Have students draw a picture and describe what they observed in their journals.
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7. Have a student carefully remove the rock from the bowl and place on a paper towel. Check to make sure the water level is the same as when they started. If needed, add water.
  8. Ask the students to predict what will happen when the larger rock is placed in the water.
  9. Have one student place it carefully into the water in the bowl without touching the water and mark the water level on the masking tape with the last colored marker.
  10. Discuss what students observe and why this happened. (The volume of the larger rock is greater, so it takes up more space and causes the water level to rise higher than did the smaller rock.)
  11. Have students draw a picture and describe what they observed in their journals.



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### The Definite Volume of a Liquid

- to observe that liquids have a definite volume
- to infer that the volume remains the same for liquids even when poured into different sized and shaped containers (volume is conserved)

**Materials:** (per group of three students)

- 1 small clear or transparent plastic bowl, with a strip of masking tape that goes up the side of the bowl from top to bottom.



Masking Tape Strip

- 2 dark colored markers
- a container of water
- 2 different colored markers
- clear cup with a line drawn in permanent marker to designate the fill line
- a container of water
- paper towels
- safety goggles (per student)

**Safety:** Discuss with students the need to wear safety goggles during the investigation.

**How to Conduct:**

1. Have students fill the clear cup with water up to the fill line.
  2. Have students draw a picture of what they observe in their journals.
  3. Have the students guess where the level of the water will be when poured into the bowl. Have one student in each group mark where their group predicts the level of water will be in the bowl by on the masking tape on the side of the bowl with one of the colored markers.
  4. Have one student in each group carefully pour all the water from the clear cup into the bowl.
  5. Discuss whether their predictions were correct or not.
  6. Have students draw and describe in their journals what they observed.
  7. Then have students predict where the water level will be when the water is poured back into the cup.
  8. Discuss the results with the students. (The volume of a liquid remains the same when poured from one container to another. Liquids have a definite volume, but they do not have a definite shape. Liquids take the shape of their container.)
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