

Name: \_\_\_\_\_ Date: \_\_\_\_\_

## Student Exploration: Density Experiment: Slice and Dice

**Vocabulary:** density, mass, matter, volume

**Prior Knowledge Questions** (Do these BEFORE using the Gizmo.)

1. What do you think would happen if you threw a block of Styrofoam™ into the water?

\_\_\_\_\_

2. What would happen if you broke the Styrofoam up into lots of pieces, then threw the pieces into water? \_\_\_\_\_

3. What would happen if you threw a big rock into water? \_\_\_\_\_

4. What would happen if you broke the rock into little pieces, then threw the pieces into water?

\_\_\_\_\_

### Gizmo Warm-up

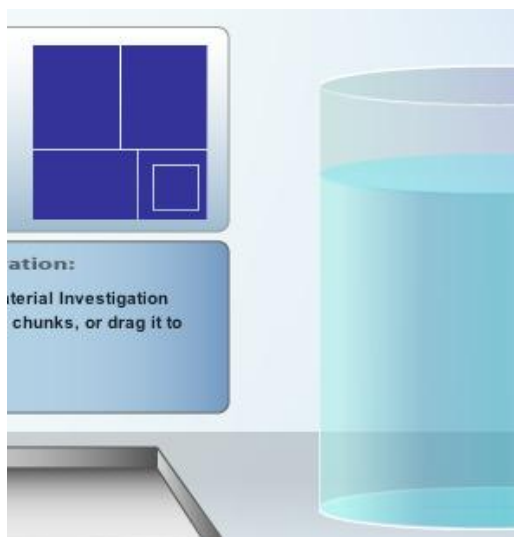
The *Density Experiment: Slice and Dice* Gizmo™ allows you to compare different-sized pieces of the same material.

1. Check that **Styrofoam** is selected. Drag the whole Styrofoam piece into the water.

Does it sink or float? \_\_\_\_\_


2. Click **Reset**, and then click **Slice** to cut the styrofoam into pieces. Drag each piece into the water and then back to the block.

What happens? \_\_\_\_\_



3. How do you think the amount of a material affects its tendency to sink or float? \_\_\_\_\_

\_\_\_\_\_

<b>Activity A:</b> <b>Slice and dice</b>	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> <li>Click <b>Reset</b>. Check that <b>Styrofoam</b> is selected.</li> <li>A calculator is recommended for this activity.</li> </ul>	
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**Introduction:** The **density** of a material is the amount of **mass** per unit of **volume**. Density is calculated by dividing an object's mass by its volume.

**Question: How does density depend on the amount of material?**

1. Form hypothesis: How do you think cutting up a material will affect its density? \_\_\_\_\_  
 \_\_\_\_\_

2. Collect data: Click **Slice**. Choose a piece of Styrofoam and drag it onto the **Material Investigation** tray. Record the mass and volume, then calculate the density by dividing the mass by the volume. Replace the piece, and then repeat for the remaining pieces.

Piece	Mass (g)	Volume (cm <sup>3</sup> )	Density (g/cm <sup>3</sup> )
1			
2			
3			
4			
5 (if available)			


3. Analyze: What do you notice about the density of the Styrofoam pieces? \_\_\_\_\_  
 \_\_\_\_\_

4. Predict: What do you think is the density of the whole block of Styrofoam? \_\_\_\_\_

5. Test: Click **Reset**. Drag the whole (uncut) block of Styrofoam onto the **Material Investigation** tray. Record its mass and volume and calculate the density.

Mass: \_\_\_\_\_ Volume: \_\_\_\_\_ Density: \_\_\_\_\_

6. Apply: An archaeologist finds a golden figurine. How could she determine if the figurine is solid gold without cutting it? \_\_\_\_\_  
 \_\_\_\_\_

<b>Activity B:</b> <b>Sink or float?</b>	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> <li>Click <b>Reset</b>.</li> </ul>	
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**Question: The density of water is 1.0 g/mL, which is equivalent to 1 g/cm<sup>3</sup>. How does an object's density affect whether it sinks or floats in water?**

1. Form hypothesis: How do you think an object's density relates to whether it sinks or floats?

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2. Collect data: Measure the mass and volume of each known material, and calculate its density. Then drag each material into the water to see whether it sinks or floats.

Material	Mass	Volume	Density	Sinks or floats?
Styrofoam				
Aluminum				
Wood				
Slate				

3. Analyze: How does an object's density determine if it will sink or float? \_\_\_\_\_

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4. Apply: Find the density of Unknown A and Unknown B. Based on their densities, predict whether each will sink or float. Then, test your prediction using the Gizmo.

Material	Mass	Volume	Density	Sinks or floats? (prediction)	Sinks or floats? (actual)
Unknown A					
Unknown B					

5. Extend your thinking: Compare the three floating materials. How does the density of each material relate to how high it floats in the water? \_\_\_\_\_

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