

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?

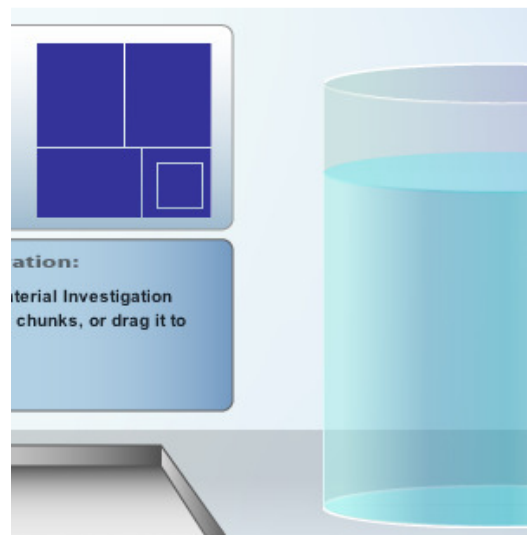
Gizmo Warm-up

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? _____

| | | |
|---|--|---|
| Activity A: Slice and dice | <u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> • Click Reset. Check that Styrofoam is selected. • A calculator is recommended for this activity. |  |
|---|--|---|

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 ³) | Density (g/cm ³) |
|------------------|----------|---------------------------|------------------------------|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 (if available) | | | |

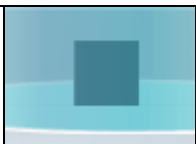
3. Analyze: What do you notice about the density of the Styrofoam pieces? _____

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? _____

| | | |
|---|---|---|
| Activity B: Sink or float? | <u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> Click Reset. |  |
|---|---|---|

Question: The density of water is 1.0 g/cm^3 . 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?

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? _____

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? _____
