

Name: _____

Date: _____

Student Exploration: Density

Vocabulary: density, mass, matter, volume

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

1. List three objects that you think would sink in water.

2. List three objects that you think would float in water.

3. Why do you think some things float and some things sink?

Gizmo Warm-up

1. In the Gizmo™ select an object and drag it onto the scale. **Mass** is the amount of **matter**, or “stuff,” in an object.

A. Which object did you choose? _____

B. What unit of measurement is used for mass? _____

C. What is the object's mass? _____

2. Drag the object into the graduated cylinder. The number above the cylinder gives the **volume**, the amount of space the object takes up.

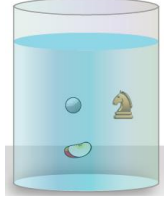
A. What unit of measurement is used for volume? _____

B. Which object did you choose? _____

C. What is your object's volume? _____

D. Drop the object into the beaker of water. Does it sink or float? _____



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| Activity A: Sink or float? | <u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> • Replace all objects on the shelf. • Be sure the liquid in the beaker is Water. |  |
|---|--|---|

Question: How do mass and volume affect sinking and floating?

1. Predict: Which objects will float in water? Which will sink? Record your predictions below.

| Object | Prediction (sink or float?) | Mass | Volume | Result (sink or float?) |
|----------------|-----------------------------|------|--------|-------------------------|
| Ping pong ball | | | | |
| Golf ball | | | | |
| Apple | | | | |
| Chess piece | | | | |
| Penny | | | | |
| Rock | | | | |

2. Experiment: Use the Gizmo to find the mass and volume of each object and whether it floats or sinks. Record your results in the table.

3. Analyze results: Look at the data in your table.

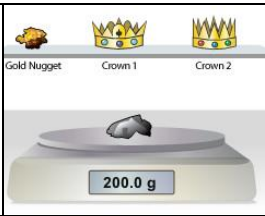
A. Can you use mass alone to predict whether an object will sink or float? Explain.

B. Can you use volume alone to predict whether an object will sink or float? Explain.

4. Draw conclusion: Can you use mass *and* volume to predict whether an object will sink or float in water? Explain your thinking.

5. Apply: Measure the mass and volume of the toy soldier: Mass _____ Volume _____

Will it float or sink? _____ Use the Gizmo to test your prediction.

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| Activity B: Calculating density | <u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> • Replace the objects on the shelves. • Be sure the liquid in the beaker is Water. |  |
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Question: How does density tell you whether an object will sink or float?

1. Calculate: **Density** is the amount of mass in a certain volume. To find the density of an object, divide its mass by its volume. Density is recorded in units of grams per milliliter (g/mL). What is the density of an object if its mass is 100 g and its volume is 50 mL?

2. Record data: In the Gizmo, find mass and volume of the objects listed below. Then calculate each object's density and record it. Finally, test whether each one sinks or floats in water.

| Object | Density | Sink or Float? |
|-------------|---------|----------------|
| Chess piece | | |
| Rock | | |
| Toy soldier | | |
| Apple | | |

3. Draw conclusion: The density of water is 1.0 g/mL. Look at the data in your table. How can you use the density of an object to predict whether it will sink or float?

4. Apply: In the Gizmo, either **Crown 1** or **Crown 2** is solid gold (but not both). Find the density of the gold nugget and of each crown. (Hint: You will probably need a calculator to do this.)




A. Density of the gold nugget: _____

B. Density of Crown 1: _____

C. Density of Crown 2: _____

D. Which crown is pure gold? _____

| | | |
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| Activity C: Egg-speriment | <u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> • Replace all the objects on the shelf. |  |
|--|---|---|

Question: How does an object behave in different liquids?

1. Observe: Use the Gizmo to explore whether the **egg** sinks or floats in different liquids. Record what you find in the table below.

| Liquid | Water | Oil | Gasoline | Seawater | Corn Syrup |
|----------------|-------|-----|----------|----------|------------|
| Sink or Float? | | | | | |

2. Draw conclusion: Which liquids are denser than the egg? Which are less dense? Explain your reasoning.

3. Extend your thinking: Observe the egg in each liquid again.

- A. In which liquid does the egg float the highest? _____
- B. In which liquid does the egg sink the fastest? _____
- C. Which liquid do you think is the densest? Least dense? Explain. _____

4. Challenge yourself: Using the objects in the Gizmo to help you, list the liquids from densest to least dense. Discuss your answer with your teacher and classmates. (Hint: Compare where objects float within each liquid.)
