

Name _____ Class _____

Density and Crust

Part I: Simulating Density

Claim: Objects with a larger mass will sink in water.

Objective: You will use a simulation to collect evidence to either support or refute this claim.

1. Open the PhET Simulation, "Density"
<https://phet.colorado.edu/en/simulation/density>. (or search, "phet density")
2. Explore each of the objects by placing them in water. Record if each object sinks or floats, its mass, volume and density.

Object	Sinks/Floats	Mass (kg)	Volume (L)	Density (kg/L)
Styrofoam				
Wood				
Ice				
Brick				
Aluminum				

Write a rule about the densities of sinkers vs. floaters.

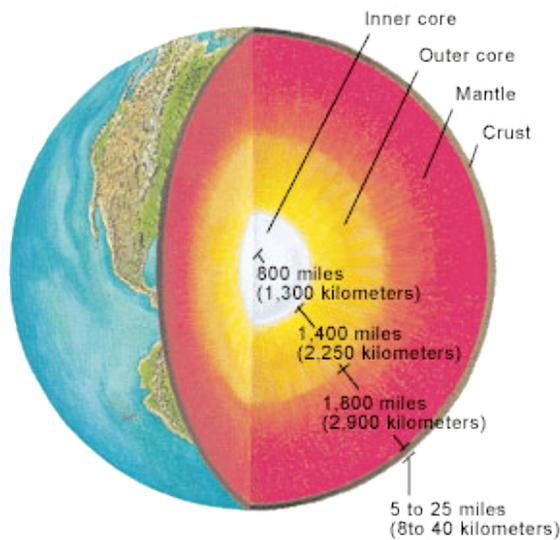
3. Click on the "My Block" option. Design a block that has the same density as water.
 Density of your block _____ kg/L
 How do you know it has the same density as water?

4. Continue to explore the simulation. What kind of evidence do you need to definitively support or refute the claim?

5. Collection of evidence to support or refute the claim.

6. Does the evidence you collected support or refute the claim, "Objects with a larger mass will sink in water."? Construct an explanation of these results. Share an everyday example that demonstrates your point.

Part II: Layers of the Earth



Based on your understanding of floating and sinking, what can you infer about the density of the Earth's crust (solid) compared to the mantle (molten)? Extend this inference to the densities of the inner core and outer core.

Part III: Oceanic and Continental Crusts

The Earth is covered in two types of crust, continental and oceanic. Continental crust is made mostly of a rock called granite with a density of 2.65 to 2.75g/cm³, whereas, oceanic crust is made of a rock called basalt with a density of approximately 2.9g/cm³.

Why do you think this difference in density is important for the existence of oceans? What would happen if both types of crust had the same density?

Name _____ Class _____

Exploring Density and Crust Interactions

Part I: Simulating Density

Claim: Objects with a larger mass will sink in water.

Objective: You will use a simulation to collect evidence to either support or refute this claim.

1. Open the PhET Simulation, "Density"
<https://phet.colorado.edu/en/simulation/density>. (or search, "phet density")
2. Explore each of the objects by placing them in water. Record if each object sinks or floats, its mass, volume and density.

Object	Sinks/Floats	Mass (kg)	Volume (L)	Density (kg/L)
Styrofoam	floats	0.75	5.00	0.15
Wood	floats	2.00	5.00	0.40
Ice	floats	4.60	5.00	0.92
Brick	sinks	10.00	5.00	2.00
Aluminum	sinks	13.50	5.00	2.70

Write a rule about the densities of sinkers vs. floaters.

Answers will vary.

Objects with a density less than 1.00 kg/L will float, objects with a density greater than 1.00kg/L will sink.

3. Click on the "My Block" option. Design a block that has the same density as water.

Density of your block 1.00 kg/L

How do you know it has the same density as water?

When placed in the water, the object with a density of 1.00 kg/L neither sinks nor floats.

4. Continue to explore the simulation. What kind of evidence do you need to definitively support or refute the claim?

Answers will vary.

5. Collection of evidence to support or refute the claim.

Answers will vary.

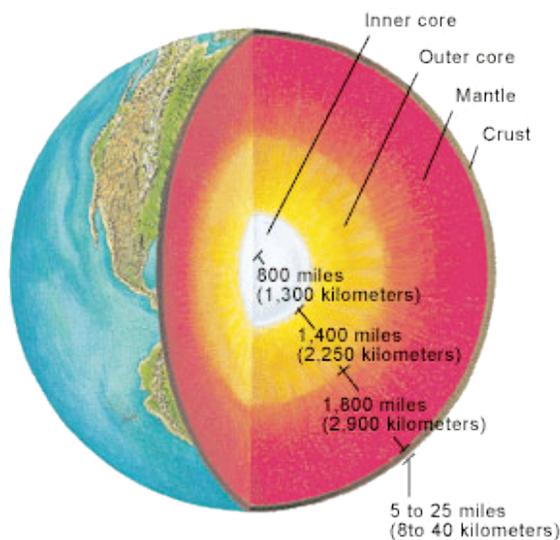
Under the "same density" tab, objects have masses of 1kg, 2kg, 3kg, and 4kg. All objects float at the same level but have varying volumes.

6. Does the evidence you collected support or refute the claim, "Objects with a larger mass will sink in water."? Construct an explanation of these results. Share an everyday example that demonstrates your point.

Refute. As the mass of an object increases, its volume increases at the same rate keeping the density of the object the same. Density determines if an object will float or sink, not its mass.

Example: Ships weigh many tons and float but a penny will sink.

Part II: Layers of the Earth



Based on your understanding of floating and sinking, what can you infer about the density of the Earth's crust (solid) compared to the mantle (molten)? Extend this inference to the densities of the inner core and outer core.

The crust must be less dense than the mantle otherwise the crust would sink. That means that density increases as one moves closer to the center of the Earth.

Part III: Oceanic and Continental Crusts

The Earth is covered in two types of crust, continental and oceanic. Continental crust is made mostly of a rock called granite with a density of 2.65 to 2.75g/cm^3 , whereas, oceanic crust is made of a rock called basalt with a density of approximately 2.9g/cm^3 .

Why do you think this difference in density is important for the existence of oceans? What would happen if both types of crust had the same density?

It is important for that oceanic crust has a greater density than continental because it sits lower on top on the mantle. Because water flows downhill and pools in regions of low elevation, we are able to have oceans. If both types of crust had the same density, there would be no place for the water to pool so the entire Earth would be covered in a shallow layer of water. This might cause more evaporation as more surface area is exposed.