



5-Minute Refresher: DENSITY

SIEMENS | Foundation

 **Discovery**
EDUCATION™

Density- Key Ideas

- Density is a measure of how much mass is located within a specific volume of space:

$$\text{Density} = \text{mass} / \text{volume}$$

- If a small object has a lot of mass, it has a high density.
Examples: medicine ball, steel marble
- If a large object has very little mass, it has low density.
Examples: hot air balloon, sheets of cork
- Density determines whether substances will sink or float.



Density- Sinking and Floating

- If two fluids do not mix together, the less dense fluid will float on top of the denser fluid. Example: oil floats on water
- In general, a solid that is less dense than a fluid will float on the fluid. Example: sailboats float on water
- Temperature can affect the density of a fluid. When a fluid is heated, its molecules spread out and the fluid becomes less dense. Thus, a warmer volume of fluid will rise and “float” on top of a cooler volume of the same fluid. Examples: hot and cold currents in air and water



Density- Learning Objectives for Grades K - 3

- Some objects are light and others are heavy.
- Some objects take up a small amount of space and others take up a large amount of space.
- Some objects sink in water and some float.
- An object will continue to sink or float in water unless some properties of the object change.



Density- Learning Objectives for Grades 4 - 6

- Density is the amount of mass located in a specific volume.
- The density of an object can change if either the mass or volume of the object is changed.
- Fluids, such as water, have a certain density.
- If an object is more dense than water, it will sink; if it is less dense than water, it will float.



Density- Prior Knowledge for Grades K - 3

- Students should be able to observe and identify various physical properties of objects, such as size, shape, color, texture, and mass.
- Most students have observed different objects that sink or float in water. Students should be able to list different objects that sink and float, but they will be unable to explain why this happens.



Density- Prior Knowledge for Grades 4 - 6

- Students should understand that mass is the amount of matter in an object, and volume is the amount of space that an object occupies.
- Students have most likely observed that sinking and floating relates to the mass of an object, but they may not realize that it also relates to the volume of the object.

Density- Common Misconceptions

- If an object is very heavy, it must be very dense.
 - **Reality:** Density is not necessarily related to how heavy an object is; density is related to how closely packed the mass is distributed over the object. An object, such as a sailboat, may be very heavy, but the sailboat is not dense because its mass is spread out over a large volume.
- Heavy objects sink and light objects float.
 - **Reality:** Sinking and floating are related to density, not mass. If an object is more dense than an equal volume of fluid, the object will sink in that fluid.



Density- Additional Information

Convection is a process of heat transfer in the ocean, Earth's atmosphere, cooking ovens, and our homes. It relies on the principle of density. To learn more about this, watch the video at the following link:

http://siemensscienceday.com/activities/motion_in_the_ocean.cfm