

## Density Exercises



Background (Notes:  
learn this for upcoming test!!!)

**Density:** How **heavy** something is for its **size**. In more scientific terms density is mass/volume. Units will be in  $\text{g/cm}^3$  or  $\text{g/mL}$ .

**Mass:** amount of matter in something. Doesn't vary due to the gravity of the planet (weight does depend on the gravity of the planet where you are measuring). Measured with a balance, or an electronic scale. Units are grams (g).

**Volume:** the size of an object or how much space it takes up. For regular objects, those with straight sides, volume is  $L \times W \times H$ . Measure L, W, H in cm and multiply them together for volume. Units are  $\text{cm}^3$ . An irregular objects volume can be measured by finding out how much liquid (like water) that it displaces. This is also volume. Measure the amount of liquid you have to start, record, add your object, measure the ending volume, subtract the starting volume and you have the volume. Units are mL

**Important fact:** water has a density of  $1.00 \text{ g/cm}^3$  at room temperature.

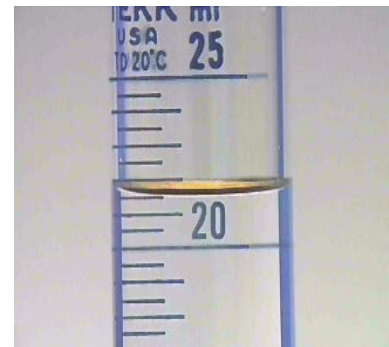
Density controls **sinking and floating** behavior. If it floats in water, it must have a density less than  $1.00 \text{ g/cm}^3$ .

**Conversion:** 1 mL is exactly the same as  $1 \text{ cm}^3$ .

Problems:

1. If a rectangle of metal is 2.65 cm length, 2.51 cm width and 1.05 cm height, what is its volume: (Show your work for credit)

2. What is the volume shown in the graduated cylinder at the right?  
Hint: short marks are 0.5 mL.



3. An irregular crystal is placed in a graduated cylinder to measure its volume. The starting water level is 21.0 mL the ending water level is 36 mL. What is the volume of the irregular crystal? (Show work).
4. What is the density of a wooden block whose mass is 79.15 grams and whose volume is  $110 \text{ cm}^3$ ?  
Would this item float in water? (Show work)

5. A plastic rectangle has dimensions of 1.0, 2.0 and 3.0 cm respectively. It masses 5.5 grams when placed on an electronic scale. What is its volume, its density, and will it float if placed in water. (Show your work).
6. Mr. K is trying to identify a white crystal he found this summer by determining the density of it. He placed it on a scale and it massed out at 51.00 grams. When he placed it in 50.0 mL of water, the level rose to 61.4 mL. Can you identify the mineral based on density.



Mineral	Barite	Calcite	Gypsum
Density (g/cm <sup>3</sup> )	4.48	2.71	2.36

7. Mr. K has two liquids that will not mix together. He wants to know which one will float on the other. Liquid A has a volume of 15.00 mL and a mass of 17.5 g. Liquid B has a volume of 31.00 mL and a mass of 28.55 grams. Please find the density of both liquids and determine which floats on top.
8. Jessica bought a diamond on E-bay. Then Clarisse told her that sometimes people sell cubic zirconia as diamonds. Jessica's 1 carat diamond masses 0.22 grams. By placing it in a very precise graduated cylinder the liquid level rose from 20.00 mL to 20.06 mL. Real diamonds have a density of 3.6 g/cm<sup>3</sup> while the fakes have a density of 5.7 g/cm<sup>3</sup>. Is it likely that Jessica got ripped off or did she get the real thing for bling?



9. What is the density of a block whose dimensions are 2.5, 4.5, 6 cm and whose mass is 100.0 grams
10. A piece of wood has a volume of 115 cm<sup>3</sup> and a mass of 98.00 grams will it float? Justify your answer.