Mass, Volume, & Density

Short Informational Videos

Mass

Volume & Density

Buoyancy

Mass

Measurement of the amount of matter (or stuff) in an object

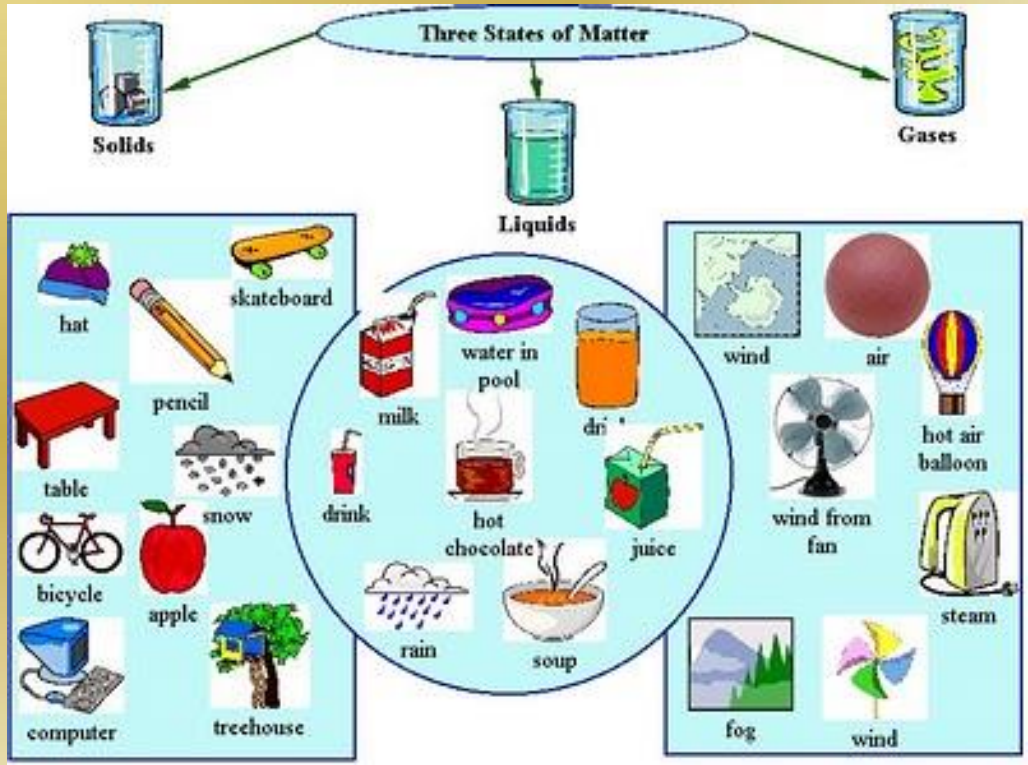
– Measured in grams (g)

There are 3 states of matter:

Solid

Liquid

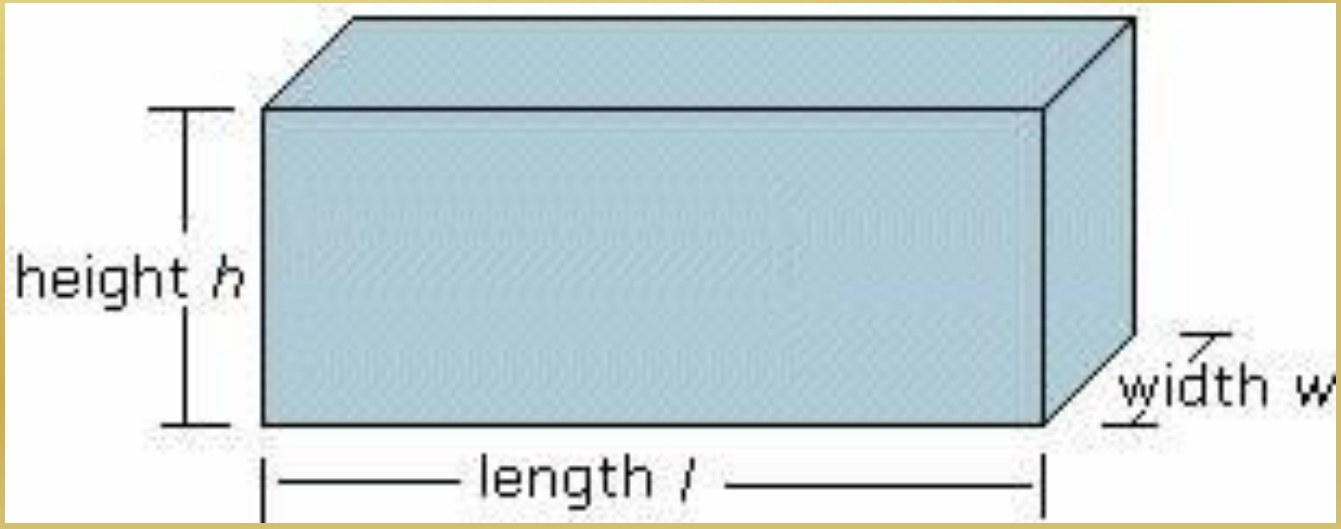
Gas



Volume

Measurement of the amount of space an object takes up

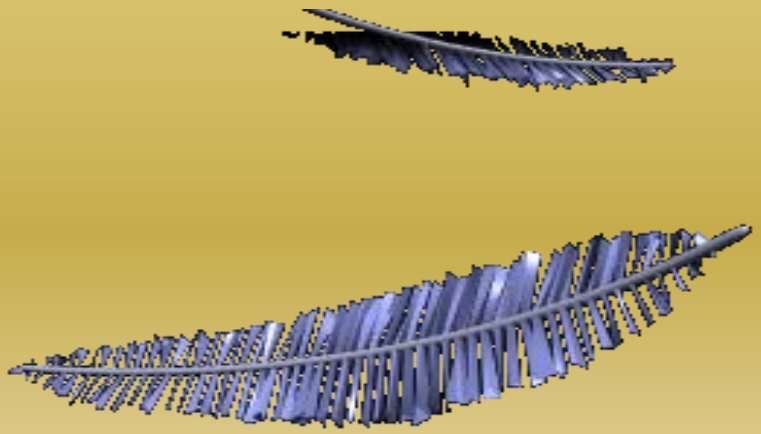
- **Measured in milliliters (ml) or cm^3**



Which do you think would have the greater volume? The greater mass?

Why?

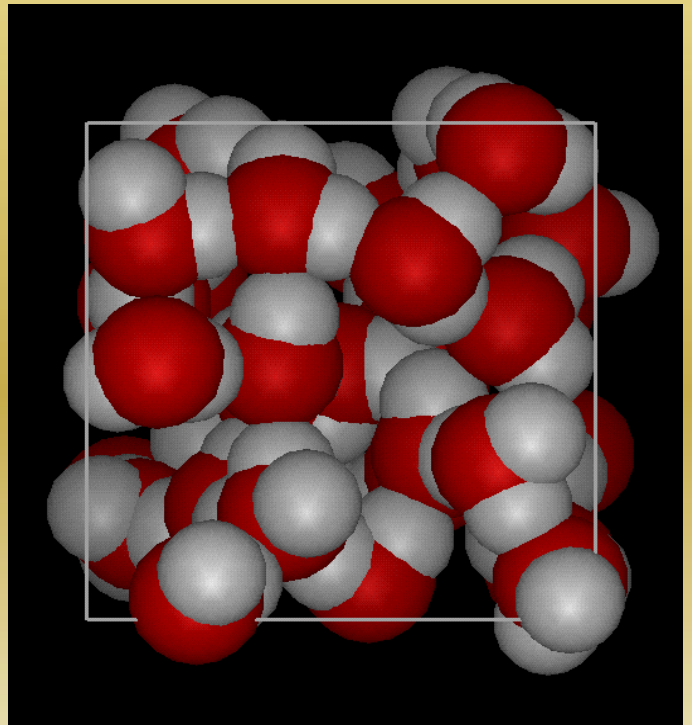
1 kg of feathers

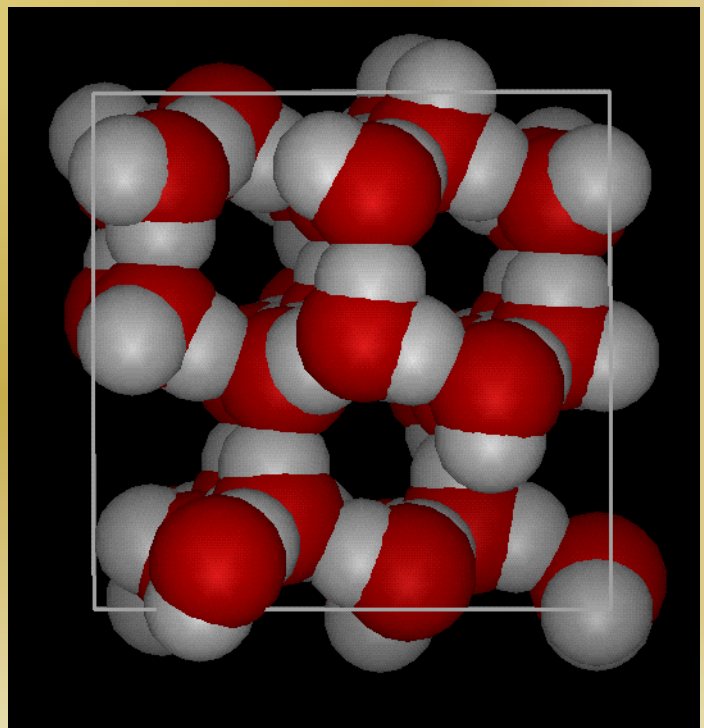


1 kg of rocks

Density

Density is defined as mass per unit volume. It is a measure of how tightly packed and how heavy the molecules are in an object. Density is the amount of matter within a certain volume.

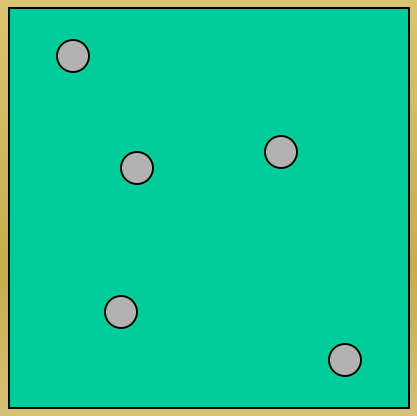


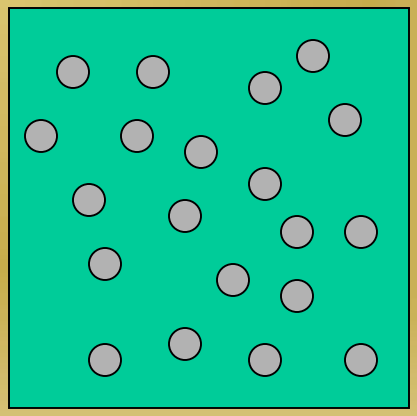


Which one is more dense?

Demonstration: People in a square

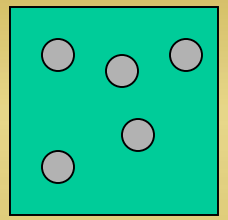
How about this: Which square is more dense?

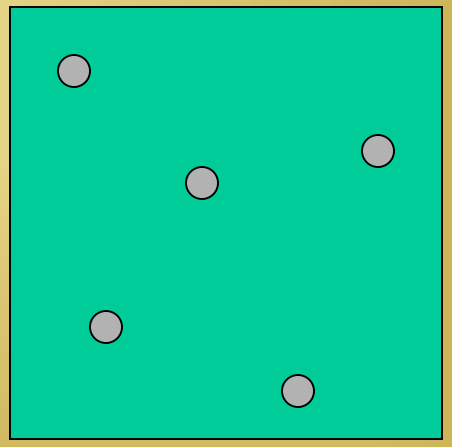




Which one is more dense?

Now which one is more dense?

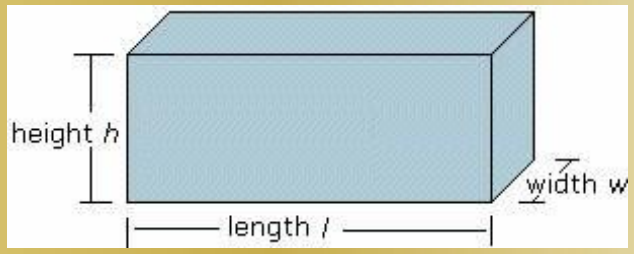




To find the density

1- Find the mass of the object

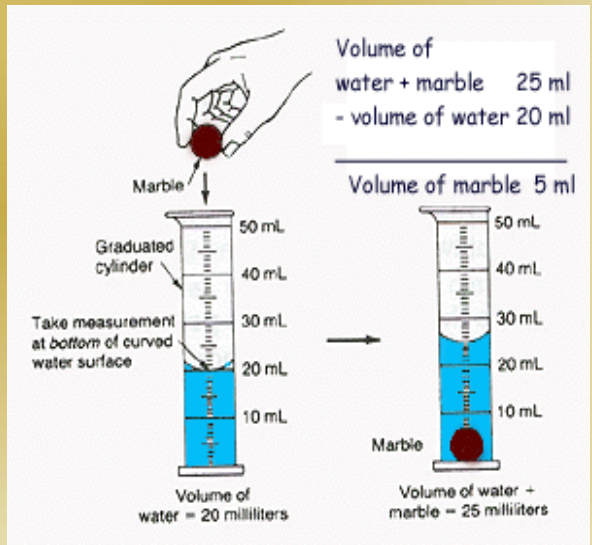
2- Find the volume of the object



3- Divide

$$\text{Density} = \frac{\text{Mass}\quad g}{\text{Volume}\ c^3}$$

ALWAYS REMEMBER UNITS!



To find density:

1) **Find the mass of the object**
2) **Find the volume of the object**
3) **Divide : Density = Mass - Volume**

Ex. If the mass of an object is 35 grams and it takes up 7 cm^3 of space, calculate the density.

To find density:

1) **Find the mass of the object**
2) **Find the volume of the object**
3) **Divide : Density = Mass - Volume**

Ex. If the mass of an object is 35 grams and it takes up 7 cm^3 of space, calculate the density

Set up your density problems like this:

Given: Mass = 35 grams
Volume = 7 cm^3

Formula: D = M / V

Unknown: Density (g/ cm^3)

Solution: D = 35g/7 cm3

D = 5 g/cm3

Let's try some density problems together Work on these problems with your neighbor

1 Frank has a paper clip. It has a mass of 9g and a volume of 3cm^3. What is its density?

2. Frank also has an eraser. It has a mass of 3g, and a volume of 1cm^3. What is its density?

3. Jack has a rock. The rock has a mass of 6g and a volume of 3cm^3. What is the density of the rock?

4. Jill has a gel pen. The gel pen has a mass of 8g and a volume of 2cm^3. What is the density of the rock?

Ways to Affect Density

Change Mass AND Keep Volume Same

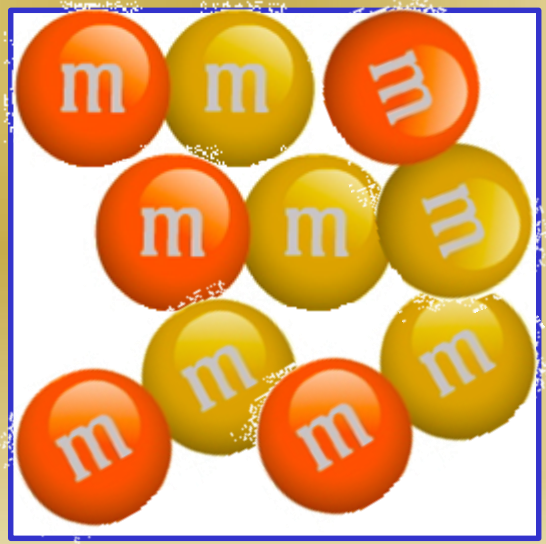
Increase the mass → increase density

Decrease the mass → decrease in density

Which container has more density?

A

B



Ways to Affect Density

Change Volume AND Keep Mass Same

Increase the volume → decrease density

Decrease the volume → increase density

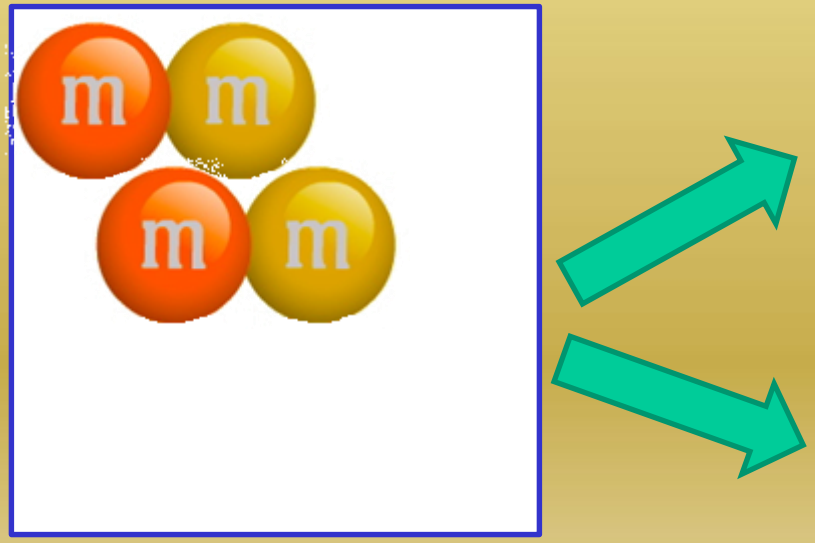
Which container has more density?

A

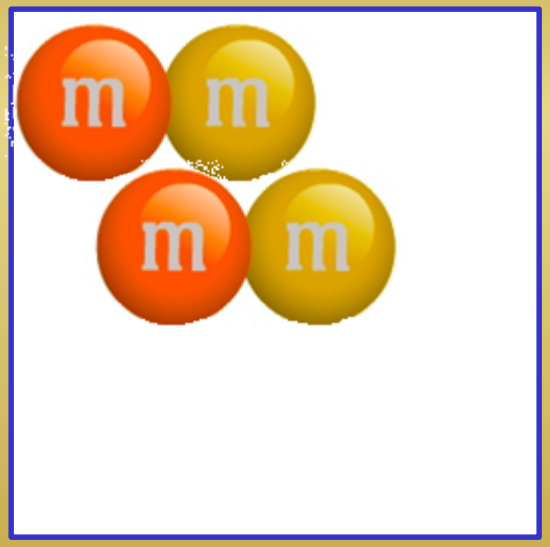
B

In your notebook illustrate the answer to the following question:

What 2 ways will INCREASE density?



What 2 ways will INCREASE density?



Keep the same mass AND decrease the volume

Keep the same volume AND increase the mass

Liquid Layers

If you pour together liquids that don't mix and have different densities, they will form liquid layers.

The liquid with the highest density will be on the bottom.

The liquid with the lowest density will be on the top.

Objects or substances with MORE density will sink below objects or substances with LESS density

- **Which do you think is MORE dense,**

  Water or Oil???

Water, Oil…and a Superball

The oil is less dense than the water, so it's on top. The superball is less dense than water, but more dense than oil, so it sinks to the bottom of the oil layer, yet floats on the top of the water layer.

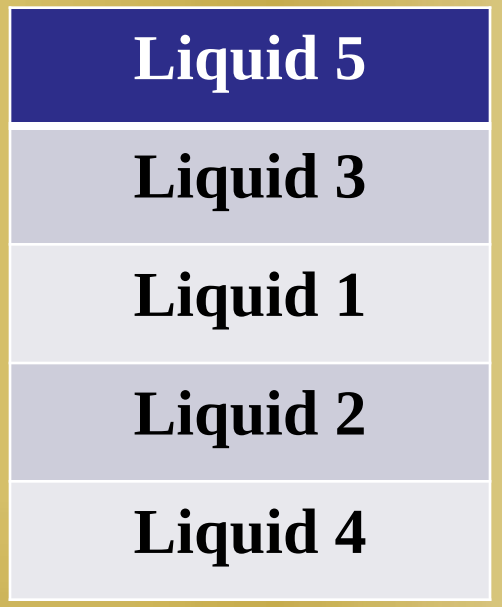
If you have 2 or more substances,

the MORE dense substance will be on bottom

The LESS dense substance will be on top

The density of five liquids are measured as follows:

- **Liquid 1: 1.0 g/mL**
- **Liquid 2: 1.38 g/mL**
- **Liquid 3: 0.77 g/mL**
- **Liquid 4: 2.95 g/mL**
- **Liquid 5: 0.056 g/mL**



Draw a picture of all 5 liquids in a test tube how they would layer according to density

Liquid Layers

Check out this picture. Which layer has the highest density?

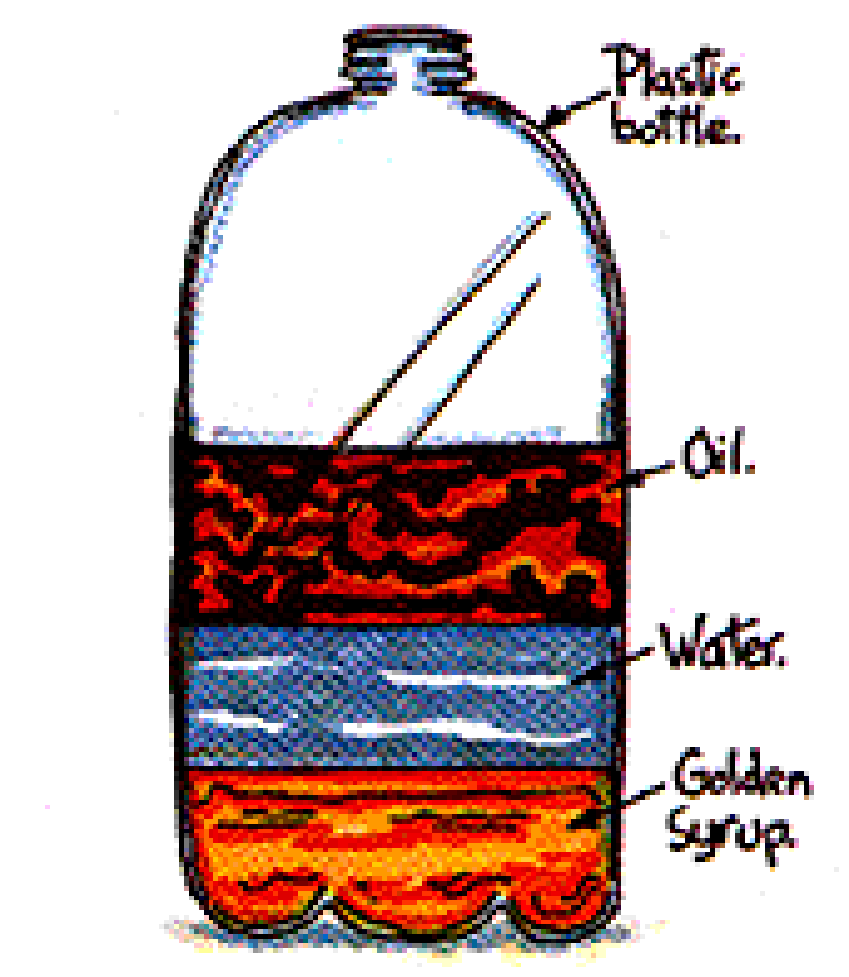
Which layer has the lowest density?

Imagine that the liquids have the following densities:

- **10g/cm^3.** **3g/cm^3.**
- **6g/cm^3.** **5g/cm^3.**

Which number would go with which layer?

Liquid Layers – Try with your neighbor



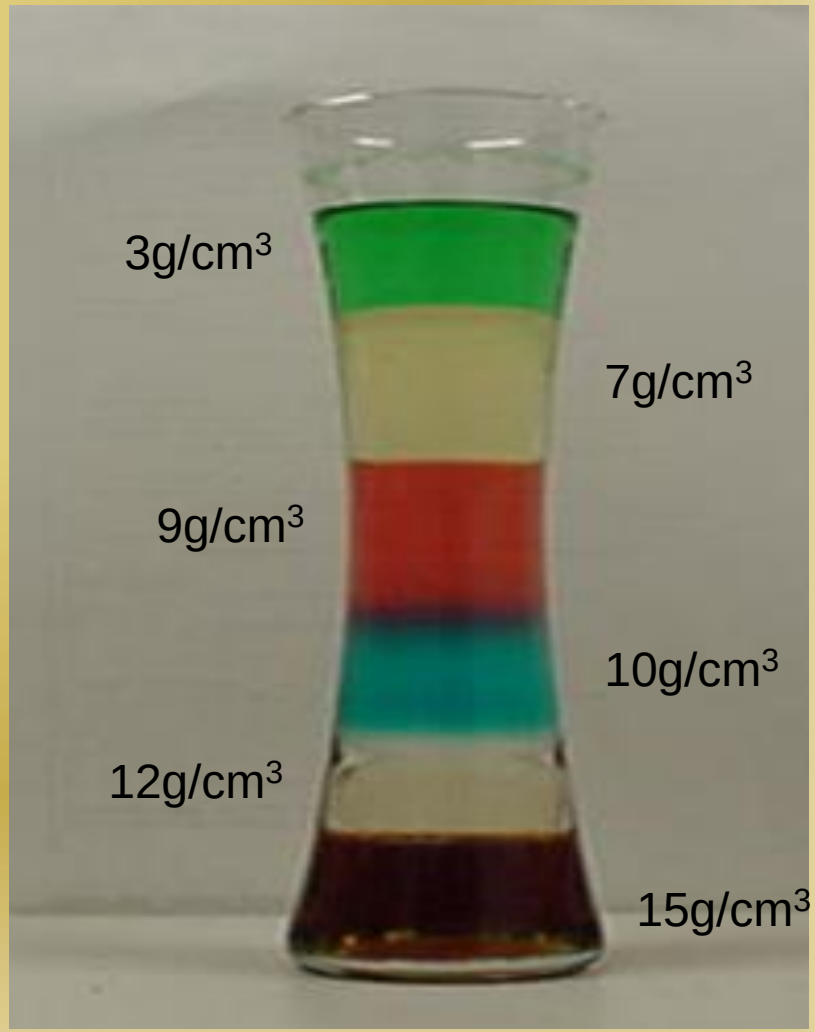
- Which liquid has the highest density?
- Which liquid has the lowest density?
- Which liquid has the middle density?

Liquid Layers
Try on your own!

Imagine that the liquids on the right have the following densities:

- **15g/cm^3 10g/cm^3**
- **3g/cm^3 9g/cm^3**
- **7g/cm^3 12g/cm^3**

Match the colors to the correct densities.



Review

What is the formula for density?

What happens if you pour together liquids that have different densities?

Will the liquid on the top have the highest or lowest density?

Will the liquid on the bottom have the highest or lowest density?

Super Scientist
Question of the Day

- Jake has a book, a ruler, and a balance.
- **How can Jake find the density of the book with the tools he has?**