

# Chemistry All Around Us!

## Week 5: Grades 6-8

### Day 2: Density

#### Teacher/Parent Background:

Everything on Earth is made of matter. Matter is anything that has mass and takes up space. Matter is as simple as a single element or as complex as the entire planet. In science, an amount of space is called volume. Matter can be any substance in the gas, liquid, or solid state.

When we describe matter, we usually think of the physical properties of the object, for example: color, smell, taste, feel, volume, and mass. Another important physical property is density. The more matter squeezed into the space, the denser the substance will be. Density is a physical property that relates the amount of matter to a certain amount of space.

#### Overview:

In this activity, students learn about the physical property, density. Students complete activities in order to learn the definition of density, the units used to calculate density, and the methods to calculate density.

#### Related Standards:

Obtain and evaluate information regarding how scientists identify substances based on unique physical and chemical properties.

#### Key Terms:

- Mass: Measures how much matter is present in a substance.
- Gram, g: The basic metric unit of mass.
- Volume: A measure of the space that matter occupies.
- Cubic Centimeter, cm<sup>3</sup>: A metric unit of volume equal to a milliliter.
- Milliliter, ml: A metric unit of volume.

#### Materials List:

- Vegetable Oil
- Water
- Honey

- Rubbing Alcohol
- Corn Syrup
- 1 clear cup
- 1 or 2 liter bottle
- Food Coloring
- Alka Seltzer Tab
- Pen/pencil
- Colored pencils/crayons/markers
- Internet access - optional for *Extensions*
- Calculator - optional
- *Student Resources*

### Activity Description:

1. Provide students with the Student Resource pages and have them follow instructions.
2. You can help them check their math with the answers below:

Object	Mass (g)	Volume (cm <sup>3</sup> )	Density (g/cm <sup>3</sup> )
Vegetable Oil	18.83	20.42	.922
Water	18	18	1.0
Gold	9.565	.5	19.13
Honey	9.94	7	1.420
Potato	11.66	11	1.06
Liquid Nitrogen	1.42	20	.071
Aluminum	37.8	14	2.7
Ping Pong Ball	1.765	21	.084
Rubbing Alcohol	13.352	17	.7854
Corn Syrup	3.45	25	1.38

## Closure:

**Why do some things float and others sink?** Items that sink are more dense than water: their particles are more tightly packed, with less air inside. Items that float are less dense than water: their particles are more loosely packed, with more air inside.

## Extensions:

Temperature and Pressure: Earth's conditions vary by both temperature and by pressure. Have students investigate how temperature, pressure, density and phase changes in matter interact. Assign one of the following examples to each person in the class.

(1) In regions where winter temperatures dip below freezing temperatures, sidewalks and roadways crack and heave during the winter, often forming potholes.

(2) In the mountains, rocks fracture and erode due to the water that enters small cracks in the surface.

(3) Rocks deep in the Earth are under great pressure and high temperatures. Under such great pressure rocks often remain in a solid state even though they are heated beyond their melting point. When the pressure rapidly reduces, the rocks melt and because molten rock is less dense than solid rock, it rises to the surface as a liquid magma in a volcanic eruption.

## Student Resources

The data table below shows measurements of the amount of matter of various physical properties according to the following mathematical expression:

$$\text{Density} = \text{mass/volume} \quad \text{Volume} = \text{mass/density} \quad \text{Mass} = \text{density} \times \text{volume}$$

Complete the data table. Next, circle the highest density and place a square around the lowest density.

Object	Mass (g)	Volume (cm <sup>3</sup> )	Density (g/cm <sup>3</sup> )
Vegetable Oil	18.83	_____	.922
Water	_____	18	1.0
Gold	9.565	.5	_____
Honey	_____	7	1.420
Potato	11.66	_____	1.06
Liquid Nitrogen	1.42	20	_____
Aluminum	_____	14	2.7
Ping Pong Ball	1.765	21	_____
Rubbing Alcohol	13.352	17	_____
Corn Syrup	3.45	_____	1.38

When liquids of different densities are put in the same container, they will separate into layers. You might have seen this with oil and vinegar. The oil is less dense, so it will “float” on the vinegar. The more dense liquids will “sink” to the bottom.

Use the data table to answer the following questions.

1. If mixed with water, which liquids will sink to the bottom?

2. If mixed with water, which liquids will float on top?

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3. Draw what you predict would happen if you poured all the liquids from the data table above together into a single cup. Color your picture after you've completed the legend below.

Color	Liquid	Color	Liquid
	Oil		Water
	Honey		Alcohol
	Nitrogen		Syrup

4. Make your own lava lamp! Create your own "lava lamp using 1- or 2-liter bottles. To make a simple lava lamp, first fill the bottle almost full with vegetable oil. Add a small spoonful of water and a few drops of food coloring. Next, break an alka seltzer tablet into small pieces and add to the bottle. Put the cap on and observe the reaction! Additional alka seltzer tablets can be added as needed. Send a video of your lava lamp to your teacher!.