

# St. 4 Density

# Density Objectives

## Level 3

- Is able to utilize the density equation to solve for density, volume or mass
- Is able to identify a substance based on its density.
- Can explain whether density is an intrinsic or extrinsic value

## Level 2

- Recognizes or recalls specific terminology such as: mass, volume, density, intrinsic, extrinsic
- Performs basic processes, such as:  
Calculate the density of a substance given its mass and volume

# Are you dense?

- Well, you all are...

Because you all have these two properties

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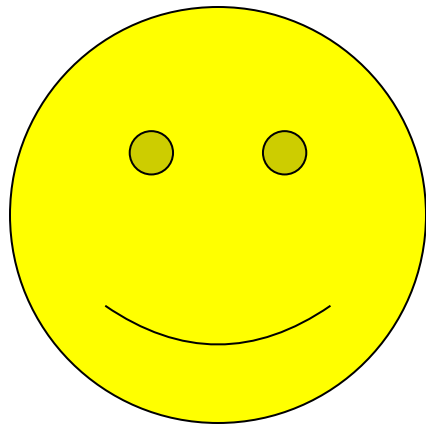
You are made up  
of  
**MATTER**...which  
means you have  
mass

You all have  
**VOLUME**...which  
means you take  
up space

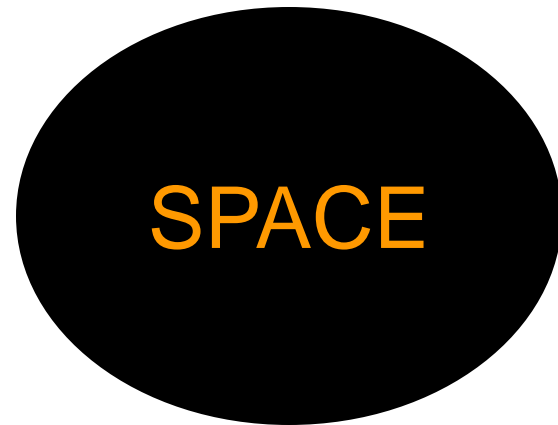
# When You Combine Mass and Volume, you get...

- Density

A measure of the amount of matter that occupies a given amount of space



Amount of Matter

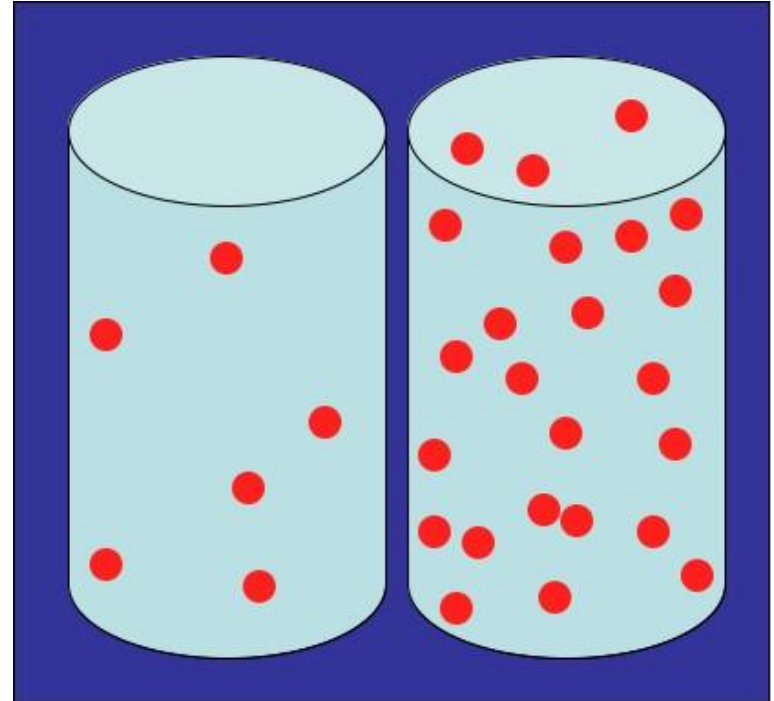


# Density

- Density is a physical property of matter.
- Density is an Intrinsic Value (next slide)
- Density is the amount of matter contained in a unit of volume.

*OR*

- Mass divided by volume (g/mL)



# Intrinsic vs Extrinsic

- Intrinsic- Does NOT matter how much matter you have
  - Ex: color, boiling point, melting point, density
- Extrinsic- Does matter how much matter you have
  - Ex: length, mass, volume, size, shape

So now you're going to say we need math to help understand science?

- Right!!!!

# Here's the Equation

$$D = \frac{M}{V}$$

Units for Density =  
Grams per milliliter  
or g/mL

Grams per  
cubic centimeter  
or g/cm<sup>3</sup>

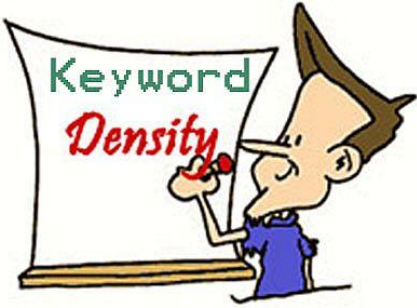
# What Do All Those Letters Mean?

**D = Density**

**M = Mass**

**v = Volume**





- To find density you must find a mass and a volume
- 1. Find the mass with a triple beam balance
- 2. Find the volume using displacement in a graduated cylinder
- 3. Divide

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

or, in short form:

$$d = \frac{m}{v}$$

# Want to See An Example Question?

- An unknown object has a mass of 15 grams and a volume of 5 cm<sup>3</sup>. What is the density of this object?

$$\text{Density} = \text{Mass} \div \text{Volume}$$

$$\text{Density} = 15 \text{ grams} \div 5 \text{ cm}^3$$

$$\text{Density} = 3.0 \text{ g/cm}^3$$

# Your Turn!!!

- An unknown liquid has a volume of 6 cm<sup>3</sup> and a mass of 6 grams. What is the density of this liquid?

$$\text{Density} = \text{Mass} \div \text{Volume}$$

$$\text{Density} = 6 \text{ grams} \div 6 \text{ cm}^3$$

$$\text{Density} = 1.0 \text{ g/cm}^3$$

**GOOD JOB!!!**

# Density

- Density is different for each substance.
- “Heavier” is the same as “more dense”.
- Density is a measure of how close atoms are in an object.
- Atoms with greater atomic mass are denser.

# Which is more dense?

One penny OR 10 pennies?



# Intrinsic vs Extrinsic

- Intrinsic- Does NOT matter how much matter you have
  - Ex: color, boiling point, melting point, density
- Extrinsic- Does matter how much matter you have
  - Ex: length, mass, volume, size, shape

# How Can We Compare Densities?

- Well...there are a known set of densities on record throughout the world

Density of Water =

1.0 g/cm<sup>3</sup>

**Gives Us Buoyancy**

# Buoyancy

- An object's ability to float in water

Density Greater than  $1.0 \text{ g/cm}^3 =$

**Sinks**

Density Less than  $1.0 \text{ g/cm}^3 =$

**Floats**