

Density:

- A property of matter that is independent of quantity and shape
- Different for every substance because:
 1. atoms have different masses
 2. atoms may be packed tightly or loosely

Equation:



$$\text{Density} = \frac{\text{mass}}{\text{Volume}}$$

$$V \cdot D = \frac{m}{V} \cdot V$$

$$V \cdot D = m$$

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

Density Lab:

Problem: Can you identify unknown metals by calculating their density?

Objectives:

1. Measure the mass and volume of 6-12 substances.
2. Calculate the density of each sample.
3. compare your calculated value with known densities to identify your metals.

Pre-Lab

$$D = \frac{\text{mass}}{\text{Volume}}$$

$$\left[\frac{\text{g}}{\text{mL}} \right] \left[\frac{\text{kg}}{\text{L}} \right] \left[\frac{\text{g}}{\text{cm}^3} \right] \left[\frac{\text{kg}}{\text{m}^3} \right]$$

$$1 \text{ mL} = 1 \text{ cm}^3 \Rightarrow 1 \text{ g}$$

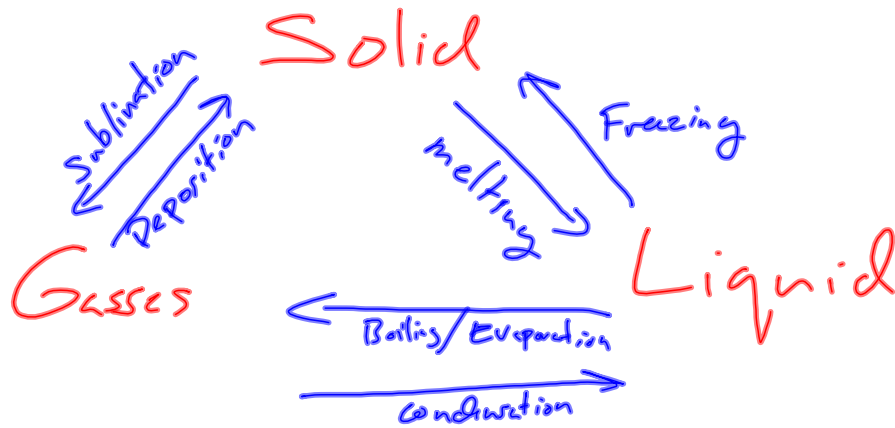
Sample	Mass (g)	Volume of cube (cm ³)				Volume w/ graduated cylinder (mL)			Density [*] (g/mL) (g/cm ³)
		Side 1 (cm)	Side 2 (cm)	Side 3 (cm)	Volume [*] (cm ³)	Water before (mL)	Water after (mL)	Vol of Object [*]	

- 1) Finish collecting data
- 2) Identify substances using the Chart + Google
- 3) Finish Post Lab Questions

Possible substances:

copper, brass, Iron, steel,
aluminum, lead,

Sample	Density g/cm ³
Acrylic	1.17 +/- 0.02
Oak	0.7 +/- 0.2
Nylon	1.13
Pine	0.47 +/- .1
Poplar	0.43 +/- 0.8
PVC	1.41 +/- 0.02



1. Find the Average and Uncertainty of the following data:

$$\frac{27800 + 28220 + 28010 + 27932}{4} = 27990.5$$

$$\frac{28220 - 27800}{2} = 210$$

$$27990.5 \pm 210$$

$$28000 \pm 200$$

2. Convert 96 clowns into buttons where

$$\frac{96 \text{ clowns}}{2 \text{ clowns}} = 7 \text{ buttons} \quad 2 \text{ clowns} = 7 \text{ buttons}$$

$$336 \text{ buttons}$$