

Name: _____

Period: _____

Density and Buoyancy

Density



Density is a measure of how tightly packed the atoms of a substance are.

A ping-pong ball and a golf ball are approximately the same size.
Which one is more dense? A: _____.



The density of an object could be increased in two ways:

- 1) if you cram more matter into a particular volume of space (increase mass) or
- 2) cram the matter you have into a smaller volume of space (decrease volume—which you could do with a gas).

Density: $D = \frac{m}{v}$

in g/mL or g/cm³ Mass in grams (g) Volume in cm³ or mL

What does this equation say in plain English?

Ex. An 20 gram object has a volume of 5 cm³. Find its density.

Solution: $D = \frac{m}{v} = \frac{20 \text{ g}}{5 \text{ cm}^3} = 4 \text{ g/cm}^3$

Practice:

Find the density of an 45 gram object that's volume is 15 mL.

If a 10 mL object weighs 22 grams, what is its density?

In class find the density of the three object that you are given.

	Mass	Volume	Density
Object 1:			
Object 2:			
Object 3:			

Density of States of Matter

You already know about the three most common states of matter. How does the density of a substance change when it changes temperature or changes its state of matter?

Which is more dense a liquid or a solid?

Which is more dense a liquid or a gas?

We learned that the molecules in a solids are closer together. This is why solids are more dense.

Liquids slide around and are less closely packed. Liquids are less dense than solids.

Not all solids are denser than liquids. There is one great and important exception.

What is it?



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Water is more dense as a liquid than a solid. And good thing, too!
 Many forms of life depend on ice being less dense.
 Name one:

List the densities of the 3 objects from the first page and record if they floated or sank.

In class find the density of water:

<u>Mass</u>	<u>Volume</u>	<u>Density</u>

	Density	Sink or Float?
Object 1:		
Object 2:		
Object 3:		

What did you find out about floating or sinking substances and density?

If an object has a density of 1.35 g/mL, will it float or sink in water?

Buoyancy

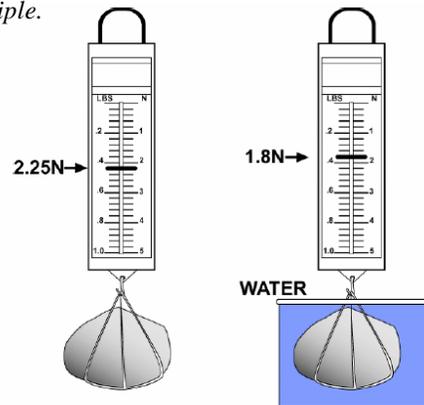
Buoyancy is the force of a liquid or gas pushing up on an object that is immersed in it (put into it).

Buoyancy is why you feel lighter in water than on land. Buoyancy is why sea animals can grow to be so large. A blue whale is the largest mammal to have ever lived: up to 100 feet long. The water supports a whale's body.



A whale would be crushed by its weight on land.

Water pushes on an object immersed in it. The amount of buoyancy force it exerts on the object equals the amount of water that is displaced. If the water displaced equals or exceeds the weight of the object it will float. This is known as *Archimedes Principle*.



1. Density	a. A measurement of how easily a solid can be pounded into thin sheets	1. Tensile Strength	a. Upward force of a liquid or gas pushing upon something immersed in it.
2. Hardness	b. A measurement of the "compactness" of a substance; ratio of mass to volume.	2. viscosity	b. Any material that flows; either a gas or a liquid.
3. Brittleness	c. Measure of a solid's ability to return to its original shape after stretching.	3. buoyancy	c. Measure of a fluid's resistance to flow. (How thick a fluid is.)
4. Elasticity	d. A measure of how easily a solid will shatter.	4. g/mL	d. Measure of how hard it is to break something by pulling.
5. Malleability	e. A measure of how easily a solid can be scratched.	5. fluid	e. Unit of density.