Lesson 4 – The Concept of Density

THE FOLLOWING **VIDEO** HAS BEEN APPROVED FOR
ALL AUDIENCES
BY THE EARTH SCIENCE TEACHERS ASSOCIATION OF AMERICA, INC

THE VIDEO HAS BEEN RATED

I — INTELIGENT
UNDER 15 REQUIRES TEACHER ASSISTANCE

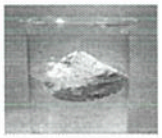
STRONG EARTH SCIENCE LANGUAGE, DETAILED DIAGRAMS, AND SUPER AWESOMENESS

- I can find the relative density of an object.
- I can explain why density does not change based on size or shape.
- I can describe how temperature affects density
- I can describe how pressure affects density
- I can explain how phases of matter affect density

Determining Relative Density

- Relative Density is <u>comparing</u> one density to another and finding an <u>estimated density</u>
- For example:

Pumice floats in water. What do you think its estimated density is?



Less than one g/cm³

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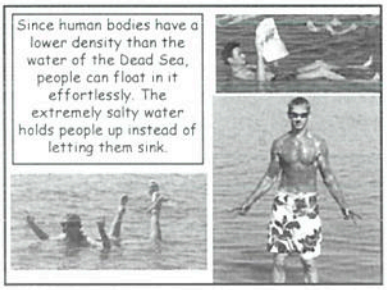
Put the following objects and liquids in order of least dense to most dense.

		Liquids	Solids
Least Dense	A		←A
	E	E →	
	B		←B
	F	F →	
	G	G →	←C
	C	H →	
	H		←D
Most Dense	D		

Dead Sea

- Regular ocean has 35g of salt per liter (1,000 ml). The water in the Dead Sea has 345g per liter (1,000 ml).
- Almost 6x more salty than the ocean
- NO Fish or Plants

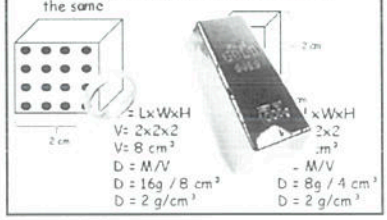
Since human bodies have a lower density than the water of the Dead Sea, people can float in it effortlessly. The extremely salty water holds people up instead of letting them sink.



What is Density?

A. Fusibility
B. Weight
C. Volume/Mass Ratio
D. Mass/Volume Ratio

- Density is a ratio of Mass to Volume
  - If you cut an object in ½ you are reducing the mass & volume by ½ so the density will stay the same



V = LxWxH
V= 2x2x2
V= 8 cm³
D = M/V
D = 16g / 8 cm³
D = 2 g/cm³

V = LxWxH
V= 2x2x1
V= 4 cm³
D = M/V
D = 8g / 4 cm³
D = 2 g/cm³

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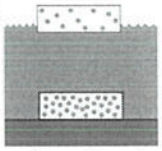
Changes that Affect Density

- Temperature:
  - If an object is heated, molecules move further apart
  - Therefore there is less mass per unit of volume
  - If an object is cooled, the molecules move closer together and density increases again.

Example

Heated object →

Cooled object →



(Draw Picture)

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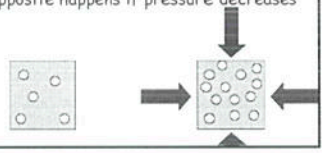
- Pressure
  - If pressure increases, molecules move closer together and mass increases
    - more mass per unit volume & a higher density
  - Opposite happens if pressure decreases



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Phases of Matter and Density

- Density of a substance changes with changes in its phase (state) of matter
- Most substances have a higher density as a ___Solid___, because the molecules are ___closer together___.

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- The exception to this rule is water.
- Water has its greatest density at 3.98°C.

This is why ice floats in water!