

Teaching Sciences by Ocean Inquiry
SMS 491/ EDW 472
Spring 2008

Background:

Density (ρ) is defined as mass divided by volume ($\rho = \frac{m[M]}{V[L^3]}$). The SI unit of density is kg/m^3 and the cgs unit is g/cm^3 .

Mass is a fundamental physical property because it is conserved. When comparing fluids, however, mass (how much matter there is) is not a very useful quantity. We may have a lot of one fluid and little of the other, yet it is the one that is denser that will sink below the less dense fluid, regardless of their relative amounts. Thus, for fluids the property we are interested in is the mass per unit volume, that is, the density. Density is central to the understanding of many oceanic processes: from plate tectonics and the formation of ocean basins, through ocean circulation and the transport of carbon from ocean surface to depth.

As a property of matter, density is one of the topics taught in secondary school physical science. While most adults have heard about the concept of density both school-age students and adults hold a number of *misconceptions* about density. Examples of *misconceptions* include (the list was compiled by the [Operation Physics](#) Elementary/middle school physics education outreach project of the [American Institute of Physics](#)):

- Large objects sink and small objects float.
 - Objects float in water because they are lighter than water.
 - Objects sink in water because they are heavier than water.
 - Wood floats and metal sinks.
 - All objects containing air float.
 - Mass/volume/weight/heaviness/size/density may be perceived as equivalent.
- Note: while weight is commonly used as an equivalent to mass, in physics it is used to describe a particular force arising from the gravitational pull between objects (e.g. the Earth and the mass).