# 1  Chapter12 Fluid Mechanics

## 1.1  Density

For homogenous materials,

$$\rho = \frac{m}{V} \tag{1.1}$$

*$\rho_{water} = 1g/cm^3$
Example cocktail wine

## 1.2  Pressure in a fuild

Pressure, the normal force per unit area.

$$p = \frac{F_{normal}}{A} \tag{1.2}$$

$$1 Pascal, 1Pa = 1N/m^2,$$
$$1 atmosphere, 1atm = 101,325 Pa. \tag{1.3}$$

Where 1 atmosphere is the atmospheric pressure $P_a$, the pressure of the earth's atmosphere, the pressure at the bottom of this sea of air in where we live.
   * Absolute pressure and Gauge pressure

$$1atm = 14.7 lb/in^2,$$
$$1atm = 760 mmHg = 10.3 meters of water. \tag{1.4}$$

Gauge pressure is the excess pressure above atmospheric pressure.
   Example, pressue in a car is "32 pounds per square inch", it means it is greater than atmospheric pressure by this amount.
   Example, blood pressure is "130/80 millimeters of mercury".

## 1.3  Pascal's Law

Pressure in a fluid of uniform density.

$$p_2 - p_1 = -\rho g (y_2 - y_1),$$
$$p = p_0 + \rho g h. \tag{1.5}$$

Example 12.3

- All points at the same depth much be at the same presure.

- Pressure applied to an enclosed fuild is transmitted undiminished to every portion of fluid and the walls of the containing vessel.

$$p = \frac{F_1}{A_1} = \frac{F_2}{A_2} \tag{1.6}$$

## 1.4 Archimedes's principle

When a body is completely or partially immersed in a fluid, the fluid exerts an upward force (buoyant force) on the body equal to the weight of the fluid displaced by the body.

http://www.youtube.com/watch?v=ijj58xD5fDI