# Fluids

Planet Holloway Physics

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

Density – kg/m$^3$

$$P = \frac{F}{A},\ P = \frac{dF}{dA}$$

Pressure – measured in N/m$^3$ (a Pascal (Pa)) or ATM (1.01 x $10^5$ Pa = 1 ATM)

- same pressure in all directions at a given point
- same pressure at equal depths

$$P = P_0 + \rho g h$$

Absolute pressure is the fluid pressure plus "outside" pressure

- typically adding air pressure that is from atmosphere

$$F_{buoy} = \rho V g$$

Buoyancy – it is not the density of the object but a comparison of the weight of the object to the weight of the fluid displaced

$$SG = \frac{\rho_{object}}{\rho_{referencefluid}}$$

Specific Gravity – a ratio of the density of an object to the density of the reference fluid (typically water).

$$A_1 v_1 = A_2 v_2$$

Equation of Continuity (for an ideal fluid)

Ideal fluid

- nonviscous – no internal friction
- incompressible – never happens, but most liquids compress very little

- steady motion – no changes over time
- no turbulence – no rotation within fluid

$$P_1 + \rho g h_1 + \frac{1}{2}\rho {v_1}^2 = P_2 + \rho g h_2 + \frac{1}{2}\rho {v_2}^2$$

Bernoulli's Equation

- Venturi tube – when fluid is routed through a smaller opening the pressure drops as the speed increases. (Can be used to create a "vacuum")

$$F_1 A_2 = F_2 A_1$$

Pascal's Principle – this is how hydraulic lifts work