

## Fluids

Density:  $\rho = \frac{m}{V}$        $\rho_{\text{water}} = 1.000 \times 10^3 \frac{\text{kg}}{\text{m}^3}$

### Pressure:

Pressure:  $p = \frac{F}{A}$        $p_{\text{atm}} = 1.013 \times 10^5 \text{ Pa} = 1 \text{ atm}$

Pressure in a Static Fluid:  $p = p_0 + \rho g d$

*Pascal's Principle:* Any change in the pressure applied to a completely enclosed fluid is transmitted undiminished to all parts of the fluid and the enclosing walls

### Buoyancy:

*Archimede's Principle:* the magnitude of the buoyant force on an object partially or completely immersed in a fluid equals the weight of the fluid displaced

Buoyant Force:  $F_B = \rho_{\text{fluid}} V_{\text{sub}} g$

⇒ if an object is completely submerged,  $V_{\text{sub}} = V_{\text{obj}}$

⇒ if an object is floating,  $F_B = w = mg$

### Fluids in Motion:

Equation of Continuity:  $\rho_1 A_1 v_1 = \rho_2 A_2 v_2$

⇒ if the fluid is incompressible ( $\rho_1 = \rho_2$ ):  $A_1 v_1 = A_2 v_2$

Bernoulli's Equation:  $P_1 + \frac{1}{2} \rho v_1^2 + \rho g y_1 = P_2 + \frac{1}{2} \rho v_2^2 + \rho g y_2$

*Bernoulli's Principle:* where the speed of a fluid increases, the pressure in the fluid decreases