**Fluids**

**Density:**  \[ \rho = \frac{m}{V} \quad \rho_{\text{water}} = 1.000 \times 10^3 \text{ kg/m}^3 \]

**Pressure:**

**Pressure:**  \[ P = \frac{F}{A} \quad \text{P}_{\text{atm}} = 1.013 \times 10^5 \text{ Pa} = 1 \text{ atm} \]

**Pressure in a Static Fluid:**  \[ P_2 = P_1 + \rho gh \]

**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

\[ F_B = \rho_{\text{fluid}} V_{\text{sub}} g \]

⇒ 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