

Answer on Question #75819, Physics / Mechanics — Relativity

Question A solid block is attached to a spring scale. When the block is suspended in air, the scale reads 21.4 N ; when it is completely immersed in water, the scale reads 15.2 N . a)What is the volume of the block? b)What is the density of the block?

Solution The forces in these cases (air and water) are:

$$F_a = mg = \rho_b V g$$

$$F_w = (\rho_b - \rho_w) V g$$

where $\rho_w = 1000 \text{ kg/m}^3$ is density of water and ρ_b is density of the block and V is its volume. We can find it from this two equations:

$$\frac{F_a}{F_w} = \frac{\rho_b}{(\rho_b - \rho_w)}$$

$$\rho_b = \rho_w \frac{F_a}{F_a - F_w} = 1000 \cdot \left(1 + \frac{21.4}{21.4 - 15.2}\right) \approx 3452 \text{ kg/m}^3$$