

Answer on Question #45446, Physics, Mechanics – Kinematics - Dynamics

A rectangular block of plastic, measuring 2.27 cm by 2.43 cm by 2.11 cm, floats in the middle of the Pacific Ocean. The volume of sea water displaced by the plastic block is 8.24 cm³. Assuming the density of the sea water is 1.025 g/mL, what is the density of the plastic?

The sum of all forces on the block should be 0, because the block is in equilibrium position:

$$m_b g - F_a = 0$$

Where F_a is the Archimedes' force, m_b is the mass of block

$$m_b g = \rho_w g V_d$$

Where V_d – displaced volume

This equation could be transformed:

$$\begin{aligned} m_b &= \rho_w V_d \\ \rho_b V_b &= \rho_w V_d \rightarrow \rho_b = \frac{\rho_w V_d}{V_b} = \frac{\rho_w V_d}{abc} \\ \rho_b &= \frac{1.025 \frac{g}{cm^3} \cdot 8.24 cm^3}{2.27 cm \cdot 2.43 cm \cdot 2.11 cm} \approx 0.726 \frac{g}{cm^3} \end{aligned}$$

Answer: the density of the plastic is: $\rho_b = 0.726 \frac{g}{cm^3}$