

A hollow box has a mass of 200g, what is the minimum volume the box could have and still float?

The limiting condition for the box to float is when it's completely immersed in the liquid, but still doesn't drown. In such case, according to the Newton's third law, buoyant force has an opposite direction and the same magnitude as the weight force, which drowns the box.

From this condition we obtain equation of force equilibrium:  $\rho_{liq} \cdot g \cdot V_b = m_b \cdot g$ , where  $\rho_{liq}$  is the density of the liquid,  $\text{kg/m}^3$  (for water  $\rho = 1000 \text{ kg/m}^3$ );  $g = 9.81 \text{ m/s}^2$  - standard gravity;  $V_b$  – required volume,  $\text{m}^3$ ;  $m_b$  – mass of the box,  $\text{kg}$  ( $200 \text{ g} = 0.2 \text{ kg}$ ).

Then,  $V_b = m_b / \rho_{liq} = 0.2 / 1000 = 2 \cdot 10^{-4} \text{ m}^3 = 0.2 \text{ L}$ .

Answer: 0.2 L.