

Question: a block of density D floats in a liquid with its one third volumes immersed. What is the density of the liquid?

Solution: the block floats in a liquid, so it means that this block is in equilibrium state: the sum of all forces acting on it is zero. There are two forces acting on this block: downward gravitational force $F_g = mg$ and upward buoyant force. The buoyant force we find from equation

$$F_b = \rho g V,$$

Here ρ is the density of a liquid and V – volume of immersed part of the body. Since $F_g = F_b$, we become:

$$\rho g V_{immersed} = mg$$

$$\rho g \frac{V}{3} = DVg,$$

Because the mass of the body is $m = D \cdot V$. From last equation we obtain density of the liquid:

$$\rho = 3D.$$

Answer: $\rho = 3D$.