Question #78313, Physics / Other

A 5.0 kg block and 4.0 kg of water in a 0.5 kg container are placed symmetrically on a board that can balance at the center. A solid aluminium block of sides 10 cm is lowered into the water. How much of the aluminium must be under water to make this system balance? The density of water and aluminium are 1.0 x 103 kg/m3 and 2.7 x 103 kg/m3, respectively.
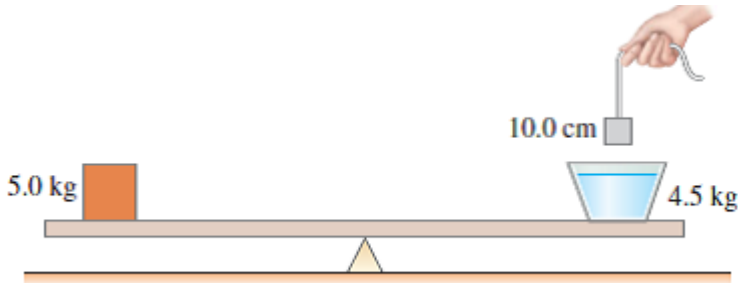

10.0 cm

5.0 kg

4.5 kg

FIGURE 10–60 Search and Learn 1.

Solution

$$F_{LHS} = mg = 5.0g$$

$$F_{RHS} = 4.5g + \rho_{water}gV$$

For the equilibrium:

$$F_{LHS} = F_{RHS}$$

$$5.0g = 4.5g + \rho_{water}gV$$

$$V = \frac{0.5}{\rho_{water}}.$$

$$M_{al} = \rho_{al}V = \rho_{al}\frac{0.5}{\rho_{water}} = 0.5\frac{2.7}{1.0} = 1.35 \ kg.$$

Answer: 1.35 kg.

Answer provided by https://www.AssignmentExpert.com