Question#23227

Suppose you have a rectangular wooden block with dimensions 8.0 cm x 8.0 cm x 9.0 cm that has a density of 0.85 x 10^3 kg/m^3. The block has a cylindrical hole inside it so that a lead cylinder 5.0 cm in diameter and 7.5 cm high can be fitted completely inside. What is the volume of the lead cylinder that fits inside (in m^3)? What is the mass of the lead cylinder if the density of lead is 1.13 x 10^4? (Density kg/m^3)? What is the volume of the wood in the wooden block (excluding the volume of the cylindrical hole)?

Solution:

Let:

$L = 8\ cm = 0.08\ m$

$B = 8\ cm = 0.08\ m$

$H = 9\ cm = 0.09\ m$

$D = 5\ cm = 0.05\ m$

$h = 7.5\ cm = 0.075\ m$

$\rho_{lead} = 1.13 * 10^4\ \ kg/m^3$

$m_{lead} = ?$

$V_{wood} = ?$

The mass of lead is:

$m = \rho_{lead} * V_{lead},\ were\ V_{lead}\ is\ the\ volume\ of\ the\ lead\ cylinder$

$V_{lead} = \frac{1}{4}\pi D^2 h$

$$\boldsymbol{V_{lead} = \frac{1}{4}3.142 * 0.05^2 * 0.075 = 0.000147\ m^3}$$

$$\boldsymbol{m = 11300 * 0.000147 = 1.664\ kg}$$

The volume of the wood is:

$V_{wood} = V - V_{lead},\ were\ V\ is\ the\ volume\ of\ the\ rectangular\ block$

$V = L * B * H$

$V_{wood} = L * B * H - V_{lead}$

$$\boldsymbol{V_{wood} = 0.08 * 0.08 * 0.09 - 0.000147 = 0.000429\ m^3}$$

Answer:

The mass of lead is 1.664 kg, the volume of wood is 0.000429 m^3(429 cm^3).