

Answer on Question #58063-Physics-Mechanics

A hollow cylinder is made of gold. The mass of the object is $m = 702.24 \text{ kg}$ and the volume enclosed by the outside surface of the cylinder is $V_{outer} = 49.28 \cdot 10^{-3} \text{ m}^3$. What is the radius of the cylindrical cavity if the height is $h = 20 \text{ cm} = 0.2 \text{ m}$? $\rho_{gold} = 19000 \frac{\text{kg}}{\text{m}^3}$

Solution

$$V_{outer} = \pi R^2 h$$

The outer radius is

$$R = \sqrt{\frac{49.28 \cdot 10^{-3}}{\pi \cdot 0.2}} = 0.28 \text{ m.}$$

The volume of hollow cylinder is

$$V = \pi(R^2 - r^2)h = \frac{m}{\rho} = \frac{702.24}{19000} = 36.96 \cdot 10^{-3} \text{ m}^3$$

The radius of the cylindrical cavity is

$$r = \sqrt{\frac{V_{outer} - V}{\pi \cdot h}} = \sqrt{\frac{49.28 \cdot 10^{-3} - 36.96 \cdot 10^{-3}}{\pi \cdot 0.2}} = 0.14 \text{ m} = 14 \text{ cm.}$$

Answer: 0.14 m = 14 cm.