Question #62383, Chemistry / General Chemistry

A 10.0 cm long cylindrical glass tube, sealed at one end, is filled with ethanol. The mass of ethanol needed to fill the tube is found to be 12.12 g. The density of ethanol is 0.789 g/mL. Calculate the inner diameter of the tube in centimeters.

Solution:

To calculate diameter of the tube we need to check the volume of this tube:

$$V = \pi \cdot r^2 \cdot h$$

where h is a height of cylindrical glass tube.

But in this problem we can calculate the volume of this tube using the mass and density of ethanol:

$$V = \frac{m}{\rho} = \frac{12.12}{0.789} = 15.36 \text{ cm}^3$$

Using this volume value we can calculate radius of a tube:

$$r = \sqrt{\frac{V}{\pi \cdot h}} = \sqrt{\frac{15.36}{3.14 \cdot 10.00}} = 0.70 \text{ cm}$$

As we know, the inner diameter of cylindrical tube is the twice radius:

$$d = 2 \cdot r = 2 \cdot 0.70 = 1.40 \text{ cm}$$

Answer: the inner diameter of the tube equal to 1.40 cm.