

Answer on Question #71706-Physics-Other

The pressure increases by $1.0 \times 10^4 \text{ N/m}^2$ for every meter of depth beneath the surface of the ocean. At what depth does the volume of a Pyrex (bulk modulus $2.6 \times 10^{10} \text{ N/m}^2$) glass cube, $5.6 \times 10^{-2} \text{ m}$ on an edge at the ocean's surface, decrease by $3.0 \times 10^{-10} \text{ m}^3$?

Solution

Bulk modulus is

$$K = \frac{\Delta P}{\frac{\Delta V}{V}}$$

$$\Delta P = K \frac{\Delta V}{V}$$

$$\Delta P = \frac{dP}{dh} h$$

$$h = \frac{K}{\frac{dP}{dh}} \frac{\Delta V}{V}$$

The depth is

$$h = \frac{2.6 \cdot 10^{10}}{1.0 \cdot 10^4} \frac{3.0 \cdot 10^{-10}}{(5.6 \cdot 10^{-2})^3} = 4.4 \text{ m.}$$

Answer: 4.4 m.

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