

Answer on Question #53003, Physics / Mechanics | Kinematics | Dynamics

For $K = 2.2 \times 10^9 \text{Pa}$ for the bulk modulus of elasticity of water, what pressure is required to reduce its volume by 0.5%?

Solution:

We have the following given data.

Bulk modulus of elasticity of water (K) = $2.2 \times 10^9 \text{Pa} = 2.2 \text{ Gpa}$

Reduction in volume ($\frac{\Delta V}{V}$) = $-0.5\% = -0.005$

We need to determine the pressure (ΔP).

We know that the modulus of elasticity is equal

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

Thus, we can substitute the given values according the condition of the task into the noted above formula.

$$2.2 \times 10^9 = -\frac{\Delta P}{-0.005}$$

Now, we can simplify the obtained equation in order to find the value of pressure which is required to reduce its volume by 0.5%.

$$\Delta P = (2.2 \times 10^9) \cdot 0.005 = 11000 \text{ KPa}$$

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