Answer on Question#38131 – Physics - Mechanics

When the pressure on a sphere is increased by 80 atmospheres, its volume decreases by 0.01%. Find the bulk modulus of elasticity of the material of the sphere?

Solution:

Here, increase in pressure, p = 80 atmosphere. Now, 1 atmosphere = $1.013 \times 10^5 \frac{N}{m^2} \Rightarrow p = 80 \cdot 1.013 \times 10^5 \frac{N}{m^2}$ and $\frac{\Delta V}{V} = \frac{0.01}{100}$.

Bulk modulus:

$$B = \frac{p}{\left(\frac{\Delta V}{V}\right)} = \frac{80 \cdot 1.013 \times 10^5 \frac{N}{m^2}}{\left(\frac{0.01}{100}\right)} = 8.1 \cdot 10^{10} \frac{N}{m^2}.$$

Answer: Bulk modulus is equal to $8.1 \cdot 10^{10} \frac{N}{m^2}$.