

## Answer on Question 70377, Physics, Other

### Question:

A bulk modulus of water is  $2.1 \text{ GPa}$ . Compute the volume contraction of  $100 \text{ mL}$  of water subjected to a pressure of  $1.5 \text{ MPa}$ .

### Solution:

Let's recall the definition of the bulk modulus. The bulk modulus,  $K$ , is a material property characterizing the compressibility of the fluid. The bulk modulus can be calculated as follows:

$$K = -\frac{dp}{dV/V_0},$$

here,  $K = 2.1 \text{ GPa}$  is the bulk modulus of water,  $dp = 1.5 \text{ MPa}$  is the pressure change that is required in order to change the volume of water by  $dV$ ,  $V_0 = 100 \text{ mL}$  is the initial volume of water.

From this formula we can find the volume contraction  $dV$ :

$$dV = -V_0 \frac{dp}{K} = -100 \text{ mL} \cdot \frac{1.5 \cdot 10^6 \text{ Pa}}{2.1 \cdot 10^9 \text{ Pa}} = -0.071 \text{ mL}.$$

The sign minus indicates that an increase in pressure is accompanied by a decrease in volume.

### Answer:

$$dV = -0.071 \text{ mL}.$$

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