Answer on Question #41041, Physics, Other

The length of each side of a cube measured with verier calipers is 30mm.If the vernier calipers can be read with an uncertainty of ±0.14mm, what does this give for approximate uncertainty in the value of its volume?

Solution

The length of each side of a cube is $l = 30 \ mm$. The uncertainty in length is $\Delta l = 0.14 \ mm$. The percentage uncertainty in volume is

$$\frac{\Delta V}{V} = \frac{\Delta l}{l} + \frac{\Delta l}{l} + \frac{\Delta l}{l} = 3\frac{\Delta l}{l} = \frac{3 \cdot 0.14}{30} = 0.014.$$

The volume of a cube is

$$V = l^3 = 30^3 = 27000 \ mm^3 = 27 \ cm^3.$$

The uncertainty in the value of volume of a cube is

$$\Delta V = \frac{\Delta V}{V} \cdot V = 0.014 \cdot 27000 = 380 \ mm^3 = 0.38 \ cm^3.$$

Answer: $0.38 \ cm^3$.