

Answer on Question #70364, Physics / Mechanics | Relativity

Question. The least count of a stopwatch is $\frac{1}{5}$ s. The time of 20 oscillations of a pendulum is measured to be 25 s. What is the maximum percentage error in this measurement?

Given.

$$\Delta t = \frac{1}{5} \text{ s} = 0.2 \text{ s};$$

$$n = 20;$$

$$\langle t \rangle = 25 \text{ s}.$$

Find.

$$\varepsilon - ?.$$

Solution.

The measured time of 20 oscillations of a pendulum is

$$t = \langle t \rangle \pm \Delta t = (25 \pm 0.2) \text{ s}.$$

The period of one oscillation is

$$T = \langle T \rangle \pm \Delta T = \frac{t}{n} = \frac{\langle t \rangle}{n} \pm \frac{\Delta t}{n}.$$

Finally

$$\varepsilon = \frac{\Delta T}{T} = \frac{\Delta t/n}{\langle t \rangle/n} = \frac{0.2}{25} = 0.008 \text{ or } 0.8 \%$$

Answer: $\varepsilon = 0.8 \%$.

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