

Answer on Question#54894 - Physics - Other

Least count of stopwatch is $\sigma = 1/5$ of a second. If it measures $n = 20$ oscillations in $t = 25$ seconds then find max percentage error in the experiment.

Solution:

The measured time of 20 oscillations is given by

$$\tau = t \pm \sigma = 25\text{s} \pm 0.2\text{s}$$

The period of one oscillation is then given by

$$\tau_1 = \bar{\tau}_1 \pm \sigma_{\tau_1} = \frac{\tau}{n} = \frac{t}{n} \pm \frac{\sigma}{n}$$

Therefore the max percentage error is given by

$$\varepsilon = \frac{\sigma_{\tau_1}}{\bar{\tau}_1} = \frac{\sigma/n}{t/n} = \frac{\sigma}{t} = \frac{0.2}{25} = 0.008 = 0.8\%$$

Answer: 0.8%.