

Warm-up 10/6/17

In a simple pendulum experiment, a student measures the period T of the pendulum many times and obtains an average value $T = (2.540 \pm 0.005)$ s. The length L of the pendulum is measured to be $L = (1.60 \pm 0.01)$ m.

Calculate, using $g = \frac{4\pi^2 L}{T^2}$, the value of the acceleration of free fall, including its uncertainty. State the value of the uncertainty to one significant figure.

$$\%T = \frac{0.005}{2.540} \times 100 = 0.197 \approx 0.2\%$$

$$\%L = \frac{0.01}{1.60} \times 100 = 0.625\%$$

$$\%g = \%L + 2(\%T) = 0.625 + 2(0.197) = 1.02 \approx 1\%$$

$$g = \frac{4\pi^2(1.60)}{(2.540)^2} = 9.791 \pm 1\% \approx 9.791 \pm 0.098 \approx 9.8 \pm 0.1$$

$$g = 9.8 \pm 0.1 \text{ m}\cdot\text{s}^{-2}$$