



2. The period of oscillation of a simple pendulum is $T = 2\pi \sqrt{\frac{L}{g}}$. Measured value of L is 20.0 cm known to 1 mm accuracy and time for 100 oscillations of the pendulum is found to be 90s using a wrist watch of 1s resolution. The accuracy in the determination of g is:

- (1) 2% (2) 3% (3) 1% (4) 5%

Answer: We know that $T = 2\pi \sqrt{\frac{L}{g}}$, $T^2 = 4\pi^2 \frac{L}{g}$

$$\text{or } g = \frac{1}{4\pi^2} \frac{L}{T^2}$$

$$\text{or } \frac{\Delta g}{g} \times 100 = \frac{\Delta L}{L} \times 100 + \frac{2\Delta T}{T} \times 100$$

$$\text{given } \Delta L = 0.1 \text{ cm}, L = 20 \text{ cm}, T = \frac{90}{100} = 0.9 \text{ and } \Delta T = \frac{1}{100}$$

$$\text{therefore } \frac{\Delta g}{g} \times 100 = \frac{0.1}{20} \times 100 + \frac{2 \times 1}{100 \times 0.9} \times 100 = 0.5 + 2.22 = 2.72 \approx 3,$$

Nearest value in the option is 3.

Correct Answer is option (2) 3%