Answer on Question #64293-Physics-Other

A period of disk of radius 10.2 cm executing small oscillation about a pivot at its rim is measured to be 0.784 s. find the value of g. the acceleration due to gravity at that location?

Solution

For a physical pendulum the period is

$$T = 2\pi \sqrt{\frac{I}{mgh}}.$$

$$h = r.$$

$$I = I_{disk} + mh^2 = \frac{mr^2}{2} + mr^2 = \frac{3}{2}mr^2.$$

$$T = 2\pi \sqrt{\frac{\frac{3}{2}mr^2}{mgr}}$$

$$\left(\frac{T}{2\pi}\right)^2 = \frac{3r}{2g}$$

$$g = \frac{6\pi^2 r}{T^2} = \frac{6\pi^2(0.102)}{(0.784)^2} = 9.83\frac{m}{s^2}.$$

Answer: $9.83\frac{m}{s^2}$.