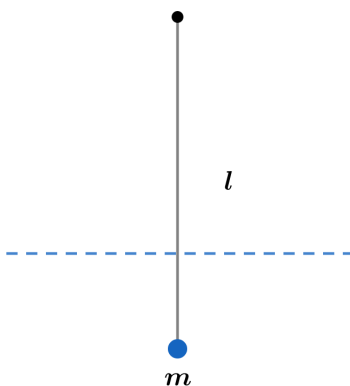


2019A F=ma Exam: Problem 19

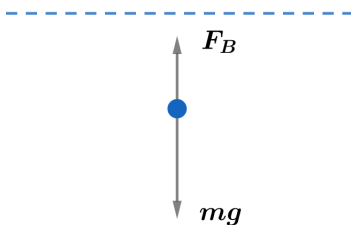
Kevin S. Huang



Recall the angular frequency for a simple pendulum is given by

$$\omega = \sqrt{\frac{g}{l}}$$

The presence of water changes the effective gravitational acceleration.



We have

$$\begin{aligned} mg_e &= mg - F_B \\ \rho_r V g_e &= \rho_r V g - \rho_o V g \\ g_e &= \frac{\rho_r - \rho_o}{\rho_r} g = \frac{2\rho_o - \rho_o}{2\rho_o} g = \frac{g}{2} \end{aligned}$$

Thus,

$$\omega = \sqrt{\frac{g_e}{l}} = \sqrt{\frac{g}{2l}} = \sqrt{\frac{10 \text{ m/s}^2}{2(5 \text{ m})}} = 1 \text{ rad/s}$$

so the answer is A.