65. The rotational inertia for an axis through A is $I_{\rm cm} + mh_A^2$ and that for an axis through B is $I_{\rm cm} + mh_B^2$. Using Eq. 16-29, we require

$$2\pi\sqrt{\frac{I_{\rm cm} + mh_A^2}{mgh_A}} = 2\pi\sqrt{\frac{I_{\rm cm} + mh_B^2}{mgh_B}}$$

which (after canceling 2π and squaring both sides) becomes

$$\frac{I_{\rm cm} + mh_A^2}{mgh_A} = \frac{I_{\rm cm} + mh_B^2}{mgh_B} \ .$$

Cross-multiplying and rearranging, we obtain

$$I_{\rm cm}\left(h_B - h_A\right) = m\left(h_A h_B^2 - h_B h_A^2\right) = mh_A h_B\left(h_B - h_A\right)$$

which simplifies to $I_{\rm cm} = mh_A h_B$. We plug this back into the first period formula above and obtain

$$T = 2\pi\sqrt{\frac{mh_A h_B + mh_A^2}{mgh_A}} = 2\pi\sqrt{\frac{h_B + h_A}{g}} \ .$$

From the figure, we see that $h_B + h_A = L$, and (after squaring both sides) we can solve the above equation for the gravitational acceleration:

$$g = \left(\frac{2\pi}{T}\right)^2 L = \frac{4\pi^2 L}{T^2} \ .$$