Thomas-Palmer Physics In-Class Lecture Notes:

A Pendulum Conservation of Energy Problem
Thank You, Samya Ahmed, for these notes.

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$L = 2.0\,m$

$V_i = 0$

$\theta = 25.0°$

V @ bottom = ?

$ME_i = ME_f$

$PE_{ei} + PE_{gi} + KE_i = PE_{ef} + PE_{gf} + KE_f$

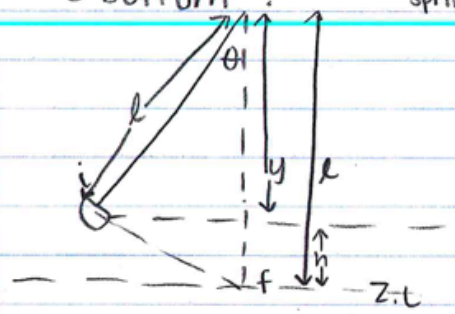
$\cancel{\frac{1}{2}kx_i^2}\ (\text{NO spring}) + mgh_i + \cancel{\frac{1}{2}mv_i^2}\ (v_i = 0) = \cancel{\frac{1}{2}kx_f^2}\ (\text{NO spring}) + \cancel{mgh_f}\ (h_f = 0) + \frac{1}{2}mv_f^2$

$\cancel{m}gh_i = \frac{1}{2}\cancel{m}v_f^2$

$gh_i = \frac{1}{2}v_f^2$

$gh_i = \frac{v_f^2}{2}$

$v_f = \sqrt{2gh_i}$



$\cos\theta = \frac{A}{H} = \frac{y}{l}$

$y = l\cos\theta$

$L = y + h_i$

$h_i = L - y$

$h_i = l - l\cos\theta$

$h_i = L(1 - \cos\theta)$

$$v_f = \sqrt{2gL(1-\cos\theta)} = \sqrt{(2)(9.81)(2)(1-\cos(25))} = 1.9164 \approx \boxed{1.9\frac{m}{s}}$$